MAKING L.F. AND SMOOTHING CHOKES

Practical Wireless

3D

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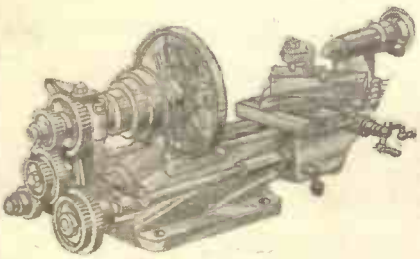
EDITED BY F. J. CAMM.

MICROPHONES - Types & Uses!

fascinatingly illustrated from cover to cover



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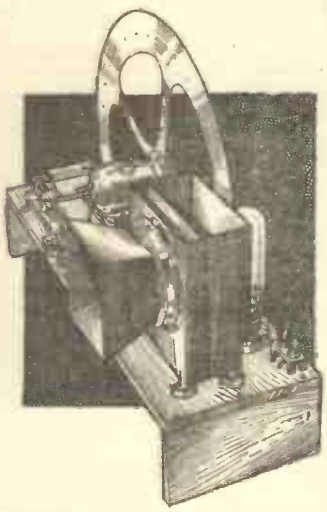

PRACTICAL MECHANICS

The January issue contains an entertaining blending of the most interesting subjects of modern appeal to every man.

There are articles on lathe building and lathe work, astronomy, microscopy, all types of mains transformers, model boats, railways and aeroplanes, television, wireless, the latest novelties, tools, gadgets, accessories, cinematography, photography, patent advice, electrical experiments, chemistry, etc., etc.

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THE LEADING HOME CONSTRUCTORS' WEEKLY

Practical Wireless

EDITOR: F. J. CAMM

Technical Staff: W. J. DELANEY, H. J. BARTON CHAPPLE, Wh.Sch., B.Sc., A.M.I.E.E., FRANK PRESTON, W. B. RICHARDSON

Vol. III, No. 66 Dec. 23rd, 1933

ROUND *the* WORLD *of* WIRELESS

Listen in to H.M. The King!

HIS MAJESTY THE KING will broadcast a message to his subjects in all parts of the world on Christmas Day at 3 p.m. G.M.T. Every reader should keep this appointment with his radio set. And, again, a pleasant and enjoyable Christmas to every reader.

A Remarkable Radio Year

THE year 1933, now drawing to a close, has been the most remarkable one for radio developments since the industry first started. Next year may witness even more astonishing developments, for radio still awaits its missing link—television. Radio cannot be considered as perfect until a satisfactory combined speech and vision programme is an actuality. Much is being done to accelerate that desirable end, especially with high definition television, and it seems to us that the solution will *not* be a mechanical one. We should not be satisfied with silent films today, and once we have synchronized vision and speech we shall marvel that we were able to suffer for so long from radio "blindness." Whenever television arrives, it will be suddenly—overnight, so to speak, as radio did over twelve years ago.

Our Prompt Query Service

ALTHOUGH our Readers' Query Service is free, and hundreds of technical queries are received each week; and notwithstanding that the number of queries is on the increase, yet we are able in most cases to send a reply within forty-eight hours. We have considerably augmented the staff attending to readers' letters, and we hope that *every* reader in doubt or difficulty will not hesitate to seek our advice. It will be speedily, cheerfully, and helpfully forthcoming.

Motala's Increased Output

FOLLOWING the lead given by other European nations in the increased power of their National transmitters, Sweden in the early part of 1934 will broadcast its main programmes through Motala on 150 kilowatts. So far the transmissions of this station have not exceeded 30 kilowatts (Copenhagen rating).

B.B.C. Regional Stations' Increased Power

WITH the reorganization of the B.B.C. system which is taking place next year, the power of the London, North, West, and Scottish Regional stations will be raised to 70 kilowatts as against 50 kilowatts at present used. The super high-power transmitter now under construction at Droitwich, and which is to replace Daventry National, will work on 150 kilowatts. It is expected to start testing towards March, and will then be formally opened for the summer months. Three National stations, namely, London, North and West, will then close down.

Original Musical Comedy Broadcast

MEET THE PRINCE, adapted from *The Prince and Betty* by P. G. Wodehouse, has been made the subject of a new musical comedy to be included in the Regional and National programmes on January 1st and 2nd.

Radio Lisboa

ALTHOUGH the buildings of the new high-power Portuguese station are not completely finished, the engineers have been trying out the transmitter. Listeners in the British Isles report hearing tests on 476.9 metres in the early hours of the morning.

American Stations Install Own News Service

AS a result of the restrictions made by the American newspaper organizations, the Columbia Broadcasting System has set up its own press bureau and broadcasts news collected by its representatives throughout the entire network. The C.B.S. news agencies have been established in the leading cities, and for the purposes of distribution the chain of stations is linked up by teletype, in order to rush the items through for dissemination through the microphone. It is stated that in this manner they are able to give their listeners details of topical events many hours before the newspapers are on sale in the streets. There is little doubt that the step taken will precipitate a fight between the broadcasting stations and the local press associations.

Belgium's Third Station

TO counteract Nazi propaganda broadcasts destined for the inhabitants of the Eupen and Malmedy (Belgium) districts, the authorities are considering the erection of a 7 kilowatt station on the eastern frontier for the transmission of programmes in the German language.

Interesting Statistics of Radio City

THE Headquarters of the N.B.C. at New York furnish some interesting figures regarding the installation on which six hundred engineers have been working for some months. The building is equipped with three hundred and twenty-five electric clocks which are all synchronized, and two hundred and fifty microphones have been scattered throughout the studios. In all, 1,250 miles of wire have been used, and it is estimated that this has entailed twenty million connections, one cable alone carrying 140 lines.

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

K-B Win-a-Daimler Competition

MESSRS. KOLSTER-BRANDES, the well-known radio manufacturers, have instituted a remarkable competition, which will be open to all purchasers of any one of their sets until the end of the year, when the competition will close. The prize is a £450 15h.p. Daimler Saloon car, fully taxed and insured for twelve months. Messrs. Kolster-Brandes are searching for: 1. A good name or title for their K-B 666 de luxe Receiver. 2. A slogan. The prize will be awarded for the best title and slogan. Full particulars, entry forms, and leaflets can be obtained from all K-B dealers. The model for which the title is being sought was created by the well-known designer, Betty Joel, seen in the illustration on this page, and is constructed of Queensland walnut, bound with chromium-plated steel. The set is designed for the anti-interference device known as the "Rejectostat," a self-contained unit applicable to any radio set. Provided the aerial is placed outside the field of interference, it will successfully eliminate electrical interference appliances of all kinds.

Fighting the Radio Pirates

IN Germany stringent measures are taken against owners of unlicensed radio apparatus. Between July and September, two hundred and forty-five persons were convicted in the courts; of these two hundred and thirty-seven were heavily fined, and eight were condemned to prison, the sentences ranging from three days to three months!

Further Relays for Austrian Network

TWO new relay stations are to be installed at Leoben and Villach, and will be constructed as soon as the Bregenz-Vorarlberg transmitter has been completed. Following the German plan, Austria contemplates a regrouping of her stations. Graz, Salzburg, and Villach will then work on one common wavelength and Linz, Klagenfurt, and Bregenz on another. On January 15th the following alterations in channels will take place: Vienna (Bisamberg) 506.8 m., Graz, 338.6 m., Salzburg, 226 m., and Innsbrueck, 578 m. With the exception of Vienna, most of the other stations will see an increase in power during 1934.

European Broadcast of Lehar's new Opera

THE first performance of Franz Lehar's new opera *Giuditta* is expected to take place at Vienna in January next. It will be relayed later to most of the main European broadcasting stations, as Austria's contribution to the International transmissions. Richard Tauber will sing the principal part.

A Greatly Sought Honour

OVER six hundred applications from wireless operators were received by the Organisers of the Byrd Antarctic Polar Expedition, of which four only were chosen. Many of them were well-known experimental amateurs.

INTERESTING and TOPICAL PARAGRAPHS

Punctuality!

IN American broadcasts you will frequently notice that transmissions are faded out if they exceed by only a minute or so their allotted time limit. Punctuality in the working of the advertised programmes is strongly insisted upon, and the drastic measure adopted of cutting out the microphone in the case of offenders permits the studio's strict adherence to the time schedule. There are no waits between items.

A WOMAN RADIO DESIGNER

Betty Joel with the famous K-B 666 she designed, in connection with which there is now running a £450 "Win-a-Car" competition.

SOLVE THIS!

Problem No. 66

Whilst listening to a broadcast programme Brown's receiver suddenly gave a slight click and thereafter produced only badly distorted signals. He switched off and substituted all the valves with spares which he had and found that still only badly distorted signals could be heard. He inserted a milliammeter in each anode circuit in turn, and although the H.F. and detector valves gave correct readings, the current of the putput valve was much greater than it should have been. He altered the grid biasing plug, but this made no difference to the anode current of this valve. What had happened? Three books will be awarded to the first three correct solutions opened. Address your envelopes to The Editor, PRACTICAL WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2. Envelopes should be marked Problem No. 66, and should be posted to reach here not later than Dec. 28th, 1933.

SOLUTION TO PROBLEM No. 65

Rodgers had forgotten that resistances in series produce a total resistance equal to the sum of the resistances, and thus he used a far too high value to enable the valve to receive sufficient H.T. Had he paralleled the two 250,000 ohm resistances he would have obtained better results.

The following three readers gave correct solutions of Problem No. 64, and books have accordingly been forwarded to them:

Mr. T. G. Childs, Torwood, Gubbins Lane, Harold Wood, Romford. Mr. G. T. Jervis, 343, Birchfields Rd., Webheath, Redditch. Mr. R. Taylor, Hazeldene, Churt.

Germany's Four Programmes

WITH the exception of the *Deutschlandsender* (Königs Wusterhausen), from January 15th, Germany will only broadcast three distinct programmes daily, as the stations are now being amalgamated into a Northern, Western, and South-Western network. The first will include Berlin, Stettin, Magdeburg, Hamburg, Hanover, Bremen, Flensburg, Kiel, Danzig, Königsberg, and Heilsberg; the second, Frankfurt, Cassel, Trier, Langenberg, Stuttgart, and Freiburg; the third, Munich, Nürnberg, Augsburg, Kaiserslautern, Leipzig, Dresden, Breslau, and Gleiwitz.

Monument plus Church Equals Station

THE new Turin local transmitter, which relays the Rome programmes, has been installed in the Teatro Torino, taken over by the Broadcasting Company. The aerial is connected to the top of the Mole Antonelliana, the tower of which is 550 feet high, the highest point of the City. The station works on 220 metres (1,364 kc/s), and has replaced the old Eremo transmitter, which was rendered useless through snow storms.

The First Time Signal

IN these days of progress it is easy to lose sight of events which in previous years aroused considerable interest. November 21st, 1933, was the twenty-third anniversary of the first time signal wirelessed by the Eiffel Tower from the Paris Observatory to ships at sea, an innovation which benefited the world at large.

Broadcast of Christmas Greetings

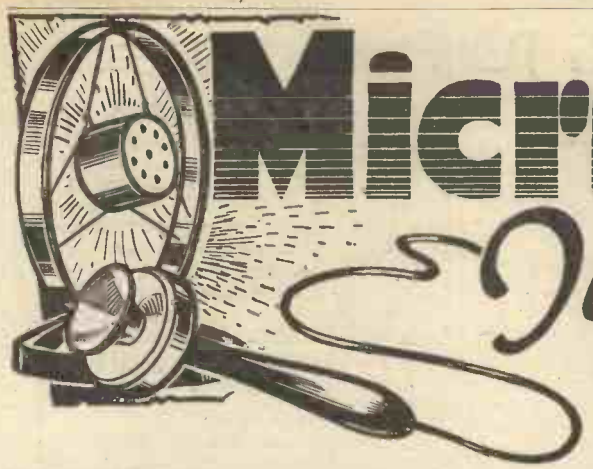
SIMILAR to the principle adopted last year the Danish authorities will again permit their licence-holders to broadcast private Christmas messages to relatives in Greenland and the Polar Circle. Seven studios will be placed at their disposal for this purpose for three nights before Christmas Eve between 11.0 p.m. and 1.0 a.m. G.M.T. The messages, which must be of a purely private character, are transmitted verbally through the high-power Kalundborg station.

How Many Broadcasters?

IF the latest returns are to be taken as accurate, there are, at present, 1,426 broadcasting transmitters in the world giving a daily service of wireless programmes. Of these, 585 are situated in the United States of America.

The Bells of Bethlehem

IT is now possible to announce that the programme specially composed for Christmas Eve by the B.B.C., in co-operation with the N.B.C. of America, will include items relayed from Bethlehem, Winchester, London, and New York. Thanks to the active co-operation of the Colonial Office and the High Commissioner for Palestine, arrangements have been concluded which will permit of a relay from the Holy Land at 8 p.m. G.M.T., on December 24th.



Microphones Types & Uses

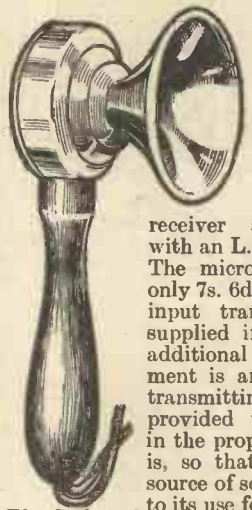
There are Now a Number of Small Microphones on the Market, and the Reader is Often in Doubt as to Which He Should Buy. This Survey of a Few of the Best-known Will Prove Helpful.

MICROPHONES are being used more and more by owners of wireless sets, and there is no doubt that they add much to the interest and entertainment of parties which are so frequently held at this time of the year. Until quite recently there were very few simple, inexpensive microphones available to the amateur, and to buy one of these instruments involved an expenditure of a fairly considerable amount of money. This state of affairs has now been modified entirely by the introduction of a number of really efficient, compact microphones, designed especially for use in conjunction with an ordinary wireless receiver of practically any type. Methods of connecting a microphone to the set were dealt with rather fully in articles which appeared in our Christmas Number, and we have since received numerous inquiries from readers in regard to the most suitable microphone for their individual requirements. For this reason a general review of some of the better-known components on the market, and at popular prices, will be helpful.

We might first of all refer to the General Electric Company's well-known "Home Broadcaster," which consists of a microphone flexibly suspended within a metal ring which is mounted on a hollow metal base. Inside the base are fitted a volume-control potentiometer (with calibrated scale) and also a small dry battery which supplies the energizing power. Additionally, there is a convenient switch connected in the battery-microphone circuit. Altogether this is an extremely convenient instrument which only requires to be connected up to the pick-up terminals of any receiver to enable excellent results to be obtained. The makers have even made arrangements for the latter connection by providing a good long, screened lead. Due to the screening, it is possible to use the microphone at almost any distance from the set without running the risk of instability or L.F. oscillation. The G.E.C. "Home Broadcaster" is unusually sensitive, and responds quite well to sounds originating several feet from it; in fact, we have found it possible to reproduce good quality speech by speaking at a distance of four feet from the instrument. At an inclusive price of 18s. 6d. this instrument represents wonderful value.

The Epoch Microphone.

A somewhat different type of microphone is that made by Messrs. R. C. and Wilson Electric, Ltd. This is of the "hand" pattern with "trumpet" mouthpiece, and is also supplied with a length of connecting lead. It is not fitted with a transformer, battery, or volume control, however, but is intended rather for use with a receiver already provided with an L.F. volume control. The microphone itself costs only 7s. 6d., whilst a suitable input transformer can be supplied if required for an additional 6s. This instrument is amply sensitive for transmitting speech or music, provided that it is turned in the proper direction, that is, so that it "faces" the source of sound. In addition to its use for home entertainment purposes, it will also find a wide application with those amateurs who hold transmitting licences.



The R.C. and Wilson Microphone.

Several useful and interesting microphones are made by the Scientific Supply Stores (Wireless), Ltd., and these range from a small microphone button (No. 1) at 3s. 6d., to a complete assembly (called the "De-Luxe" at 17s. 6d. There is also a second microphone button (No. 2) at 4s. 9d., or 5s. if fitted with a diaphragm. This firm supplies an extremely wide range of microphone components from which the constructor can build his own instrument in the simplest possible way and at a minimum of expense. The completely assembled microphone ("Junior" type), which costs 12s. 6d., is illustrated on the right, and can be seen to consist of a unit flexibly mounted in a metal ring and fitted with a circular base. An interesting point about both this and the "De-Luxe" model is that the flexible connecting lead supplied with it is provided with a neat valve-holder adaptor, consisting of a paxolin disc with holes corresponding to the pins on the valve base. A metal eyelet is fitted to the hole corresponding to the anode pin, and this is connected to one microphone lead; the other lead is fitted with an eyelet connector which is taken to an earth terminal. This method of connecting a microphone is rather unusual, but is found to work extremely well and has the advantage that it is applicable to any receiver whether it is provided with pick-up terminals or not. Additionally, it removes the need for an energizing battery, whilst the normal L.F. volume control in the set is operative upon the microphone input.

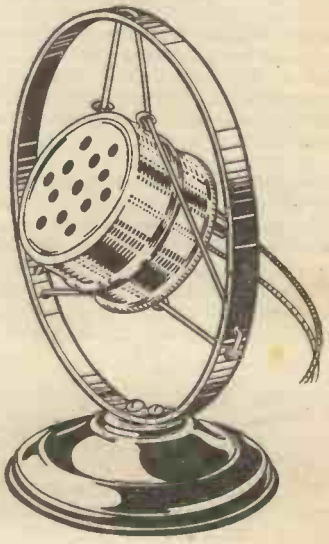
The Scientific Supply Stores Junior Type Microphone.

It will also interest readers to know that the Scientific Supply Stores publish an interesting little book entitled "Wonders of the Microphone," and costing 6d. Besides giving much useful information and many diagrams, showing how different microphones can be connected and employed for a variety of purposes, this booklet contains a price list of the many microphone accessories which the firm supply.

A Non-Directional Microphone

Another microphone which has many points of interest is that made by Capt. A. J. Roberts. This instrument can be used in the hand or it may be stood up on the table.

(*Continued on page 742*)



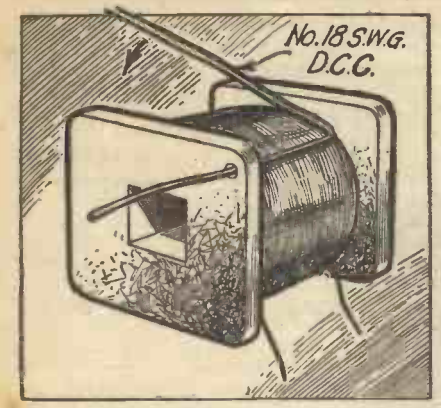


Fig. 1.—Cover the primary with a layer of cambric before starting the secondary winding.

CONVERTING TO ALL-MAINS

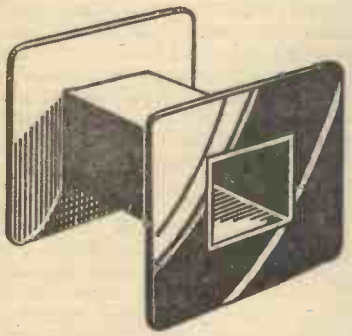
(PART II).

Details are Here Given for Building a Heater Transformer.

By C. H. KEELING, A.M.I.R.E.

IN the previous article we indicated the various alternatives, so far as the output valve is concerned. Readers may have in their possession a 2-volt, 4-volt, or 6-volt valve, therefore details will be given for the different windings required when building a heater transformer.

The number of turns of wire should be 9 per volt—that is to say, assuming A.C. mains of 230 volts, our primary will have to be wound with 2,070 turns of .0092 (34 gauge) enamelled wire, and the secondary supplying the heaters of the 4-volt valves should be wound with 36 turns of .048 (18 gauge) double cotton-covered wire. If we are using a 2-volt or 6-volt valve in the output stage, the filament of which is to have "raw" A.C. applied as shown previously, it becomes necessary to wind two separate heater secondaries, one for the 4-volt valves, and another for the 2- or 6-volt valve. If 2-volt, the separate winding will have to have 18 turns, and for a 6-volt filament we must employ 54 turns.



Centre-tapped Transformer

It is essential that the secondaries shall be centre-tapped, and this is easy to accomplish if we proceed to wind the transformer methodically. The primary wire can be wound first, care being taken to leave a good length of wire at both ends for making our external connections. Double cotton-covered wire could be employed for the primary, and no doubt would be less likely to be damaged in the hands of the beginner; incidentally, it is cheaper, but it is considerably more bulky, and would probably necessitate a larger bobbin. For this reason enamelled wire is recommended, it being stressed that great care must be taken to avoid "criss-cross" windings, which impose an enormous strain on the turns when the coil is fully wound. This very often is the cause of short-circuited turns owing to the enamel cracking. Periodical "interleaving" with cambric or impregnated paper will make for efficiency.

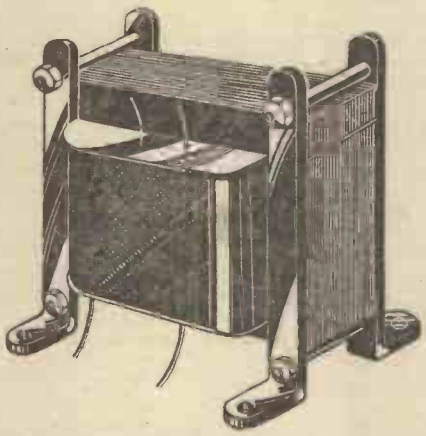


Fig. 3.—The finished transformer.

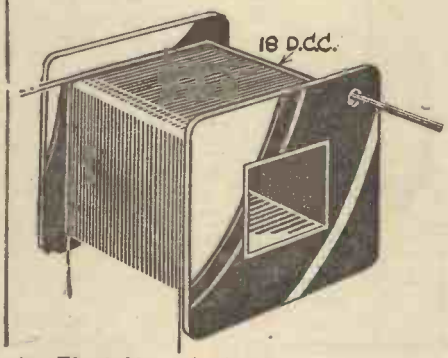
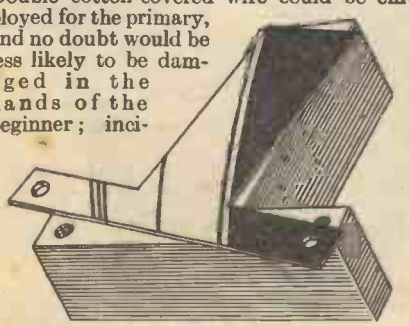


Fig. 4.—The bobbin, finished primary winding, and partly wound secondary winding.



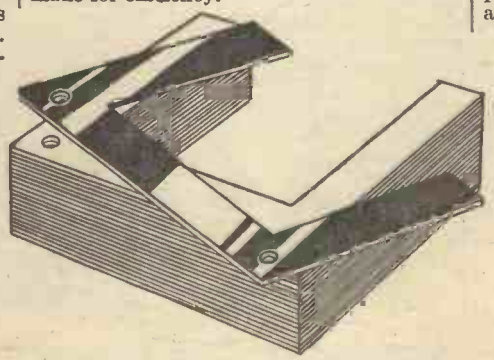


Fig. 5.—The stampings and clamping brackets.

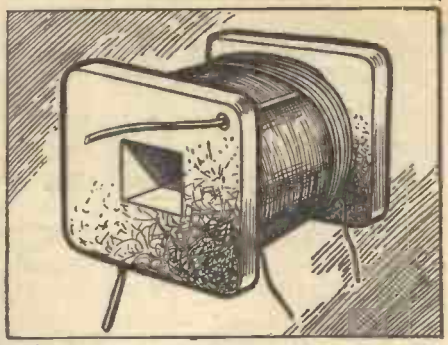
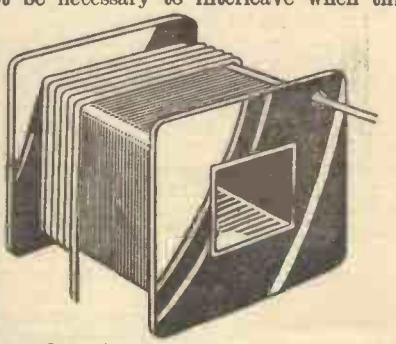


Fig. 2.—The commencement of the secondary winding.

The Secondary Winding

Having finished the primary, we can start on the secondary winding. First cover the primary with a layer of cambric, then drill a hole in the cheek of the bobbin just clear of the cambric; make a right-angle bend in the thick wire and place the end through the hole, allowing the angle in the wire to rest against the inside of the opposite bobbin cheek (see Fig. 1). We can now wind this thick wire over the bent section, thus ensuring that it will not slip. To obtain the centre tap, wind half of the total number of turns to be wound, bring out the end a few inches, bend a loop, and proceed to wind the rest of the turns. As we will have to bare the insulation at the loop, it may be advisable to cut the wire at this point, and twist the two bared ends together preparatory to soldering them later. In order to fix the turns in position when making the centre tap, or for any other reason, use a little Chatterton's Compound.

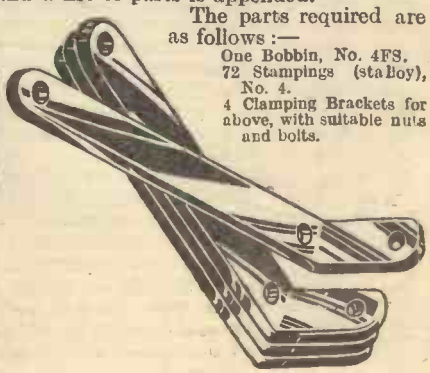
If d.c.c. wire is used instead of enamelled for the primary, first coat it with shellac and allow to dry before winding. It will not be necessary to interleave when this type of insulated conductor is in use, but a good layer of varnished cambric should be placed between the primary and secondary windings.



The illustrations Figs. 4 and 5 show the parts required to make a workmanlike job, and a list of parts is appended.

The parts required are as follows:—

One Bobbin, No. 4FS.
72 Stampings (stalloy), No. 4.
4 Clamping Brackets for above, with suitable nuts and bolts.



Interesting uses for H.F. METAL RECTIFIERS

The "Westector" has Many Interesting Applications to Modern Receivers, and a Number of These are Explained Below. By BERNARD DUNN

THE dry high-frequency metal rectifier, better known as the "Westector," was introduced to the public rather less than a year ago but, although it has been widely adopted by manufacturers of both complete receivers and components, the constructor seems to have been somewhat slow to recognize the undoubted advantages which it offers. As a matter of fact, this type of rectifier is of particular value in modern circuits, where it can be used for a variety of purposes. Moreover, it is inexpensive in prime cost and, since it requires neither high nor low tension current, it costs absolutely nothing in the way of running expenses.

As a Normal Detector

First of all let us consider just what this H.F. metal rectifier is capable of. It is similar in construction and principle to the larger metal rectifiers used in mains receivers and eliminators, but its self-capacity is so low that it can be used in radio frequency circuits. It is not particularly sensitive, and because of that it is not suitable for use in a "crystal" set in place of the crystal detector. But, on the other hand, it can handle a considerable amount of signal current, and is therefore eminently suitable for use as a detector following two or more stages of high-frequency amplification. A portion of the complete circuit of a two-V.M. receiver in which a "Westector" of the half-wave type is used as detector is shown in Fig. 1. It can be seen from this that the metal rectifier acts in almost the same way as does a diode valve, but it does not require any filament current. As the rectifier is connected it will be seen that the end which is remote from the tuned-grid coil becomes negative in respect to the other end (which is connected to earth), and from this it will be evident that the voltage-drop across the rectifier can be used for providing A.V.C. acting upon the V.M. valves. All the necessary components and connections required in order to obtain A.V.C. are shown in broken lines. The method of functioning of the automatic volume control device is perfectly simple and can readily be understood when it is realized that the voltage-drop, or potential difference, across the terminals of the rectifier depends upon the strength of the signals applied to it. The bias voltage fed back to the V.M. valves is, therefore, proportional to the voltage (H.F.) of the signal applied to the rectifier.

The method of rectification and A.V.C. just described is applicable to any receiver in which tuned-grid or tuned-transformer coupling is used between the second H.F. amplifier and the detector, but cannot be employed in conjunction with tuned-anode coupling because in that case there is no direct connection between the positive side of the rectifier and earth. Since the rectifier is so comparatively insensitive it is also absolutely essential for good results that the H.F. stages are really efficient. It can be stated as a fairly general rule that unless the degree of H.F. amplification is so high as to make it possible to overload an ordinary leaky-grid valve detector, the metal rectifier will not be very suitable.

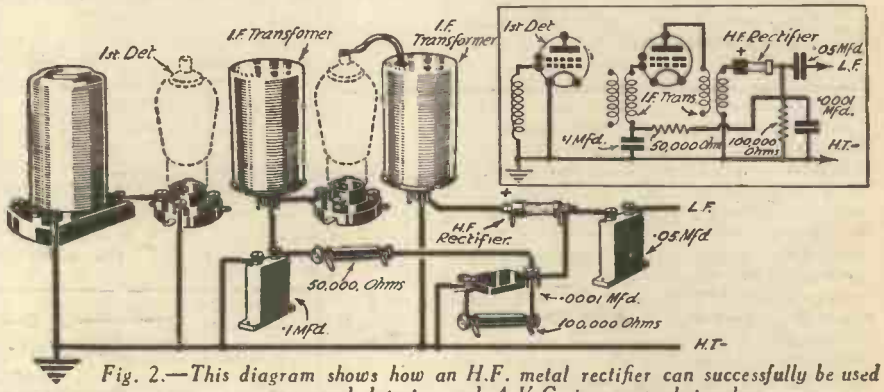


Fig. 2.—This diagram shows how an H.F. metal rectifier can successfully be used as second detector and A.V.C. in a superheterodyne.

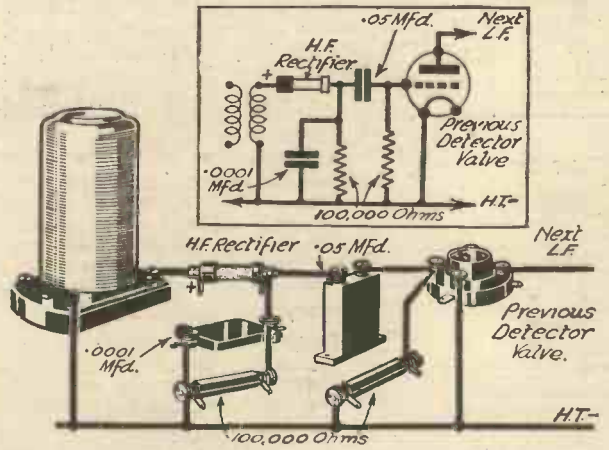


Fig. 3.—This circuit shows how a half-wave rectifier can be inserted between the last tuned circuit and the valve which previously acted as detector. The latter valve now acts as a resistance-coupled L.F. amplifier.

Better for Superhets

"Westectors" operate more efficiently at the lower radio frequencies, and for that reason they are particularly suitable for use as second detectors in superheterodynes, in which capacity they are nearly as sensitive as a valve, besides having the advantage that they can be used to provide an effective measure of automatic volume control. A skeleton circuit showing the first detector and a single I.F. stage of a superhet followed by a half-wave metal rectifier providing A.V.C., is given at Fig. 2.

In many cases where a metal rectifier is used to replace a valve as detector it is

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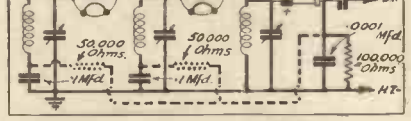

Fig. 1.—The skeleton circuit of a two-V.M. amplifier followed by a half-wave H.F. metal rectifier. The connections for A.V.C. are shown in broken lines.

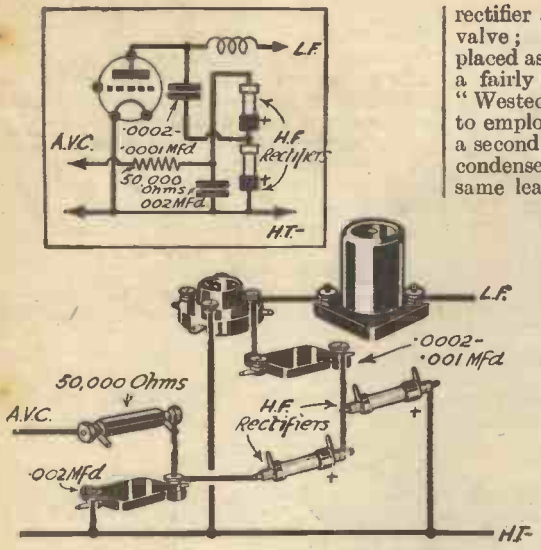

Fig. 5.—An arrangement which is somewhat better than shown in Fig. 4. The A.V.C. bias is supplied by a "voltage-doubler" circuit comprising two half-wave rectifiers.

(Continued from previous page)

preferable to add a second L.F. stage in order to maintain signal strength at the same level as before the alteration. This can be done most easily as shown in Fig. 3 by retaining the detector valve as a resistance-coupled amplifier and inserting the rectifier between it and the tuned circuit. The few new components required in addition to the "Westector" are:—One .0001 mfd. fixed condenser, two 100,000 ohm resistances, and one .05 mfd. condenser. If desired, the second 100,000 ohm fixed resistance used as a grid leak can be replaced by a potentiometer of similar value, which will serve as an effective L.F. volume control. Additionally, of course, provision can be made for connecting a pick-up in the grid circuit of the valve in the usual way.

Simplified A.V.C.

The methods of using the "Westector" as detector and A.V.C. so far dealt with have necessitated some departure from the conventional circuit arrangement, but it is quite possible to use the new rectifier for A.V.C. without modifying the standard circuit to any appreciable extent. The simplest way of doing this is shown in Fig. 4. It can be seen that the rectifier is connected in series with a fixed condenser (about .0002 mfd. is best with "straight" sets, and .001 mfd. with superheterodynes) between the anode of the detector valve and H.T. negative, whilst a lead is taken from the "top" of the rectifier (negative) to the grid circuit of preceding V.M. stages. When a signal is applied to the detector a portion of the signal voltage appearing in the anode circuit is diverted through the rectifier, across the ends of which a D.C. potential is developed. This potential is used to apply a variable bias to the preceding valves, and since the bias is proportional to the strength of the signal in the detector circuit, a true A.V.C. effect is produced. It will be seen from Fig. 4 that a decoupling resistance is included between the negative side of the rectifier and the grid coil of the preceding valve; this is essential and should be placed as near as possible to the coil. When a fairly long lead is necessary from the "Westector" to the grid coil it is better to employ "double" decoupling by fitting a second 50,000 ohm resistance and .1 mfd. condenser (non-inductive, of course) in the same lead but close to the rectifier. The second set of decoupling components are not indicated on the accompanying sketch.

Detector Damping

On first trying out the circuit shown in Fig. 4, it might be found that the detector does not oscillate in a normal fashion due to the damping imposed by the A.V.C. device. Should that prove to be the case, it will indicate either that the series condenser from the anode to the rectifier is of too high a capacity or that the leads in the anode circuit are too long.

It has been mentioned before that the H.F. metal rectifier is more efficient at the lower frequencies (higher wavelengths), so it will be obvious that the arrangement shown in Fig. 4 will be more effective on long waves in a "straight" set, although it will be equally effective over both wavebands in the case of a superhet. Where a greater degree of A.V.C. is required in a "straight" set, and especially when only a single V.M. valve precedes the detector, it is better to employ a pair of half-wave rectifiers connected in series as shown in Fig. 5. For simplicity, only the connections in the detector anode circuit are given, but the remainder of the circuit will be precisely the same as that shown in Fig. 4. The circuit given at Fig. 5 is a "voltage-doubler" arrangement, and thus the theoretical bias voltage applied back to the V.M. amplifier will be twice that of the previous arrangement; in practice the voltage is not quite doubled, but it is certainly greater and is sufficient to produce a really useful A.V.C. effect in even the simplest type of receiver.

H.T. Current Economy

There is yet another interesting use to which the "Westector" can be put, and this was described in a previous article in PRACTICAL WIRELESS. I refer to the use of the rectifier as an H.T. battery current economizer in conjunction with a super-power or pentode output valve. All the connections are given in Fig. 6, and from this circuit it will be seen that the rectifier is connected in series with a large capacity (1 to 4 mfd.) fixed condenser between the anode of the output valve and H.T. negative. A potentiometer arrangement is wired in parallel with the rectifier and a lead is taken from the tapping on this to the positive terminal of a grid-bias battery. The function of the circuit is briefly as follows: When a signal is being handled by the output valve a certain amount of the L.F. current appearing in the anode circuit is fed to the rectifier, and so produces a D.C. voltage across it. This voltage is in "opposition" to the normal grid-bias voltage, with a result that the G.B. actually applied to the grid of the valve is less than that of the battery. The voltage developed across the rectifier will clearly be proportional to the strength of the signal being handled by the valve, and consequently the bias voltage applied will vary in *inverse* proportion to the signal strength.

An Economy Device.

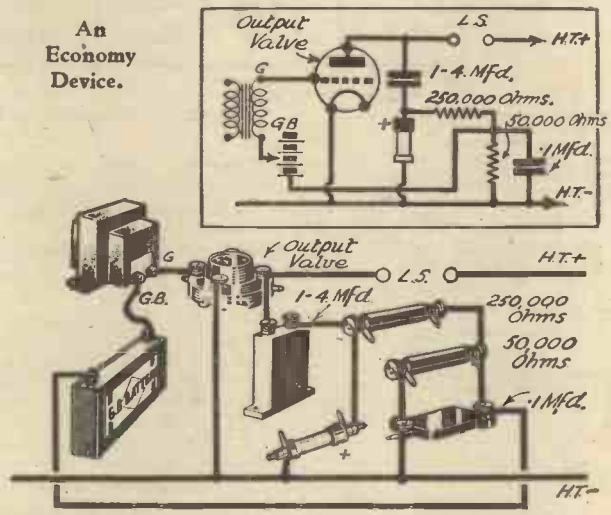

Fig. 6.—This circuit shows how an H.F. metal rectifier can be employed to reduce the H.F. current consumption of a power or pentode output valve.

Resistances Adjustments

Due to the effect mentioned above, it is possible to adjust the voltage of the G.B. battery so that the output valve is

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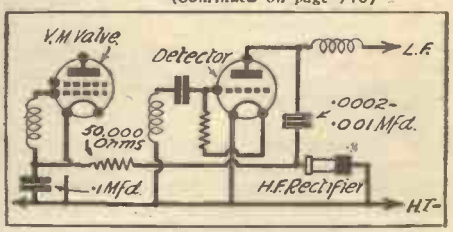


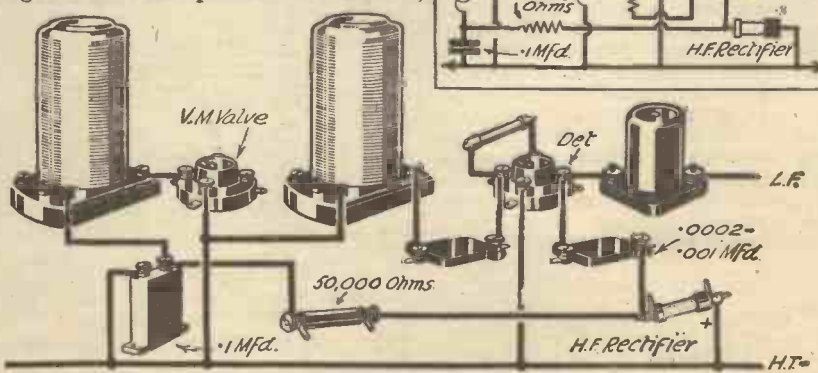
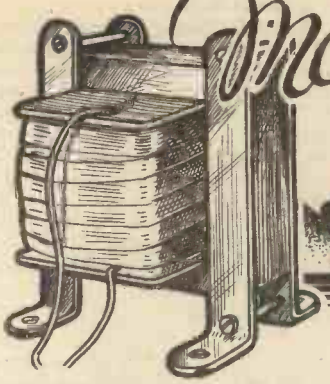


Fig. 4.—This is a very simple way of adding A.V.C. to any ordinary V.M. receiver. A half-wave H.F. metal rectifier provides the necessary A.V.C. bias voltage.



Making L.F. and Smoothing Chokes

Simple Instructions are Here Given Which Will Enable any Reader to Construct his own Chokes Without Difficulty.

By FRANK PRESTON, F.R.A.

THE tremendous amount of interest which is shown by readers of PRACTICAL WIRELESS in the home-construction of their own components is clearly indicated by the enormous number of letters we receive in regard to this matter. And, despite the fact that it is not usually any cheaper to make components than it is to buy them, the constructional work certainly forms a most interesting and fascinating pastime, besides giving a wonderful insight into the functioning of the parts.

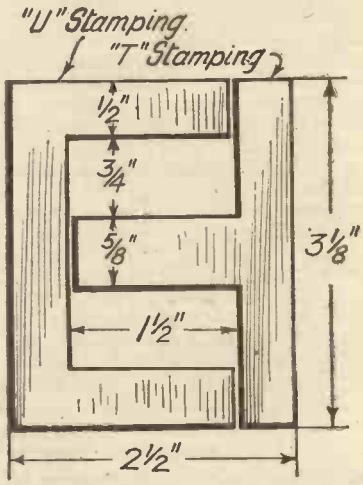


Fig. 1.—A sketch giving the dimensions of the No. 5 stalloy stampings required for the first choke described.

In a series of articles which is now appearing I describe the easy construction of various types of screened tuning coils, and here it is proposed to deal with the making of two or three kinds of iron-core chokes. Actually, chokes are very simple components consisting essentially of nothing else than a length (it is a very long length) of wire wound on a former built up from a number of laminations of iron. But to make a really efficient choke, of inductance, resistance, and current-carrying capacity, suitable for a particular purpose entails a certain amount of initial design, and it is the points which require special consideration that will be dealt with in this article.

A Low-frequency Choke

The simplest type of iron-core choke is one intended for coupling together two valves on the choke-capacity principle, or for connecting a loud-speaker to the output valve. The essentials of such a component are: An inductance of not less than 50 henries at the normal working current, a resistance to D.C. current of 2,000 ohms or less, and a safe current-carrying capacity of not less than 20 m.a. It is also an advantage, if the choke is provided with a tapping point, to enable alternative ratios to be obtained when it is employed to feed a loud-speaker.

In order to cover all the above requirements with an ample "reserve," the first choke I shall describe has an inductance of about 50 henries when carrying 25 milliamps. and a D.C. resistance of only 1,700 ohms. The winding is centre-tapped, and consequently the component can successfully be employed for a wide variety of purposes.

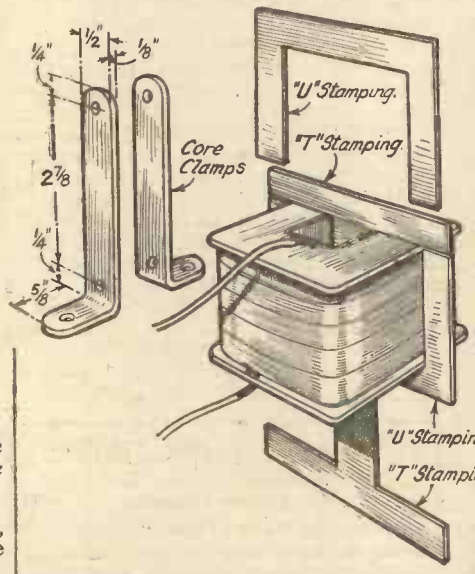


Fig. 3.—This sketch shows how the core stampings are fitted and gives details of the core clamps.

The core consists of about 3½ dozen pairs of No. 5 Stalloy stampings of "T" and "U" shape, whilst rather less than ¾ lb. of 38-gauge enamelled wire is used for the winding. Stampings of the size mentioned can be obtained from certain firms who specialize in the supply of such parts, but, incidentally, this size was employed for many of the better-quality L.F. transformers that were made a few years ago. The dimensions of the stampings are shown in Fig. 1, and by referring to these it will be an easy matter to tell if the core of an old burnt-out transformer which happens to be on hand can be made use of.

The Winding Spool

The first thing is to make a winding spool, which may have either a square or circular section "tunnel." If it is square it should be of the dimensions shown in Fig. 2, and can be made up by bending a strip of stout card in the manner indicated. When the card has been bent to shape it should be fitted with two end cheeks 2in. square. The latter can be fixed in position with "tacky" glue, after which the complete spool should be given a coat of thin shellac varnish to make it rigid. Before winding is commenced it is a good plan to wrap a layer of insulating tape round the spool to cover the otherwise sharp corners which might tend to cut the fine wire. A circular spool is somewhat easier to make, but is not quite so efficient. It is built up on a cardboard tube ¾in. inside diameter, and fitted with a pair of 2in. diameter end cheeks, after which shellac is applied as before.

Winding the Spool

After the winding spool has been made, two small holes should be made near the inside of one end cheek and a short length of rubber-covered flex threaded through these, leaving about 4in. projecting outside and 6in. projecting inside the spool. Next carefully solder the bared end of the 38-gauge enamelled wire to the end of the flex which is on the inside of the spool. It then only remains to wind on the wire. As there are a total of approximately 12,000 turns of this fine wire to be put on, however, it is best to give some thought to the most convenient way of winding. The complete job can be done entirely by hand, provided that a reasonable amount of patience is exercised, by making a wooden handle which will fit tightly into the spool. Should a lathe be available, this work may considerably be simplified and speeded up by gripping the handle between the jaws of a chuck. Yet another way is to make a short piece of wood to fit into the spool, and to fit this with a stout nail or bolt which can be held in the chuck of a hand-drill mounted in a vice. In any case, the bobbin of wire should be fitted into a small stand or on to a spindle, so that it can rotate freely whilst the wire is being drawn off. Also, when winding in the lathe, it is essential that a speed not greater than 50 or 60 revolutions per minute should be employed.

After winding on one-quarter of the wire the turns should be covered with a layer of insulation such as waxed paper, oiled silk, or empire tape, and this should be so put on that it will be impossible for later turns to slip past it. The winding should then be continued to 4,000 turns (it is not necessary to count, and an approximation based on the total quantity of wire will suffice) at which a tapping point should be made. To make this, scrape the in-

sulation away from the wire for a short distance, make a loop and then solder on a short length of flex, covering the joint with a blob of sealing wax, or with insulation tape. Fit another layer of insulation, continue to the 8,000th turn, again insulate, and then complete the winding. Solder a third length of flex to the last turn, pass this once round the spool, and then anchor it in a pair of holes made in a convenient position in the end cheek. It is a good plan to finish off the wound spool by applying a liberal coat of thin shellac varnish; this will keep out all traces of dampness. The winding should finally be covered with a protecting layer of empire tape.

Once the coil has been wound the stampings can be fitted into the spool. The method of fitting is perfectly simple if it is remembered that "T" and "U" shaped pieces are alternated throughout. Another point to remember is that each stamping is insulated on one side, and, to ensure that this shall be effective, the insulated (white or grey) side of every stamping should face in the same direction. To make the idea quite clear, the method of assembly is shown in Fig. 3. The core should be a really tight fit in the spool to prevent the possibility of vibration, and because of this it is best lightly to tap the last few stampings into position. The component is finally finished off by fitting a pair of core clamps made according to the dimensions given in Fig. 3. These are made from ¾in. wide by ⅛in. thick brass strip, and are held in place by means of 2 B.A. bolts, 1¼in. long.

It has been stated that the choke described above can be used for various L.F. coupling purposes, but it should be added that it is also entirely suitable for H.T. smoothing in mains equipment, where the total current does not exceed about 50 milliamps. When passing the maximum current, the choke will have an inductance of rather more than 30 henries and will produce a voltage-drop of eighty-five. The choke is really most suitable for use in an eliminator supplying about 30 milliamps., and under such conditions its inductance is sufficiently high to give adequate smoothing, whilst the voltage-drop produced will be fifty-one (a reasonably low figure).

A Gapped-core Choke

When dealing with currents in excess of some 50 milliamps., it is advisable to employ

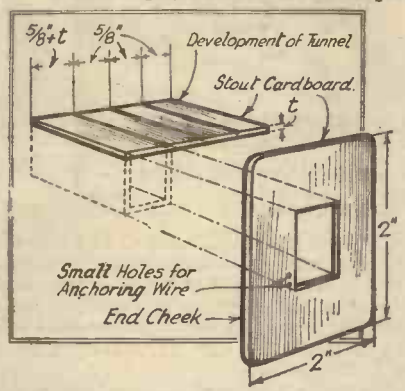


Fig. 2.—Constructional details of the winding spool for the choke.

a smoothing choke of greater dimensions and having a lower resistance to D.C. It is also an advantage to make the component of the so-called constant-inductance type, so that its inductance varies by only the very slightest amount when the current passing through the winding is varied. In order that a choke should show such characteristics, there must be an air-gap in the core; that is the "T" and "U" shaped stampings should not touch each other, but should be arranged with a small gap between them. Particulars will be given of a component of this type which has an inductance of 50 henries, a D.C. resistance of about 1,300 ohms, and a maximum current-carrying capacity of nearly 100 milliamps.

Six dozen pairs of No. 4 Stalloy stampings are required for the core, and the winding should consist of approximately 12,000 turns, or 1½lbs. of 36-gauge enamelled wire. The winding arm of the core will measure 15/16in. by 1 1/16in. by 2 5/16in. long, so a spool of these dimensions and fitted with end cheeks measuring 2⅝in. by 2⅝in. should first be made. This will be wound in exactly the same manner as was described for the smaller component, taking tappings if desired.

The only real difference occurs when the core stampings are to be fitted, since arrangements have to be made to provide the necessary air gap. This is easily done by fitting all the "T" stampings into the spool from one end, and then arranging all the "U" stampings opposite to them. The necessary gap is fixed by slipping strips of card 1/10in. thick between the ends of the "U" stampings and the sides of the "T's." Additionally, to prevent the gap being short-circuited, slips of paper must be placed between the core clamps and the core itself. When the clamps have been tightened up the cardboard slips may be removed if preferred, but there is no reason why they should not be left in place, because they have precisely the same magnetic properties as air.

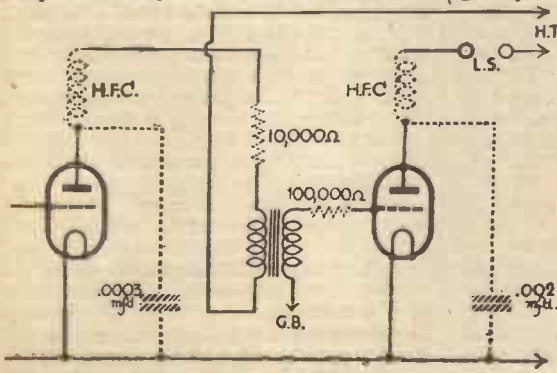
The gapped-core choke can be used for any purpose which demands a choke, but it is especially suitable for use in powerful mains receivers for smoothing, or feeding the loud-speaker. It can also be used very successfully as a loud-speaker field replacement choke. Very often, it is desired to make use of a permanent magnet speaker which might be more convenient, and in that case a choke having characteristics similar to those of the speaker field is called for. Most speakers of the type under consideration have a D.C. resistance of approximately 2,500 ohms; thus, to make our choke suitable it must be wired in series with a 3-watt (minimum), 1,000-ohm resistance. As an alternative, and where the maximum current does not exceed some 50 milliamps., the choke may be wound to almost exactly the correct resistance (2,500 ohms) by using approximately 1lb. 2ozs. of 38-gauge enamelled wire. This amount will run to just about 13,500 turns.

ELIMINATE THOSE HOWLS

Simple Precautions to be Taken for Curing the Trouble.

By "ELECTRON"

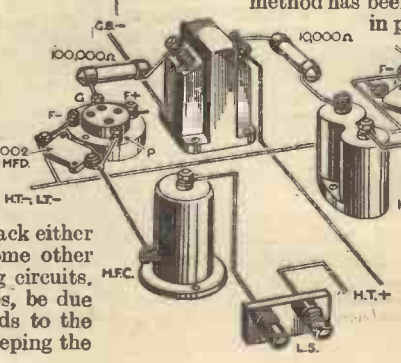
ONE of the greatest bugbears to the radio amateur is what is known as "threshold howl," which is an extremely aggravating type of reaction in the form of a low-frequency oscillation. It generally reveals itself as a low squeak or howl just as the set is brought to the "threshold" of oscillation by means of the reaction control, hence the name "threshold howl." When it occurs in a receiver relying upon the extensive use of the reaction control for the reception of the more distant stations, it can be very disturbing, as its effect is to limit the use of the reaction control to a point considerably lower than that at which the maximum sensitivity of the set is developed. To cross the threshold where the howling begins is to blot out signals completely. Consequently, some of the stations that could normally be received by the use of reaction are quite impossible to get.



Theoretical circuit of the principal modifications referred to in this article.

Simple Remedies

However, the fault is not usually a difficult one to overcome, being generally caused by high-frequency currents reaching the low-frequency stages, and feeding back either into the aerial or some other portion of the tuning circuits. It may, in some cases, be due to long extension leads to the loud-speaker. By keeping the loud-speaker leads away from the aerial, and not allowing them to double back across the receiver, a cure is often effected. A further precaution may be taken by inserting a high-frequency choke in the negative lead (the one nearest the plate of the output valve) to the loud-speaker, and connecting a by-pass condenser of about .002 mfd. between the plate side of the choke and negative filament. Frequently, however, volts are too precious to permit of any drop, no matter how small, in the anode potential of the output valve, so that it is wiser to bear in mind that "prevention is better than cure," and to take steps to eliminate the fault where the low-frequency stages begin, namely, the detector valves. The method has been fully described in previous articles.



Pictorial representation of the circuit shown opposite.

By PERCY RAY

CLASS B & the STRAIGHT THREE

A Practical Article Dealing With Essential Points, with Special Reference to the Pentode

PART 2

Last Week the Theoretical Side of Class B Amplification was Fully Dealt With, and in This Article the Practical Constructional Side is Considered

THE theoretical circuit, including the driver valve, is shown in Fig. 1. As touched upon in the previous article, the driver valve must be an L.F. or small power type, as it functions in the nature of a preliminary output valve rather than as a voltage amplifier, as it would do if used as a normal L.F. stage; this driver valve feeds the two grids of the 240B valve.

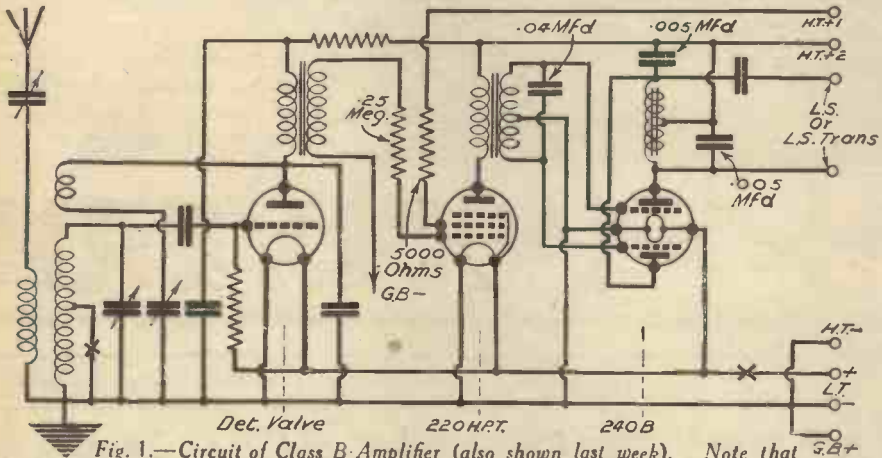


Fig. 1.—Circuit of Class B Amplifier (also shown last week). Note that the secondary of the input transformer and primary of output transformer must have very low resistance.

Reference to Fig. 2 will show that when the valve is delivering its maximum output, grid current up to 10 milliamps will be flowing. When current flows through a resistance there is always a voltage drop across it, and if the secondary winding of the input transformer has a high resistance, the passage of the grid current will result in bias being placed on the grids, which will result in horrible distortion if the resistance is high enough to raise the bias to an appreciable value.

Obviously, this secondary winding should have the lowest possible resistance, but in practice a value not exceeding 300 ohms will be found suitable It should be noted that the grid current will only flow through half the transformer at any given instant, so that the effective resistance will only be half of 300, namely, 150 ohms.

When only a small, undistorted output is required it would, at first sight, seem practicable to drive the valve direct from a power grid detector, leaving out the driver stage altogether. Such a procedure would work satisfactorily in the middle of the Sahara Desert, but would be quite useless in Europe, as the anode circuit of the detector valve would be so heavily damped that the tuned circuit in front of the detector would be very unselective indeed. To make matters worse, the selectivity would be dependent on the power of the incoming signal, so that irritating snatches of other programmes would be super imposed on the music from time totime.

Output Arrangements

The output arrangements call for some special care, and may either take the form of an output transformer, as shown in Fig. 1, or preferably an output choke, as shown in Fig. 3; the latter has the advantage that when suitably tapped it can be used with a moving-coil loudspeaker that would otherwise be quite unsuitable.

The primary of the transformer, shown in Fig. 1, or the choke shown in Fig. 3, must have a resistance not exceeding 400 ohms, as high resistance at this point would result in considerable loss of output; for example, 1,000 ohms would lower the output by a figure approaching one half, and would, in addition, tend to vary the "light and shade" of the music. Where choke or transformer is used, the ratio must be such that the speech coil of the lower speaker is raised to the optimum load of the valve, which should be 8,000 ohms for 120 volts, or 10,000 ohms when 90 volts is used. The output for the former set of conditions will be a little over two watts, and for the latter just over one watt. Reference to the accompanying table will show at a glance the load, the

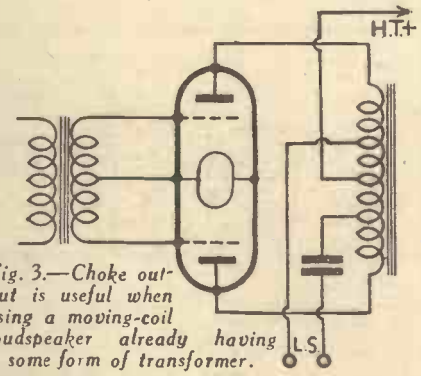


Fig. 3.—Choke output is useful when using a moving-coil loudspeaker already having some form of transformer.

(Continued on page 728)

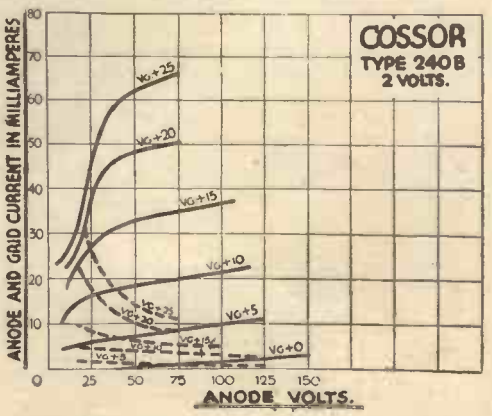


Fig. 2.—Anode/volt anode/current curve.

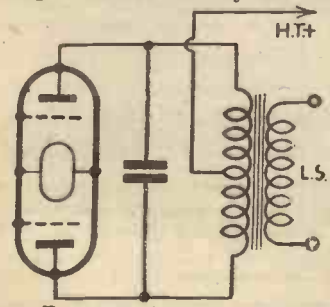


Fig. 4.—Tone control necessary with moving-iron speakers.

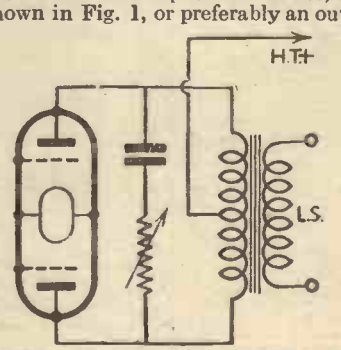


Fig. 5.—A modification of Fig. 5 to permit variation of tone.

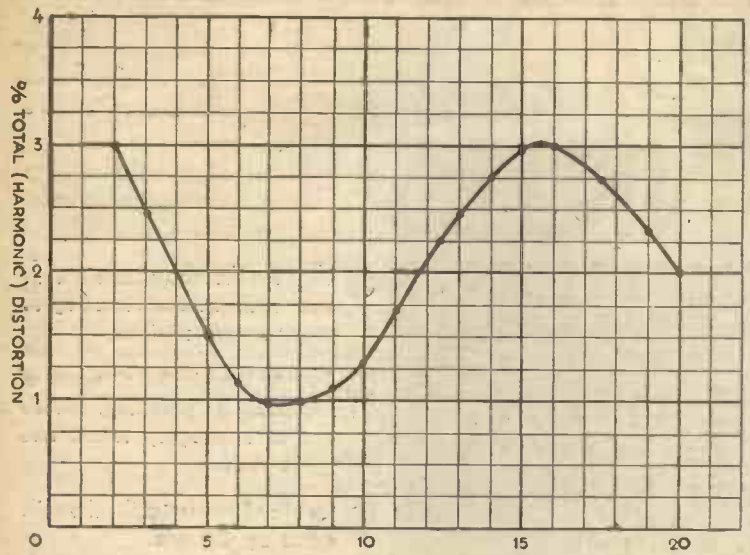


Fig. 6.—It will be seen from this curve that distortion does not exceed 3%.

(Continued from page 726)

undistorted output, average anode current, and other relative data.

Owing to the fact that only one valve is working at a time, the ratio of the transformer will be proportional to secondary turns and half of the primary turns. Thus, if the primary of the transformer has twice the number of turns as there are on the secondary, the transformer may be regarded as having a ratio of 1 : 1 for whichever valve is in operation.

Before leaving the subject of the output transformer, it will be as well to stress the fact that although the average anode current is only 11 milliamps, it will rise to 45 or more milliamps when the valve is called upon to deliver its maximum output; the secondary must, therefore, be capable of standing at least 50 milliamps. It should also be noted that, unlike the ordinary middle point push-pull output stage, the anode current is only flowing through one half of the transformer, and the iron core will become magnetized, as there is no current in the opposite direction.

The purpose of drawing attention to the magnetization of the core and the high momentary current is to illustrate to the reader, beyond any shadow of doubt, that the ordinary push-pull transformer is absolutely unsuitable. Only transformers or chokes expressly designed for use with Class B valves are suitable, and then only when made by a firm of repute.

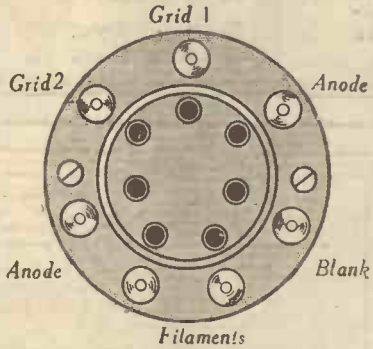


Fig. 8.—Drawing of valve holder showing pins

Tone Control and Moving-Iron Speakers

When using an ordinary balanced armature loud-speaker, there will be a slight tendency towards shrillness, and tone correction should be introduced similarly to the tone correction employed when an ordinary pentode valve is used. It should be clearly understood that this is not required with a moving-coil loud-speaker, unless of very indifferent design. Fig. 4 indicates the method of connecting the condenser between the two anodes of the 240 B valve. With the average loud-speaker, this may be any value between .005 and .02 mfd. Owing to the variations in transmissions and for other reasons, it is often desirable to make the tone correction variable, which is easily accomplished, as shown in Fig. 5, by inserting a 50,000 ohm variable resistance in series with the condenser.

These last remarks give rise to consideration of quality of reproduction, and it may be pointed out that the tone correction is not a reflection upon the valve in any way but is a reflection upon balanced armature speakers in general, as they have the inherent disadvantage that their impedance varies within wide limits at various frequencies; for example, a loud speaker that is good to listen to may have an impedance of 100 ohms at 250 cycles and 1,000,000 at 5,000 cycles.

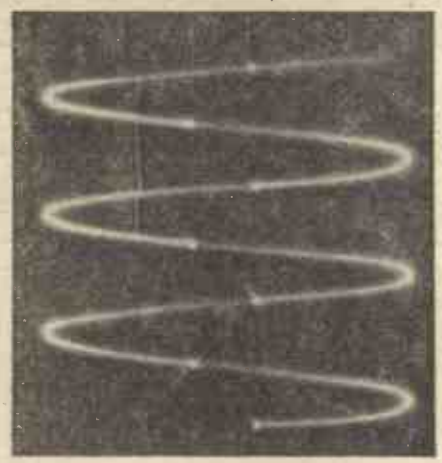


Fig. 7.—An interesting study of the output of a Class B valve taken with a cathode ray oscillograph.

Anode Volts	Static Anode Current		Average Anode Current		Optimum Load (ohms)	A.C. Output
	240 B only	with driver	240 B only	with driver	Plate to Plate	
						Watts
90	2·8	4·3	5·5	7·0	10,000	1
120	4	6·5	8·5	11	8,000	2

Harmonic Distortion

Figure 6 shows a distortion curve from which it can be seen that third harmonic distortion does not rise beyond three per cent., whereas a single pentode valve working in a normal manner usually gives as much as five per cent. third harmonic distortion when fully loaded. It will, therefore, be apparent that the 240B valve gives appreciably better quality than a pentode output stage. Fig. 7 shows an output study taken with the cathode ray oscillograph, and most careful analysis fails to show signs of appreciable distortion.

Fig. 8 shows the valve-holder, clearly indicating the connections to the new standard 7-pin base and valve-holder. It will be observed that one pin is left blank, presumably for some other form of valve, possibly an indirectly heated Class B valve.

Do not forget that the resistance of the grid and anode circuits must be kept low; those pitfalls such as the use of a grid stopper or anode resistance for lowering the H.T. voltage must be avoided with due care.

An eliminator invariably possesses resistance in its maximum tapping either deliberate, accidental or unavoidable, so that, quite obviously, a Class B valve or incidentally a pair of Q.P.P. valves, should not be used with an eliminator, unless special precautions are taken.

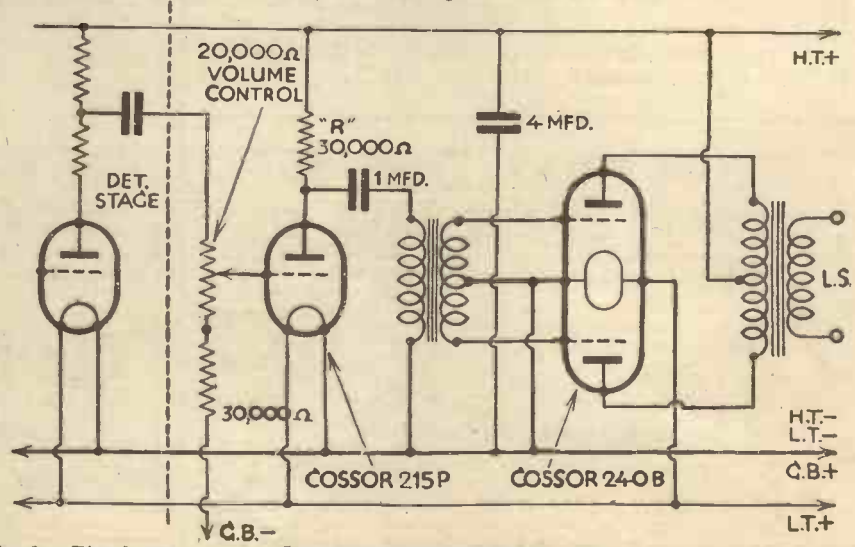


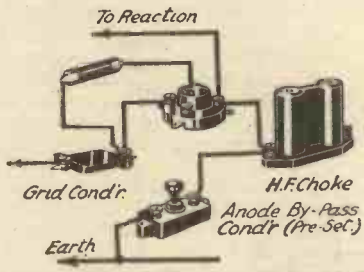
Fig. 9.—This drawing shows a Class B output stage with such refinements as the author considers to be reasonably necessary.

READERS' WRINKLES

THE HALF-GUINEA PAGE

Using a Pre-set Condenser for Anode By-pass

SOME time ago when I was making up a two valver, I used an old pre-set condenser (.0003 max.) for anode by-pass. This seemed to give better results than the fixed condenser generally used for this purpose. By unscrewing the knob one



A wiring diagram showing a pre-set condenser used for anode by-pass.

can obtain more reaction at will. This is, of course, the same action as obtained when using differential reaction. Recently I incorporated a differential reaction condenser in my set and so, when I was making up a one-valve short-wave adaptor, I used the old pre-set for by-pass—and with even better results. My adaptor had a tendency to threshold-howl over the lower portion of the wave-band and by adjusting the condenser it could be effectively cut out. —W. L. HUDSON (Kentish Town).

A Useful Compass Device

MANY other fellow-constructors may find the compass device, shown in the sketch, useful for marking out discs and centring cones. The following pieces of wood are required:—two pieces 8in. by ¾in. by ¼in., and two pieces 2½in. long. Cut the head off a 1in. wood screw, file to a point and screw it into the end of one of the short pieces of wood. The other short piece of wood is drilled to a depth of ½in. with a ¼in. drill to hold a short piece of pencil. The joints are made with 2B.A. screws and terminal nuts.—W. SHEPPARD (Birmingham).

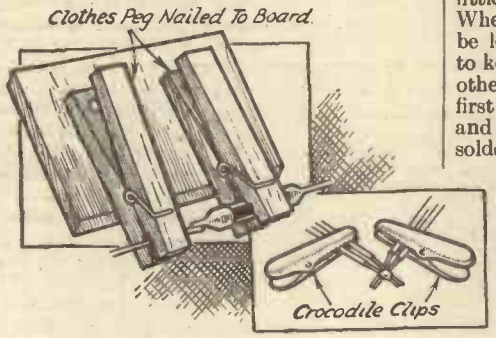
A Use for Spring Clips

IT is often found difficult to solder connections to the small tubular type of fixed resistances and condensers which have become so popular of late. A quick and easy way of doing this is to fix two clothes pins to a small piece of wood. These are secured by a couple of fine nails

THAT DODGE OF YOURS!

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

or screws a few inches apart and parallel to one another. The condenser or resistance is placed in one, and the wire to be soldered is placed in position and held there by the other, thus leaving both hands free for soldering. Another difficult soldering job is joining two wires together or making a number of contacts at one point, since the making of the second or subsequent joints is likely to melt the solder on the first

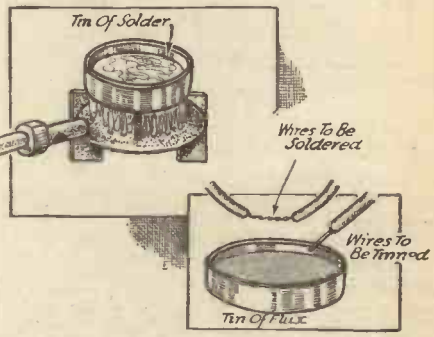


Spring clips used to facilitate the soldering of joints.

one. A few crocodile clips will be found ideal for holding wires both before and after they are soldered, and will enable any number of connections to be made at one point. They are quickly fixed and removed, and are so small that they do not get in the way. By use of the latter, and the board mentioned above, flex leads can be joined together or to spade terminals, and wires to soldering tags and other small objects connected; jobs which would otherwise be almost impossible to do single handed being quickly and easily completed.—Mr. M. MAHAFFEY (Belfast).

Mass Production Soldering

THE operation of soldering many wires together becomes somewhat tedious after a time, especially so if one's iron is only small, and needs constantly re-heating. A good idea, under these circumstances, is to get a shallow tin—the lid of a boot-polish tin will be very suitable—put a

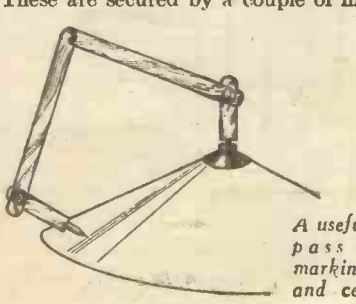


A quick method of soldering wires together.

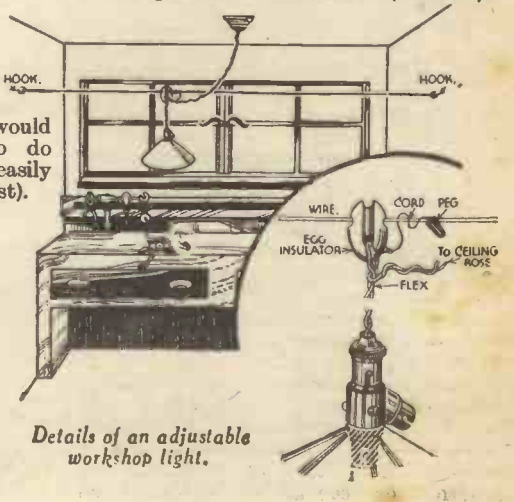
little solder in and heat on a gas ring. When the solder has melted the gas should be lowered, quite a low flame is sufficient to keep it molten. A tin of flux is the only other necessity, the wires to be soldered are first twisted together, dipped in the flux, and then into the molten solder. A good soldered joint is the result; this method is also very handy for tinning wires.—E. L. PARKER (London, S.E.15).

An Adjustable Workshop Light

WHEN working at my bench these dark evenings, I have found the necessity of having the light directly over the work in hand (inside the set cabinet, etc.), so I have devised the scheme shown in the sketch, which I think is more or less self-explanatory. I found that the weight of the lamp and adaptor caused the wire to sag, so a peg was fitted which, when plugged tightly into the insulator through which the running wire passes, effectively locks it in any desired position.—L. BOWMAN (Bicester).



A useful compass device for marking out discs and centring cones.



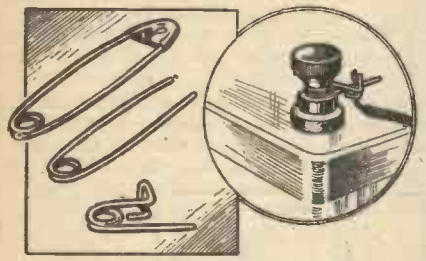
Details of an adjustable workshop light.

READERS' WRINKLES

(Continued from previous page)

Spring Clip Terminals

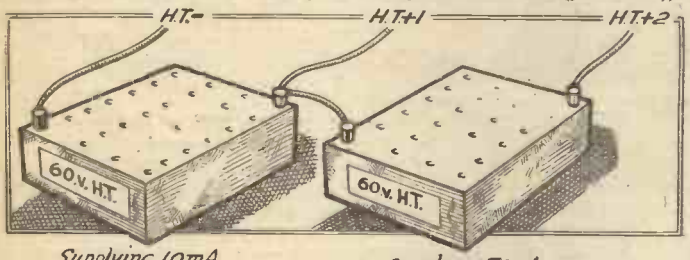
EXCELLENT wiring clips can be very easily made from safety pins, as shown in the accompanying illustration. The fastening end is first cut off, and the pin then bent as shown, so making a spring grip. By reason of the safety pins being tinned, excellent contact is made by the use of these clips.—A. G. ACKROYD (Forest Gate).



Handy spring clip terminals.

H.T. Battery Connections

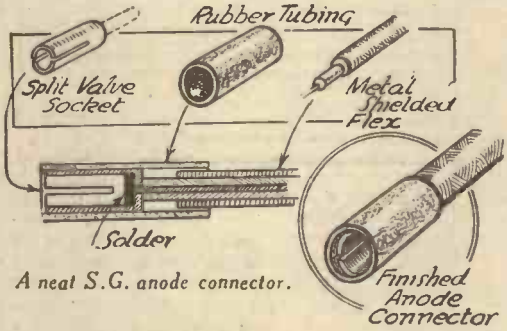
THE compactness and availability of 120-volt high-tension batteries has led the majority of battery users to use these instead of the 60-volt units. Most battery sets require a total current of about 3 m.a. at 60 volts (screened grid and detector) and 7m.a. at 120 volts (S.G. plate and output), thus the first half of the battery is supplying 10 m.a., and the second half only 7m.a. The second half will, therefore, last longer than the remainder of the battery, and the usual method is to buy another battery of the same voltage and join part of it in series until the old battery has run down, then the whole of the new battery is brought into use. This method is rather unsatisfactory, as part of the battery is always more run down than the other, and one is liable to get somewhat confused when it comes to remembering which is the best section. If two 60-volt batteries are used, the first one can be replaced when run down, the second one being replaced at a later date, its life being longer through less H.T. consumption. The result is that the H.T. supply is always reasonably constant and, instead of several sections of various batteries connected in series, two batteries only are used.—R. WATERS (Putney).



Connecting H.T. batteries.

Soldering Enamelled Wires

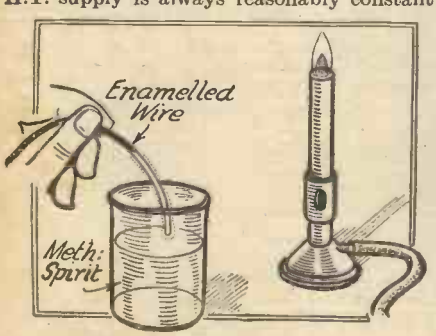
SOME difficulty is often experienced when soldering thin wires which have enamel insulation. If the wires are thick they can easily be cleaned by ordinary methods, such as rubbing with sand-paper, etc. To overcome the badly-cleaned wire problem, place it in a clean bunsen flame, and when red hot, plunge into a container of methylated spirit. When the wire is withdrawn it will be found to be perfectly clean. It will be appreciated that the above method of cleaning cannot be employed with success where the wire is oxidized.—W. G. HILL (Jnr.) (Dagenham).



A neat S.G. anode connector.

S.G. Anode Connector

THE illustration shows a method of making a safety S.G. connector from a few simple parts which the average constructor will no doubt have amongst his spares. The requirements are: one valve socket, ¼in. of rubber tubing (acetylene tubing will do), and a piece of flex, preferably metal shielded. The drawing is self explanatory, the thread is cut off the socket, and a hole is drilled in the bottom. If not already so, the socket should be split, to make it springy. The wire is dipped in flux, and the end pushed into the hole. the end being splayed by means of a match pushed into the socket. If a small blob of solder is dropped into the socket it will be found that the application of a hot iron to the base of the socket will soon melt the solder, and a solid join should result. The rubber tubing is then slipped over so that it projects about 1·32in., this prevents the socket from touching any projecting metal parts, thereby shorting the H.T. battery.—E. L. PARKER (London, S.E.15).



Soldering enamelled wires.

Neat Flex Ends

WHEN braided flex is used for connections to terminals it is often found that however much care is taken, the braiding eventually comes undone and looks untidy and ragged. An easy method of preventing this is to get a blob of molten sealing-wax and press it around the prepared wire. The wax can be neatly shaped before it sets, and different colours can be used for different leads, such as red for the aerial lead, and black for earth.—E. L. PARKER (London, S.E.).

Neat flex ends.

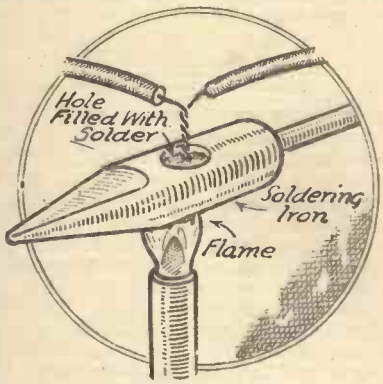
Soldering Twisted Wires

WHEN soldering two twisted wires it is often difficult to know if the iron is hot enough to permit of the solder to run well in and bring about amalgamation.

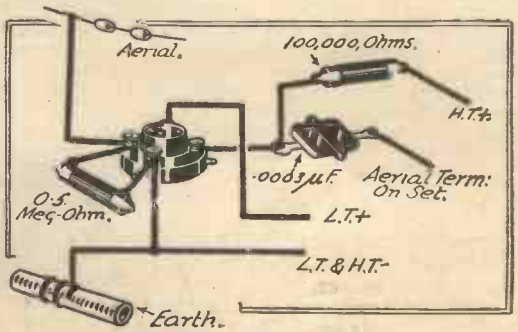
By this it is meant that the solder may combine only on the surface of the twist, but to all intents and purposes appears a good joint which only time disproves. A good plan is to drill a hole, say, ⅛in. in diameter, in the soldering iron, fill it with solder and place over a gas flame. When the solder has reached a temperature sufficient to permit a good joint being made plunge the fluxed joint into the hole and a perfectly good joint will result. —S. JACKSON (Bushey).

An Emergency Amplifier

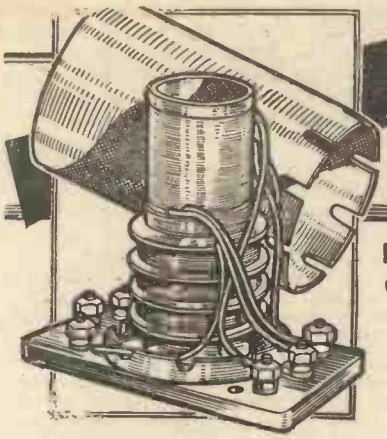
AN aerial breakdown recently was hurriedly repaired in time to listen to the evening's broadcast, but the inefficiency of the temporary aerial made it necessary to construct an amplifier quickly so that the programme could be heard at sufficient strength through the loud-speaker. A resistance-coupled H.F. stage was successfully made as shown in the sketch below.—M. L. HASELGROVE (Dorchester).



A soldering dodge.



An emergency amplifier arrangement.



MAKING YOUR OWN Screened Coils

In This, the Third Article of a Series, the Author Describes in Detail the Construction of an Efficient Dual-range Short-wave Screened Coil, and Gives a Circuit in which it can be Successfully Employed.

IT is frequently considered that short-wave coils cannot properly be screened unless one is prepared to tolerate inefficiency, but this idea is entirely disproved by the component to be described, as well as by a number of the high-class short-wave tuners which are now on the market. As a matter of fact, I am of the opinion that screening is even more important in a short-wave set than in one designed for use on the higher wavebands, and provided that it is properly and carefully arranged, screening is an undoubted advantage in so far as it eliminates unwanted hand-capacities. By so doing, it considerably simplifies the operation of the receiver and enables it to be used in its most sensitive condition, almost on the verge of oscillation.

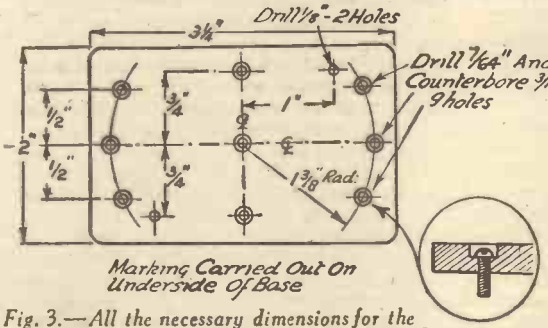


Fig. 3.—All the necessary dimensions for the ebonite base-plate are given in this drawing.

Two Tuning Ranges

The tuner to be described is really two tuners in one, since it has been carefully designed to operate satisfactorily on two wavebands. Actually, the approximate wavelength ranges covered, when a .0003 mfd. tuning condenser is employed, are from 14 to 30 metres and from 25 to 55 metres, and the positions and sizes of the windings have been so arranged that maximum efficiency is obtained over the whole of both bands. It might also be mentioned at this point that, if desired, a smaller tuning condenser (.0002 or .00025 mfd.) can be used to cover a slightly narrower band of wavelengths, and to permit of rather easier tuning below 20 metres or so. Even when using the smallest condenser mentioned, there is a very slight "overlap" between the two ranges, so that there is no "break" between the ultra-short and normal short wave bands.

By making reference to Fig. 1, it will be noticed that there are actually six windings on the paxolin former, two each of which are for the aerial coil, grid coil, and reaction respectively. This arrangement has been found best in preventing "dead spots" and similar troubles, and makes the dual-range tuner quite as efficient as two separate coils of the more usual type. The two aerial windings are in series, and although they both remain in circuit on both wavebands, one of them is ineffective on the lower range due to the fact that it is well away from the smaller grid winding. The same idea applies to the reaction winding, whilst a switch is connected across a portion of the grid coil so that it can be short-circuited when desired.

Parts Required

For the benefit of those readers who missed the first two articles on making screened coils, it should be stated that the paxolin former, screen, and mounting bracket are to be obtained as a complete set from Messrs. Peto-Scott. The other materials required are: one piece of ebonite, measuring 3in. by 2in., six 6B.A. terminals (also obtainable from Messrs. Peto-Scott, or any good radio stores), a few feet of 28 gauge d.c.c. wire, a length of systoflex sleeving, and a short length of insulated connecting wire, such as that made by Messrs. British Radiophone. It will be seen from this list that the total cost of the tuner works out at less than half a crown.

Fig. 2.—This photograph shows the appearance of the finished short-wave tuner.

Winding The Tuner

Having obtained the required parts, the first thing is to make a couple of small holes near one end of the paxolin former, anchor one end of the 28-gauge wire in these, leaving a length of about 4in. projecting, and then wind on three turns. A single hole is then made near the end of the third turn and about 18in. of wire passed through this. Another hole is then made lower down the former in the position clearly shown in Fig. 1, and the wire passed back through this and taken another four times round the former. Two holes are made near the end of the fourth turn and the end of the wire anchored in these. It is important to make sure that the turns in both halves of the winding go in the same direction, since if they do not the halves will be in "opposition."

So much for the aerial winding. The grid winding comes next, and is again in two halves, one of four and the other of five turns. The thicker connecting wire is used for this winding, and the end should be bared for a length of 4in. or so. Two small holes are made in the position indicated in Fig. 1, and the bared

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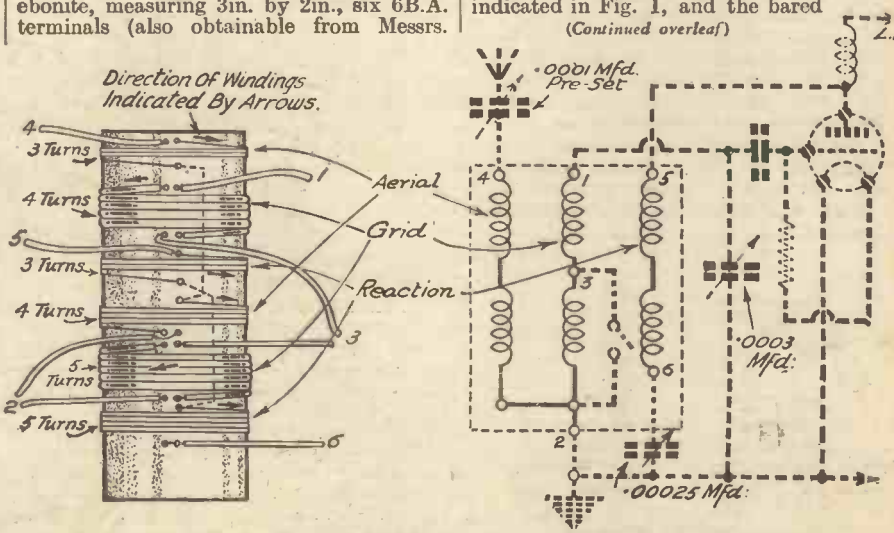

Fig. 1—Details of the windings and connections for the dual-range short-wave tuner are clearly shown in this diagram.

(Continued from previous page)

end of the wire is anchored by passing it through them. Put on the necessary four turns, placing them side by side. Instead of passing a length of wire through a hole to the second portion of the winding, it is better (due to the thick-

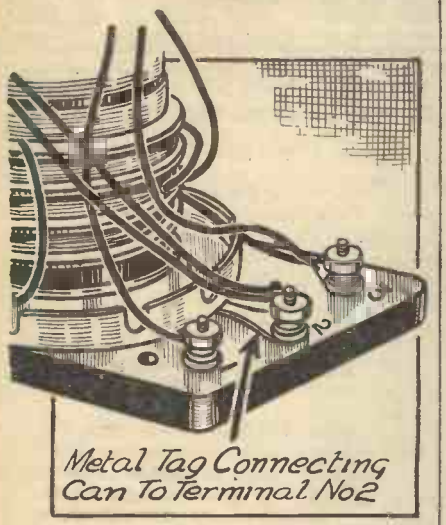

Fig. 4.—This sketch shows how the screen is earthed by means of a soldering tag fitted under the clamping nut of terminal number 2.

ness of the insulated connecting wire) to terminate the first section by baring the end and anchoring it in a couple of holes. At this juncture it should be explained that, although the turns are close together, there is actually a space between the wire forming one turn and that forming the next, which is produced by the insulating material. In the case of the particular wire specified above, and which is of 22 gauge, the thickness of the insulation gives a space between the actual turns which is equivalent to three times the diameter of the wire. Thus, the self-capacity is reasonably low and, since the insulating material has very low losses, the efficiency of the finished coil is quite as high as would be the case if the much more difficult method of using bare wire and spacing the turns were employed. The second portion of the grid winding should next be wound on in the correct position, and it should carefully be noted that the turns forming the grid coil are put on in the *opposite direction* to any of the others. This is important, for if the turns were wound in the opposite direction correct coupling between the various windings would not be obtained.

After completing the grid coil the reaction winding can be dealt with, and the positions for the two halves of this can again be obtained from Fig. 1. This winding consists of eight turns in all, of which three constitute the upper and five the lower sections. Both windings are continuous, the wire being passed through holes in the former from the end of one to the beginning of the other. In Fig. 1 all the holes for anchoring the ends of the various windings are shown as being one above the other; this is only for clarity in the drawing, and it is much better in practice to arrange them at different points on the circumference, so that the connections can more easily be recognized and connected to their appropriate terminals. This particular point will perhaps be more readily understood by making reference to the photograph of the actual coil described, which is shown at Fig. 2.

Mounting the Coil

On completion of the windings, the ebonite base and screen must be prepared. Drawings which give the necessary details of this part of the construction were published with the article under this heading given a fortnight ago, but that showing the layout of the baseplate is reproduced at Fig. 3. It will be seen that there are six holes for terminals and three for mounting screws, and that each of these is first drilled 7/64in. diameter and then counterbored ⅜in. diameter so that the heads of the terminals are slightly recessed and cannot short-circuit on to a metallized chassis.

A soldering tag is fitted under the clamping screw of each terminal for taking the coil connections, whilst a second tag is fitted to terminal 2 to make contact with the "lid" of the screening can in order to earth it. (See Fig. 4.) All the leads are cut off to such lengths that they will just reach the terminal soldering tags and are then passed through suitable lengths of systoflex sleeving. In judging the lengths of the leads it is well to rotate the former until all leads are as near to their respective terminals as possible, and at the same time care must be taken that the leads are long enough to loop sufficiently to allow the screening cover to be fitted without pressing against them. The correct terminal connections are shown in Fig. 1, and it is best to make soldered joints although, if this presents any very great difficulty, the bared ends of the leads can be gripped tightly underneath the tags.

Connecting the Tuner in Circuit

The more experienced readers will find all the information they require for connecting up the tuner in the theoretical circuit at Fig. 1, but for the benefit of others who are not so accustomed to circuits, the pictorial wiring plan given at Fig. 5 will be more useful. This circuit is for a two-valve Det.-L.F. short-waver of fairly standard type and high efficiency. The circuit shows a .0001 mfd. pre-set condenser in series with the aerial lead, and this is to enable the optimum aerial coupling to be obtained at all frequencies. It should be adjusted until smooth and steady reaction can be obtained over the whole of both wavebands. In some cases, however, it might be found that such a setting is impossible, and then it will be necessary to make a slight adjustment to the condenser at different parts of the tuning scale.

A .0003 mfd. variable condenser is shown for tuning purposes but, as was explained above, a somewhat lower capacity can be employed if desired. The essentials of the condenser are that it should be of the distinctly low-loss type and must be fitted with a good slow-motion drive. For reaction purposes a .00025 mfd. variable condenser is indicated, for although this capacity is rather higher than that generally employed it is found to be most suitable. This is partly because the number of turns on the reaction winding has been purposely made less than that on the tuned winding. The reason for this is that when more turns (and consequently a lower condenser capacity) are used for reaction there is often some difficulty in entirely preventing "dead spots" and parasitic oscillation. Personally, I have always found it better to use a large capacity and a (comparatively) small number of turns, but this idea is not shared by all experimenters. If you happen to be one of those who are in favour of the opposite system, there is no harm in trying the effect of increasing the reaction turns to 5 and 8 respectively on the two portions of the winding, and using a .0001 mfd. or a .00015 mfd. reaction condenser.

The H.F. choke shown in Fig. 5 may be any good one of the short-wave type, or may be made by winding a hundred turns of 32 gauge d.c.c. wire on a former exactly like that employed for the tuner; the screen and base will, of course, be used exactly as for the coil excepting that only two terminals will be required on the latter. When using a receiver designed around the circuit given at Fig. 5 it might sometimes be found that better results can be obtained by transferring the connection to the pre-set aerial condenser from terminal 4 to terminal 1 on the tuner; this will cut out the loose coupled aerial winding and might in some cases result in greater signal strength. If the aerial is too long, however, the change-over might make it impossible to obtain sufficient oscillation at certain points on the tuning scale.

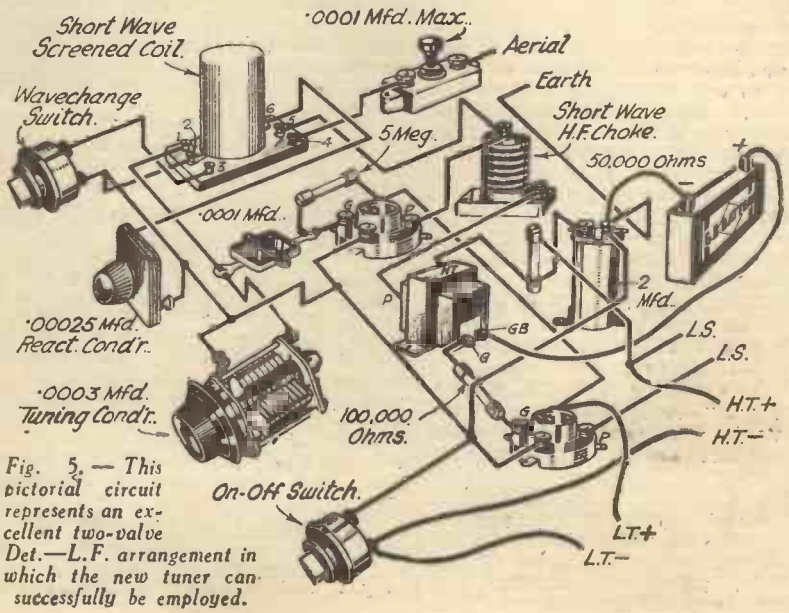

Fig. 5. — This pictorial circuit represents an excellent two-valve Det.—L.F. arrangement in which the new tuner can successfully be employed.

Where the CURRENTS FLOW

In this Article the Author Describes the Various Types of Current Flowing in Radio Circuits and How these Currents are Distributed in a Modern Radio Receiver.

By H. J. BARTON CHAPPLE,
Wh.Sch., B.Sc.

WHEN we connect a piece of apparatus such as a small lamp bulb to an electric battery we know that a steady, direct current will flow, and will have a value depending upon the voltage of the battery and the resistance of the circuit. Similarly, when we switch on a lamp connected to the alternating current electric mains we realize that an alternating current of a certain strength will pass along the wires.

Familiarity with these simple circuits is apt to make one forget that in most sections of a radio receiver the currents flowing are of a much more complex nature. As a matter of fact, there are very few portions of a radio circuit which carry only a simple current; most of the network carries at least two, and in many cases three or more different currents are flowing in one wire at the same time.

This subject is really an important one and merits investigation, for it throws some light on the actual operating principles of radio reception.

Types of Current Found

First of all, however, it is advisable to consider what types of current are likely to be found in a radio receiver. The simplest of all electric currents, of course, is the ordinary direct current—a more or less steady current flowing always in the same direction. A familiar example of a direct current is the current passing along the low tension (filament) circuit of a battery-operated receiver.

Then, if your set be of the A.C. all mains type, we shall encounter the commercial alternating current—a current which flows first in one direction, and then in the reverse direction, the changes in direction being made at a definite frequency—usually fifty complete alternations per second. Such currents will flow in the primary and secondary windings of the power transformer and in the low-tension heating circuits of the set.

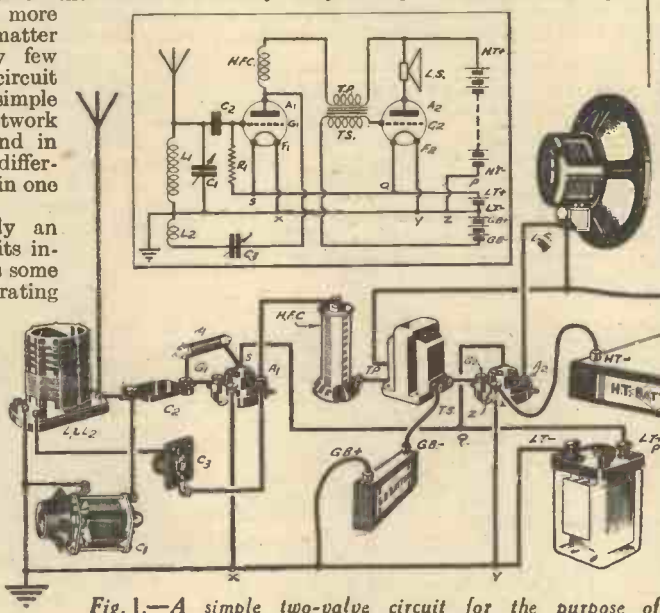

Fig. 1.—A simple two-valve circuit for the purpose of explaining current flow.

Next we must consider the radio-frequency or high-frequency currents. A radio-frequency current is, in point of fact, an alternating current, but one in which the number of complete alternations per second is very much higher than for a commercial alternating current power supply, and ranging, in the case of broadcasting transmissions, between about 100,000 and a couple of million vibrations per second. They correspond to the frequencies of the waves broadcast from the various transmitting stations.

Complexity

Finally, some of the currents with which we shall have to deal will be "audio-frequency" currents—again alternating currents, but this time covering a range of frequencies quite different from those of the radio-frequency currents—frequencies corresponding to those of the air vibrations which we call "sound." These frequencies range from a few dozen up to several thousands of vibrations per second.

Here it must be explained that when speech or music is being reproduced the audio frequencies are constantly changing and combining in accordance with the "pitch" of the sounds, treble notes being represented by higher frequencies than bass notes. It will thus be seen that the audio-frequency currents in a radio receiver are very complex in nature.

It should also be mentioned that in some sets, those known as superhets, a fourth kind of alternating current occurs, this being called "supersonic" or "intermediate frequency." The frequency in this case is greater than those in the normal audio-frequency range, but less than the radio frequencies.

Having described the various types of currents flowing in radio circuits we can now proceed to examine typical receiver circuits, and to see how these different currents are combined and distributed in the network of apparatus.

On the Aerial Side

Fig. 1 shows the circuit diagram of a conventional two-valve receiver of the battery-operated type, employing an ordinary leaky grid detector and a three electrode output valve. Various letters and figures are marked on the diagram to facilitate reference to the different parts of the circuit. Possibly the simplest way of tackling the problem will be to build up this circuit gradually, seeing what currents flow in each part.

For example, Fig. 2 indicates the aerial and earth, and the tuning coil, L_1 only. If the coil were simply connected in this way between aerial and earth, and we

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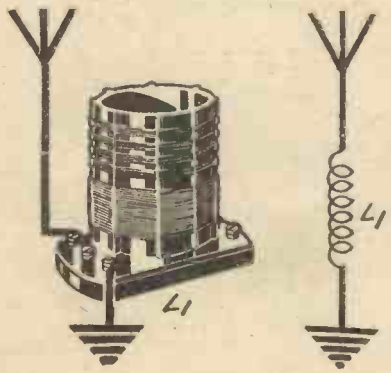


Fig. 2.—In the plain untuned aerial coil various high-frequency currents flow.

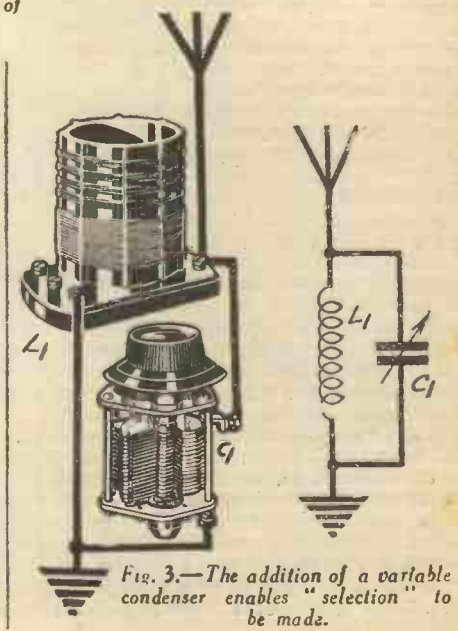


Fig. 3.—The addition of a variable condenser enables "selection" to be made.

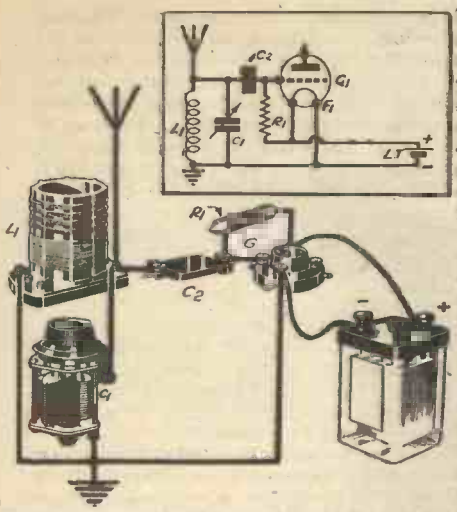


Fig. 4.—The circuit is here taken a stage farther by adding the rectifying valve.

(Continued from previous page)

had the necessary delicate instruments, we could discover that in this circuit would be flowing a large number of radio-frequency currents, all of different frequencies, corresponding to the frequencies of the broadcasting stations of the world, and all of different strengths according to the powers of the stations and their distance from the aerial. Furthermore, the instantaneous strengths of these radio-frequency currents would be constantly varying at audio frequency in accordance with the musical programmes being radiated from each station.

In the next diagram, Fig. 3, an addition to the circuit has been made—the tuning condenser, C_1. The effect of this is to make the circuit sensitive to the frequency of the "wanted" station and comparatively insensitive to all other frequencies. So we can consider, for all practical purposes, that the current circulating in the tuned circuit is of one selected radio frequency, and of an amplitude which constantly varies at audio frequency. Across this tuned circuit then will be developed a radio-frequency voltage which will be applied *via* the condenser C_2 to the grid of the detector valve (G_1).

Grid Variations

Note now that in Fig. 4 the filament circuit of the detector has been added. From the low-tension battery, and through the connecting leads and the filament of this valve, will flow a steady direct current which will heat the filament and cause it to emit electrons. A high-resistance grid leak, R_1, connects the grid of the detector valve to the positive side of the filament circuit, and this gives the grid a slight positive bias with respect to the filament. This means that, forgetting for a moment the existence of an anode in the valve, electrons emitted from the heated filament will be collected by the grid and will return to the filament *via* the grid leak R_1. The electron flow is called "grid current," and for steady conditions of grid voltage the grid current would be constant. But we have seen that a radio-frequency voltage is applied to the grid of the detector *via* the grid condenser, C_2, so that the actual grid voltage will vary above and below the initial positive bias, and because the increases in grid current during positive half-cycles of the radio-frequency impulses are greater than the decreases in grid current during negative half impulses, the high-frequency signal will be "rectified."

The net result is that the working potential of the detector grid varies at audio frequency, and we must now see what effect this has upon the current flowing in the anode circuit of the valve.

The Anode Circuit

In Fig. 5 the anode of the detector valve has been connected to the high-tension positive terminal through something labelled "anode load"—which will be more particularly described in the next paragraph. As the high-tension negative terminal is connected to the filament circuit, the anode current has a path from H.T. + through the anode load, through the anode to filament path of the valve, and back to the H.T.+ terminal *via* that part of the low-tension wiring marked XZ. If the grid voltage of the detector was constant, the anode current would also be constant, and it would be correct to say that the current in the anode load would be a steady, direct current equal to the anode current, while the piece of wiring between X and Z would carry two direct currents, one equal to the normal filament current and one equal to the anode current.

But we have seen that the grid of the detector varies at audio frequency, so that the valve acts not only as a rectifying or detecting device, but also as a low-frequency amplifier, that is to say, the audio-frequency voltage at the grid causes audio-frequency variations in the anode current. In addition, since grid rectification is a functioning factor not 100 per cent. efficient, there will be a high-frequency component in the anode current. So in Fig. 5 we can take it that the anode current can be split up into three components—a steady, direct current, an audio-frequency current, and a small high-frequency component. This complex current will traverse the whole of the anode circuit, and, in addition, the part XZ will carry the filament current of the detector valve.

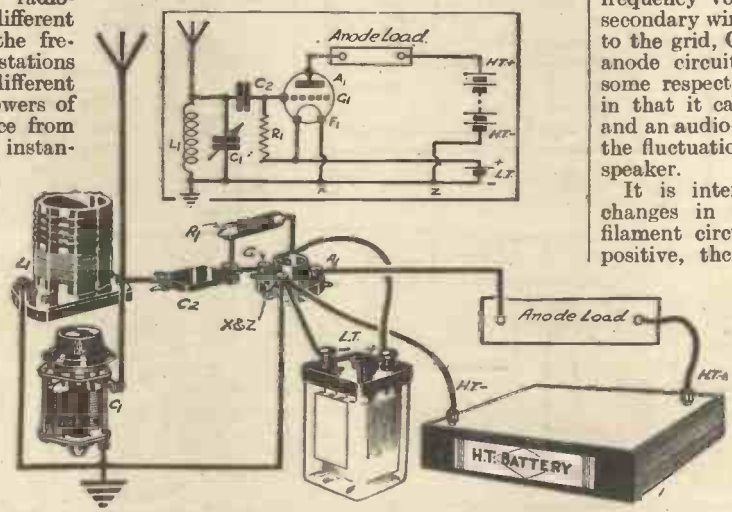


Fig. 5.—The addition of an anode load brings about three types of current flow in the anode circuit.

The Next Stage

A stage farther in building up the circuit is taken in Fig. 6. First of all, a high-frequency choke is included in the anode circuit. This filters out the small radio-frequency component and diverts it *via* the reaction condenser, C_3, to the reaction coil, L_2, where it assists in building up the signal strength, because it is transferred by electro-magnetic induction into the grid coil. Then the nature of the anode load is revealed as an intervalve transformer, the anode current passing through the primary winding TP.

Now, going back to Fig. 1 for the last stage, we see that the combined direct and audio-frequency current passing through the primary winding of the intervalve transformer causes an audio-frequency voltage to be developed in the secondary winding, which voltage is applied to the grid, G_2, of the output valve. The anode circuit of this valve resembles in some respects that of the detector valve, in that it carries a steady, direct current and an audio-frequency alternating current, the fluctuations of which operate the loudspeaker.

It is interesting to note the various changes in the current carried by the filament circuit. Commencing from L.T. positive, the circuit carries the filament current of both valves as far as point Q. Here the filament current of the output valve leaves the line and passes into the filament. From Q to S the circuit carries only the filament current of the detector, while the part from X to Y carries the filament current of the detector valve and also the anode current, comprising both direct and alternating components.

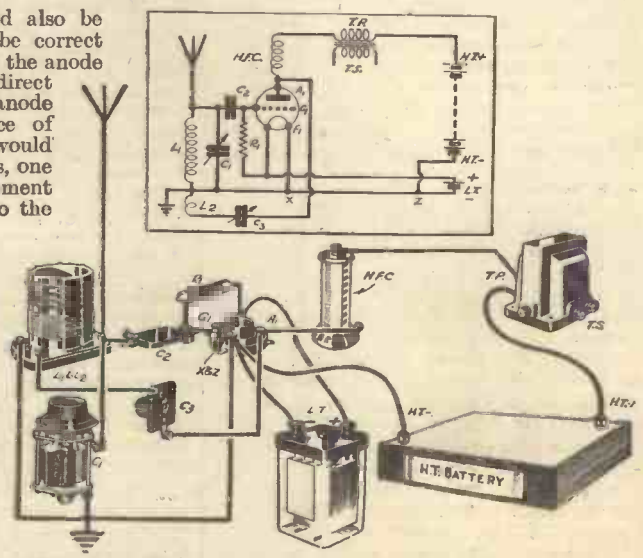


Fig. 6.—With an anode load of this character the current distribution is altered.

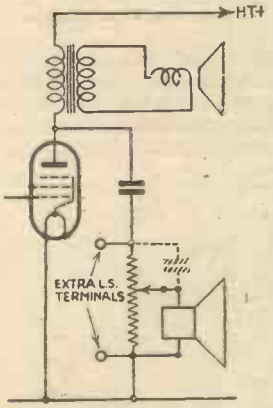
THE EASY ROAD TO RADIO

THE BEGINNER'S SUPPLEMENT

CONNECTING THAT EXTRA LOUD-SPEAKER.

Important Points to Bear in Mind Concerning the Matching Between the Output Valve and the Speaker it is Intended to Use. By "ELECTRON"

USUALLY, when an amateur wishes to connect an extra loud-speaker to a receiver provided with sockets for this purpose, his natural impulse is to plug the two loud-speaker leads into the sockets, and hope for the best when the set is switched on. Sometimes, of course, he may be lucky enough to obtain very good results indeed. But if his optimism allows him to do this without any other considerations, there are almost equal chances that he will get poor results, and begin to wonder whether to blame his set or his speaker; the set, because he is led to believe that it has not sufficient energy to drive the two speakers, and the speaker, perhaps, because it is not sensitive enough, or, if overloaded, because it cannot handle the energy supplied to it. In either case he is probably doing one or the other a gross injustice.



Circuit diagram showing the potentiometer connected across the extra L.S. sockets.

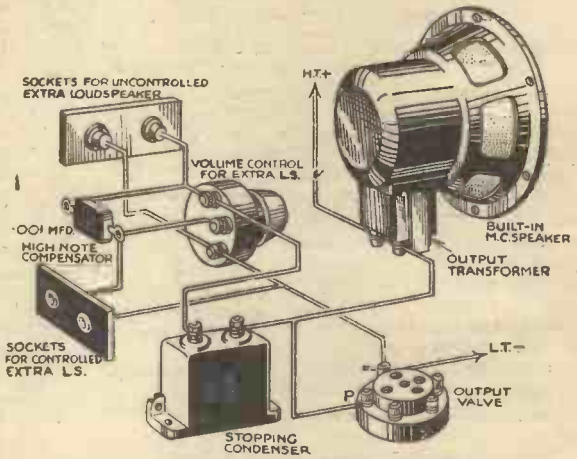
It would be wise, therefore, to consider for a moment other factors that have to be taken into account. In the first place, it should be obvious that a moving-iron speaker is not interchangeable with one of the moving-coil type. Primarily, our object should be to obtain suitable matching between the output valve and the loud-speaker we wish to use. To gain this end we shall either have to select a speaker that will be suitably matched or, if we already have a speaker, to take steps to match it to the output of the receiver. This, of course, will depend upon the type of output valve used. To obtain the maximum undistorted output from the valve, the impedance of the speaker circuit should be twice that of the valve; or, more correctly, it should be as near as possible to the "optimum load" for the valve. However, for our present purpose it will be sufficient to summarize a few points to bear in mind, and to remember also, should we wish to determine correct matching impedance by calculation, that we already have in circuit the impedance of the speaker incorporated in the receiver.

In the case of the triode, or ordinary power output valve being used, an additional speaker of the high-resistance moving-iron type may be connected direct to the extra loud-speaker sockets. Provided that the speaker in the set is of similar type, good results may be expected, and beyond a slight reduction in volume, owing to the available energy being divided between each speaker, no ill-effects should occur, unless they are introduced through other causes. We mention this because it sometimes happens, when connecting an additional speaker, that the use of long extension leads gives rise to instability in the low-frequency circuits. If the speaker in the receiver is a moving-coil, and we wish to use a moving-iron one externally, we may have a little difficulty owing to their being of different types.

Although the reproduction of the moving-coil may be slightly affected, the chief trouble will probably be due to the incapacity of the moving-iron speaker to cope with the energy imposed upon it, especially if the output valve is a super-power valve capable of handling large outputs. The external speaker, therefore, must have its available energy controlled, but it is obviously desirable that this should be made possible without seriously affecting the volume obtainable from the moving-coil speaker. This can be done by connecting a potentiometer of about 50,000 ohms across the extra loud-speaker sockets, the loud-speaker being connected between the centre point or sliding contact of the potentiometer and the earth end, as shown in the accompanying illustrations.

If, by this arrangement, there should be too much loss of high notes, we can compensate for it by inserting an extra condenser of about .001mfd. across the other half of the potentiometer, as indicated by the dotted lines in the circuit diagram.

In the case of a pentode output valve, which has a very much higher impedance, an output transformer or low-frequency choke is invariably employed in the output circuit to ensure correct matching. We can assume that the built-in speaker will already have a matched output, but the extra loud-speaker circuit seldom incorporates an additional output transformer, which, if needed, depends for its correct ratio on the impedance of the loud-speaker to be used in conjunction with that of the built-in circuit. Generally speaking, when a high impedance loud-speaker is connected externally to a receiver with pentode output, it is preferable, although not essential, to feed it through a small step-down transformer; whereas an additional speaker of the moving-coil type must always be fed through a fairly high ratio step-down transformer, whether used with power or pentode output. With the latter the ratio may be anything from 10–1 to 80–1, while for a power valve a ratio of 25–1 is seldom exceeded.



Wiring diagram of the complete arrangement.

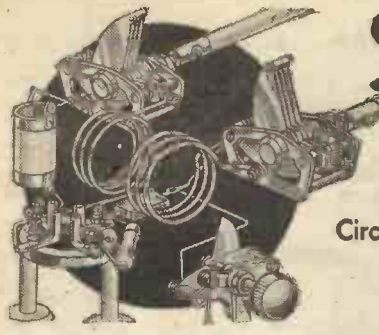
TOPICAL TECHNICALITIES

Electro-Magnetic Induction

THE principle of electro-magnetic induction is used extensively in electrical and wireless practice and the following brief description will enable the principles underlying the design of a generator, for instance, to be clearly understood. When a coil of wire is moved in a magnetic field an e.m.f. will be induced in the coil, and the direction of this induced force will depend upon the direction in which the coil is moving. Thus, if a magnet having north and south poles is arranged so that a coil may be rotated between its poles, the induced currents will be greatest when the coil is situated centrally between the two poles and at a minimum when it is at right angles to the poles. In this position the winding of the coil will be in a plane parallel with the lines of force of the magnet, and consequently the movement of the coil will result in only a small change of induced e.m.f. until it (the coil) approaches the central position. The magnetic poles produced in the coil are of the same nature as the fixed poles, thus tending to stop rotation, and as the coil is moved farther through its rotation it becomes necessary for the current to change its direction in order to oppose rotation and thus the cycle repeats, the current continually changing from zero to maximum in one direction, back to zero and then to maximum in the opposite direction, and thence back to zero. This complete change is known as one cycle, *whilst passage of the current from zero to maximum and back to zero is known as* one alternation. *The time required for a complete cycle is known as a* period. *The number of cycles produced each second is known as* the frequency.

Two Valves in Parallel

IT is well known that two valves in parallel give twice the volume that one alone would give, but it quite often happens that a constructor parallels up a valve with the existing output valve without making the least difference. This is due to the impedance in the anode circuit being left as before, whereas it should be halved. The point is that there is twice the available speech current, but the same voltage, so that the impedance must be halved. This will allow the unchanged voltage to drive twice the current through the loud-speaker transformer primary.

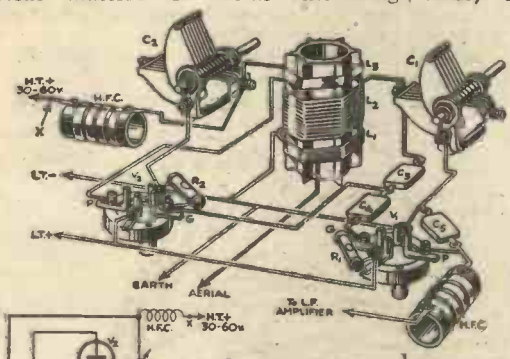


Short Wave Section

Circuits for the Short-Wave Experimenter

By "SHORT WAVER"

ALMOST all short-wave listeners are experimentally inclined, and usually are not content to use one circuit or lay-out for any length of time, and it is hoped that the circuits given here will provide material for some interesting



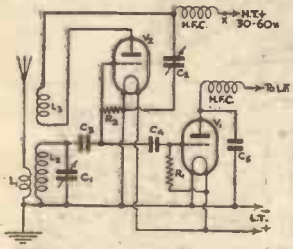
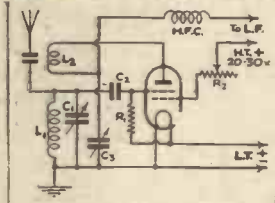


Fig. 1.—Using a separate valve for reaction purposes.

experiments, although from the point of view of improved results it will be found difficult to better the simple capacity controlled reaction detector circuit. One of the hardest things with this circuit is to get smooth reaction and good detector efficiency at the same time, because the H.T. voltage has to be kept low for smooth reaction, whereas the best detector action and subsequent amplification is obtained with high H.T. volts. In our first circuit (Fig. 1) therefore, these functions have been divided between two separate valves; V_1 does the detecting, and the second valve V_2 provides the reaction control. Each valve has its own grid condenser and leak, C_4 and R_1 for the detector and C_3 and R_2 for the reaction valve; C_3 and C_4 can be the same size, about .0001 to .0002 mfd., but R_1 may well be smaller than R_2, say 5 megohms and 7 to 10 megohms respectively; C_5 is a .0005 mfd. detector plate by-pass condenser. All other components have their usual values, although it may be found desirable to have a slightly larger reaction coil than ordinarily. Control of reaction is provided by C_2 or else by a 100,000



to 250,000 ohm variable resistance inserted at X. The H.T. to V_2 should be adjusted to obtain smoothest reaction, but the maximum recommended by the makers may be used on V_1. This circuit gives very smooth control of reaction, and largely eliminates the detuning effect of the average reaction control and the noisy background often experienced with reacting detectors. It may be used very well with a screen-grid detector at V_1.

"Space Charge" Detector

Mention of screen-grid detectors brings to mind an unorthodox arrangement, which makes use of the screen-grid valve, called the space charge detector. The circuit is given in Fig. 2, and it will be seen that, contrary to all usual practice, the screen grid is connected to the tuned circuit (*via* a grid condenser and leak), while a positive potential is applied to the control grid. Component values are normal except that L_2 will probably need to be larger than usual unless exceptional care is taken in laying out the circuit, and C_3 must be at least .00025 mfd. for satisfactory control. The potential of the control grid will be found to be very critical, so R_2 should be about 250,000 ohms to ensure an adequate range of variation. The chief feature of the arrangement is the remarkably smooth reaction control that is obtained, so smooth that it is often difficult to decide

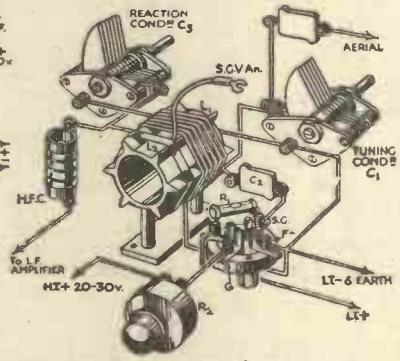


Fig. 2.—A novel way of using a screen-grid valve in a detector circuit.

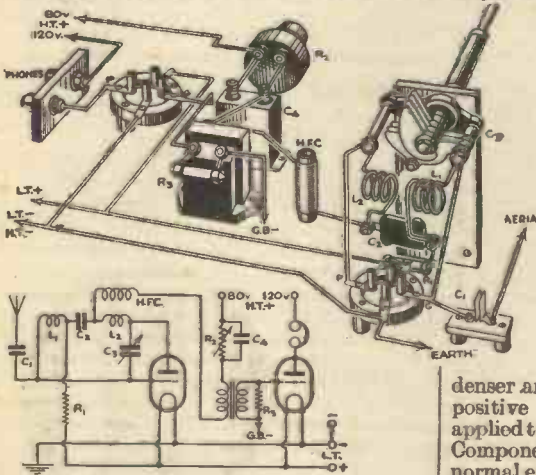


Fig. 4.—This arrangement provides splendid results.

whether the detector is oscillating or not. While not as easy to get going as some circuits, this is certainly a very interesting arrangement for the experimenter.

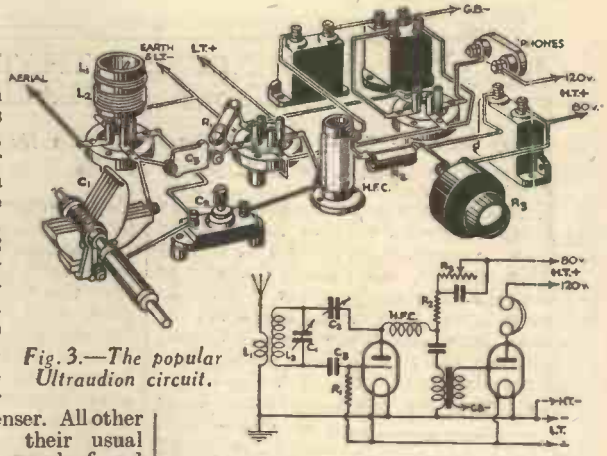


Fig. 3.—The popular Ultraudion circuit.

The "Ultraudion" Circuit

Reverting to three electrode valves, an old circuit which is worth attention is the Ultraudion. The circuit is given in Fig. 3, from which it will be seen that there is no separate reaction coil, a single coil fulfilling the functions of both grid and reaction coils. The aerial is shown coupled by a coil L_1, but it could equally well be tapped on to L_2, with a small condenser in series. If an H.F. valve is required to precede the detector, L_1 may be connected in series with the H.F. valve plate, and so become the primary of an H.F. transformer. The great advantage of the Ultraudion for this purpose is that since only two windings are

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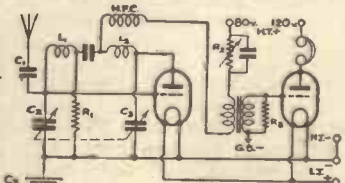


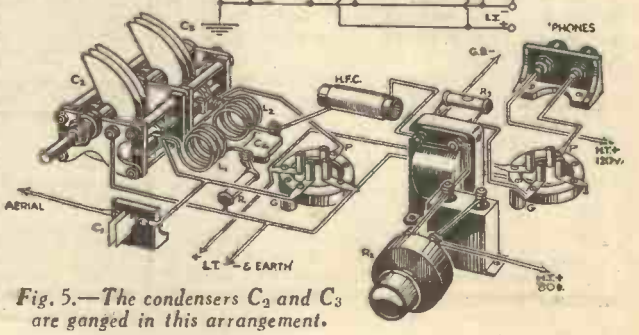


Fig. 5.—The condensers C_2 and C_3 are ganged in this arrangement.

(*Continued from page 736*)

required (L_1 and L_2) the transformer can be wound on the ubiquitous valve base, which is not possible when a third (reaction) winding is necessary. The chief disadvantage of the circuit is that both the tuning condenser C_1 and the reaction condenser C_2 are above earth potential, and hence must be mounted away from the panel and fitted with extension handles to avoid hand capacity effects. Suitable capacities for C_1 and C_2 are .00015 and .0002 mfd. respectively; if C_2 is a pre-set condenser mounted on the baseboard, reaction can be controlled by means of a 50,000 to 100,000 ohm variable resistance at R_3. Other values of components are normal, although it will probably be found that L_2 must be a little larger than the usual grid coil. This circuit has been found very satisfactory on five metres.

The "Hartley" Circuit

Another good circuit for five-metre work is the split Hartley arrangement, shown in Fig. 4, which is adapted from a transmitting circuit. This arrangement is very easy to get into operation, but has the same disadvantage as the Ultraudion, that the tuning condenser C_3 is above earth potential; this can be overcome by mounting C_3 on a sub-panel parallel to the main panel and using an extension handle, a precaution which would be necessary in any case on a five-metre receiver even if the tuning condenser was earthed. Reaction control is by means of the 50,000 ohm variable resistance R_2, the 2 mfd. condenser shunting it being to remove any noise resulting from manipulation of the slider knob. On five metres suitable values for C_2 and C_3 are .0001 mfd. and .000015 mfd. respectively. Self-supporting coils half an inch in diameter, and wound with number 18 tinned copper wire, are used; two coils of three turns each should cover the amateur five-metre band from 5 to 5.4 metres. C_1 is a very small condenser made from two plates of aluminium or brass half an inch square, and separated about an eighth of an inch. R_1 is the usual grid leak, and H.F.C. is a special five-metre H.F. choke containing 30 turns of 32 D.S.C. wire, space wound on a half-inch former. The circuit can be used on the longer short waves very satisfactorily also; in this case C_3 may have the more usual value of .00015 to .0002 mfd. while C_2 should be about .00025 mfd.; although this condenser may be used as a reaction control if desired, this is not recommended because of the very considerable detuning experienced. Probably R_2 will have to be larger than 50,000 ohms in order to obtain adequate reaction control over a large band of wavelengths. With regard to coil sizes, if L_1 and L_2 are both five turns on a two-inch former a .00015 mfd. condenser will tune from about 25 to 46 metres, while wavelengths below 25 metres could be covered by two three-turn coils. Above 5 metres C_1 may be a .0001 mfd. semi-variable condenser. This circuit is a little prone to threshold howl, hence the 250,000 ohm resistance R_3 across the L.F. transformer secondary.

Series Colpitts Circuit

A modification of the split Hartley that is rather interesting is the series Colpitts circuit shown in Fig. 5. In this circuit the tuning condenser C_3 of Fig. 4 is replaced by a double condenser consisting of two sections C_2 and C_3 of equal capacity operated by the same spindle. The chief advantage of this circuit is that the moving plates of both condensers can be earthed, and so help to remove hand capacity. This circuit is primarily an oscillator.

RADIO RAMBLINGS

By JACE

Jottings from my Notebook

Magnetostriction Oscillators

THIS term looks somewhat formidable, but is easy to understand, and offers some interesting possibilities. It is now well known to our readers that the coupling of a coil in the anode and grid circuits of a valve results in oscillation. A further well-known fact is that the passage of a current through a winding round a soft-iron rod results in magnetism being imparted to that rod. When a soft-iron rod is surrounded by the anode and grid coils of an oscillating valve a very high vibration is imparted to the rod, depending upon the frequency of the two circuits, and some wonderful effects are obtained with an instrument designed on this basic line. As some indication of the power it may be mentioned that during some experiments it was found possible to burn a cork inserted in the neck of a glass bottle filled with liquid. Some interesting developments in this class of experiment are expected in the future.

Reflected Short Waves

IT was recently mentioned in these pages that the short wave offers some peculiar possibilities in view of the fact that it is reflected from certain bodies. For instance, when wavelengths below 5 metres are radiated from a beam type of aerial it is found that they are reflected upon coming into contact with any earthed body. This idea has led to direction finders for ocean-going craft and aeroplanes being designed to incorporate a special short-wave transmitter. The radiation is directed downwards in both cases, and is reflected, in one case from the surface of the earth, and in the other from the ocean bed. By means of a receiver situated in another part of the craft the reflected wave is received, and the difference in time between transmission and reception is recorded and a specially calibrated dial shows in one case the airman's height above the nearest ground, and in the other the depth of the ocean, thus removing the necessity for soundings to be continually taken.

Proof of Our Popularity

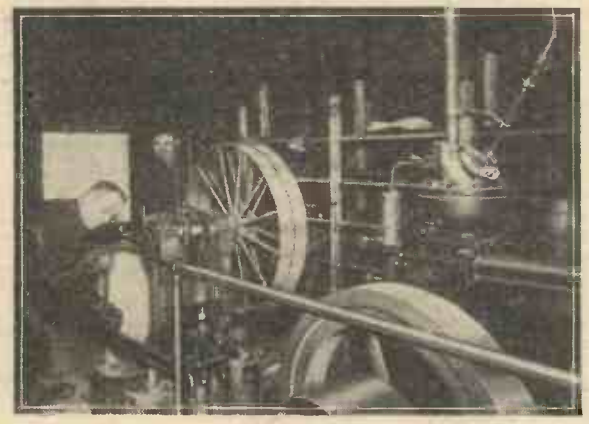
IT may interest our readers to know that the popularity of the circuits published in our pages has made Messrs. Graham Farish so busy that, notwithstanding the fact that they are working twenty-four hours a day, a still greater output is required. In order to cope with increasing business they have been obliged to scrap some of their plant, and substitute other more up-to-date appliances.

The illustration shows the new hydraulic machinery being put in for the production of bakelite mouldings, from which an increased output of nearly 50 per cent. is anticipated.

How the 10s. Licence Fee is Disbursed

ACCORDING to the B.B.C. Year Book 1934, for every fee of ten shillings payable in respect of each wireless licence, considerably less than that amount goes to the B.B.C. for the broadcasting service. In point of fact, the Corporation received in 1932 precisely four shillings and sevenpence from each ten shillings; the balance of five shillings and fivepence went to the Government, made up as follows: Post Office, 1s.; Treasury, 3s. 5½d.; Income Tax, 5d.; additional contribution to the Government's general revenue, 6½d.

The main items of the B.B.C.'s expenditure out of its own share of 4s. 7d. were as follows: Programmes, including artists' fees, orchestras, news service, performing rights, simultaneous broadcast telephone system, programme staff salaries and expenses, 2s. 6½d.; Engineering, including maintenance of plant, power, research, engineering staff salaries and expenses, 11½d.; Standing charges, including rents, rates, taxes, insurance, heating and lighting, upkeep of premises, telephones, bank interest, etc., 7½d.; Administration—staff salaries, travelling expenses, etc., 3½d.; Governors' fees, ½d.



New hydraulic machinery installed in the factory of Graham Farish Ltd.

Western Australian Air Survey

WIRELESS will play an important part in the air survey of Western Australia, which is to be made by the Western Mining Corporation in connection with their mining prospecting operations. The two aeroplanes to be used for the survey have been fitted with Marconi transmitting and receiving equipment, and a comprehensive service of air-and-ground wireless communication and direction finding will be provided by three mobile Marconi ground stations mounted in motor lorries. By means of this wireless organization the position of the surveying aeroplanes will be plotted on a chart in the office of the Manager of the Expedition during the entire operations in the air, and it will be possible to exchange messages, by medium and short waves, between any of the ground stations and the aircraft in flight, and also with Australian wireless stations outside the survey area. The expedition officials will thus have direct control over the vital operations of aerial photography, each pilot will be constantly informed of his position—a factor of considerable practical value when working over remote areas—and the geologists will be able to communicate any reports regarding visual reconnaissance direct to headquarters by wireless telephony.

Gramophone Companies and Lucerne Wavelength Plan

IT is understood that although the Lucerne Wavelength Plan comes into operation on January 15th, modifications to the wavelengths of British and the Continental stations may take place after this date, and it is unlikely that permanent wavelengths will be definitely settled until the middle of 1934. The "His Master's Voice" and Columbia Companies are consequently making arrangements to ensure that owners of their radio receivers and radio-gramophones, at present fitted with station and wavelength scales, will be able to use them during the next six months with the least amount of trouble. The companies are preparing special cards for each type of instrument, on which will be a replica of the present station dial and—side by side—the sketch of a dial based on the Lucerne Plan. Simple reference will show the listener the new position of any desired station. These cards will be available free of charge from the "His Master's Voice" or Columbia dealer from whom the instrument was purchased.

The B.B.C. and Television

IN September notice was given to Baird Television, Ltd., of the termination, on March 31st, 1934, of the arrangement under which regular television programmes are transmitted on a medium wavelength using their "30-line" system. Meanwhile, experimental work is being carried out with high definition systems transmitted on ultra-short wavelengths. Such systems offer more possibilities of future development than the low definition systems, although only the latter can be transmitted on medium wavelengths. If, however, the development of high definition television is not sufficiently stabilized by March 31st to justify regular transmissions by any of the methods tested, then the B.B.C. may continue transmissions, probably twice a week, using the low definition method on an ordinary broadcast wavelength, with a view to assisting those members of the public who are experimenting in television. These transmissions would depend on future development, with no guaranteed duration.

High Tension *from a* Low-Tension Accumulator

A Simple Converter Which Will Prove Very Efficient in Use

THIS converter consists of two sections. First an induction coil working off an input of 6 volts converts this up to 180 volts, and as the output is alternating current it has to be rectified and smoothed by the second section.

The primary of the coil absorbs about .75 ampères at 6 volts, but this can be reduced to .5 ampères at 4 volts with a corresponding decrease in output. The secondary voltage is stepped up to 150 volts on full input, and fed into a half-wave rectifier, R.

The rectified current is smoothed by choke Ch and condensers C1, C2. A second tap is provided by resistance P. The rectifier is an old 6-volt super-power valve obtaining its filament current from the primary supply.

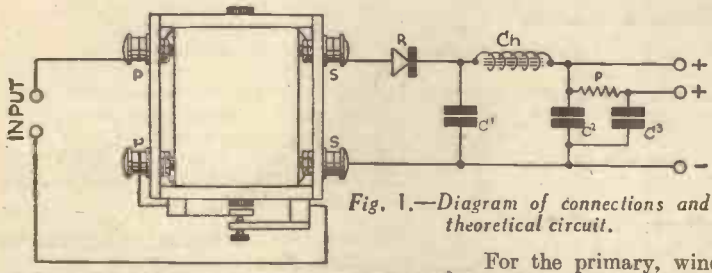


Fig. 1.—Diagram of connections and theoretical circuit.

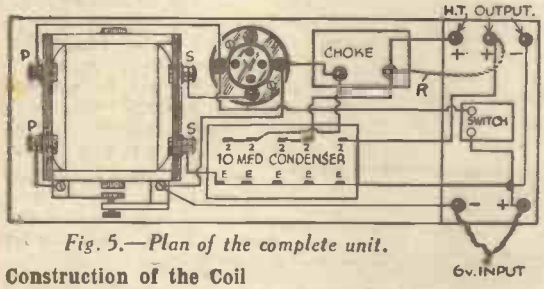


Fig. 5.—Plan of the complete unit.

Construction of the Coil

Cut two end pieces of hardwood 3in. by 3in. by ⅜in. and drill the centre of each to a diameter of ½in. (Fig. 2). Next obtain some iron wire, form this into a core ½in. diameter and 5½in. long. Slide on the end pieces till the inner faces are 4in. apart, and bind over the core with a layer of empire cloth. The tendency for the cheeks to slip off can be avoided by two brass washers placed over and soldered to the projecting core. Two similar washers can be fixed inside the cheeks.

The contact breaker next calls for attention, and this can be obtained from an old ignition or medical coil, or made according to Fig. 3, in which A is the support for armature, ½in. by ½in. by ⅛in. brass; B, support for adjusting screw, ⅜in. by ½in. by ⅛in. brass; C, arm for adjusting screw, 1½in. by ½in. by ⅛in. brass, threaded to take screw E; D, soft-iron armature riveted to spring (clock spring) S. The soft-iron armature is ½in. diameter by 3/16in., and the spring is 1 9/16in. by ½in. to ½in.; E, the adjusting screw, preferably with platinum point (this can be obtained from an electric bell); L is a locknut to hold E in adjustment. It is inadvisable to mount the contact-breaker till the coil is wound.

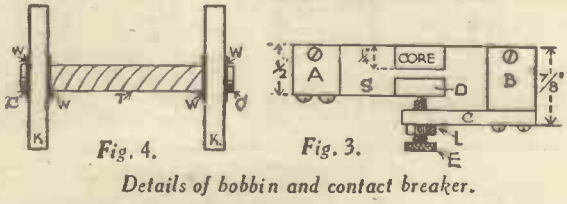


Fig. 4. *Fig. 3.*

Details of bobbin and contact breaker.

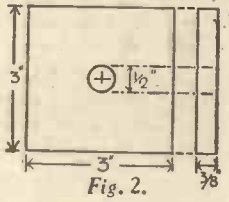


Fig. 2.

Winding the Coil

The bobbin for winding is shown in Fig. 4, in which W are washers, C the projecting ends of the bare core, KK hardwood end pieces and T the taped winding core.

For the primary, wind on three layers of 21-gauge enamel covered wire. This is equivalent to 348 turns at 116 turns per layer. Over this winding lap two layers of empire tape and apply a thin coat of shellac.

The secondary consists of 10,400 turns of 35-gauge enamel covered wire. This will take about 424 turns per layer, and 24 layers. When completed, the ends of the windings should be attached to terminals as in Fig. 1, marking the ends of the thick coil P, and the fine coil S.

After the contact breaker is fixed in place, the coil and rectifier can be mounted.

A complete unit is shown in Fig. 5. The spaghetti resistance R has a resistance of 25,000 ohms. This resistance can with advantage be a variable one, and separate condensers can be used in place of the block condenser shown, if desired. The rectifying valve V must be of the same voltage as the input, and almost any low impedance power valve will do, *e.g.* 6v. Mullard PM256 or PM256A, Six-Sixty 625SP or 625SPA, 4v. Mullard PM4, or Cossor 415XP.—H. B. SMITH (Kenton).

The Cause of a Valve Going Soft

A CORRESPONDENT who had trouble with a receiver traced the fault to a break in a bias resistor, and when this was duly replaced the associated valve was found to be dead soft. It would not seem possible for the resistor to have impaired the valve, bearing in mind that the anode current could not flow with a break in the bias resistor. Actually the reverse is the case; the anode is tied to the cathode by a small stray emission, and the cathode is then at, say, 200 volts positive (the anode voltage) compared to the heater which emits a stream of electrons which bombard the cathode and break it up, thus liberating occluded gases which render the valve soft.

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.

SLADE RADIO

The Sixth Annual General Meeting of this Society was held recently, when a large number of members were present and the Hon. Sec. was able to report a very successful year. Forty-nine meetings were held, at each of which there was a lecture, demonstration, or discussion. The Society still has plenty of room for anyone interested and will welcome inquiries. Full details of membership, together with copy of advance programme, will be forwarded on request.—Address, Hon. Sec., 110, Hillaries Road, Gravelly Hill, Birmingham.

INTERNATIONAL DX'ERS ALLIANCE

This organization, which has its headquarters at Bloomington, Illinois, U.S.A., was formed last winter by Count Alexis Ross, of Vallejo, California, and other well-known sponsors of verified long-distance reception. Its chief objects are to encourage amateurs in all parts of the world to co-operate in the logging and verification of long distance reception, and to bring about a better understanding between nations. Part of the work of the alliance, which already has members scattered over the globe, is the arranging of special broadcasts on both medium and short waves from stations in different parts of the world. The organization is now running a special DX contest which continues till March 31st next, and several valuable prizes are offered. The official organ, "The Globe Circler," is issued monthly to members. Particulars of membership can be obtained from the European representative, F. Wiseman, 90, Brighton Grove, Newcastle-on-Tyne, or R. A. Rawles, Publicity Dept., Blackwater Corner, Newport, I. of W.

ILFORD AND DISTRICT RADIO SOCIETY

On November 16th, the Ilford Society entertained the Southend and District Radio Society, and on this occasion a talk and demonstration of an experimental photophone was given by Mr. R. McV. Weston. After describing the principles involved, Mr. Weston mentioned the results he had obtained in the transmission of music along a modulated light beam, in daylight at a distance of 144 yards.

Mr. W. G. J. Nixon, of the General Electric Co., Ltd., lectured on Modern Valve Developments on November 30th, and showed a large number of lantern slides which demonstrated the improvements in design of Osram valves from 1919 to the latest types of catkins, including the new DA 60.

Visitors are welcome at any meeting and readers should write for details to the Hon. Sec., Mr. C. E. Largen, 44, Trelawney Road, Barkingside, Ilford.

EXETER AND DISTRICT WIRELESS SOCIETY

On December 6th, through the kindness of the Edison Swan Electric Co., the Exeter and District Wireless Society were enabled to stage the first public demonstration of Television ever given in this district. After an extremely interesting lecture and demonstration on the Cathode Ray Oscillograph, during which he dealt particularly on its applications to Television reception, Mr. T. D. Humphreys connected his apparatus to the output of a six-valve "straight" set, designed by an amateur member specially for television work.

Immediately the transmission commenced, a very clear image was obtained, showing as an emerald-green picture on the end of the cathode ray tube, and was clearly visible to everyone in the room. Apart from occasional black-outs, due to complete fading of the transmission, and a rather bad heterodyne from Frankfurt, which is unavoidable in this district, the whole programme was clearly followed, even the full-length dancing act coming over exceptionally well. The synchronization of the picture was remarkably good, even through complete fades.—E. H. Ware, Programme Sec., "The Beeches," Woodbury.

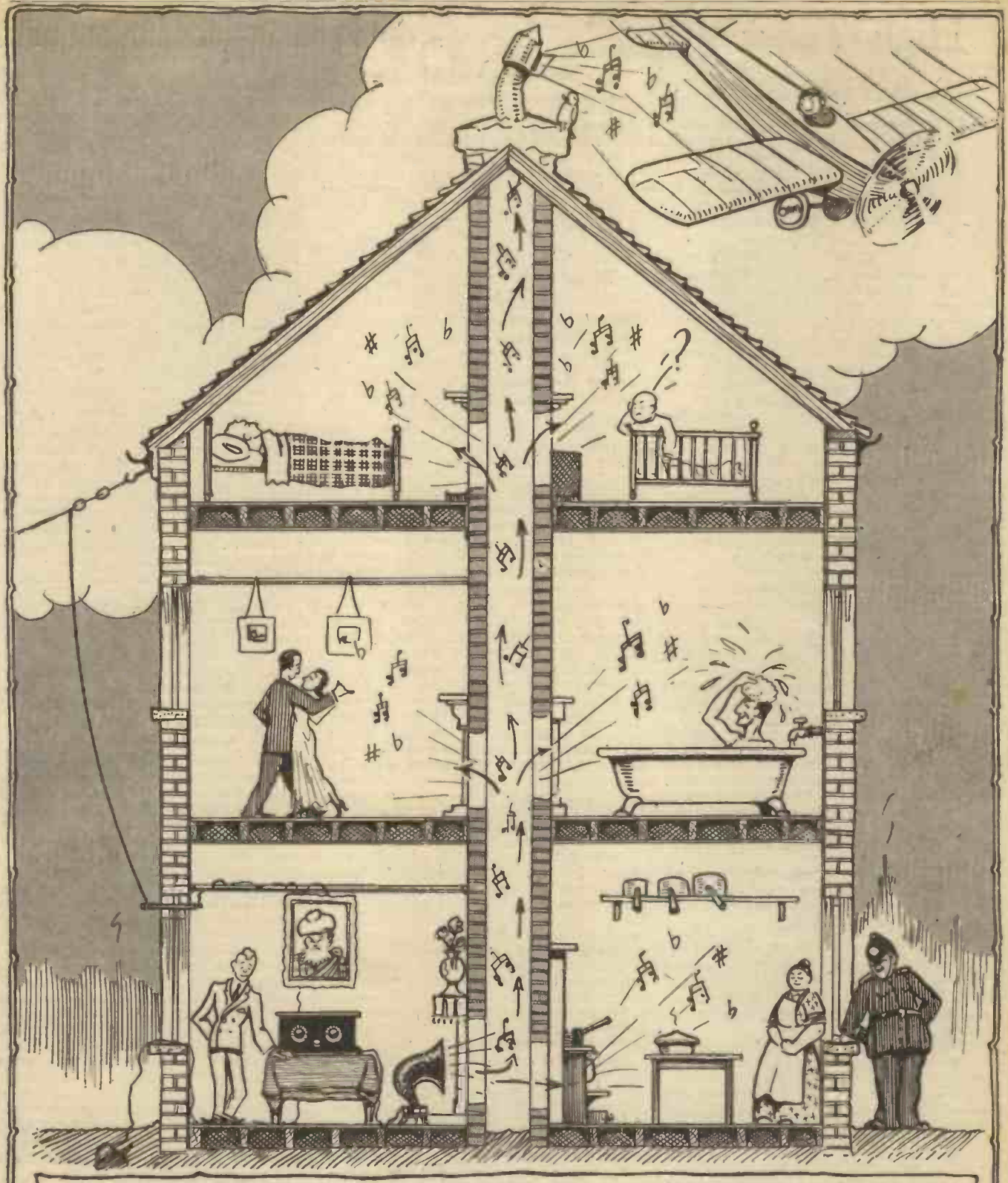
THORNTON HEATH RADIO SOCIETY

A meeting of this Society was held at St. Pauls Hall, Norfolk Road, Thornton Heath, on Tuesday, the 5th instant. Mr. S. J. Mears presided. The Chairman, in opening the meeting, extended a welcome to the members of the Croydon Radio Society. Mr. Basil Wardman (G5GQ) gave a talk and demonstration on short-wave transmission and reception. He stated that a transmitting apparatus was simpler than a receiver, and that any standard receiver would act as a transmitter by making certain adjustments.

Various types of aerial were then discussed and stress was laid upon the necessity of erecting an aerial the length of which corresponded to the wave being transmitted. The "beam" system was also fully described.

Mr Wardman then proceeded to demonstrate his transmitting apparatus, consisting of a crystal oscillator stage, a frequency doubler stage, and a power amplifier, operating on 40 metres. Mr. Wardman's call sign and test signal was very quickly picked up by EAR 324 n Cartagena (Spain).

Particulars of future fixtures can be obtained from the Hon. Sec., Mr. J. T. Webber, 368, Brigstock Road, Thornton Heath.

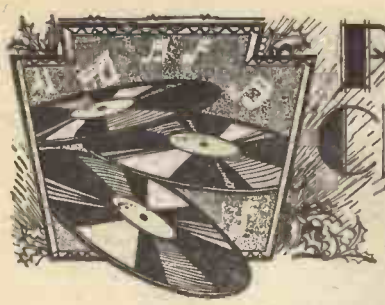


DEAR EDITOR—

"CUCKCOO COT"
COLNEY HATCH.

I AM SENDING YOU HEREWITH, MY "RADIO WRINKLE"—
ENTITLED— THE MAGIC FLUE"— FOR WIRELESS IN EVERY ROOM.
SO ECONOMICAL & CUTE— DON'T YOU THINK?— OR DON'T YOU?

YOURS HOPEFULLY— Arthur Ashdown.



RECORDS for CHRISTMAS

A Further Selection of Some Bright Numbers for the Festive Season

A VARIETY of entertainment is to be had from the British Homophone releases for this month. The Barnstormers, who recorded for this company last month for the first time, are heard again on *Sterno* 1298. This record, *Christmas Bells at Eventide*, a tune well in keeping with the festive season, and *Alice in Wonderland*, is well worth hearing. *Heatherland*, parts 1 and 2, *Sterno* 1305, include a number of well-known Scottish tunes played by Alexander's Accordeon Band. Whilst on this type of band, *Lover* and *Oh Ella*, *Sterno* 1304, played by Zigano's Accordeon Band, and *Merrie Soldiers* and *Waltz Espagnole*, *Plaza P*172, played by Devereux and his Accordeon Band, are two records that bring out these instruments at their best. For those who like dance tunes, *I Gotta Get Up and Go to Work* and *Ah, but is it Love?* from the film *Moonlight and Melody*, played by the Casani Club Band, *Sterno* 1294, *Gold Diggers of* 1933, which gives selections on both sides of the record from the film of that name, played by Sidney Lipton and his Band, *Sterno* 1297, *Swingy Little Thingy* and *Headin' for a Weddin'*, played by George Glover and his Band, *Sterno* 1300, are a few of the popular tunes that afford a fine selection.

Vocal Records

For those who like comedy records, *Eleven Good Lads*, an amusing football song, and *There are Many Good Reasons for Drinking* will no doubt suit their requirements. This record is played by Billy Hart and His Boys on *Homochord HR*26.

Two popular dance tunes that are very popular at the moment, *Love Locked Out* and *Happy and Contented*, are well sung by Eve Becke (Just a Singer of Songs) on *Sterno* 1306.

George Hocking, the well-known baritone who records for this company, gives us a very fine record in *Bless This House* and *In Happy Moments*. Both tunes are well sung and are well worth hearing, on *Sterno* 1282.

The Hymn that I Sang as a Boy, sung by Fergus Kelly, tenor, and *Make Believe*, sung by Roland and Ron, two fine duettists who have made a number of entertaining records, appear on *Plaza P*173. This is an extremely good record.

Light Music

This type of music is always appreciated by all music lovers, and *Lohengrin*, the introduction to Act Three, and the *Hungarian March*, played by the Plaza Military Band, *Plaza P*171; *None but the Weary Heart* (Tschaikowsky) and *A Night in May*, a waltz by Strauss, played by Leroy's Orchestra, *Plaza P*150, *Play of the Butterflies*, an intermezzo, and *The Cage in the Window*, played by Mantovani and His Tipica Orchestra, *Sterno*, 1302, are delightful and well-played tunes that will meet with their approval.

Brass Bands well recorded are always appreciated, and The Challenge Brass Band, who play *Two's Company*, which includes a fine trombone duet, and *The Enchantress March*, *Homochord HR*21, is well worth hearing.

Records by Stage and Film Celebrities

There are several new records by stage and film celebrities and one even appears by the famous stage impresario—C. B. Cochran—on *H.M.V. C*2628. He recounts his successes in the world of the theatre, whilst his favourite songs, from his own shows, are interpreted by Elisabeth Welch, Janet Joyce, Edward Cooper and Ray Noble and His Orchestra.

Jack Buchanan also introduces nine of his song successes, including *Her Mother Came Too*, *Fancy our Meeting*, *Who?* and *Two little bluebirds*, on *H.M.V. C*2630, whilst Jack Hulbert has recorded with sparkling gusto the two hits—*My hat's on the side of my head*, and *I want to ring bells*, from his new film *Jack Ahoy* on *H.M.V. B*8062. His wife—Cicely Courtneidge—treats us to an interpretation of four songs in her new film "Aunt Sally"—*If I had Napoleon's Hat*, and *We'll all go riding on a rainbow*, *H.M.V. B*8067 and *My wild oat*, and *The wind's in the West* on *B*8068. She conveys with amazing fidelity the particular brand of fooling in which she has made her name.

U.S.A. Cable Pronunciation of Word

Derickson and Brown, the popular American entertainers, have made a good record of a new song hit, *The last round-up*, *H.M.V. B*8076. In this song there is a very conspicuous phrase "Git along little dogie, git along." This does not refer to a young dog, but to a stunted calf which is sometimes seen in a herd. Derickson tells us that he and Brown were not sure how this word should be pronounced and unsuccessfully searched through nearly a dozen dictionaries. Eventually, he cabled to an uncle of his who had a big ranch in Texas, who cabled back "Pronounce as doh in dough-nuts."

Many hosts at Christmas parties will have their worries relieved this year by mystifying their guests with *Everyday noises as heard through the microphone* on *H.M.V.* C2609. There are twenty ordinary everyday sounds authentically recorded, but in some cases under or over amplified. The record will cause more controversy than any other that has been issued for some time. It would "let the cat out of the bag" to reveal now what sounds are heard, but they will cause much amusement at any party. Another record suitable for the same purpose is *H.M.V. B*8048—*Forfeits—Old and New*. On one side of this record are six forfeits for ladies and on the other six for men. Guests should be invited to place the soundbox of the gramophone on the record and then carry out the forfeit it commands. It is quite impossible to tell beforehand which forfeit, all of which are highly entertaining, each guest will have to undergo.

Old-time Dances

Hearts of Oak Lancers and *Valse Septembre* by Sydney Baynes and His Orchestra on *H.M.V. C*2632-3 will also add liveliness to the Christmas festivities, also *The Valeta* and *See me dance the polka* by the New Mayfair Dance Orchestra on *B*6418, whilst Don Bestor and His Orchestra's interpretation of *Who's afraid of the big bad wolf?* on *H.M.V. B*6420 will be considered by many to be the best recording of this Christmas Pantomime hit.

Another out-of-the-ordinary comedy disc is Ray Noble and His Orchestra's new edition of *More Turkish Delight* on *H.M.V. B*6424, in which the lyrics have been written by Max Kester, who has been responsible for many B.B.C. productions, the music being by Ray Noble.

Good Tenor Discs

To complete the first H.M.V. batch of December records there are three excellent vocal ones by tenors. *The Waltz Song* from "A Waltz Dream," which was recently broadcast by the B.B.C., sung by Richard Crooks, on *H.M.V. DA*1328, coupled with *Castles in the Air*. Two old favourites—*Roses of Picardy* and *Love's Garden of Roses*—are the subjects of Derek Oldham's new record, *H.M.V. B*8053, which will add to the popularity of this well-known artist.

Ketelbey's *In a Monastery Garden* has always been one of the most popular pieces of descriptive music, and now Peter Dawson's fans will be interested to hear that he has made an outstanding record of a vocal interpretation of this famous piece.

CHOOSING A MICROPHONE

(*Continued from page 719*)

The chief feature of the Roberts' microphone is that it is almost entirely non-directional; that is, it responds to sounds created at any angle to the enclosed diaphragms. Instead of the usual single diaphragm, this component has two flexible ones between which are placed the usual carbon granules. By this arrangement the microphone responds to sounds impinging upon it from any angle, due to the difference in phase existing between the pressure on the front and back diaphragms. This arrangement also results in greater efficiency at the higher frequencies, so that sibilants in speech and higher musical notes are reproduced better than with microphones of the ordinary type. Besides the model mentioned above, and which costs 12s. 6d., there are two others. These are, perhaps, not of such great interest to the average listener, but are worthy of note. One of these is a rectangular one which can be hung up or suspended in some other way, and the other is a small circular one which can be hung on the lapel of the coat for public-address work and similar purposes.

A More Elaborate Instrument

Although it is scarcely of the type which the average listener would care to employ for entertainment purposes, the moving-coil microphone made by Messrs. Epoch (makers of the well-known loud-speakers bearing their name) is a particularly interesting instrument. It is of the table type and is extremely sensitive, whilst giving a practically uniform response to the complete range of audio frequencies. It is illustrated on page 719.

8-11, Southampton Street, Strand, W.C.2

MY OPINION

BY THE EDITOR.

Soldered Joints or Terminals? Send Your Opinion Now!

FROM time to time it is stated, by those who claim to know, that home-constructed receivers which require soldered joints are not popular because very few people can solder. I do not subscribe to this view, and give it as my definite opinion that the amateur *can* solder and prefers a soldered joint. Obviously if terminal-equipped components are specified, he will back the designer's judgment and use them; and it may be that the popularity of terminal-equipped components is due to this. Nor can I admit that it is possible satisfactorily to build a set *entirely* without the use of soldered joints. Connections have to be made at points in the wiring where no terminals are provided, and unless clumsy methods are resorted to, the soldering bit usually provides the solution. The terminal method does not permit of the shortest possible leads being used. Surely, if soldering cannot be undertaken by most wireless amateurs to-day, the technical press of this country has failed in one of its duties? Articles by the hundred have appeared explaining how to solder, and if this information has failed to enlighten the reader on a comparatively childish process, the technical press should find fresh staffs of contributors. Most of the sets made by PRACTICAL WIRELESS readers which I have inspected have soldered joints.

With the object of guiding the component industry on this point, readers are invited to state, on a postcard, whether they prefer terminals or soldered joints—and why. The information supplied by our readers will be circulated to every member of the component trade. Books will be awarded to the senders of the twenty best opinions received. My own opinion of some of the terminals fitted to components is that they are far worse than a poor soldered joint. The contact or clamping area is totally inadequate, the screw threads easily strip, they are often of insufficient length to accommodate more than two wires, and (worst of all) those provided on transformers, etc., often rotate and snap the wire affixed to their inner extremities.

Wavelength Changes

IN reply to many readers who have written asking how the wavelength changes in January next will affect their receivers, I would say that those receivers which are calibrated in wavelengths only will be unaffected, except that the dial reading will be slightly different. In fact, the changes do not affect the operator of a home-constructed set at all, as none of the condensers supplied for home-constructors have station-engraved dials. Commercial receivers with the latter type of tuning scales will need to have a new scale fitted, calibrated according to the new plan, and a number of firms have already arranged to supply these at a nominal charge. It must be borne in mind, however, that further changes may take place even after the Lucerne Plan has been put into effect, and it is not considered by some manufacturers wise at the moment to issue new dials.

FACTS & FIGURES

BY THE PRACTICAL WIRELESS TECHNICAL STAFF.

UTILITY "MITE" CONDENSERS

THE new range of gang condensers manufactured by Messrs. Wilkins and Wright under the name "Mite" has been mentioned before, and further samples have now been received showing only one or two slight modifications. The illustration below gives some idea of the general appearance, and in this particular case the dust cover has been placed into position at one end of the entire assembly in order to show how the trimming adjusting screws are permitted to project from the cover, and also to show the method of making the moving vanes and spindle as a solid metallic mass. This is apparently accomplished by running molten metal round the assembly before finally placing the spindle into position and it gives great rigidity with no possibility of losses due to poor contact being set up due to oxidization, etc. The overall length of this three-gang model is only 4ins., and the total height is 3ins. It will be noticed that the first section

The Utility "Mite" condenser with one section enclosed to show the method of fitting the dust cover.

has the fixed vanes cut to permit of even tracking in a superheterodyne circuit and this model is known as the "Superheterodyne" model and costs slightly more than the standard three-gang type. The entire finish is in grey cellulose enamel, and at a cost of 24s. this represents very good value. A further example of the thoughtfulness which is expended in the Utility products is evidenced in the lower photograph, which shows one of the Micro Disc dials. It will be seen that every necessary screw and bolt is included with this dial, so that it may be mounted into its position without any difficulties whatsoever. The slotted metal strip on the right is employed for anchoring the lower portion of the dial to the edge of the chassis, and the dial may be obtained with bevelled or flat scale, as well as in full vision types. The reduction ratio is 50 to 1, and the flat type costs 8s., whilst the bevel type costs 8s. 6d.

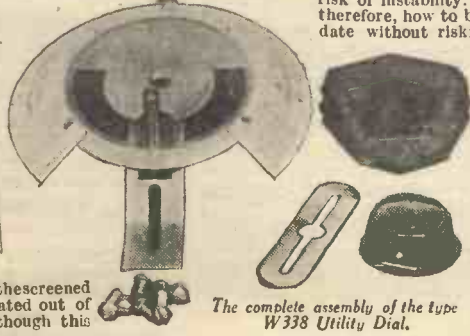
"REJECTOSTAT" INTERFERENCE ELIMINATOR

SEVERAL readers have asked for further particulars of the interference eliminating system invented by Messrs. Kolster-Brandes and known as the "Rejectostat" device. As the name implies, the device is developed for the rejection of static, not that kind which is due to natural electrical disturbances, termed "Atmospherics," for which no known cure exists, but the "man-made" variety, caused by electric motors, trams, trains, lifts, flashing signs and the many other electrical devices in daily use. The complete system comprises two units which are added to the aerial system and connected together by a length of metal-sheathed twin cable, termed a "transmission line," these being used in conjunction with a specially designed and completely screened receiver. The two units and the screened cable allow the aerial to be located out of the reach of interference, even though this may necessitate it being erected up to several hundred feet from the receiver, and this without noticeable loss of signal strength. In fact, so efficient is the system that with a transmission line of average length there is an effective increase of sensitivity over certain parts of the wave range of the receiver. The transmission line may be brought to the receiver by any convenient route (it may be laid underground if desired) and as it is screened, it does not pick up interference. The special screened receiver prevents interference reaching the wiring or from entering by way of the mains and thus all channels of entry are effectively closed. Provided the aerial is suitably located and the units and transmission line are properly installed, radio reproduction practically free from distracting background noises will be obtained.

Those who already possess a receiver may use the units and transmission line and will secure a very welcome measure of relief from "man-made" static.

Naturally, no assurance of complete immunity from interference can be given unless the complete system, including a "Rejectostat" receiver is employed, but, in all cases, a big improvement in reception will result.

In addition to its ability to eliminate or considerably reduce "man-made" static, the "Rejectostat" System possesses other valuable advantages. For example, it allows the aerial and receiver to be located in the most convenient places irrespective of their relative positions, so that the receiver may be at the front of the house and the aerial at the rear. In hotels or blocks of flats where normally it might be impossible to arrange an ordinary aerial system efficiently, a "Rejectostat" aerial can be placed on the roof while the receiver may be situate in any part of the building without impairing performance. Where it is not possible for each receiver to have its own aerial, several receivers may be operated from a single "Rejectostat" aerial without mutual interference or noticeable loss of efficiency.



The complete assembly of the type W338 Utility Dial.

R. & A. EXTENSION SPEAKER

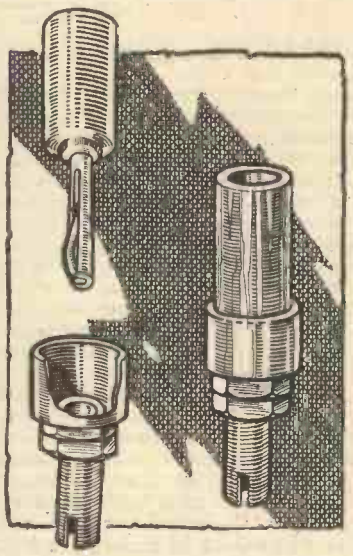
MESSRS. REPRODUCERS & AMPLIFIERS, Ltd., have now developed a special model of the well-known "Challenger" speaker, arranged for connection to existing receivers as an extension model. The principal feature of this new idea in radio is that an additional speaker may be added to a receiver and no loss of volume or distortion experienced. Many commercial receivers are designed to accommodate an external speaker, but this has to be of a certain impedance in order not to upset the balance of the output circuit which is fitted, and if attention is not paid to this point, not only will the added speaker produce an inferior tone and lower volume, but the speaker fitted to the receiver will also be affected. The new extension model is provided with an auto-transformer which enables an adjustment to be made to balance the impedance and thus obtain good quality and equal volume. The price of this speaker is 35s., and the speaker is known as the "Challenger" Model P.

NEW OSRAM S.G. VALVE

THERE are thousands of Kit and Portable sets in use which, owing to the fact that they were designed primarily from the point of view of ease of construction and simplicity of operation, could not use the high-efficiency valves in view of the risk of instability. The problem arose, therefore, how to bring such sets up to date without risking instability. The new Osram S.23 valve is the solution, and this has been designed by the G.E.C. primarily for the purpose above mentioned. It has the lowest possible anode current for adequate efficiency, lower even than the older S.G. valves fitted to kit sets. The screen current is also very low, and combined with a high impedance and slightly higher mutual conductance, the valve will prove extremely valuable to users of the types of receiver mentioned.

GRIPSO PLUGS AND SOCKETS

THE Gripso handy connecting devices are made in various types, and that illustrated is very suitable for mains connecting purposes. As may be seen the socket is protected with an insulated collar effectively preventing the fingers or other bodies coming into contact with the metal portion. The contact is quite substantial and there will be no risk of any losses being incurred, whilst the particular method of making connection with the plug will ensure that good contact without risks of shocks is maintained all the time. The price of these plugs and sockets is twopence each.



The Gripso power plug and socket.

THE PIX MODULA

A SPLENDID article of great utility which we unfortunately overlooked in our "Christmas Presents" article is the arm-chair volume-control, manufactured by the Pix people, and known as the Modula. As we have before pointed out, this enables one to control the volume given by the wireless receiver without moving from the arm-chair. The device may be fitted to any receiver so that one need have no fears that it might prove impracticable to fit it to certain sets, and there is also no technical skill or mechanical ability called for in the fitting. A small variable resistance form the mains portion of the device, and this fits over the arm of the chair by means of a leather strap or in any other desired manner, and the cable, which is supplied in either a 12ft. or a 36ft. length, is fitted at its opposite end with a cardboard disc, having a number of holes punched in it. A valve is removed from the receiver and plugged back with the cardboard disc interveuing. The device in its simplest form costs 2s. 11d., or with a neat armchair strap, 4s. If the long cable (36ft.) is required the extra charge is 1s. 6d.

PRACTICAL LETTERS FROM READERS

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

Anti-Break-Through Choke

SIR,—I was rather interested in your reply to A. T. (Dewsbury) in your issue of November 11th. The trouble he complains of is by no means an unusual one, especially to those in close proximity to a powerful transmitter. The design of the coil is considered to be the real cause of the trouble, but I have experienced this form of interference in well-designed commercial coils. Sets having only one tuned circuit are particularly liable to it. The anti-break-through choke will prevent the local from "butting in" all over the dial, but there is the possibility that including too large a fixed inductance in series with the aerial, selectivity may be affected on the long waves. A. T. could try ordinary plug-in coils (I have done so with varying degrees of success), but if he cares to experiment with the choke described in your issue of November 4th, I think he will eliminate the trouble he complains of. As the writer of the article referred to in your reply, I have used it many times, and always successfully, but as this kind of interference varies in different localities, he will have to ascertain by trial just which tapping will give the best result. He might have to add a few more turns to the total winding, but once having found the correct number to suit his case he could make one up with the required number of turns and fix it inside the set with a shorting switch.

I have not had occasion to write you before, so I now take the opportunity of congratulating you on the excellence of PRACTICAL WIRELESS.

The first number you published set a very high standard, and you have maintained it week after week. I hope you will continue to do so.—WILLIAM B. ASPINALL.

"Such Good Value"

SIR,—I thank you very much for the Tool Kit which I received safely. I need hardly say how delighted I am with it. I may mention that the tools are finely made and are packed in a very compact case. I was surprised to receive such good value. I know a little bit about tools, as I am a smith by trade, and they are just the tools that those who like to experiment with wireless will find useful. In wishing your paper every success, I may mention it has passed many a pleasant hour away for me.—A. H. JAY (Halstead).

"A Real Christmas Gift"

SIR,—Many thanks for the Pocket Tool Kit, just received; it is a gem, and a real Christmas gift. My congratulations on your enterprise.—A. ASHTON (Twickenham).

"Surpasses Anything I Had Expected"

SIR,—I feel bound to express my appreciation of the Pocket Tool Kit I have just received from you. I can see that it is going to be most useful to me, and the quality of the tools surpasses anything I had expected.—JOHN S. CHANNON (Rugby).

"A Very Fine Production"

SIR,—I wish to thank you for the Pocket Tool Kit, which arrived safely. It is certainly a very fine production and is well in keeping with the high quality of your paper.—D. C. GREEN (Clevedon, Som.).

"Well Up To Your Standard"

SIR,—I have safely received your Presentation Tool Kit. It is well up to the high standard of all your previous presentations.—GERALD C. JERVIS (Redditch).

A Five-Valve Circuit Wanted

SIR,—Being a regular reader of PRACTICAL WIRELESS since it was first issued, I have one complaint to make, and that is that every circuit diagram you have published has been an ordinary one. Why not publish a five-valve circuit, with "Class B" and two screened-grid valves, to give good quality output, with tone control, but not A.V.C.? I think that most wireless fans like to have reaction control, as without it I always think that one is not getting all that is possible, especially on foreign stations. I trust that you will see your way to publish such a circuit in the near future.—G. W. FORTNAM (Sutton Bridge).

What do readers think?—Ed.

CUT THIS OUT EACH WEEK

DO YOU KNOW?

—THAT it is possible to construct a simple apparatus which will locate a short-circuited turn in a coil or transformer or choke winding.
—THAT a tapping point can be taken from some types of moulded resister by twisting a piece of bare wire round the outside.
—THAT the value of such tapping will be approximately proportional to the length; in other words, a wire wrapped round one quarter of the way along the resistance will tap off three-quarters or one-quarter of the total value.
—THAT for trimming a home-made intermediate-frequency transformer, or for other similar uses, a coil of wire may be used as a condenser, the requisite capacity existing across the total winding.
—THAT ordinary metal braiding such as is used for H.F. leads generally proves ineffective for screening leads carrying A.C. supplies.
—THAT copper tube is most effective for winding short-wave coils for use on wavelengths lower than 10 metres.
—THAT a D.C. milliammeter may be converted into an A.C. voltmeter by means of a midget metal-oxide rectifier.

NOTICE.

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

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

CATALOGUES RECEIVED

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

"IGRANICOR" COILS

THE Igranic Electric Co., Ltd., have, for a considerable time, been carrying out research work on coils, using magnetic cores in high-frequency inductances, with the result that a series of tuning coils have been produced which are as striking in departure from present practice as they are in performance. It is possible to reduce the number of turns upon a coil, and then bring up the inductance to the required figure by inserting a core of magnetic material. By suitably designing a core, and proportioning the number of turns with the amount of core, a coil has been evolved which possesses a high-frequency resistance lower than any practical air-cored coil on the market. The decrease in high-frequency resistance, apart from increased efficiency, means that selectivity is enhanced considerably, and the question of station separation becomes simplified. A further advantage is that the stray field, instead of spreading, as with an air-cored coil, is confined to a practically closed circuit in the core, and a close-fitting metallic screen can be placed close to the coil to remove static coupling effects without in any way impairing the efficiency of the coil.

The core of these new coils is composed of very finely divided iron mixed with other materials to insulate the particles of iron from one another. A very fine and thorough mixing is employed, and, finally, a percentage of resinous powder is added to the mixture. It is then moulded under the heat and pressure conditions which are used for bakelite products.

Full particulars and prices, together with circuit diagrams incorporating various types of Igranicor coils, are given in an attractive folder, copies of which can be obtained from Igranic Electric Co., Ltd., 149, Queen Victoria Street, London, E.C.

BULGIN PRODUCTS

IF it's a high-class radio component you require, you will find it in the new edition of the Bulgin Radio Catalogue for the season 1933-4. It is, undoubtedly, one of the most comprehensive catalogues we have yet seen, and covers everything the constructor is likely to require. Included in the list is a fine array of switches for various purposes; screened H.F. chokes for chassis or baseboard mounting; tuning coils; valve-holders and adaptors; cartridge fuses; signal lamps and panel lights; and numerous other small components. In the back part of the catalogue there is a 24-page technical manual giving instructive information and showing how various Bulgin components are connected in different circuits. Copies of this useful list can be obtained on application to A. F. Bulgin and Company, Ltd., Abbey Road, Barking, Essex, enclosing 2d. for postage.

HANDBOOK OF TUNING COILS

THIS useful handbook, issued by the British Ebonite Co., Ltd., is full of information on the construction and winding of various types of coils used in present-day practice. All the coils described are wound on the well-known Becol Ebonite Formers, and the clear explanatory diagrams in the book make the task of coil winding a comparatively easy matter for the amateur. Amongst the coils dealt with are a Universal Dual-range Tuner, H.F. Chokes, Band-Pass Tuner, a Matched Dual-range H.F. Tuner, and a Triple-range Oscillator Coil. A handy table of wire gauges and turns per inch is included in the handbook, a copy of which can be had for 6d. post free. The address is Nightingale Road, Hanwell, London, W.7.

EDISWAN BATTERIES

USEFUL hints concerning Ediswan H.T. and grid-bias batteries is given in a neat booklet recently issued by Ediswan Swan Electric Co., Ltd. Users of these batteries who wish to know how to obtain the maximum length of life from them, together with the highest quality of reproduction from their sets, will find the information in this booklet, which also contains a handy two-page chart for logging stations. A leaflet giving particulars of the new Ediswan Multi-circuit charger is included in the booklet, a copy of which can be obtained from 123, Queen Victoria Street, London, E.C.4.

SOME INTERESTING USES FOR H.F. METAL RECTIFIERS

(*Continued from page 722*)

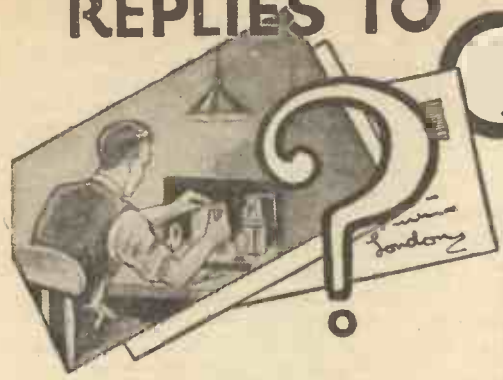
very much over-biased when no signals are being received. As soon as a station is tuned in, however, the bias automatically adjusts itself so that when the valve is fully loaded, the G.B. voltage is of the correct value specified by the makers. Because of this the anode current consumption of the output valve is always proportional to the volume of sound being delivered by the speaker. By this means, then, one of the most important advantages of the Class B valve can be obtained from a power or pentode valve of normal type. In Fig. 6 the values of the two resistances forming the potentiometer are given as 250,000 and 50,000 ohms respectively. These are average figures which usually suit power pentodes, but it is always best to try the effect of varying them, and choosing the lowest value for the "upper" resistance which permits of good quality reproduction when the output valve is fully loaded. An alternative method is to replace the 50,000-ohm fixed resistance by a variable one of about twice the value; increasing the value of that resistance will be equivalent to reducing the value of the other one. Another way is to replace both resistances by a 250,000-ohm potentiometer which can be mounted on the chassis of the set. After setting up the circuit shown in Fig. 6, all that is necessary is to adjust the G.B. voltage to the highest value at which good reproduction of loud passages is obtained. It should be pointed out that where two L.F. valves are employed, a separate G.B. battery will be necessary for the output valve, and it should have a voltage of twice that previously employed. The first L.F. valve will be biased in the ordinary way exactly as it was before.

REPLIES TO BROADCAST QUERIES

MUD (Tottenham): (1) OK2EA, amateur transmitter, Czecho-Slovakia, but cannot trace call in latest lists; we advise you to write: C.A.V. Box 69, Prague, Czecho-Slovakia; (2) CT1FU, Mario de Vasconcelos e Sa, 461, Rua das Valas, Porto, Portugal; (3) PA0OE, F. Bennick, Jnr., Breelaan 14, Bergen (N.H.), Holland; (4 and 5) Belgian amateurs, but cannot trace call-signs; for particulars write: *Réseau Belge*, 33, rue Alphonse Renard, Brussels, Belgium; (6, 7 and 8) French amateurs; for particulars write: *Réseau des Emetteurs Français*, 17, rue Mayet, Paris VIe., France; (9) F8PI, Samuel, 1, rue Gilbert, Epinal (Vosges), France; (10) F8PU, Bassus, 2, rue Saint-Vincent-de-Paul, Bordeaux (Gironde), France; (11) F8AE, Derasse, route de la Pyramide, Denain (Nord) France; (12) F8CC, Fernand Laye, 1, rue du Jasmin, Algiers, North Africa; (13) F8JC, Groizeiller, 12, avenue de la 42e Division, Verdun (Meuse), France; (14) VE9GW, Experimental station; Gooderham and Worts, Ltd., Bowmanville (Ontario); (15) W8XK, Westinghouse Electric and Manufacturing Co., East Pittsburgh (Pa.); (16) W2XAD, General Electric Co., South Schenectady (New York); (17) W2XE, Atlantic Broadcasting Corporation, near Wayne (New Jersey); (18) VK2ME, Amalgamated Wireless(Australasia), Ltd. Radio Transmitting Centre, Pennant Hills, New South Wales; (19) PLE, Bandoeng Radio Club, Java (Dutch East Indies); (20) G6DU, J. McOmish, "Curracheen," Perth Road, Crieff, Perthshire; (21) G6IA, T. H. Colbourn, "Ardchalligan," Selbonrne Drive, Douglas, Isle of Man; (22) CGA, Drummondville (Que.); (23) WQP, Radio Corporation of America, Rocky Point, New York; (24) YVR, Maracay (Venezuela); (25) LSY, Monte Grande (Buenos Aires); (26) CNR, Rabat (Morocco); (27) F8CA, Audureau, 29, rue de Bretagne, Laval (Mayenne); (28) F3DN, see reply to Nos. 6, 7 and 8; (29) F8ZW, Jean Wibrotte, 70, Avenue d'Italie, Paris, 13e, France; (30) See reply to Nos. 6, 7 and 8. J. G. ASTON (Dublin): We can trace the following call-signs: G2XA, M. Griffin, 101, Crossways, Heston, Hounslow, Middlesex; G6XN, Downside School, Stratton-on-the-Fosse, Bath, Somerset; cannot trace PA0EW; are you sure this was not PA0IDW, D. H. Wijkman, 13, Kanaalstraat 2, Amsterdam, Holland; F8EJ, Rene Trere, 36, Rue de Chateaudun, Cambrai, France; F8BI, M. Cassaigne, Rue Sadi-Carnot, La Magistère (T. et G.), France; cannot trace W2GOQ, but if W2GQ, William McClenahan, 5,324, Av. L., Brooklyn, New York, U.S.A. YANKEE (Derby): (1) WGY, Schenectady (N.Y.), 379.5 m.; (2) WJZ, Bound Brook (N.J.), 394.5 m.; (3) WJR, Detroit (Mich.), on 399.8 m., apparently relaying WRC, Washington (D.C.); (4) WEAF, New York, 454.3 m.; (5) WABC, New York, 348.6 m.; (6) KDKA, East Pittsburgh (Pa.), 305.9 m.; (7) WTAM, Cleveland (Ohio), 280.2 m.

LET OUR TECHNICAL STAFF SOLVE YOUR PROBLEMS

REPLIES TO QUERIES and ENQUIRIES by Our Technical Staff



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

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

SPECIAL NOTE.

We wish to draw the reader's attention to the fact that the Query 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. It is available only to genuine home constructors, not dealers or traders. 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 contemporaries.
(3) Suggest alterations or modifications to commercial receivers.
(4) Answer queries over the telephone.

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

TRANSFORMER BREAKDOWN

"I enclose a circuit of my receiver which has suddenly ceased to work. I was listening to a broadcast programme when, without any warning, the signals ceased. I have had the valves tested at a local shop and they are quite in order, so I should be glad to know what might be the cause of the trouble, or how to trace it out."—H. Y. T. (Peckham).

The circuit is the conventional H.F., detector, and power stage, and we think the most likely cause is a breakdown in one of the L.F. transformer windings. This is parallel-fed, and therefore it may quickly be checked by connecting the coupling condenser direct to the grid of the output valve. This will leave the circuit as a resistance-capacity coupled arrangement with the primary of the transformer in place of the customary grid-leak. If signals are then obtained it will denote that the secondary has broken down. If, however, no signals are heard the secondary winding should be joined between grid and earth (or grid bias) and the primary winding left disconnected. Signals now will indicate that the primary has broken down. If, however, neither of these tests enables signals to be heard we can only suggest that the circuit is tested stage by stage, using headphones in the anode circuit of each valve in order to ascertain that each is working correctly. Resistances and condensers are the most likely cause of a sudden cessation of signals.

CALIBRATED TUNING SCALES

"I have seen in the wireless shops lately one or two different makes of tuning scale of the slow-motion type on which the wavelengths are marked instead of the usual 0 to 100. I do not see how the dial makers can give this calibration, as they do not know what type of condenser will be used, nor the coil with which it may be associated. Is it intended that the scale shall only be used with their condensers and coils, or is it a ramp? I notice particularly in the case of the firm it does not make tuning coils."—F. P. O. (Preston).

The idea is perfectly sound, F. P. O., and you need have no fears that the idea is a ramp. If you examine one of these tuning scales carefully you will find that it states on the ivorine, or at least in the makers catalogues, that the scale is intended for a condenser of a given value and a coil of a certain inductance. For instance, the Utility dial, which was recently illustrated on the Facts and Figures page, is designed to work in conjunction with coils having an inductance of 157μ H on the medium waves and 1,900μ H on the long waves. Similarly, the other scales are designed for specific coil inductances, and used under those conditions the calibration holds good.

INSTABILITY

"My set periodically breaks out into motor-boating although it is decoupled. I have been all over it and tested each part and no part seems defective. I do not seem, however, to be able to get it to work for more than one night without the instability, and I should like to know how to set about finding the actual cause and effecting a cure."—S. L. (Birkenhead).

It may be that your decoupling is not complete enough, by which we mean that the capacity of the by-passing condenser is not sufficiently high to act in the manner intended. You should therefore try the dodge of connecting a further condenser in parallel with those which are at present in use. Try each stage in turn, adding a 2 mfd. condenser. It may be found necessary to increase the value in more than one stage, although it is most likely that the detector stage is responsible for the instability. If this does not effect a cure we would undoubtedly state that the resistance in one of the anode circuits is defective and when it warms up its value materially decreases. You can check this point by feeling the resistances after an evening's working. There should be no material rise in temperature.

NEW RECEIVING CIRCUITS

"After reading all your issues since No. 1, I have not been able to see that you have originated a single new idea in radio. All your circuits have been of the standard arrangement, using the ordinary sequence of valves, etc. Is it not possible that you have sufficient talent to design something entirely new? I should certainly be one of the first to try out the idea if I saw it written up in your pages."—A. J. R. (Oxford).

We cannot agree that we have not shown originality. A. J. R. appreciates, we assume, that valves can only be connected in a certain sequence, with the science as it is to-day, and any departure from these "standard" methods would be invention, and as such would surely not be published until sufficient patent protection had been obtained. The circuits which we have published have all shown originality, from the first introduction of the "chassis-type" of construction to the latest receiver, which employed the A.V.C. principle with battery-operated valves. Surely originality is evidenced when a circuit is designed round a newly obtainable component? However, we trust that A. J. R. is sufficiently interested to try out the various circuits which we publish, when we are sure he will find that the receivers are certainly modern in both performance and design.

PARTS FOR THE ORBIT

"I have been waiting now for three weeks to get the parts for the Orbit, and am becoming disgusted that you should publish a design before the components are on the market. Can you not do something to stir up the manufacturers? If things get much longer I shall certainly not try to make up your sets but shall be content to stick to my old set or buy one of shop-built design."—T. B. N. (Gloucester).

We are sorry to say that, owing to the enormous demand for components for the Orbit, the manufacturers of certain parts have disposed of their entire stocks and are working now at high pressure in order to keep pace with the demand. You will no doubt find that the makers themselves can supply you direct although your local supplier may have run out. In most cases of this complaint—and we have had many—it has been found that the local dealer has no stock, and as the manufacturers must deal with all orders in rotation, they have had to wait some time before receiving further supplies. It is regretted that this should occur, but we hasten to assure our readers that we do not publish any design until the components are on the market, and it is only in isolated cases like this where the demand is so phenomenal that supplies are quickly exhausted.

DATA SHEET No. 66.

Cut this out each week and paste it in a notebook

MULTIPLE DIODE VALVES NOW OBTAINABLE.

Type	Rating: Filament Volts	Rating: Anode Volts	Type of Base	Price	Maker
DDT	4	200	7-pin	15/6	Cosor
DD/PEN	4	250	do.	20/-	Cosor
DDT.16	16	200	do.	15/6	Cosor
H4D	4	200	do.	15/6	Ferranti
L2/D	2	150	5-pin	10/6	Lissen
AVC/2	2	150	4-pin	17/6	Lissen
AC/AVC	4	200	5-pin	20/-	Lissen
MHD.4	4	200	7-pin	15/6	Marconi & Osram
DHD	16	200	do.	15/6	Marconi & Osram
L2/DD	2	150	5-pin	9/-	Mazda
AC/DD	4	—	do.	13/6	Mazda
AC/HL.DD	4	250	7-pin	15/-	Mazda
H.A2	4	200	do.	15/6	Micromesh
TDD.4	4	200	do.	15/6	Mullard
SD.4	4	200	do.	20/-	Mullard
TDD.25	25	200	do.	15/6	Mullard
BA 1	250	300	do.	18/3	Ostar Ganz
BA 5	250	300	do.	18/3	Ostar Ganz
SS.4.DDT.AC	4	200	do.	15/6	Six Sixty
B.430.N	4	200	do.	13/6	Tritron
B.2030.N	20	200	do.	13/6	Tritron
DS.4100	4	200	do.	17/-	Tungsram
DS.2018	20	—	do.	17/-	Tungsram

FREE ADVICE BUREAU COUPON

This coupon is available until Dec. 30th, 1933, and must be attached to all letters containing queries.

PRACTICAL WIRELESS, 23/12/33.

PRACTICAL WIRELESS MISCELLANEOUS ADVERTISEMENTS

Advertisements are accepted for these columns at the rate of 3d. per word. Minimum charge 3/-. All advertisements must be prepaid.

PREMIER SUPPLY STORES Offer the following Set Manufacturers' Surplus New Goods at a fraction of the Original Cost, all goods guaranteed perfect, carriage paid over 5/-, under 5/- postage 6d. extra (Ireland, carriage forward).

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

T.C.C. Condensers, 750v. working 2 mf. 3/6, 4 mf. 6/-, 4 mf. 450v. working 4/-, 250v. working 1 mf. 1/3, 2 mf. 1/9, 4 mf. 2/6; aqueous electrolytic 440v. working, 4 mf. 3/-, 8 mf. 3/6.

ALL the following Lines 6d. each or 5/- per dozen: 5-pin chassis mounting valve holders; shielded screen grid or pentode leads 1-watt wire end resistances, any value; 0.1 condensers; on-off switches push-pull; .01, .05 and 0.5 condensers.

AMSCO Triple-gang 0.0005 Condensers, with trimmers, 4/11.

T.C.C. Electrolytic Condensers, 100 volts working 15 mfd., 1/3.

PREMIER Chokes, 40 m.a., 25 hys., 4/-; 65 m.a., 30 hys., 6/-; 150 m.a., 30 hys., 10/6.

PYE Chokes, 20 hys., 4/-; Premier multi-ratio output transformers, giving 15 different ratios, 7/6.

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

BRITISH RADIOPHONE Wire Wound Potentiometers, with mains switch incorporated, 10,000 ohms, 50,000 ohms, any value; 3/6.

KOLSTER BRANDES Gramophone Motors, dual type, can be worked by clockwork or mains, induction type 100-250 volts, 27/6; complete with all fittings and turntable.

SPECIAL Offer.—Microphones by prominent manufacturer, high sensitivity, uniform response, complete with stand, transformer and battery; listed £3/15, our price 18/6.

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

ORMOND Condensers, 2-gang, semi-shielded; 2/6.

SPECIAL Offer of Mains Transformers, manufactured by Philips, input 100-115v. or 200-250v., output 180-0-180 volts, 40 m.a., 4v. 1a., and 4v. 3a., 4/6; 100-0-200v., 4v. 1a., 4v. 3a., 4/6.

ALL Premier Guaranteed Mains Transformers have engraved terminal strips with terminal connections, input 200-250 volts, 40-100 cycles, all windings paper interleaved.

PREMIER H.T.8 Transformers, 250v., 60 m.a., rectified, with 4v. 1-2a. and 4v. 3-5a., L.T. (both C.T.) and screened primary, 15/-; with Westinghouse rectifier, 25/-.

PREMIER H.T.9 Transformer, 300v. 60 m.a., rectified, with 4v. 1-2a. and 4v. 3-5a. L.T. (both C.T.) and screened primary, 15/-; with Westinghouse rectifier, 26/-.

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

CENTRALAB POTENTIOMETERS, 200 ohms and 400 ohms, 1/-. 250,000 ohms, 50,000 ohms and 500,000 ohms, 2/6.

ROLA F7 MOVING COILS, 1,000 Ohms. FIELD, 20/-; MAGNAVOX 142, 1,000 Ohms. FIELD, 22/-. PLEASE STATE WHETHER POWER OR PENTODE TRANSFORMER REQUIRED. A.C. CONVERSION KIT 10/- extra.

FOLLOWING VALVES USED FOR TEST ONLY. CALLERS ONLY. MS4B, MS4, DSB, DS, PT4, S4VB, ALL HALF PRICE.

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PREMIER Mains Transformer, output 135v. 80 m.a. for voltage doubling, 8/6; 4v. 3-4a., c.t. L.T., 2/- extra; Westinghouse rectifier for above, giving 180v. 80 m.a., 8/6.

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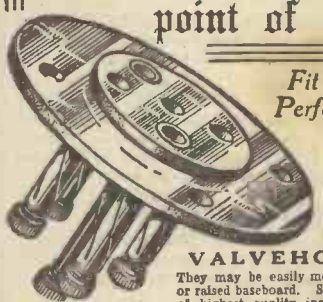

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PREMIER Mains Transformers, output 400-0-400 volts, 100 m.a., 4v. 4-5a., 4v. 2-3a., with screened primary, 15/-.

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