FREE BLUEPRINT OF "FAVOURITE THREE"

Amateur Wireless And Electrics

Every Thursday 3d

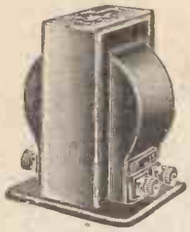
Vol. XII. No. 294 Saturday, Jan. 28, 1928

FREE FULL SIZE BLUEPRINT

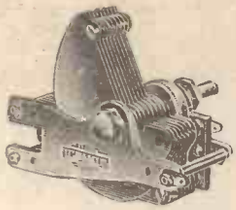
Registered at the G.P.O. as a Newspaper

Plain Valve Holder

Indigraph Vernier Dial



L.F. Transformer, Type "G"



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Amateur Wireless

and Electrics

The Leading Radio Weekly for the Constructor, Listener and Experimenter

Edited by BERNARD E. JONES

Technical Editor: J. H. REYNER, B.Sc.(Hons.), A.M.I.E.E.

Vol. XII. No. 294 — JANUARY 28, 1928

Britain's "Favourite Three"!—B.I.F.!—Important Coil Development!—Talks and More Talks!—5GB

Britain's "Favourite Three" on View!

READERS living in and around London will be interested to know that several models of Britain's "Favourite Three" are on view at Messrs. Selfridges. A unique opportunity is thus afforded for intending constructors of this excellent receiver to appreciate at a glance the lines on which Britain's "Favourite Three" has been conceived. As Messrs. Selfridges are making a very fine display of these receivers, a visit, if at all possible, is well worth while.

For A.C. Consumers

THOSE of our readers who have been wanting to do away with their H.T. battery and make use of their A.C. mains can well be advised to build the eleminator unit described on page 125. This unit is remarkably efficient and quite safe to use, and is not expensive to build up. It can be used on A.C. mains of about 110 volts or 200 volts.

BRITAIN'S "FAVOURITE TWO"

Given below is a view of next week's "star" set, which embodies the simple two-valve circuit placed second in our recent competition. It is aptly named Britain's "Favourite Two," and represents the next best receiver for those who, for various reasons,

A "phantom" picture of Britain's "Favourite Two"

do not build Britain's "Favourite Three," described and illustrated in this issue.

The two-valve circuit favoured by our readers is an old and well-tried one, consisting of a detector valve with magnetic reaction, followed by a stage of transformer-coupled L.F. amplification. The Technical Staff have interpreted this circuit in an eminently practical form. There are three panel controls: one for reaction, the second for tuning, and the third for the filament supply.

Simple plug-in coils are used, and the coil-holder is arranged so that these can be readily inter-changed. The battery connections are simplified by the incorporation of the G.B. battery inside the cabinet of the receiver.

If you are a two-valve enthusiast, on no account miss our next issue, in which a full-size blueprint of Britain's "Favourite Two" will be given FREE, together with full constructional details, lavishly illustrated with photographic views and working drawings, of the receiver.

Talks and More Talks

IN the B.B.C.'s recently issued syllabus of talks for January to April there is much to delight lovers of art, literature, and music. Doubtless, lovers of the "lighter" entertainment will not be equally delighted! The fortnightly talks now given by various critics will be continued, and talks on philosophy, health, history, Greek plays, Eastern art, sociology, æsthetics, farming, heredity, and motoring will be added to the list! We understand there will be *some* music!

"B.I.F."!

ARE you going to the British Industries Fair, to be held from February 20 to March 2 concurrently at the White City, London, and at Castle Bromwich Aerodrome, Birmingham? Many wireless firms have promised their strong support, and already the Board of Trade has issued a bulky catalogue and list of exhibitors in no less than nine languages!

An Important Coil Development

AT the present time there is undoubtedly a great demand for a more efficient and simpler type of tuner, particularly for use in high-frequency circuits. Amateurs, therefore, will read with particular interest a special article from the pen of Mr. J. H. Reyner, B.Sc. (Hons.), A.M.I.E.E., about the new "Q" coil, which will appear in the next issue of AMATEUR WIRELESS.

Le Journal Parle

THE *Journal Parle* at the Eiffel Tower station necessitates no less than forty persons passing before the microphone (it seems a large number, but that is on the authority of the announcer). It is a regular "news" affair, as it is backed by some of the leading Parisian daily papers, and has the best telegraphic news services at its disposal. We feel sure this is the sort of thing listeners would like to hear from 2LO, instead of the "Court Circular and Chinese Map," as Mr. Sydney A. Moseley has tersely described our news bulletin!

Will 5GB Come South?

IT'S going to be a long time before the problem of the two Daventry's is settled. Some people are complaining that the bad results experienced in some parts are caused by working two very powerful stations next door to one another. It is rumoured that 5GB will be moved to a district nearer London.

PRINCIPAL CONTENTS

THE COIL-CHANGING PROBLEM SOLVED—FULL DETAILS IN OUR NEXT ISSUE

HILVERSUM —A PIONEER STATION

By ARTHUR J. ALLAN

The Hilversum Headquarters

HILVERSUM has always been a station worth listening to; moreover, it has been easy, and still is, to "catch" it over here. Passing through Amsterdam, I decided to look up the powers that be in the Dutch broadcasting world. It was not at all as easy as I had at first imagined. A few months before my arrival the old and tried Hilversumsche Draadlos Omroep (HDO), hitherto responsible for the programmes sent out by Hilversum, had been dissolved.

I found that there were no less than six different bodies of people responsible for programmes transmitted by Hilversum. One was a Socialist club; it however only goes on the air now and then, three others were, respectively, one Catholic and two Protestant. These three have now a transmitter of their own. The remaining two organisations, I found, were the most important; in fact, by the time this appears in print they will most likely be only one. They are the only perfectly neutral programme organising societies in Holland. One, the smaller, is the N.O.V. (Nederlansche Omroep Vereenigung), the other, by far the largest, best organised, and most important, is the A.N.R.O. (Algemeene Ned. Radio Omroep). And it is of this latter association I intend talking.

Although no licence fee is charged in Holland, there is a law to the effect that every listener should inform the nearest P.O. of his having a wireless set. By this means one is able approximately to set the number of listeners in Holland down at 200,000. Of these alone, 50,000 are paying members of the A.N.R.O.

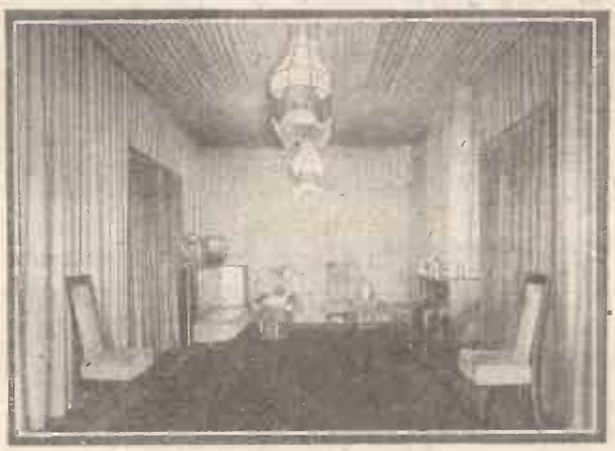
How much is generally contributed by these members? As I should have mentioned before, if no fee is collected and if the programmes broadcast are not to be merely advertisements, somebody has to pay. As set out in a printed folder of the A.N.R.O., some give 25 gilders or more; a lot of people 10 gilders; the most contribute 5 gilders (8s.) every half-year. Some give less; everybody gives what he can and what he considers as adequate.

That is the reason why the A.N.R.O. sends out the best all-round programmes. It also owns a radio weekly, the *Aetherbode*. It has offices in Amsterdam looking on to one of the famous *grachts* (canals) and has its own private detached house in Hilversum, which is only half an hour by train from Amsterdam. Two studios and the control room are in Hilversum.

The transmitter itself belongs to the Ned. Seintoestellen Fabriek, in Hilversum, which lies a little over a mile as the crow flies from the studios. The connection is by the usual telephone line, and all the more praise to the N.S.F. engineers for managing to transmit undistorted programmes, especially when an outside transmission from Rotterdam or the Hague is being put through.

When I went over to have a look at the transmitting apparatus of the Hilversum station in the N.S. factory, I was thankful at finding somebody who spoke English; the chief engineer and technical director is Mr. G. White, a former Marconi engineer. I had just been struggling to interview two very kind and well-meaning directors of the A.N.R.O., one of the musical, the other of the general programme department, but it had not been very easy owing to the absence of Mr. de Vogt, the secretary, announcer, and co-director of programmes of the A.N.R.O., who speaks English.

The transmitting apparatus consists of one giant oscillator valve and of three 5OKW water-cooled transmitting valves. But at the present time only about one-tenth of the power is put into these valves.



An Interior of the Hilversum Studio

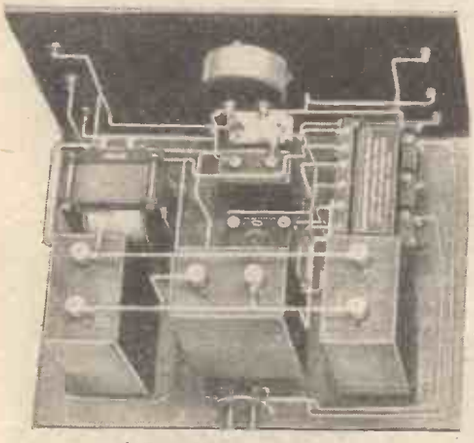
The transmitter is rented by the different programme producing societies at about £2 per hour, the A.N.R.O. alone transmitting during some fifty hours a week. The aerial is of the usual T type, supported by two iron masts. Hilversum can only be heard on crystal sets in Amsterdam if a good outdoor aerial is provided. Most people in Holland own valve sets.

H.T. SUPPLY FROM A.C. MAINS

CONSTRUCTIONAL DETAILS OF AN H.T. BATTERY ELIMINATOR UNIT

DESIGNED AND BUILT BY THE "A.W." TECHNICAL STAFF

ALTERNATING-CURRENT electric-light mains are not so readily useful to the wireless enthusiast as direct-current mains. But the advantages to be gained by the substitution of battery supply for "mains" supply to run a wireless receiver apply with equal force to A.C. and D.C. mains. Admittedly, the D.C. mains man



A Rear View of the Unit

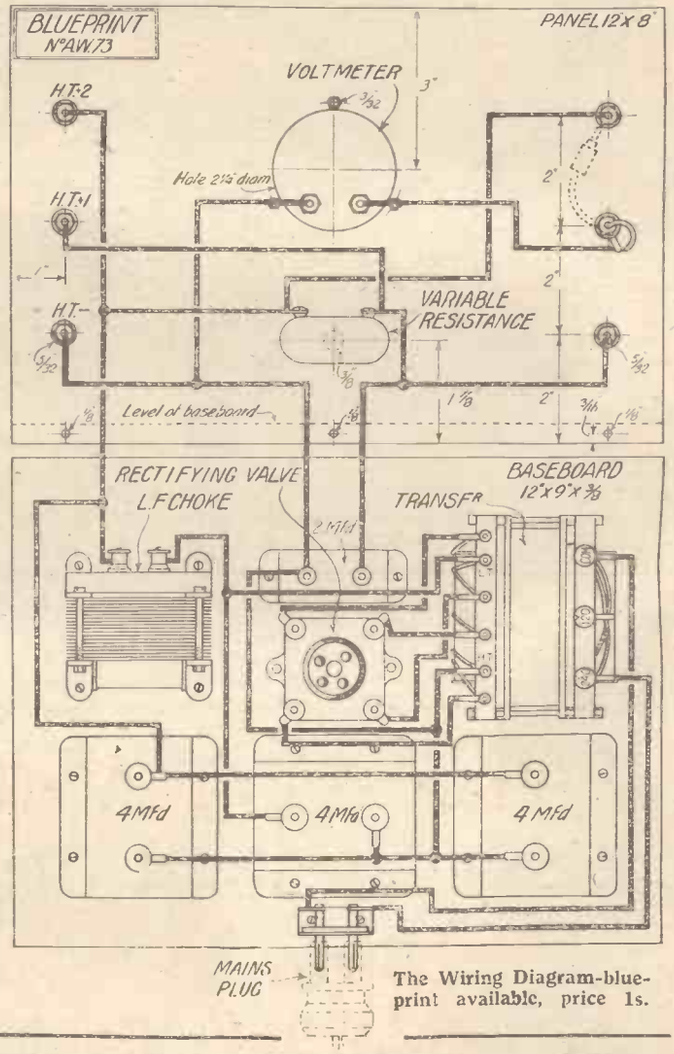
has the easier way available, because the current has only to be smoothed and regulated to be of immediate use.

Problems Involved

With A.C. mains the problem is a little more involved, owing to the nature of the current. With the average A.C. supply the current reverses its direction perhaps a hundred times per second, which is a useless state of affairs for a wireless supply, which requires a constant and uni-directional current. Before we can attempt to smooth our A.C. mains it is essential that the current be made uni-directional. For this purpose a rectifier is required, which, in the unit described, is a full-wave valve rectifier. The Osram U5 rectifier specified has the outward appearance of an Osram receiving valve of the DE5 type. Inside it there is a substantial filament taking 1.7 amps. and two anodes arranged one at each side of the filament. Used in conjunction with a Marconi Power Transformer Model A, this valve gives a well-rectified and easily-smoothed output of just over 130 volts when connected to 205-volt mains. The power transformer consists of three distinct windings. There is the primary winding which is connected across the mains, and two secondaries.

The "outers" of the smaller of the two secondaries are connected across the filament of the rectifier, and the centre-tapping forms the H.T.+ output lead. The 'outers' of the larger secondary winding are connected to the two anodes of the rectifying valve, the centre-tapping forming the H.T.— output lead. The general scheme will be perfectly clear from an examination of the theoretical diagram of connections. So far we have the two centre-tap connections giving the two output leads, positive from the filament secondary, negative from the anode secondary. The alternating current passed through the primary of the power transformer flows as a rectified current from the output. All that remains is to smooth this output and cut down the voltage to a suitable value. In the unit illustrated, the smoothing system consists of three large smoothing condensers and a "power" L.F. choke, i.e., a choke which passes the required current without loss of effective inductance. A 4-microfarad condenser is connected across the two centre-tap connections to form a "reservoir" condenser. This condenser is charged up from the rectifier and discharges through the L.F. choke in the positive lead. On the other side of the L.F. choke is another shunt capacity having a value of 8 microfarads, which so smoothes the output that the "hum" is negligible.

The values of the smoothing condensers have been chosen as the result of some considerable experience with eliminators



The Wiring Diagram-blueprint available, price 1s.

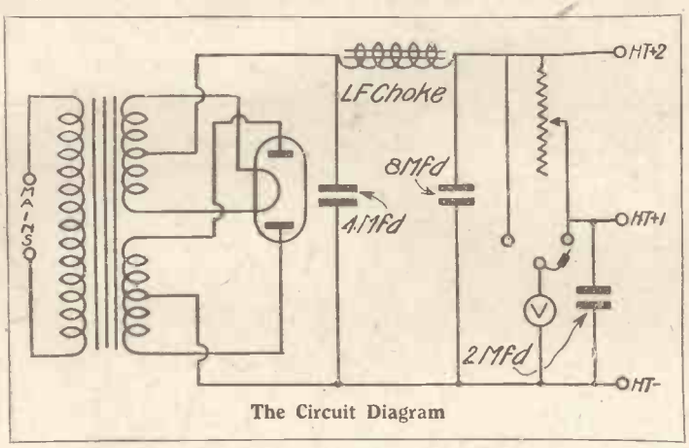
BRITAIN'S "FAVOURITE TWO" : Full Description and Free Blueprint Next Week

H.T. SUPPLY FROM A.C. MAINS (*Continued from preceding page*)

of this type and although it would be out of place here to delve into the theoretical considerations, it can be stated that the total smoothing capacity of 12 microfarads is the minimum permissible, although we have intentionally avoided the use of a larger amount of capacity in view of the not inconsiderable expense of smoothing condensers. But mains supplies in this country vary according to the locality; some supplies are much more difficult to smooth than others. If by chance it is known that the supply is particularly "fierce" it *may* be necessary to add another 4-microfarad condenser on the rectifier side of the smoothing choke. In general, however, the condensers specified are adequate.

Smooth D.C.

Having passed through the smoothing circuit the original alternating current has now become a smooth D.C. supply with a pressure of about 120 volts. For the amplifier feed the output is ready for immediate use, but 120 volts is too much for most detector and H.F. circuit requirements. The maximum H.T. is obtainable from the terminal marked H.T.+2 in the diagrams, and a lower value, which is



The Circuit Diagram

variable from 120 down to about 60 volts, is given by terminal H.T.+1.

So that listeners can see just "where they are" we have provided a high-reading voltmeter which can readily be switched from one H.T. tapping to the other. In series with H.T.+2 and H.T.+1 is a variable resistance which gives the lower H.T. value. It will be seen that one side of the voltmeter is connected to H.T.—, and the other side to a flex lead so arranged that the voltmeter can be shunted across the maximum H.T. output or the lower H.T. output.

Components

The parts required to assemble a unit such as that illustrated, are as follows:

Panel, 12 in. by 8 in. by $\frac{3}{16}$ in. (Radion, Becol, Ebonart).

Power transformer (Marconiphone "A" type).

Three 4-microfarad (600-volt D.C. test) condensers (T.C.C., Dubilier).

Anti-microphonic valve-holder (Benjamin, Lissen).

2-microfarad condenser, 200-volt type (T.C.C., Dubilier, C.D.M., Lissen).

Bradleyohm, Type 10E (Rothermel).

Panel-mounting voltmeter (0-150 volts) (Sifam, Ferranti, Heaybeard).

Three insulated terminals, H.T.—, H.T. + 1, H.T. + 2 (Belling-Lee).

Three sockets and one plug (Lisenin, Clark).

Filter choke (R.I. & Varley).

Special mains plug and socket (Bulgin).

Connecting wire (Glazite).

Construction

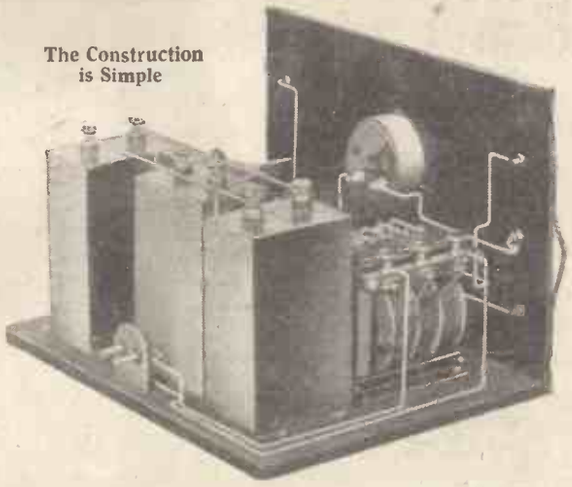
With these parts in hand, attention can be turned to the constructional details. As the photographic views and reduced reproduction of the blueprint indicate, the unit is neat and compact in its layout and very attractive in appearance. Remember that the unit if made up will out-live many receivers, and it is, therefore, well worth while to spend a little more time and money on its construction to ensure a lasting and reliable H.T. source.

An ebonite panel accommodates the voltmeter, variable resistance, H.T. terminals and voltmeter plug and sockets. The baseboard, to which the panel is screwed at right angles, has fixed on it the three smoothing condensers and small by-pass condenser, power transformer, smoothing choke, valve-holder and mains plug. The disposition of these components is very clearly shown in the full-size blueprint obtainable from this office, price 1s.

The panel-drilling is not particularly difficult, the only component which requires special fixing being the voltmeter. The Constructional Department utilised a special panel-cutting tool for this job as advocated in the Christmas number of AMATEUR WIRELESS, in the article entitled "Set Building In Pictures." Alternatively a fret-saw can be used or a series of holes drilled inside a scribed circle and the waste ebonite knocked away.

The variable resistance is mounted below the voltmeter as indicated. On the right of the panel are the two H.T.+ and one H.T.— terminals and on the left the three voltmeter sockets. The centre socket acts as a bush for the flexible lead which terminates in a plug.

The Construction is Simple



At the back of the baseboard is the special mains plug which is so constructed that the "live" part is insulated. In fact, the "plug" which is connected by a length of twin flex to the mains is really the "socket" which fits over the two plug points on the baseboard attachment. The advantage of such a device is clear—the mains can be connected to the unit with absolutely no risk of the operator getting a "shock." The condensers, transformer, etc., are grouped as indicated and after screwing them in position, the task of wiring-up can be undertaken. Constructors are advised to use insulated wire—Glazite can hardly be bettered—in order to avoid any possibility of "short-circuits" which have to be specially guarded against, when the electric-light mains are involved. But there is *no danger at all* in "mains working," if ordinary care is taken.

Connections

The connections are by no means intricate and with the assistance given by a full-size blueprint the constructor can "wire up" with confidence. It is advisable to solder the connections, direct where possible or to soldering tags well clamped down under the terminals as in the case of the condensers.

The Marconi Power transformer has three primary terminals: "com," "120v." and "240v." If the mains supply is about 110 volts, the two terminals to be used are those marked "com" and "120v." For mains supplies in the neighbourhood of 200 volts, use the "com" terminal and the "240" terminal. The differences in mains voltages account for the slight differences in output voltages and for this reason we feel sure constructors will agree that the

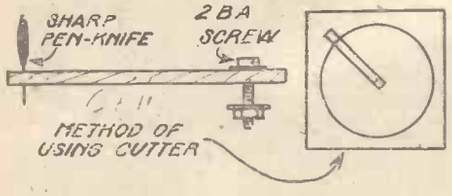
(*Concluded on page 148.*)

PRACTICAL ODDS & ENDS

When Making Cone Speakers

WHEN the writer was making his cone loud-speaker from the instructions given in AMATEUR WIRELESS, No. 289, he was unfortunate enough not to have a fret-saw handy for cutting the large hole in the three-ply which holds the cone.

He solved the difficulty, however, in the way shown in the drawing herewith,



Cutting the Hole for the Cone

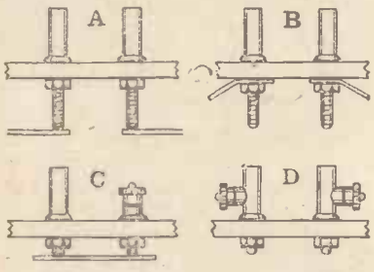
which is self-explanatory and requires no comment.

It is advisable to cut half way through on one side, and then to start from the other side; this prevents the wood from splintering and ensures a clean edge to the hole.

E. S.

Efficient Socket Connections

WHEN sockets for home-made coils, etc., are mounted on a horizontal receiver panel, the best method of making the connections is to solder the busbar leads direct to the ends of the shanks as shown at A in the accompanying sketch.



Making Good Socket Connections

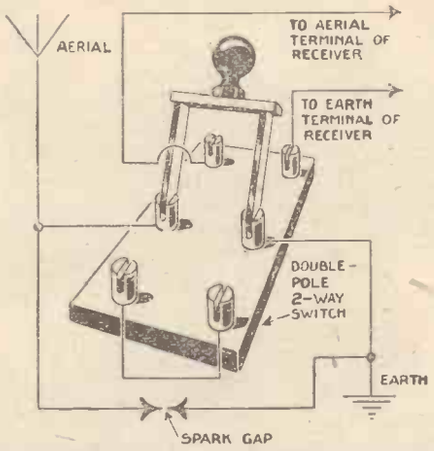
Another method is indicated at B, where tinned soldering tags are clamped very firmly under the socket nuts and the ends of the busbars well soldered to the tags.

If the coil-holder or other device is made up as a separate unit for use as an experimental component it will be necessary to provide terminal connections, and in this case the shanks of the sockets and terminals might be cut short and joined by means of a short length of busbar, as shown at C, the busbar being well soldered to the ends of the shanks. The ebonite may then be mounted on a wooden block, previously recessed to clear the nuts and busbars. A better method, however, is shown at D, where the terminals (which are of the type having their shanks integral with the hubs) are deprived of their shanks, grooved by means of a round file, and then soldered direct to the bodies of the sockets.

O. J. R.

A Good Use for an Old Switch

AN excellent use for a double-pole two-way switch is shown in the drawing below.



Making Good Use of an Old Switch

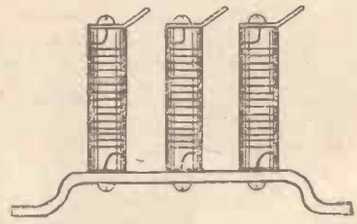
The provision of the spark gap is also well worth while, as this safeguards the set constantly.

P. E.

A Filament Resistors Tip

IF all the filament resistors in a multi-valve set are connected in the same L.T. lead (usually the negative) the wiring may be simplified by grouping the resistors and by joining one end of each to a common busbar, which is connected to the L.T. terminal shank. Connections may then be made from the other ends of the resistors to their respective valve sockets.

The sketch shows a simple method of arranging any number of resistors in this manner, and it will be seen that the lower ends are screwed to a stout sheet brass support which is provided with two feet for attachment to the baseboard, the lower ends of the windings being securely clamped under each resistor-former so that the wire makes good contact with the brass support. The upper ends of the windings are clamped under small soldering tags fitted as shown.



Simplifying Filament Resistors Connections

but if desired small terminals may be used.

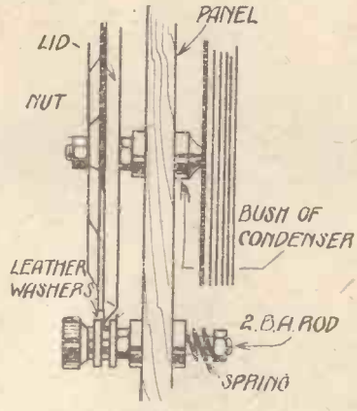
The connection to the lower ends of the resistors is, of course, made to one of the round-head wood screws holding down the support, or a lead may be soldered direct to any part of the support.

R. P.

Slow-motion Dial

IN the way shown in the diagram below a very satisfactory slow-motion dial can be made up from the scrap pieces to be found on every constructor's bench.

The constructional details are simple



Details of Slow-motion Drive

and are shown in the drawing. One detail perhaps needs explanation. The drive is made through the flange of the lid of a tin container, and the two tap washers. The dial is secured firmly in the lid by the two nuts on the condenser spindle. It greatly improves the finished appearance if the lid is first coated with black enamel.

E. R. B.

LETTERS TO THE EDITOR

The Editor does not necessarily agree with the views expressed by correspondents.

Correspondence should be brief and to the point and written on one side of the paper.

A New Accumulator

SIR,—About six months ago the managing director of my firm lunched with the principal of Maison St. Louis, the local headquarters of a large Jesuit colony.

The principal gave details of the new accumulator which is to revolutionise the electrical world. Here are the particulars so far as the writer can gather. It is the invention of a Spanish Jesuit, Pere Almeida. The accumulator is said to have ten times the capacity of an ordinary cell, weight for weight. The invention is reckoned to be of such importance as to cause the postponement of various electrification schemes in the south of France.

The manufacturing rights, running into millions of francs, have been bought by the firm of Schnieder, operating in France, and by the Tudor Company, in Germany; factories are under construction in both countries. There seems no cause to doubt the authenticity of the information.

C. E. (Jersey).

The "Ether-searcher Three" and American Reception

SIR,—I sat down at the "Ether-searcher Three" this morning (January 15), just after midnight, to try my luck at American reception.

The first station to come through was WGY (Schenectady, N.Y.), relaying "High Jinkers' Hour" from New York City. Reception was good and received at good phone strength, and could be heard on loud-speaker. I next logged KDKA (Pittsburgh, Pen.); reception was fairly good, but not so loud as WGY.

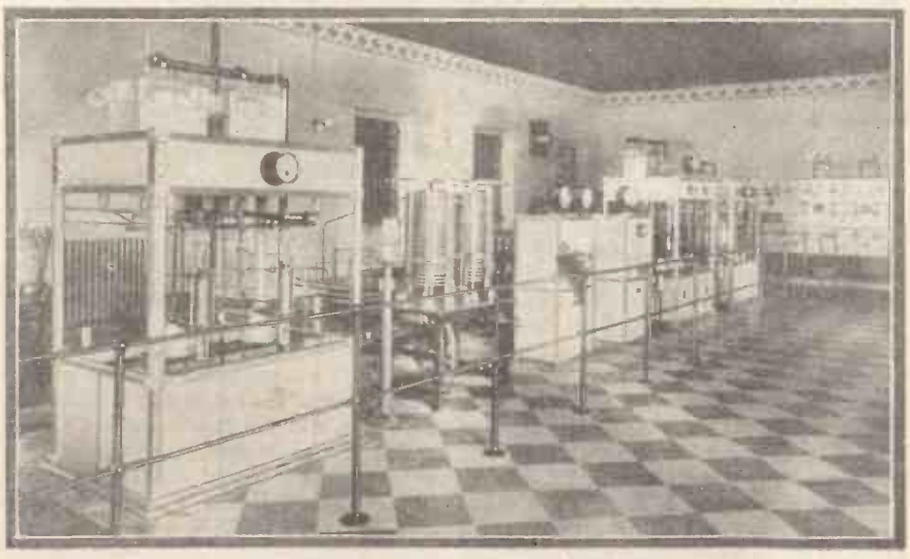
I also heard two more American stations, but was unable to identify them, owing to interference from morse and spark.

T. (Hawick).

SIR,—I am writing to let you know of the wonderful results I have been getting with the "Ether-searcher Three." I read with interest, last week, about the results of "E.S." with Lissen transformers in the L.F. stages, and was not a bit surprised, as I have used this combination. Last week-end I tried a well-known transformer and built-up R.C. unit, and at 2 a.m. Sunday I thought I'd try for U.S.A. I got two stations, and on one I caught the words "For our next number will be from New York," but on changing my loud-speaker for phones and retuning I lost them, and did not try further. Well, since then I have put my Lissen transformers back (I have had one of them two years) and on reading R. W. Hallows' article on "Sitting up for America" decided to have another try for U.S.A.

I started at about 2.30 a.m. for my first station and tuned to about 380 metres. I tuned in on my loud-speaker a tenor, followed by contralto singing "I want to be happy." After this, and during a period of fading they changed over to what I took to be news, etc. Changing my loud-speaker for phones and retuning a bit, I followed the programme easily. A baritone sang "Rose of Picardy," and between each item an orchestra struck up and then I heard the announcer, "WGY, Schenectady—from the General—Co., New York," then another bad period during which I tried elsewhere. About 490 I got jazz music, about 300 I got an orchestra.

When I picked WGY up again there was jazz music and I recognised one of the numbers as "There's one little girl who loves me." S. (Warrington).



THE MILAN BROADCASTING STATION

The Milan broadcasting station is three miles S.S.W. of the city and was built by the Marconi Company for the Unione Radiofonica Italiana. There are four main panels; rectifier, drive, modulator and magnifier. The power of the station is 7 kw. to the aerial.

The "Hartley DX Three"

SIR,—Re your circuit, the "Hartley DX Three," this is an excellent circuit; indeed I am able to receive stations on loud-speaker with this that I have found impossible before, thanks to its sharp tuning. I have for some years been a keen short-wave enthusiast, so by adding a reaction coil to the above receiver, and substituting the .0005 condenser with a .0003 (by switch) I am able to receive American short-wave stations just as easily as with any other circuit I have tried.

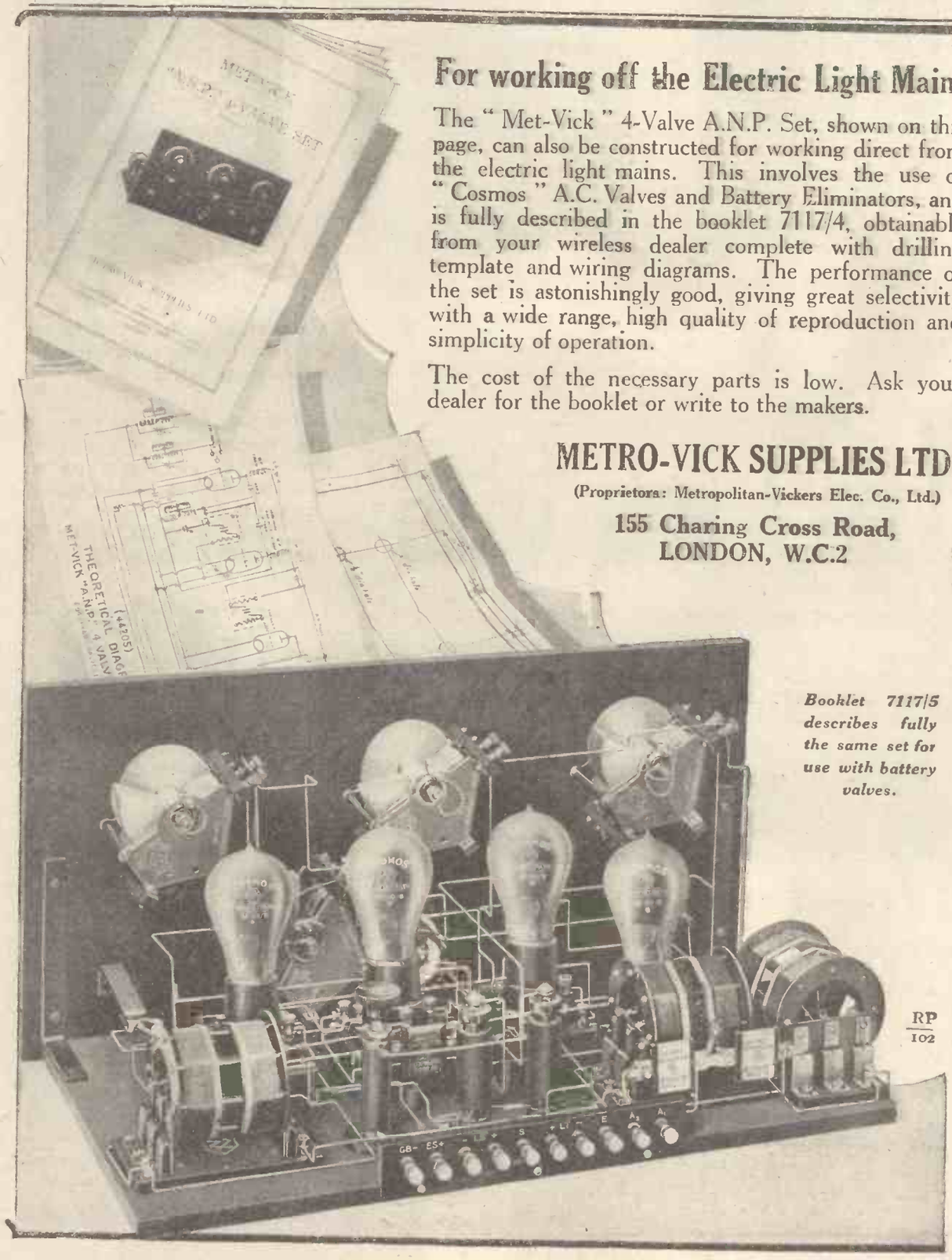
G. (Trowbridge).

"Simpler Wireless" Success

SIR,—I am very pleased to report that the Igranic double choke and condensers are a great success in reducing the hum that was so troublesome in my "Simpler Wireless" set. While the hum is still faintly noticeable in spite of reversing connections to one of the windings as you recommended, it is not at all unpleasant and the volume of sound appears to be greater than ever.

I am now well satisfied with the set and thank you for the assistance you were kind enough to give. H. (Birkenhead).

A Home-made Met-Vick Four



For working off the Electric Light Mains

The " Met-Vick " 4-Valve A.N.P. Set, shown on this page, can also be constructed for working direct from the electric light mains. This involves the use of " Cosmos " A.C. Valves and Battery Eliminators, and is fully described in the booklet 7117/4, obtainable from your wireless dealer complete with drilling template and wiring diagrams. The performance of the set is astonishingly good, giving great selectivity with a wide range, high quality of reproduction and simplicity of operation.

The cost of the necessary parts is low. Ask your dealer for the booklet or write to the makers.

METRO-VICK SUPPLIES LTD.

(Proprietors: Metropolitan-Vickers Elec. Co., Ltd.)

155 Charing Cross Road, LONDON, W.C.2

Booklet 7117/5 describes fully the same set for use with battery valves.

RP 102

FERRANTI AUDIO-FREQUENCY TRANSFORMERS

Fig. W 66.

This transformer, as the three views indicate, can be fixed in any position suitable for the set in which it is used. This adaptability has many advantages which the constructor will appreciate, and is obtained by means of feet, which can be detached and placed in any position.

Fig. W 23.—The Coil Formers.

Fig. 23. The coil formers indicate precision of workmanship, and attention to detail characteristic of all Ferranti products.

Note the special design to ensure low self-capacity.

Fig. W 21, showing the secondary coil, is typical of the Ferranti construction, using an insulated spider with sub-division of windings, and indicates also the general character of workmanship.

Fig. W 21.—The Secondary Coil.

Fig. W 19.—The Fixed Condenser. Internal View of Fixed Condenser.

Fig. W 19 shows the .0003-mfd. mica insulated condenser which is placed across the primary. This condenser is built into the terminal block and then moulded in by a special moulding process ensuring high insulation and immunity from moisture. The incorporation of this condenser ensures the use of one of the correct capacity, and, incidentally, saves the user of the Ferranti Transformer the necessity of purchasing the separate condenser required when other transformers are used.

The "exploded" view shows the sound mechanical construction of the AF-3 transformer.

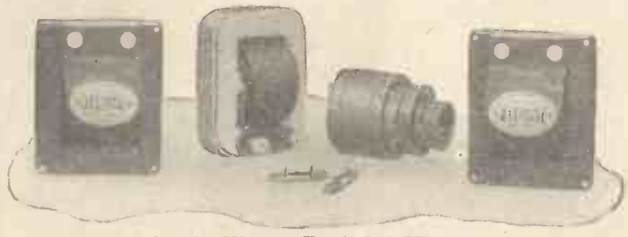


Fig. W 25.—Exploded View.

This is a page from the Catalogue which will be sent on request.
Delivery of A.F. Transformers is being made in strict rotation.

FERRANTI LTD., HOLLINWOOD, LANCASHIRE : : AND BUSH HOUSE, LONDON

On Your Wavelength!

Short-wave Howlers

TIME was when you could feel pretty safe on dropping down to the short waves that you would not be bothered by Ham-handed Henry or Oscillating Oswald. Unhappily, both H.H.H. and O.O. (Oh, Oh, *exactly*!) have now provided themselves with short-wave receivers of some kind or other, and often they are to be found busily engaged in chirping and moaning their way about the wavelets. Will you, whether newcomer to short-wave work or old hand at the game, take a tip from THERMION? (who really does know what he is talking about, though he says it himself, as shouldn't). It is usually necessary to let the short-waver oscillate mildly—more of this in a moment—when searching, for otherwise one would miss all but the most powerful of short-wave transmissions. But you will *not* get clear reception, you will *not* obtain the maximum strength, and you *will* be troubled by hand-capacity effects of the worst type if once having found the carrier wave, you try to tune to the silent point.

Mild Oscillation

A word about gentle oscillation. In the properly designed short-waver, if you put the grid tuning condenser at any setting you like and the reaction condenser at zero, the apparatus should be in a perfectly stable condition. As the reading of the reaction condenser is increased slowly, one becomes conscious of a slight rustling or hissing noise in the receiver. This is a sign that the set is in mild oscillation. There should be no chattering or howling as it reaches this condition; one should simply hear a perfectly smooth change from complete silence to a tiny rustling noise as the reaction condenser is moved.

Searching and Tuning-in

With the set in this condition of gentle oscillation, searching is a simple business. The grid tuning condenser reading is gradually increased, the reaction condenser being moved, when necessary, to maintain gentle oscillation; but the coupling never being made so tight as to produce violent oscillation. The proper searching condition is that where a very small reduction in the reading of the reaction condenser throws the set out of oscillation. As soon as a carrier is heard, slacken the reaction coupling until the set is just short of the oscillation point. Now make tiny adjustments with the grid tuning condenser, and speech or music will be heard if the station picked up is coming through well enough to make it worth listening to. A little more reaction can now be applied to bring up the strength, but it must not be sufficient to produce oscillation.

The Most Sensitive Point

The most sensitive condition for the reception of telephony is that in which the set is just below the point of oscillation. Stations tuned in in this way come through perfectly clearly and with much greater strength than if the silent point method is used. If the receiver is so designed, as practically all modern S.W. sets are, that the moving vanes of both tuning condensers are earthed, there should be no hand-capacity effects; at any rate, on wavelengths down to about 20 metres. Should it be found that signal strength is insufficient, a second audio-frequency stage is required.

L.F. Stages

In my own short-wave set I have two low-frequency stages, one or both of which can be used at will. Searching is generally carried out with one, and if the signal is on the weak side the second is subsequently brought into use. My own preference as regards note-magnifiers for this kind of work is for transformer coupling—at any rate, in the first stage—since a transformer suits a grid-leak and condenser rectifier better than resistance coupling. By using a fairly high ratio transformer between the first and second note-magnifiers enormous amplification is obtainable when both stages are in use.

An Adventure

I had finished a new receiver the other day which was to be the last word in the way of clarity, naturalness, purity, and all that kind of thing. As it was intended for the reception of the local station and 5GB, and not for long-distance work, there were no efficient H.F. stages or any frills of that sort. There was an anode-bend detector, followed by two resistance-coupled note-magnifiers. By means of jacks, one or both of the L.F. valves could be used at will. I tried it first of all with only the first in use. The quality was as near perfection as one could hope to get, though signal strength was not quite so big as I wanted. Out came the loud-speaker plug from jack number one and in it popped into number two. Quality? Purity?? Clearness??? My hat! Never have I heard such appalling distortion. Still more curious, signal strength was greater with one note-magnifier than with two.

The Trouble

A few simple tests soon disclosed the source of the trouble. When you fit an absolutely brand new anode resistance, you may take it for granted, in nine hundred and ninety-nine cases out of a thousand, that the thing is in proper working order. This was just the odd case. There was almost if not quite a complete breakdown in the resistance; and that was that! Even the best components occasionally suffer from ill-usage between the time that they pass out of the manufacturers' hands and come into those of the user. And if they are the best of components the makers will always replace them with the utmost courtesy. Of course, I should have tested out that resistance before I used it; but there are lots of things that one ought to do, but doesn't.

Gleiwitz

From what I gather, there is a strong possibility of the Gleiwitz (Silesia) broadcasting station soon ranking as Germany's *third* most powerful transmitter. Since the advent of the Polish 15-kilowatt station at Kattowitz, listeners in Breslau, Gleiwitz, Beuthen, and other German districts are unable to hear their local programmes, and strongly worded protests have been lodged with the Berlin Reichsfunk authorities. The geographical position of the new Polish station, however, is such that its broadcasts also overpower any transmissions which might be picked up in the northern and eastern districts of Czecho-Slovakia, whose inhabitants endeavour to tune their receivers to the Prague and Bruenn concerts. As, according to report, there is but little likelihood of Kattowitz reducing its power, the German authorities have expressed the intention of substituting the present plant at Gleiwitz for one capable of putting something like 12 kilowatts in the aerial. Prague, in a similar manner, contemplates a 10-kilowatt station at either Troppau or Mahrisch-Ostrau.

What is It?

I see that the development from the Furzehill laboratories, which I foreshadowed some months ago in these columns, is just coming to fruition. Mr. Reyner has been working for a considerable time on the production of a new coil with the object of simplifying the construction of receivers. His screened coil, which became so universally popular, was the outcome of research extending over a considerable time into the problems of interaction in wireless receivers.

The result was the screened coil, which was the practical solution to the problems, although not necessarily the most efficient. The immediate result of the introduction of

On Your Wavelength! (continued)

these coils was that receiver production was simplified. High-frequency circuits which had hitherto been critical of adjustment and difficult to control became delightfully simple. Even experienced engineers have expressed their surprise at the stability which can be obtained due to satisfactory control of coupling.

The "Q" Coil

At the present time we have learnt a good deal about layout and handling of high-frequency receivers, and it might appear, therefore, that there was little opportunity for any development of outstanding importance. A simple improvement of the efficiency would appear to be the only avenue of advance.

Mr. Reyner, however, has again gone to the root of the matter and evolved a coil which has decidedly interesting properties. I believe the first details of this development are to be given in the next issue of AMATEUR WIRELESS, and I cannot say much about it therefore. I may safely say that it tunes to both long and short wavelengths, and is both efficient and astatic. I have used some of these coils in various trial circuits recently, and the more I use them, the better I am pleased with this new idea; so I advise readers to make a particular point of looking out for the article next week.

A Bad Streak

Both 2LO and 5GB have had rather an unlucky time lately in the matter of breakdowns of more or less serious extent. This was probably to be expected after the extraordinary changes in temperature that we experienced at the end of the old year and the beginning of the new, combined with the very rough weather that occurred. On the whole, I think that the B.B.C. is to be congratulated on the wonderful way in which it maintained its broadcasting service under very difficult conditions. I wonder how many amateur receiving stations were thrown out of action during the same period by the crashing of masts or the snapping of aerial wires and halyards?

Cold and the H.T. Battery

One rather interesting point that concerns the listener is the way in which the high-tension battery, if of the dry-cell type, may be affected by very cold weather. If the battery is kept in a chilly spot or in a room which becomes very cold overnight, the depolariser does not seem to be able to get to work properly. I have noticed several times, when conducting battery tests, that the pick-up during a rest period is abnormally small if the temperature is allowed to get too low and that a marked increase in the voltage occurs if the battery is gently warmed up for some hours. Neither extreme heat nor extreme cold are good for the H.T. battery's in'ards. One should, therefore, be careful to keep it in a spot where it is subjected as little as possible to big temperature changes.

The Coming Regional Scheme

I read, not without a certain amount of apprehension of a purely selfish nature, that the B.B.C. has practically decided to erect a regional station some twenty miles to the north of London. The reason for these misgivings is that my own abode is to the north of London and rather less than thirty miles out. As a confirmed long-distance enthusiast, I don't want to find myself utterly swamped all over the broadcast band. I like short-range programmes, and make use of them far more than any others. But I do not want to have them and nothing else, or to be reduced to about half a valve simply because anything more powerful tears the inside out of the loud-speaker.

What Will Happen?

Some idea of the fate that may be in store for me I glean from a letter sent me by a correspondent who dwells close to Daventry. His little trouble is that with a crystal set he cannot separate 5XX from 5GB. At first blush it seems almost incredible that stations with wavelengths so far apart should perform duets even at close range. I expect that what is happening is that a powerful third harmonic of 5XX occurs on 534.9 metres and that the wipe-out of this is sufficient to cause it to interfere with 5GB.

Even at a range of forty-five miles harmonics of 5XX are rather remarkable. The second is powerful with me, though I don't get the third or the fourth. The fifth, on 320.9 metres, is strong enough to interfere at times with Dublin, and I have collected most of the others down to the tenth. But the most powerful harmonic that I get is 5GB's second, on 245.9 metres. Even in daylight this is powerful enough to give loud-speaker reception, and it comes through with a quality that is almost as good as that of the main transmission.

The Harmonic Problem

I have seen it suggested that if one hears a transmission on a half, a third, or a quarter, and so on, of its fundamental wavelength, these harmonics are harmonics not of the transmitter, but of the receiving set. I don't think, though, that this idea will hold water. If one were using an inductance coil big enough to tune in the fundamental, then possibly the second harmonic might be that of the receiving set. But if the tuned circuit will not go up to the fundamental I don't quite see how reception on half the main wavelength can be a harmonic of the receiver. On the short waves I have heard KDKA on exactly half his fundamental wavelength when using a coil that would not tune beyond 35 metres, and certainly the coils on which I heard those harmonics of 5XX would not go anywhere near his fundamental wavelength.

A Possible Trouble

It does seem to me that the harmonic question is going to play a rather important part in the broadcasting of the future. If for example, we have eight high-power stations in this country working on the medium band between 300 and 500 metres, there will be eight powerful second harmonics between 150 and 250 metres, and these may cause considerable trouble by heterodyning transmissions on the lower waves. The range of harmonics is considerable, for I have heard many of the German stations on a half or a quarter of their fundamental, and in one case, when I picked up a Swedish transmission somewhere between 60 and 70 metres, it was ascertained by correspondence with the authorities over there that no short-wave transmitter was working in that country, and that what I had heard was certainly a harmonic.

European Relays

There are signs that before long programmes from the best European stations will be available for crystal reception in England, not only on special occasions, like the Menin Gate ceremony and the meetings of the League of Nations, but as a regular nightly or, at least, weekly feature. This has been a long-standing ambition of the International Broadcasting Bureau at Geneva, who have done most of the spadework necessary to carry the notion towards success. The selected foreign programmes will be relayed in the first place over long-distance telephone trunk lines to London or Daventry direct, and will then be radiated with practically the same clearness as if it had originated in the local studio.

Difficulties Overcome

The obstacles that have so far stood in the way of international relaying have been due, in the first place, to the fact that properly Pupinized trunk lines have not been available and, secondly, to the difficulty of getting the consent of the various countries concerned to grant the necessary way leave over the lines passing through their territories. Thanks to the Geneva committee and to Mr. Arthur Burrows ("Uncle Arthur"), both these difficulties now appear to have been surmounted, so that the crystal user will soon be able to share in many of the programmes usually enjoyed by the owners of selective multi-valve sets.

THERMION.

THE THERMIONIC FAMILY

—ABOUT SOME OF THE LESSER KNOWN MEMBERS

By Morton Barr

PHOTO: M.O. VALVE Co. Ltd.

IN the original type of "soft" valve a considerable residue of air was left inside the sealed bulb. This was afterwards found to give rise to a peculiar instability in operation due to so-called "secondary" effects.

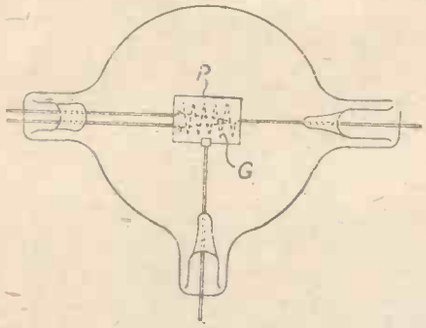


Fig. 1.—The Dynatron Valve

The electrons liberated from the filament are liable to collide in their passage to the plate with stray molecules of air, and by the impact to knock off other electrons from the gaseous particles. These secondary electrons, when added to the normal electron stream, sometimes increase and sometimes diminish the response of the valve to the applied signal.

In order to prevent such erratic behaviour Langmuir raised the degree of vacuum inside the bulb to a point where practically every trace of gas is removed. In fact the pressure inside a modern valve, by reason of improved methods of manufacture, is now less than the one-thousand-millionth of a millimetre of mercury.

The Pliotron

The first "hard" valve having a vacuum of this order was called a Kenotron (from the Greek *kenos*, a vacuum) and was used mainly for rectifying A.C. currents at high pressures up to 50,000 volts. Shortly afterwards a control grid was added, and the resulting "hard" three-electrode Kenotron was called a Pliotron (from the Greek *plio*, I bend). The pliotron was suitable for amplifying, rectifying, or modulating; or in fact for any other purpose to which a modern three-electrode valve can be applied.

At this stage of development, A. W. Hull discovered that "secondary" effects similar to those observed in the early "soft" valve could be obtained from a "hard" valve by forcing the electron stream to impact against the plate with sufficient velocity.

In these circumstances additional electrons are struck off from the metallic substance of the plate, and by suitably controlling the flow of the additional or secondary emission, sustained oscillations can be generated in an external circuit to the valve.

The Dynatron Oscillator

Hull called the new valve-generator a "dynatron" (from *dynos*, force and *tron*, an instrument). The construction of the dynatron is illustrated in Fig. 1 whilst the circuit arrangement is shown in Fig. 2.

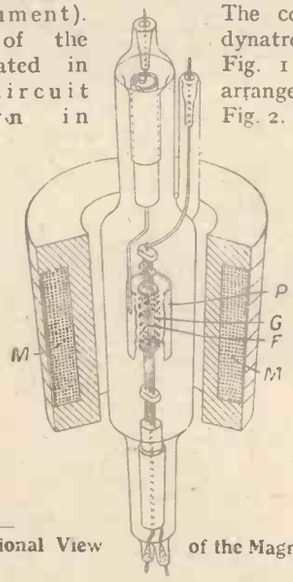


Fig. 3.—A Sectional View of the Magnetron

The grid G (or anode as it is sometimes called) consists of a spiral wire or perforated cylinder placed close to the plate P. It usually carries a higher potential, derived from the battery B than that applied to the plate.

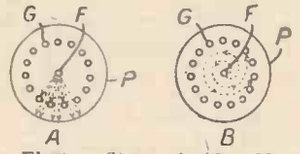


Fig. 4.—Electron Stream inside a Magnetron Tube

Suppose the plate P to be initially at the same potential as the filament. In these circumstances the whole of the electron

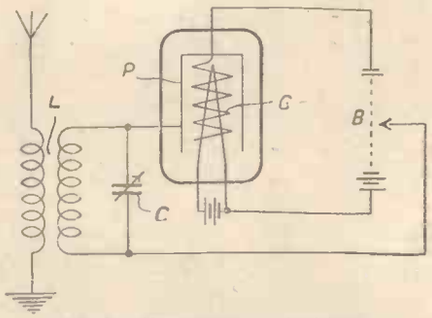


Fig. 2.—The Dynatron Oscillator

stream from the filament will be absorbed by the grid G, and there will be no current in the plate circuit. Now if the voltage on P is gradually increased, a current will commence to flow in the external plate circuit, because some of the electrons will pass through the meshes of the grid on to the plate.

This process goes on until the electrons reaching the plate, under the urge of the combined voltages on G and P, strike against the latter with sufficient force to liberate secondary electrons from the metal.

The secondary electrons so liberated will tend to flow towards the grid G owing to its higher potential, and a point will ultimately be reached where the plate will lose more electrons to the grid, in this way, than it receives from the main electron stream. When this condition obtains, the current in the external plate circuit tends to fall off as increase is made of the voltage on the plate of the valve.

In other words, the dynatron has a falling characteristic, i.e., it possesses negative resistance, and will accordingly generate sustained oscillations in any tuned circuit such as LC.

The Pliodynatron

By adding a fourth electrode in the form

NEXT WEEK: Practical Notes on the Tuning and Operation of BRITAIN'S "FAVOURITE THREE"

"THE THERMIONIC FAMILY" (Continued from preceding page)

of a control grid mounted close to the filament, the inventor of the dynatron developed a combined oscillator and modulator to which he gave the name Pliodynatron. In this tube the microphone currents are applied directly to the control grid and serve to modulate the C.W. output, so that a complete wireless telephony transmitter is contained within a single bulb.

The Magnetron

Still another variation of the dynatron or secondary-emission type of valve is

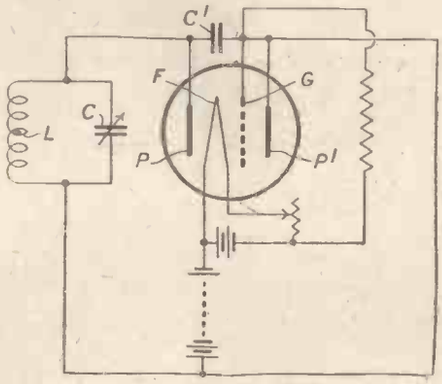


Fig. 5.—The Negatron

shown in Fig. 3. Here the novel feature lies in the use of an additional magnetic control provided by a spiral winding M mounted outside the glass bulb and carrying a modulating current

The action of the magnetic winding is indicated diagrammatically in Fig. 4, which shows a cross section taken through the glass tube, F being an axial filament, G a spiral or perforated grid or anode, carrying a high positive potential, and P the cylindrical plate.

Under normal conditions the electron stream emitted by the glowing filament travels directly outwards towards the grid and plate as indicated by the dotted radial lines in Fig. 4A. If the applied plate and grid (or anode) potentials are properly adjusted, secondary emission takes place, and the tube will generate continuous oscillations in the external circuits.

Now the effect of passing a current through the outside coil M is to set up a magnetic field, the lines of force of which pass along the axis of the coil, i.e., they are directed through the length of the glass tube at right-angles to the radial path of the electron stream. The stream is in consequence deflected out of the straight into a spiral path as indicated in dotted lines in Fig. 4B.

The extent of deviation of the electrons will depend upon the strength of the control current passing through the windings M. In fact at a certain critical value the deflection will be sufficiently great to prevent any of the electrons from reaching the plate.

For intermediate current strengths, more or less of the electrons win through to the plate, the remainder following a spiral path through the tube and being finally re-absorbed by the filament. It will therefore be clear that the amplitude of the generated oscillations can be controlled or modulated by applying microphone currents to the external windings M. A valve of this type is known as a Magnetron.

The Negatron

A negative resistance valve of later date is the Negatron, first introduced by Mr. Scott Taggart and illustrated in Fig. 5. It comprises four electrodes, a central filament F, two plates P and P1, one on each side of the filament, and a control grid G located between the filament and one of the plates.

The voltage applied to the plates P and P1 is initially so adjusted with reference to the temperature of the filament that the whole of the available electron stream is divided equally between the two plates.

Any sudden increase in the potential of the plate P will be communicated through the condenser C to the grid, and as the latter exercises a more critical control over the electron stream, the effective current flowing to the plate P1 will rise. Now as the valve was originally saturated, the only way in which the current through P1

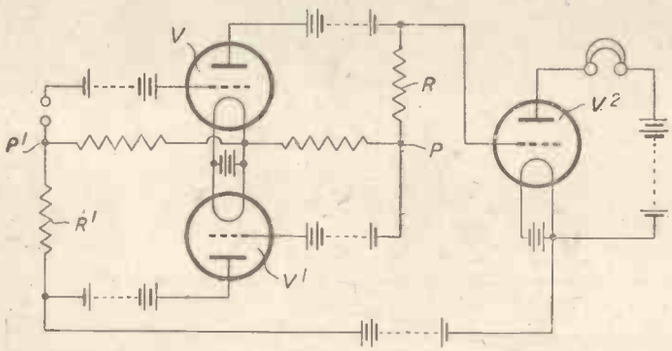


Fig. 7.—The Kallirotron Combination

can increase is by the diversion of some of the electrons from P to P1.

Accordingly the current to P must diminish as the applied voltage is increased. This is the typical "negative-resistance" effect previously referred to, which can be utilized to generate sustained oscillations in any associated circuit such as LC.

Cross-stream Valves

Another interesting class of valve is that which has been termed the cross-stream type, because the effects obtained are due to the interaction of two independent electron streams, both generated inside the same bulb.

A typical example of this kind of valve is shown in Fig. 6. It will be seen that the bulb is of cruciform shape and that two pairs of filaments F, F1 co-operate with two correspondingly opposed plates P, P1.

At first sight it might be expected that the two filament streams, flowing at right-angles to each other, would simply clash together in the centre of the tube and then divide equally between the two plates.

In actual fact, however, the discharges from filament to plate take place alternatively, and in rapid sequence, thereby setting up persistent oscillations in the outside circuit. For instance, when the

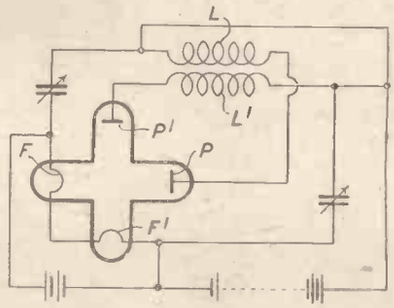


Fig. 6.—Cross-stream Valve

high-tension is first plugged in, one stream of electrons gains a mastery over the other.

Opposing Forces

Once a current starts, say, from F to F1, the growing field in the associated coil L sets up a back E.M.F. in the coil L1 to which it is coupled. This back E.M.F. reduces the effective voltage originally applied to the plate P1 and thus tends to consolidate the victory of the first electron stream over the second.

The back E.M.F. opposes the voltage on the plate P1 so long as the first current continues to increase. Directly it starts to drop off, however, the magnetic linkage between the coils L and L1 begins to shrink and so tends to increase the voltage on the plate P1.

Very soon this reaches a value at which the second electron stream overcomes the first, and in turn grows to full strength, subsequently diminishing and giving place to the first as before. This rapid interchange is maintained indefinitely, setting up persistent oscillations in the external circuits.

The Kallirotron Combination

As a last example of ingenious valve action, reference may be made to the Kallirotron (from Greek *kalliroos*, easy-flowing), an arrangement with enormous amplification powers introduced by Professor L. B. Turner. Strictly speaking, the

(Continued on page 160)











ARE YOU GETTING THE BEST FROM YOUR SET?

A Helpful Article by our Technical Editor

"YES, old man," said one motorist to another; "she really wants de-coking. A trifle inclined to knock up hills, but otherwise she's pretty full of life." How often does one hear such an expression amongst motorists. Many an owner-driver who has never heard of Otto and the four-stroke cycle of his devising, upon which 90 per cent. of the modern motor cars depend for their operation, will cheerfully and glibly discuss such matters as de-coking—adjusting the magneto points and similar technicalities.

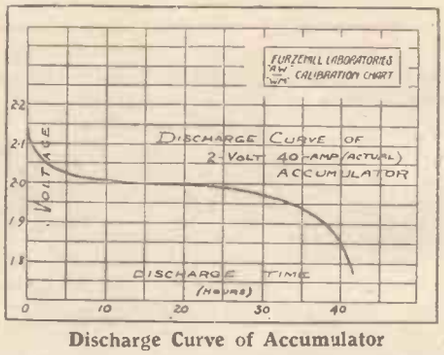
Such a man is not interested particularly in constructing his own motor car, or even in doing very much to his car in the way of repairs, but he is interested in occasional adjustments which he can make to improve the running efficiency. There is no suggestion that he is dissatisfied with his machine, but he enjoys making a slight alteration here or there in the hope of obtaining sweeter running or better pulling.

In rather the same manner it is often possible to obtain increased efficiency from an ordinary wireless receiver. Many people possess sets giving quite satisfactory results in practice, and which are perhaps not touched for many weeks at a time. It does not follow, however, that such a set is operating in its best condition, although it is working and giving no serious trouble.

Common Faults

For example, it may blast on high or loud notes. It may, perhaps, gradually develop "potatoes in the mouth," a general woolliness in the transmission becoming increasingly apparent, although there is apparently nothing definite or tangible which has changed. It is in such points as these that the set can be looked after, so that it shall operate under the best conditions at all times.

One of the principal causes of trouble in ordinary receivers is loss of voltage in the batteries. This usually brings in its train evils apart from those resulting purely and simply from the loss of voltage. The low-tension battery, of course, should be kept in a well-charged condition, more from the point of view of the battery itself. When



Discharge Curve of Accumulator

the battery begins to run down, it usually does so rather rapidly and the signal strength of the set falls away, so giving an immediate indication of the trouble. Most readers know that a battery should not be left in a discharged condition, or it is liable to damage due to the formation of insoluble lead sulphate on the plates. This appears as a whitish deposit, and in time ruins the accumulator.

The accumulator, therefore, should not be allowed to run completely down in this manner, particularly if it is a day or two before it can be recharged. The voltage should be tested periodically in order that the condition of the accumulator may then be observed. A discharge curve of an average accumulator is given in the diagram, from which it will be seen that the voltage keeps up fairly well until towards the end. When the voltage on each 2-volt cell falls to about 1.9, the battery should be taken off and charged before it actually runs right down. It should never be discharged below 1.8 volts per cell. A pocket voltmeter forms an easy method of testing the battery in this manner, and if it is of the double-range type the high-tension batteries can be tested with the same instrument. A rough-and-ready test of the condition of the battery can be obtained by looking at the plates. The negative plates are of a grey colour, while the positive plates, which are usually rather thicker than the negative and are interleaved between the negative plates, are of a dark brown or chocolate-brown. When the battery is fully charged the positives are a deep rich chocolate-brown and the negatives a very light grey. As the battery runs down, so the colours change, and when the battery is discharged the positive plates become a light brown and the negative plates become much darker in appearance. Thus the colour of the plates immediately gives some indication as to the condition of the battery. Do not confuse the positive plates with the wood spacers which are sometimes employed in batteries between the plates.

H. T. Troubles

The high-tension battery is a source of much greater trouble. As it runs down in voltage, the internal resistance of the battery decreases very rapidly. This resistance being common to all the anode circuits of the valves in the receiver, sets up a reaction effect. In certain receivers this effect is negative and reduces the signal strength. The actual reduction is not very great, but the extent varies with the frequency, so that distortion is produced. In certain other receivers the reaction is positive, and again varies with the frequency. It may, therefore, introduce serious distortion, making the speech sound woolly and transmission unpleasant

(*Continued on page* 162)

NEXT WEEK: Compressing the Carrier Wave—A New System of Broadcasting

More About The "Simpler Wireless"

"SPECIAL FOUR"

Unique Features: Reaction Effects: Some Precautions.

By J. F. JOHNSTON

READERS who decide to build the "Simpler Wireless" four-valve set described in last week's issue of AMATEUR WIRELESS should remember that this receiver is something quite out of the ordinary. They should, therefore, not expect to obtain the very best results of which the set is capable at the very first trial after completing the constructional work.

If the set has been built exactly as described, good results (and very good results, too) should be obtained straight away, but everybody who has not previously handled a "Simpler Wireless" set will have something to learn, as the receiver will be very different in many respects from any with which they have come into contact before.

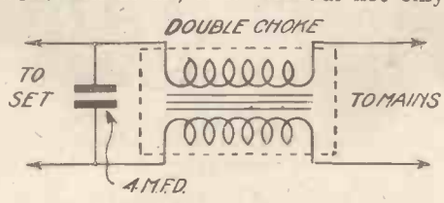
Valve Uniformity

This little warning is necessary in view of some of the extraordinary things a few readers tried to do with the "Special Three" described in No. 279. Some, for instance, who wrote to say they could get no results were using valves *not* of the .1-amp. type. They had been trying the set with valves of mixed filament-current consumptions which they happened to have on hand, "just to see if the set would work before buying the correct valves."

Readers can be absolutely sure of one thing: that is, that the "Special Four" will give entire satisfaction. The range and volume will be the same as that given by an efficient four-valve set with one H.F. stage, detector, one transformer-coupled L.F. stage, and one resistance-coupled L.F. stage. The selectivity can be made very high, if desired, by using a small coil in the plate circuit of the first valve.

All the usual advantages of a good four-valver are obtained without the trouble of either batteries or battery-eliminators; but the great feature of the set, of course, is the very pure reproduction which can be obtained on account of the unique method of coupling the L.F. valves.

In order to obtain this good reproduction and, indeed, in order that the set may work well at all, it is essential not only



Method of Preventing Hum

that the set should be correctly built to specification, but also that suitable valves should be used. These, of course, must all be of the .1-amp. type (though the filament-voltage ratings do not matter, and can be mixed if desired). Each of the first two valves should be of the type designed for H.F. amplification, the third should be an R.C.-type valve, and a power valve should be used in the last stage.

Coil Sizes

The two tuned coils, the aerial coil, and that which acts as the secondary of the H.F. transformer, should be of the sizes usually required for aerial and secondary circuit tuning. The aerial coil (that inserted in the isolated single coil holder) should be a 50, 60, or 75 for the ordinary broadcast band, depending upon the aerial used and the wavelength to which it is desired to tune. The other tuned coil (that inserted in the fixed socket of the two-way coil-holder) should be a size or two larger than the aerial coil.

The reaction coil should be the smallest which allows the set to be brought to the oscillation point over the whole of the tuning range. Two considerations determine the size of coil to be used in the remaining socket, the single coil-holder mounted close to the two-way coil-holder. Should the set be found to oscillate uncontrollably—that is, should oscillation set in at any part of the tuning range when a very small reaction coil is as loosely coupled as possible to the H.F. transformer secondary—decreasing the size of the coil used as H.F. transformer primary will stabilise the set.

Decreasing the size of the latter coil (the coil nearest the panel, of course) will also increase selectivity, and if a very small coil is used in this position very great selectivity may be obtained, although signal strength will fall off a little when the size is reduced beyond a certain limit. In no case should the H.F. transformer primary be larger than the secondary.

Mains' Irregularities

In the very great majority of cases, when the "Special Four" is used on D.C. mains, there will be no appreciable mains' hum from the loud-speaker. (It is not recommended that phones be used with this set.) In a few localities, however, as some readers found with the "Special Three," the local supply may be so uneven that it may be advisable to do a little rough smoothing. If any trouble is experienced with hum, therefore, the arrangement shown in the diagram is recommended.

Obtain an Igranic or an R.I. double

(*Continued on page* 166)

"A.W." TESTS OF APPARATUS

Conducted by our Technical Editor, J. H. REYNER, B.Sc.(Hons.), A.M.I.E.E.

Burgess "C" Battery

GRID-BIAS batteries play an important part in the operation of most receiving sets, particularly those designed especially for purity of reproduction.

As a general rule it has been customary to employ small-capacity batteries to furnish the grid bias, because, under normal conditions, the current consumption for such a battery is negligible. The disadvantage of a small-capacity battery lies in the fact that voltage drop is inevitable when the battery has been in use for a few months.

The Burgess Battery Co., represented in England by the Rothermel Radio Corporation of Great Britain, Ltd., of 24-6 Madox Street, Regent Street, W.1, make

Burgess "C" Battery

a grid-bias battery of comparatively large capacity, which can be relied upon to last for a satisfactory period. The battery, which we tested, was a 4-volt unit tapped at every 1½ volts.

"DX" Short-wave Coils

NOW that the efficiency of the short-waves has been proved, the short wave set is becoming popular with large numbers of experimenters. Those who have constructed and operated such receivers, know the need for efficient low-loss inductances. It would be difficult to find a more suitable type of low-loss coil than the plug-in variety, provided that the turns are separated and air-spaced.

We have, on a previous occasion, tested the DX coils produced by DX Coils Ltd., Glebe St., E.8; for medium and high wavelengths these coils compared favourably with many well-known makes. The manufacturers have now produced a set of four DX ultra short-wave coils suitable for covering a range from below 20 metres to values above 100 metres—depending on the capacity of the tuning condenser. Each turn is well spaced, particularly in the case of the lowest range coils. The winding consists of No. 16 tinned copper wire, mounted on

"DX" Short-wave Coil

a former composed of two thin insulated strips fitted at right angles to each other; the winding is placed in slots cut in this former and consequently the turns, although very well air-spaced, are amply supported and not prone to damage. A plug- and socket-holder is attached to the coil.

Ediswan One-der Speaker

WE have received from the Edison Swan Electrical Co., for test one of their new horn-type loud-speakers, known as the One-der speaker. Perhaps the most striking feature of this instrument is

Ediswan One-der Speaker

the large-size horn which is fitted. The makers have realized that the size of the horn is one of the most important considerations in a loud-speaker.

The electro-magnetic unit consists of a substantial permanent magnet on which two bobbins, carrying the windings, are placed. A large diameter diaphragm rests on the top of these. The position of the magnets relative to the diaphragm, may be adjusted by means of a small grub-screw placed in a convenient position. The complete instrument is finished in an attractive brown colour.

We were pleased with the tone and general quality of reproduction obtainable from the speaker, whilst the sensitivity was satisfactory.

We can recommend the speaker, which is made by The Edison Swan Electrical Co., of 123-25 Queen Victoria Street, E.C.4.

Zampa H.F. Choke

Zampa H.F. Choke

THE design of high-frequency chokes to cover a large wavelength range presents some difficulty. On the wavelengths below 50 metres, the choke coil must have negligible self-capacity—otherwise the leakage across the coil will prevent any choking action—but as the wavelength is increased, a greater number of turns is required in order to raise the natural period of the choke appreciably above the tuning range.

The Zampa H.F. choke which has been submitted for test by the Mic Wireless Co., of White Horse Place, Market Street, Wellingborough, is wound in ten slots on a low-loss former. The slots are narrow and well-spaced from each other; the winding in each slot consists of a large number of narrow layers keeping the self-capacity especially low. In order to ensure efficient choking action on the ultra short wavelengths, the winding is tapped at four places.

On test in our laboratories, we found that the choke acted efficiently from wavelengths of 1,250 metres to below 20 metres.

A SIMPLE METHOD OF INCREASING RANGE IN NEXT WEEK'S ISSUE

For the Newcomer to Wireless: Condensers and Currents

I DON'T quite understand about these fixed condensers in the wireless receiving set. I was told the other day that the purpose of the grid condenser of the rectifying valve was to insulate the grid. Surely we want impulses to reach the grid for otherwise how could the valve work?

Well, to begin with, there are two quite different kinds of current flowing in various parts of the wireless set.

You mean direct and oscillating? I've heard about these, of course, but I'm not quite sure that I understood the difference.

Direct current is delivered by both high- and low-tension batteries. It flows uninterruptedly always in the same direction, just as water flows in a river.

I see that. And what about oscillating current?

The aerial brings current oscillating at radio frequency into the wireless set. An oscillating current does not flow in one direction only. Starting from zero it begins to flow in one direction, increasing in strength until the maximum is reached. It then declines again to zero, after which it starts to pass in the *opposite* direction, again rising to the maximum and falling back to zero. That is the great difference between the two. Direct current does not change its direction; oscillating current is continually doing so.

Then do not both sorts become mixed up in the wireless set?

To some extent they do, but we can sort them out by means of condensers.

How is that done?

You know what a condenser is?

Yes, two plates or sets of plates with a layer of insulating material between them.

Exactly. If you place a condenser in a wire joined to the terminals of a battery no flow of current can take place.

As a matter of fact I tried that experiment the other day and used a milliammeter in series with the condenser. I found that the needle gave a kick when I

switched on, and then dropped back to zero.

Yes, that was because there is a flow of current *into* the condenser at the moment of switching on, when it charges up. One plate becomes negatively charged and the other positively. When this has taken place no further flow occurs.

Then what happens with an oscillating current?

Let us call the plates of a condenser A and B. When current flows in one direction, A becomes positive and B negative. As the direction changes these charges are reversed, B becoming positive and A negative. To put it in another way the charge on the set of plates connected to the source of oscillating current—the aerial tuning circuit if you like—is continually changing, and the charge upon the other set of plates also changes, for the two must always be equal and opposite.

What exactly does "charge" mean?

It means that when a plate is negatively charged it contains an excessive number of electrons. When it is positively charged it has an excessive number of positive ions. You will see then that as the aerial tuning circuit causes now electrons and now positive ions to swarm upon one set of plates there must be great activity in the electrons in the circuit connected to the other set of plates. When the first set is negatively charged by a regiment of electrons, electrons are driven away from the second set and a spurt of current takes place in the circuit connected to it. As soon as the first set of plates becomes positive electrons are drawn to the second set, which means that a spurt of current in the opposite direction takes place as the electrons rush to these plates.

Then a flow of alternating current through circuits connected to one set of plates will cause an equal and opposite flow in circuits connected to the other set?

Yes, that's exactly it, and if you come to think it out the net result is just the same as if alternating currents passed through a condenser, though actually, as we have seen, they do not. Now take their action on the grid-condenser about which you first asked me. It does insulate the grid from direct-current potentials which reach it only by way of the grid-leak. But it does not prevent oscillating potentials from reaching the grid in the way that we have just discussed.

I think I've got it quite clearly now. A fixed condenser stops direct current, but lets oscillating current pass.

Yes, that is exactly the position.

DIRECTION FINDING

UNDER favourable conditions a radio-goniometer or wireless direction-finder will give the bearings of a distant transmitter or beacon station within 1° of accuracy. Should the signal waves, however, cross over the coast from land to sea, or vice versa, a deviation up to 5° may be introduced; but this is a constant error and can be allowed for.

A variable error may arise owing to the preponderance of the space wave over the earth-bound wave. The former is deflected downwards from the Heaviside layer, and in the process of reflection is twisted so that the electric field is not polarised in the vertical plane. As a result, the magnetic field, upon which the directional action of the frame aerial depends, is no longer perpendicular to the wave travel, and an inaccurate reading may be given.

Luckily for marine navigation, this effect is less pronounced when the waves travel over the sea than when they are propagated across the land. In the former case the error does not become serious for distances less than eighty miles, though for overland transmission thirty miles is the limit for D.F. accuracy. M. A. L.

A TUNING TIP

SIGNALS from one station are often spoiled by a persistent background from another which, although faint, cannot be entirely tuned out. If an anode-bend rectifier is being used, the overlap can usually be eliminated simply by increasing the negative bias on the grid of the detector valve.

This shifts the characteristic curve over to the right, so that the weaker signal impulses fail to reach the bend, and are therefore not rectified. Some little loss in the strength of the residual signal is, of course, inevitable, but the reduced volume will be quite free from interference. The remedy is somewhat of a paradox, since it amounts to improving selectivity by deliberately reducing sensitivity.

B. A. R.

WITHOUT FEAR OR FAVOUR

A Weekly Programme Criticism by Sydney A. Moseley

THE recent sermons were "the goods," and I hope the majority of my readers heard them. The first, a real treat to listen to, was delivered by the Rev. W. H. Elliott, of the Holy Trinity Church, Folkestone. In this case the speaker set out to utilise the wireless atmosphere to the fullest advantage. With simple and homely illustrations—"You two sitting comfortably on the settee," etc.—he made it sufficiently personal to induce everyone to feel he was being individually addressed. It was a good idea, well developed, and constituted what was in my mind an ideal sermon.

◆ ◆ ◆

The other address was as good in its way, although it was differently handled. This time it was the Rev. Pat McCormick, the new Vicar of St. Martin's-in-the-Fields who took the pulpit. Despite the fact that he lacks the emotional appeal of his predecessor, he is nevertheless making big strides to equal his success. The Rev. Pat is a balanced thinker. His assertion that the phrase—"Thy will be done"—does not mean a pious acceptance of our social ills is one more refreshing hint that the churches are waking up to our earthly needs. Far, far too long has this phrase been misinterpreted.

◆ ◆ ◆

It is always a pleasure to listen to Miriam Licette, and her group of songs from Mozart, Schumann, and Schubert were beautifully given.

◆ ◆ ◆

Violet Vanbrugh's appeal on behalf of the Plaistow Maternity Hospital was, as one expected, clear, concise, and dramatic. Yet even this careful actress, who can easily memorise a dramatic part of thousands of words, referred to the B.B.C. as "The British Broadcasting *Company*"! I expected to hear the collapse of the announcer or of the microphone!

She might have also finished her excellently toned appeal a little less abruptly.

◆ ◆ ◆

Thelma Tuson has a nice voice, although her rendering of the "Musetta" song was inclined to be affected. And even from so delightful a singer five songs at a time make really too much of a dose. They should have been split up.

I continue to hear disparaging remarks regarding the Children's Hour. Both London and 5GB are at fault in this respect. The trouble seems to be the same as that which troubled theatre-goers not so long ago; that is, a tendency on the part of the entertainers to *entertain each other*.

"To make matters worse," a reader (Dewhurst Road, W.14) tells me, "the whole programme is mumbled and the birthday lists (mere caricatures of the old-time 'Look behind the sewing machine, Willie!') are rushed through at a preposterous rate."

"My children," writes H. B. G., "who should count most in this case, are not interested when five o'clock comes."

◆ ◆ ◆

I have in the past defended this feature. But, curiously enough, before these letters reached me I had made a note of a transmission I heard from Birmingham which irritated me beyond measure, and to which I referred last week. One does not want solemnity; but the "back chat" is overdone and borders on rudeness.

◆ ◆ ◆

Jay Whidden's Dance Band is creeping up in popularity. Jazz tunes these days are so like each other, *unless one is dancing*, when one is prepared to overlook a lot. The standardised tunes become wearying after a while, but Whidden succeeds in putting over a different interpretation with each number, and, in consequence, he is all the more interesting—even to non-dancers, who *cannot be left out of account*.

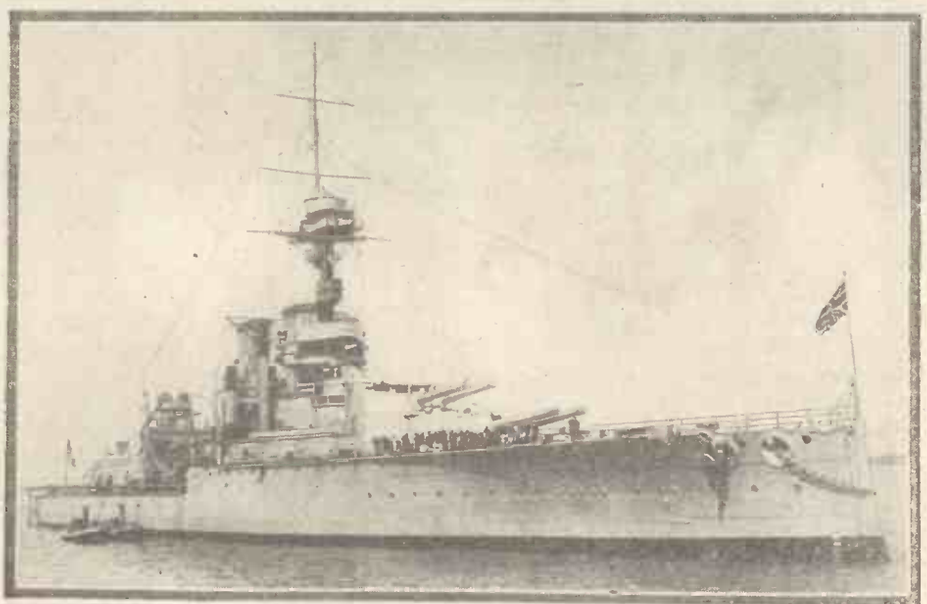
Another feature of this band is the playing of the trumpeter. Not everybody appreciates the frilly bits (or, as it is known in syncopated circles, "dirt" and "hot breaks"), but the technique of this player is worthy of the highest praise Long may he tootle!

◆ ◆ ◆

I celebrated the fine victory over our friends the Waratahs, so that this note missed my last "copy."

The unexpected English lead gave a real thrill to the "running commentary." Captain H. B. T. Wakelam did wonders in his transmission, although one missed the little intimate touches one hears in other outside transmissions.

Yet this plain business-like reporting is safer and deserves support. One point more: the score was not repeated often enough. I tuned in after the match started and had to wait a dickens of a time ere I heard the surprising score.



BATTLESHIP TO SAIL WITHOUT CREW

The former battleship "Centurion" is now a wireless-directed target ship and can manœuvre without a single human being on board.

FREE SUPPLEMENT TO "AMATEUR WIRELESS" N°294. JAN. 28. 1928

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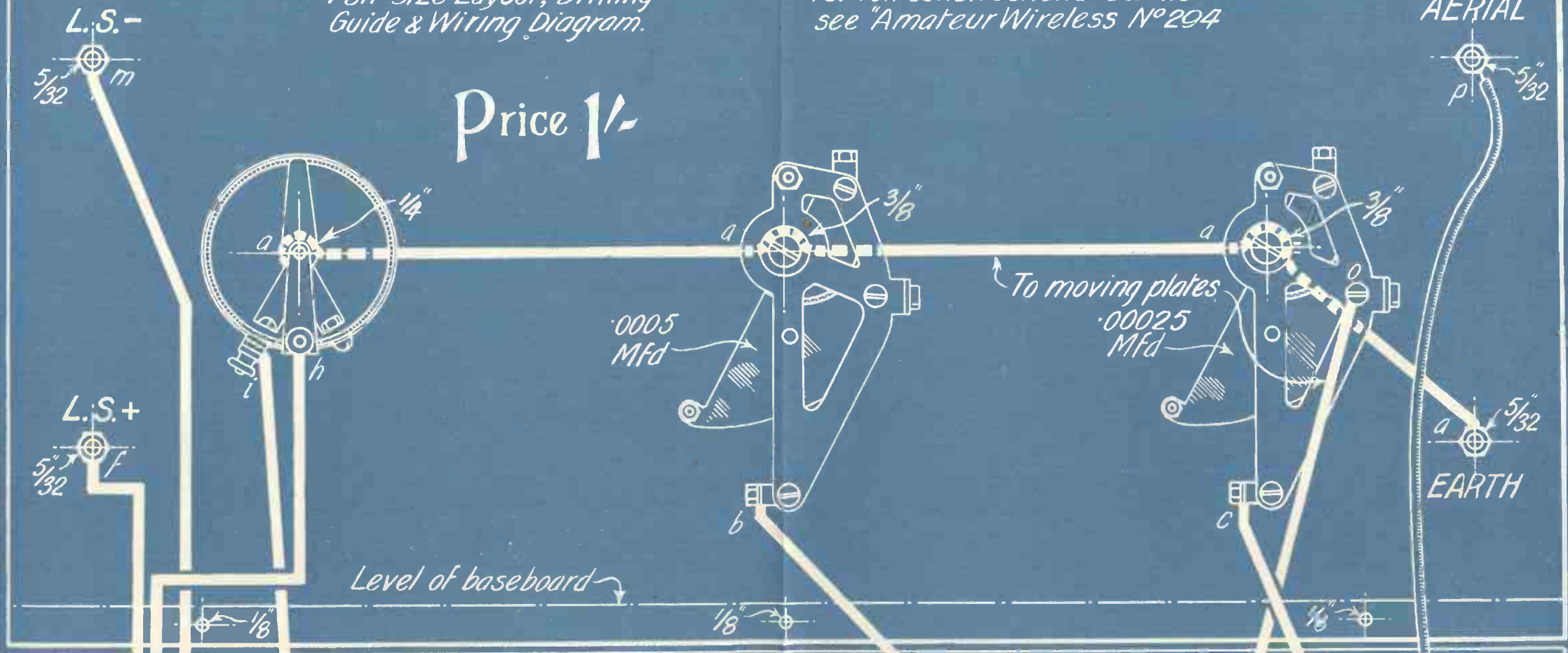

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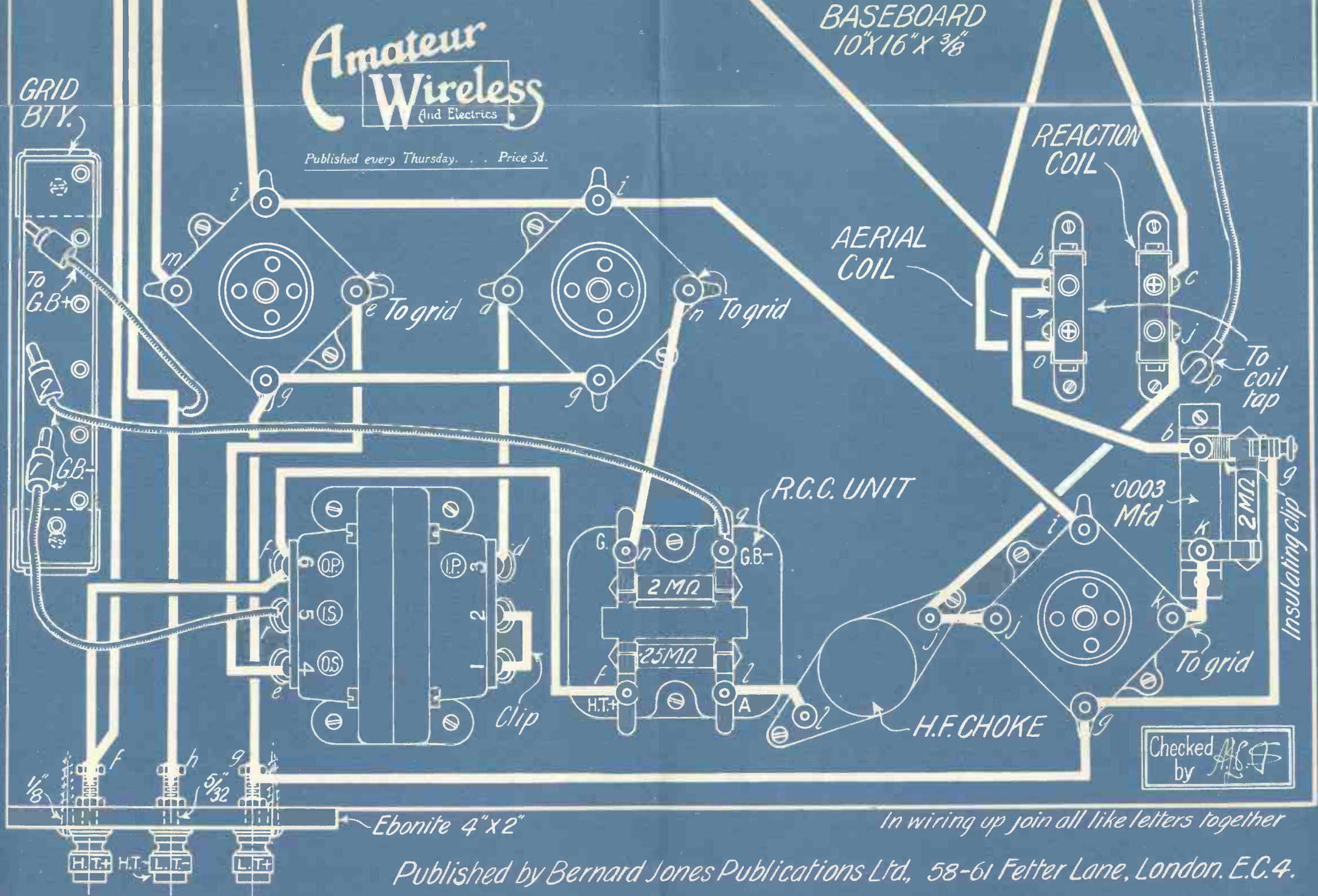


In wiring up join all like letters together

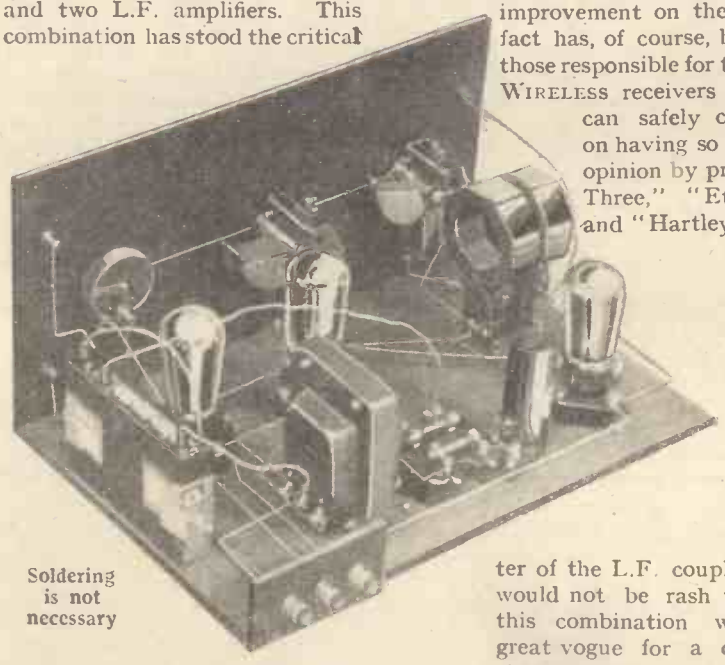
Published by Bernard Jones Publications Ltd., 58-61 Fetter Lane, London. E.C.4.

BRITAIN'S "FAVOURITE THREE"

EMBODYING THE CIRCUIT VOTED FIRST IN THE RECENT "A.W." COMPETITION

"CHOOSE your circuit," was the theme of our recent competition, which created lively interest and discussion amongst our readers, and resulted in a definite decision regarding the circuit most favoured by British listeners.

As was anticipated, the favourite number of valves was three, and we were not surprised to find so many readers voting in favour of a combination of valve detector and two L.F. amplifiers. This combination has stood the critical test of several years' handling by thousands of listeners.



Soldering is not necessary

It has become apparent that what listeners really want more than anything else is clear and powerful reproduction of the programmes broadcast from the local station. But mere "noise" such as some three-valvers are capable of producing in a most prodigious way is no longer generally acceptable. Improvements in the design of almost every type of loud-speaker have tended to show up the deficiencies of L.F. amplifiers. It is a sign of the times when we find that a combination of resistance-capacity and transformer coupling has ousted the "all-transformer" amplifier from popular favour. Experience has shown that ample volume is available with the favoured combination of L.F. amplifiers, but—far more important—the purity of reproduction is a very great improvement on the older system. This fact has, of course, been fully realised by those responsible for the design of AMATEUR WIRELESS receivers in the past, and we can safely congratulate ourselves on having so well gauged popular opinion by producing the "Victory Three," "Ether-Searcher Three," and "Hartley D.X. Three," all of which receivers, it will be remembered, embody a combination of "R.C." and transformer coupling in the L.F. stages.

Even so, we think that readers have shown a keen discrimination in the matter of the L.F. coupling, and it would not be rash to say that this combination will have a great vogue for a considerable time to come.

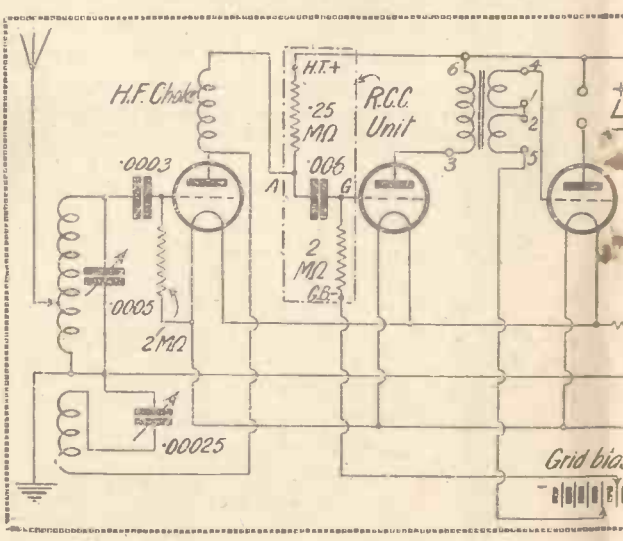
Reaction

With regard to the choice of the reaction portion of the receiver, the advantages of Reinartz reaction have been so exhaustively demonstrated that it was practically a foregone conclusion that readers would be almost unanimous in its favour.

Readers of AMATEUR WIRELESS will know that we usually abbreviate the long-winded phrase "capacity controlled magnetic reaction" by the phrase "Reinartz reaction." In this system the actual coupling between the tuning and reaction coils is fixed, and the variation of reaction feed-back is finely controlled by means of a variable condenser. Because a good reaction system, such as the Reinartz, gives such a high degree of "H.F. sensitivity" to the detector valve, it is possible to dispense with a definite stage of H.F. amplification, and so to utilise our limited number of valves to the greatest advantage on the note-magnifying side.

The Chosen Circuit

The receiver embodying the chosen circuit arrangement just discussed has been called Britain's "Favourite Three," and as it has all the potentialities of a highly successful set, we prophecy that it will enjoy an immense popularity.



AVOURITE

It will be interesting to analyse the complete circuit arrangement depicted by the theoretical diagram accompanying this article. The tuning system is extremely simple. A tapped coil tuned by a .0005-microfarad variable condenser is shunted across the grid-filament circuit of the detector valve. The aerial lead, it will be noted, is not connected to the grid end of the tuning coil, but to a point some way down. The actual point of connection can be either the centre, by using a centre-tapped coil, or a few turns from the earth end of the coil, by using an "X" coil such as Lisenin, Atlas, Tunewell, etc

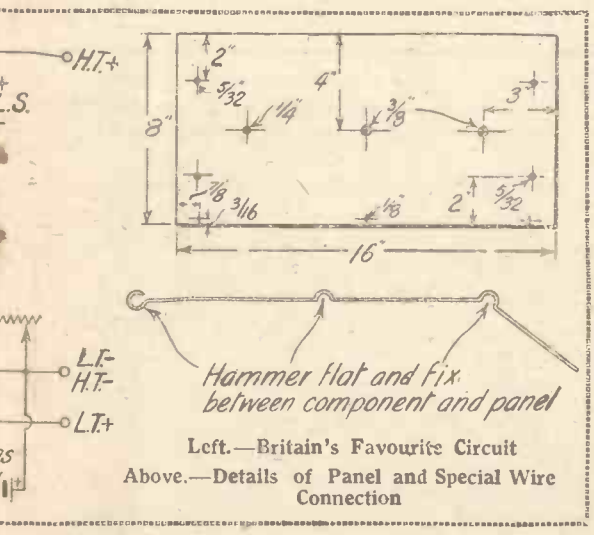
Rectification

In the circuit specification chosen, no reference was made to the form of valve-rectification to be used, but we decided without hesitation that the leaky-grid-condenser method would prove the most acceptable to our readers, and, therefore, we have inserted a .0003-microfarad grid-condenser and 2-megohm grid leak for this purpose.

Now for the reaction arrangement. In the anode circuit of the detector valve is an H.F. choke, which serves the purpose of diverting the H.F. component of the rectified anode current through an additional circuit connected between the anode and negative side of the filament. This additional circuit is, of course, the modified Reinartz arrangement, consisting of a coil and variable condenser in series, across the two points mentioned.

It should be noted that the fixed vanes of the variable reaction condenser are connected to the earth side of the tuning coil and that the moving vanes are connected to one side of the reaction coil, and lastly that the remaining side of the reaction coil is connected to the anode of the detector valve. There is a very good reason for this particular connection. One of the disadvantages of not having a stage of H.F. amplification in the receiver is that the reaction control on distant stations is extremely critical.

It is therefore essential that we arrange for a very fine control of reaction and this is best achieved by the scheme outlined. Hand-capacity effects, which often militate against critical reaction control, are practically eliminated by connecting the moving vanes of the condenser to the earth side of the coil, as shown.



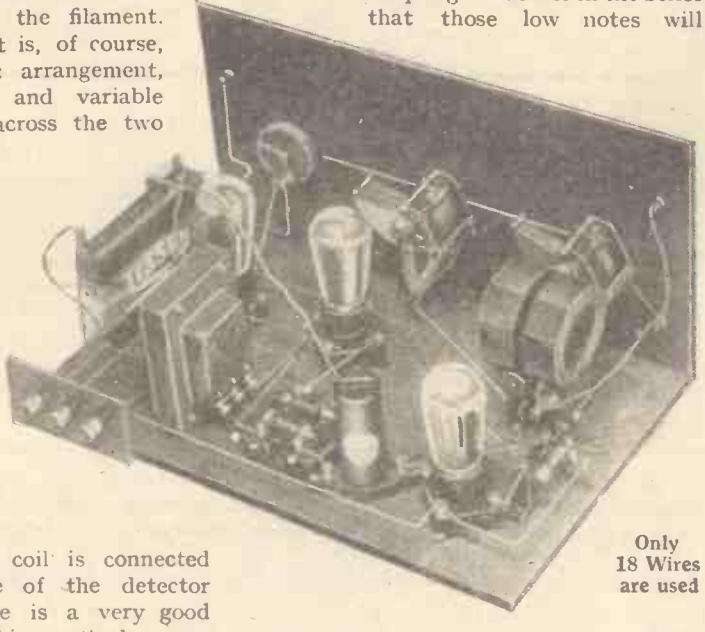
Left.—Britain's Favourite Circuit

Above.—Details of Panel and Special Wire Connection

R.C. Coupler

Between the detector valve and the first L.F. amplifying valve are the components constituting the resistance-capacity coupling, that is, an anode resistance, a coupling condenser and a grid leak. The values of these components have been selected as a result of considerable experience with this form of coupling, and no deviation from the specified values is advisable if the extraordinarily good results we have obtained with this receiver are to be duplicated.

Actually, we have used a Dubilier R.C. coupler, because the value of the coupling condenser conforms with our own ideas on the subject and also because the anode resistance and grid leaks are readily interchangeable. The anode resistance, which is a Dubilier "Dumetohm," has a value of 250,000 ohms and the grid leak a value of 2 megohms. The coupling condenser has a value of .006-microfarad which is, in our opinion, quite large enough to pass the very lowest notes in the musical scale. There is no point in using a very large coupling condenser in the belief that those low notes will trickle through the more easily, especially as the larger the size of the condenser the greater is the expense.



Only 18 Wires are used

Transformer Coupling

The coupling between the first and second amplifying valves is the conventional L.F. transformer arrangement. Up to the second valve we have passed on our initial signal in a practically unmutilated form, but before we can operate the loud-speaker,

BRITAIN'S "FAVOURITE THREE" (Continued from preceding page)

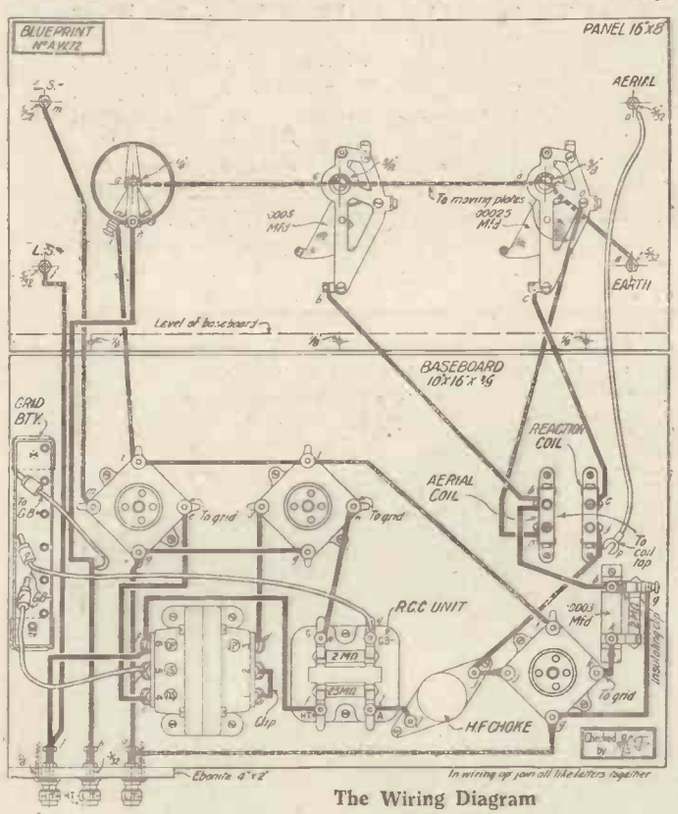
the signals have got to go "through the mill," as we might say, of an L.F. transformer, and it is wise to use a really satisfactory component for the purpose. We have used an R.I. and Varley Straight-line Super Transformer, and if an alternative is incorporated let our choice be the indication of the type that we consider to be absolutely necessary to maintain the purity of reproduction.

Remaining points regarding the circuit arrangement can be summarised as follows:

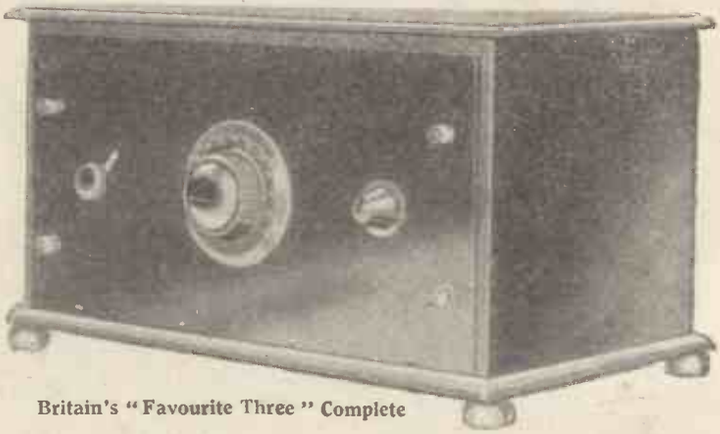
(1) There is only one H.T. + connection, which is common to the anodes of the three valves. It will be seen that we have marked this terminal H.T. + 120 volts, because we wish to impress upon readers' minds the necessity of an *adequate* H.T. supply. In the past we have found that where a stage of R.C. coupling follows the detector valve, difficulty is frequently experienced in obtaining reaction, due to the fact that say, 60 volts is applied to the anode of the detector valve through an anode resistance of at least 250,000 ohms. In such a case, the anode of the detector valve receives but a fraction of the applied 60 volts, which is often insufficient to give satisfactory reaction effects. Apart from the fact that the use of one H.T.+ terminal simplifies subsequent connections, there is less likelihood of failure to obtain reaction if the same voltage is applied to the detector valve as to the L.F. valves.

(2) The question of filament control is to many readers a perplexing one. One receiver incorporates fixed resistances, another uses variable resistances and yet another omits any kind of resistance! We have compromised in a way which we think will satisfy the majority of our readers. We have used one master rheostat which controls all three filaments simultaneously and combines the function of current regulator and 'on-off' switch.

(3) Separate grid-bias tappings are provided for each of the grids of the L.F. valves, in spite of the fact that the H.T. supply is common to both. The reason for separate grid-bias tappings is that an ordinary L.F. valve is used in the first stage, whereas a power valve is used for the last stage.



The Wiring Diagram



Britain's "Favourite Three" Complete

From the foregoing considerations readers will now have a very good idea of the circuit and its possibilities. Before dealing with the practical interpretation of this circuit, a word about our special blueprint, which is given free with this issue of AMATEUR WIRELESS. This is a full-size working lay-out, which can be used as a panel drilling template and as a valuable aid in checking the point-to-point connections of the components. With the aid of the numerous photographic views illustrating this article, the constructor should have no difficulty at all in visualising Britain's "Favourite Three."

Components

The list of components required to build the receiver is as follows:

Ebonite or bakelite panel, 16 in. by 8 in. by ¼in. (Raymond, Becol, Radion, Pertinax).

Cabinet (Carrington, Raymond, London Radio Supply Co.).

.0005 log mid-line variable condenser (J.B., Cyldon, Ormond, Burton, Raymond).

.00025 log mid-line variable condenser (J.B., Cyldon, Ormond, Burton, Raymond).

Panel-mounting 7-ohm rheostat (Lissen, Igranic).

Three baseboard anti-microphonic valve-holders (Benjamin, Lissen).

Two single coil holders (Lotus, Lissen, L. & P.).

.0003 fixed condenser with series clip (Dubilier, Lissen).

2-megohm grid leak (Dubilier, Lissen).

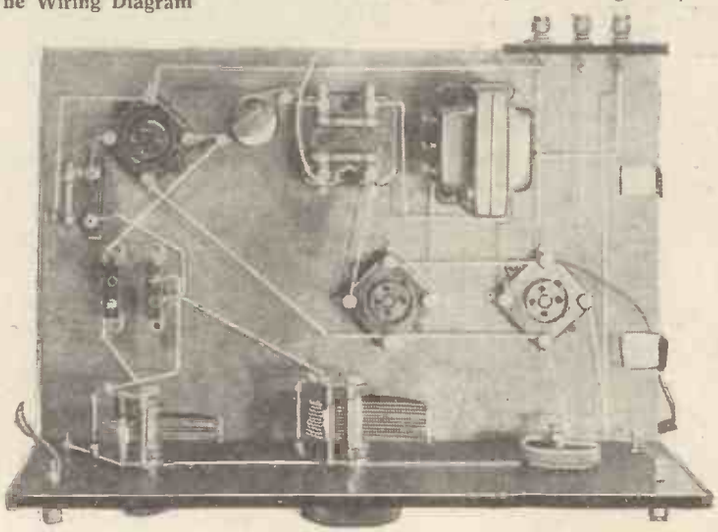
H.F. choke (Lissen, R.I. & Varley, Wearite, Trix).

R.C. coupling unit (Dubilier, Lissen, Carborundum).

L.F. transformer (R.I. & Varley).

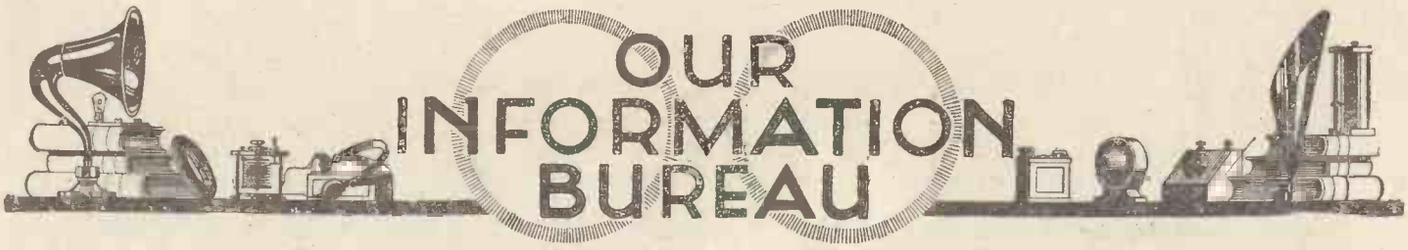
Terminals strip, 4 in. by 2 in.

Seven terminals, marked: Aerial, Earth, L.S.−, L.S.+, L.T.+, L.T.−, H.T.+ (Belling-Lee, Eastick).



Ample Space has been allowed for the Components.

(Continued on page 154)



RULES.—Please write distinctly and keep to the point. We reply promptly by post. Please give all necessary details. Ask one question at a time to ensure a prompt reply, and please put sketches, layouts, diagrams, etc., on separate sheets containing your name and address. See announcement below.

Fixed Resistors.

Q.—*How can I determine what value of fixed resistor I shall need for any particular type or make of valve?—T. G. (London).*

A.—First of all find the filament voltage and filament current requirements of the valve as specified by the valve manufacturer. Now subtract the filament voltage of the valve from the voltage of the filament accumulator or supply battery. Divide the resultant figure by the filament current requirements of the valve and the answer is the resistance in ohms required.—L.C.

Reducing Tramway Interference.

Q.—*I am greatly troubled by interference from the tramway system, which passes the front of my house. Is there any means of overcoming or reducing this interference?—D. F. (New Cross).*

A.—This type of interference may certainly be reduced, although a complete cure for this trouble is not possible in all cases. If you can erect your aerial at right angles to the tramway system, this will assist matters, but it will probably be necessary for you also to erect a counterpoise earth. The aerial lead-in wire should, for preference, be connected to the end of the aerial farthest from the tramway system. Loose-coupled aerial tuning should also be employed. If the set is completely screened in a copper-lined cabinet or container, this will tend to reduce interference which is "picked up" through sheer shock effect.—C. L.

When Asking Technical Queries

PLEASE write briefly and to the point

A Fee of One Shilling (postal order or postage stamps) must accompany each question and also a stamped, addressed envelope and the coupon which will be found on the last page.

Rough sketches and circuit diagrams can be provided, but it will be necessary to charge a special fee (which will be quoted upon request) for detail layouts and designs.

"Simpler Wireless."

Q.—*I have built the "Simpler Wireless" Special Three, and wish to know whether it is possible to add a stage of H.F. to this?—F. J. (London).*

A.—A stage of H.F. may be added to this set, but as such will entail considerable alteration to your existing set, we suggest that it will be to your advantage to rebuild your set along the lines of the special four-valve set which Mr. Johnston has described in the issue of January 21.—A. C.

Volume Control.

Q.—*Can I control the volume from my set by fitting rheostats in place of the fixed resistors at present employed? My set, by the way, is a detector and two L.F.—A. D. (Birmingham).*

A.—If you attempt to control your volume in the way you suggest, you will introduce distortion, apart from the fact that any change in the setting of the rheostat for the detector valve may throw the set into violent oscillation. We would suggest the fitting of a high-resistance variable resistance across the loud-speaker terminals or, failing this, a variable anode resistance could be connected between the grid of the last valve and its corresponding negative grid-bias wander plug. There are several well-known and reliable makes of volume control now on the market suitable for connecting across the loud-speaker terminals, and it would be to your advantage to invest in one of these.—S. C.

Croydon's New Wavelength

A WAVELENGTH of 1,400 metres will be used by the new Croydon Air Station in order to keep clear of the 900-metre channel, which will in future be used exclusively by the air lines of Imperial Airways.

A Television Claim

TRANSATLANTIC television is an accomplished fact, according to a statement made by Mr. L. G. Hutchinson, managing director of the Baird Television Company, Ltd. It is claimed that secret experiments carried on for the last six weeks have resulted in the establishment of television contact between New York and England.

Although the features of the images were indistinct, it has been possible to see faces and hands across the Atlantic. Mr. Hutchinson thinks that it will not be long before long-distance television is greatly improved. In any case he is on his way to America now to explore the commercial possibilities of transatlantic vision on the Baird System.

The work of the B.B.C.'s Advisory Committee in connection with pronunciation is described as being "all foh the welfah of the Empah."

CHIEF EVENTS OF THE WEEK

LONDON AND DAVENTRY (5XX)

Jan. 30 Musical Comedy, *The Lilac Domino*.
" 31 Military Band Concert.
Feb. 1 The Lena Ashwell Players.
" 2 Charlot's Hour.
" 3 Symphony Concert.
" 4 Wireless Military Band Concert.

DAVENTRY (5GB)

Jan. 29 Miscellaneous Choral Concert.
Feb. 1 *Dainty Diana*, an episode in the life of Sir Roger de Coverley.
" 2 *Colvin's Lane*, a play by Gladys Ward, and *Honours Easy*, a trifle of patches and powder by A. E. Drinkwater.
" 3 Mendelssohn programme.

CARDIFF

Jan. 31 A Flapper's programme.

MANCHESTER

Feb. 1 The *Duds* Concert Party.
" 3 A 'cello recital by Garbousova.

GLASGOW

Feb. 3 Military Band Concert.

ABERDEEN

Feb. 3 "Mrs. Buggins" gives a party.

BELFAST

Feb. 4 A Musical Comedy programme.

On January 26, Belfast will effect an Australia Day broadcast, with a programme of music composed "down under" and songs by Tessa Richardson, the Australian contralto.

Reminiscences of Margaret Cooper are to be given by Sara Sarony from 5GB on January 30.

An elephant holding a horn-type loud-speaker in its trunk is the chief feature of a striking emblem adopted by the Broadcasting Company of India.

"H.T. Supply from A.C. Mains."

(*Continued from page* 126)

additional cost involved by the incorporation of a reliable voltmeter is justified.

To use the unit, insert an Osram or Marconi U5 rectifying valve in the valve-holder, connect H.T.+2 to the amplifier H.T. terminal of the receiver and H.T.+1 to the detector or H.F. H.T. terminal. The unit is connected to the mains *via* a length of twin flex, one end being connected to the Bulgin mains plug and the other end to a suitable electric-light plug, the type depending of course, upon the fitting from which the mains supply is tapped.

By inserting the voltmeter plug in the top socket the maximum H.T. reading can be readily observed, and by plugging into the lower socket the resistance knob can be rotated slowly until a suitably lower H.T. value is read off on the voltmeter. These readings should be taken *when the receiver is drawing current*, otherwise they will be inaccurate. If a receiver using a detector followed by an R.C. stage of L.F. is in use, then it will probably simplify the connections and improve reception to connect all the receiver H.T.+ terminals to H.T.+2 of the unit.

Microphones have been installed in the Danish State House, so that parliamentary debates may be broadcast.

RADIOGRAMS

ONE of the first motor cars to be seen in the north of England was owned by Mr. Albert House, who to-day is considered an authority on motoring. In a broadcast from the Leeds-Bradford station, Mr. House on January 31 will tell listeners what it was like to take a car out on the road in 1900.

On February 11 Cervantes' famous story, *Don Quixote*, will be presented at the Belfast studio as a tale told by a wandering troubadour.

On the occasion of the opening of the new Town Hall organ at Cheltenham, a recital by Sir Herbert Brewer will be relayed to 5GB on February 15.

Arnold Schonberg, the well-known Austrian composer, will personally conduct the National Concert to be given at the Queen's Hall on January 27. Among the works to be performed are his own *Gurrelieder*, a ballad cycle, to be interpreted by Lilian Stiles Allen (soprano), Gladys Palmer (contralto), Walter Widdop (tenor of the B.N.O.C.), John Perry (tenor), and Arthur Fear (baritone).

Following the thrills provided at Murrayfield when Scotland just scraped home against the Waratahs, rugger enthusiasts will be interested to hear that a running commentary is to be given by Mr. J. M. MacLennan, when Scotland meets Wales in an international struggle on February 4. The broadcast will be relayed to 2LO, 5XX, and all Scottish stations.

When the Cyclists' Touring Club holds its Jubilee Banquet at the Connaught Rooms, London, on January 27, the toast of the club will be proposed by the Earl of Birkenhead, and Mr. William Haigh (chairman of the C.T.C.) will respond. These speeches, as well as one by Sir John Foster Fraser (author, journalist, and traveller) will be relayed to listeners through Daventry 5GB.

In a programme entitled *Bristol's Hour of Old Favourites*, to be broadcast from Cardiff on February 11, many of the items have been chosen by prominent citizens. One song, "The Cottage by the Sea," was selected by the city's oldest resident—a Mrs. Miller, of Southmead, aged 105.

Cuvillier's comic opera, *The Lilac Domino*, which scored such a great success in London some years ago, is to be broadcast from 2LO, 5XX, and other stations on January 30.

Who Wears the Breeks? is the title of a "controversial" debate to be broadcast on February 9 from the Glasgow station. The debaters on this occasion are Tommy Handley (an Englishman) and William McCulloch (a Scotchman), whilst T. P. Maley (an Irishman), in the chair, will endeavour to keep the peace!

ANE, the Bandoeng (Java) short-wave transmitter, will carry out a new series of tests with Kootwijk (Holland) during this and next month. On January 27 and 30 transmissions are to be made between 12.40 and 14.40 G.M.T. on a wavelength of 15.93 metres; on January 26 and 31 on 31.86 metres, between 16.40 and 18.40 G.M.T.

The Swedish Broadcasting Company has decided to raise the power of the Malmo and Gothenberg broadcasting stations from 1 to 10 kilowatts; it is also proposed to erect a new high-power transmitter at Schonen, to serve the southern part of the country.

In the opinion of James Harbord, the President of the Radio Corporation of America, wireless will play an important part in the next Presidential Elections. With the present network of linked transmitters, political speeches could be conveyed to some forty million voters, a fact which might considerably influence the results at the polling booths.

(*Continued on page* 152)

BROADCAST TELEPHONY

(Broadcasting stations classified by country and in order of wavelengths).

Metres	Kilo-cycles	Station and Call Sign	Power Kw.
GREAT BRITAIN			
24	12,500	Chelmsford (5SW)	20.0
252.1	1,190	*Bradford (2LS)	0.2
272.7	1,100	*Sheffield (6FL)	0.2
275.2	1,090	*Nottingham (5NG)	0.2
277.8	1,080	*Leeds (2LS)	0.2
288.5	1,040	*Edinburgh (2EH)	0.2
294.1	1,020	*Stoke-on-Trent (5ST)	0.2
294.1	1,020	*Swansea (5SX)	0.2
294.1	1,020	*Dundee (2DE)	0.2
294.1	1,020	*Hull (6KH)	0.2
297	1,010	*Liverpool (6LV)	0.2
306.1	980	Belfast (2BE)	1.5
312.5	960	Newcastle (5NO)	1.5
326.1	920	*Bournemouth (6BM)	1.5
353	850	Cardiff (5WA)	1.5
361.4	830	London (2LO)	3.0
384.6	780	Manchester (2ZY)	1.0
400	750	*Plymouth (5PY)	0.2
405.4	740	Glasgow (5SC)	1.2
491.8	610	Daventry EX (5GB)	24.0
500	600	Aberdeen (2BD)	1.5
1,604	187	**Daventry (5XX)	25.0
* Relay stations. **Relays 2LO.			
AUSTRIA			
272.7	1,100	Klagenfurt	1.5
294.1	1,020	Innsbruck	0.5
357.1	840	Graz	0.5
517.2	580	Vienna (Rosenhuegel)	10.
576	520	Vienna (Wien)	.75
BELGIUM			
508.5	590	Brussels (Radio-Belgique)	1.5
CZECHO-SLOVAKIA			
300	1,000	Bratislava	0.5
348.9	860	Prague (Praha)	5.0
443	676	Brunn (Brno)	3.0
DENMARK			
337	890	Copenhagen (Kjobenhavn)	2.0
1,153.8	260	Kalundborg	7.0
ESTHONIA			
408	735	Reval (Tallinn)	2.2
FINLAND			
375.9	798	Helsingfors (Helsinki)	1.8
1,428	—	Lahtis (under construction)	5.0
FRANCE			
37	8,108	Vitus (Paris)	2.0
39.5		Radio-Lyon	1.0
61	4,918	Radio LL (Paris)	1.0
158	1,899	Bezieres	0.9
200	1,500	Biarritz (Côte-d'Argent)	.25
237	1,265	Bordeaux (Radio Sud-Ouest)	1.5
250	1,200	Juan-bes-Pins	0.5
252.1	1,19	Montpellier	5:00
259	1,161	Toulouse-Pyrenées (PTT)	0.5
268	—	Strasbourg (8GF)	0.3
273	1,058	Limoges (PTT)	0.5
278	1,079	Grenoble (Poste des Alpes, PTT)	1.5
270	1,075	Bordeaux (PTT)	1.0
287.9	1,042	Lille (Poste du Nord, PTT)	0.7
291.3	1,030	Radio Lyon	1.5
293	1,023	Rennes	0.5
297	1,010	Radio Agen	0.5
302	993	Radio Vitus (Paris)	1.0
303	970	Marseilles (PTT)	0.5
340.9	880	Le Petit Parisien, Paris	0.5
370	811	Radio LL, Paris	0.5
391	767	Toulouse (Radio)	5.0
400	750	Mont de Marsan	0.3
458	655	Paris (Ecole Sup., PTT)	3.0
480	624	Lyons (PTT)	1.0
1,750	171	Radio Paris (CFR)	3.0
2,650	113	Eiffel Tower (FL)	8.0
GERMANY			
236.2	1,270	Stettin	0.75
241.9	1,240	Muenster	1.5
250	1,200	Gleiwitz	0.7
256	1,172	Kiel	0.7
272.7	1,100	Danzig	.75
272.7	1,100	Bremen	.75
272.7	1,100	Cassel	0.7
275.2	1,090	Dresden	0.7
283	1,060	Cologne	4.0
297	1,010	Hanover	0.7
303	990	Nurnberg	4.0
322.6	930	Breslau	4.0
330	908	Koenigsberg	4.0
365.8	820	Leipzig	4.0
380	789	Stuttgart	4.0
396	757	Hamburg	4.0
400	750	Aachen	0.75
428.6	700	Frankfurt-Main	4.0
470	638	Langenberg	25.0
483.9	620	Berlin	4.0
535	560	Munich	4.0
566	530	Augsburg	0.5
573.6	523	Freiburg	.75
1,250	240	Koenigswusterhausen-Zeesen	40.
1,800	167	Norddeich (KAV)	10.0
HOLLAND			
1,069	280	Hilversum (ANRO)	5.0
1,950	154	Huizen (1,840 m. between 3.40 and 5.40 G.M.T.)	5.0
1,950	154	Scheveningen-haven	2,5
HUNGARY			
555.6	540	Budapesth	3.0
ICELAND			
192	—	Akureyri	1.5
333.3	900	Reykjavik	1.0
IRISH FREE STATE			
319.1	940	Dublin (2RN)	1.5
400	750	Cork (5CK)	1.5
ITALY			
316	949	Milan (Milano)	4.0
333.3	900	Naples (Napoli)	1.5
432	663	Rome (Roma)	3.0
541	554	Milan (Vigentino)	7.0
LITHUANIA			
2,000	150	Kovno (Kaunas)	15.0
LUXEMBURG			
217.4	1,380	Radio (Luxemburg)	0.3
NORWAY			
30	9,991	Bergen (testing)	
370.4	810	Bergen	1.0
423	709	Notodden	0.7
434.8	692	Fredriksstad	1.1
448	670	Rjukan	1.5
461.5	650	Oslo	1.5
504	595	Porsgrund	1.0
555.6	530	Hamar	0.7
POLAND			
342.8	875	Posen (Poznan)	1.5
422	711	Cattowitz	12
435	689	Wilno	1.5
566	530	Cracow	1.5
1,111	270	Warsaw (Varschava)	10.0
ROUMANIA			
1,800	167.4	Bucharest	2.0
RUSSIA			
223.9	1,349	Leningrad	4.0
675	444	Moscow (Popoff)	10.0
1,000	300	Leningrad	10.0
1,450	209	Moscow (Moskva)	20.0
1,700	176	Kharkov	4.0
SPAIN			
310	967	Oviedo (EAJ10)	0.1
323.9	926	Almeria (EAJ18)	1.0
335	895	San Sebastian (EAJ8)	1.0
335	895	Cartagena (EAJ16)	0.5
344.8	870	Barcelona (EAJ1)	1½
375	800	Madrid (EAJ7)	3
400	750	Madrid (Radio Espana, EAJ2)	1
400	750	Bilbao (EAJ9)	500w.
400	750	Cadiz (EAJ3)	550 w.
405	741	Salamanca (EAJ22)	550 w.
434.8	690	Seville (EAJ5)	2.0
462	649	Barcelona (EAJ13)	2
SWEDEN			
50	5,996	Karlsborg (testing)	
454.5	660	Stockholm (SASA)	1.5
1,320	227	Motala	40
SWITZERLAND			
411	730	Berne	1.5
483	510	Zurich	0.6
680	441	Lausanne	0.6
760	395	Geneva	0.5
1,100	271	Basle	0.25
TURKEY			
1,230	244	Stamboul	7
1,800	167	Angora (testing)	7

YOU GET MORE FROM MARCONIPHONE

H.T. Supply Units that save you money

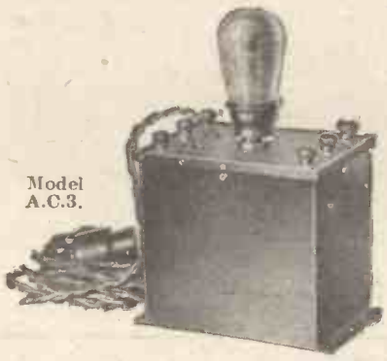
Simply plug a Marconiphone H.T. Unit into an ordinary lamp holder and you obtain continuous and steady H.T. supply, requiring no attention, no renewal. The initial cost is moderate and upkeep costs next to nothing.

Marconiphone Model A.C. 2 for Alternating Current Mains.

Supplies H.T. to receivers of almost any type. Output exceptionally high—40 milliamperes at 120 volts. Two models available for 100-125 and 200-250 volts. Price, including U.5 Valve and Royalty, £7 12s. 6d. Also two similar models for 25 cycles.

Marconiphone Model D.C. 2 for Direct Current Mains.

With output more than sufficient for any standard receiver—50 milliamperes at 120 volts. Tappings at 42 and 84 volts. Suitable for use on 100 to 250-volt mains. Price £4 2s. 6d.



Model A.C.3.

Marconiphone Model A.C. 3. for Alternating Current Mains.

For receivers employing not more than two valves and suitable for 100-125 or 200-250 volts. Complete with Valve and Royalty, 73s.

Marconiphone Model D.C. 3. for Direct Current Supply.

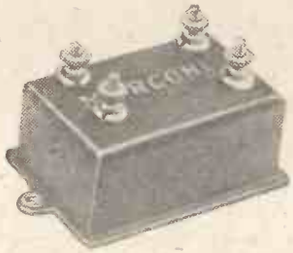
Very neat and inexpensive, this model is for receivers using not more than two valves. All components and wiring are enclosed in sealed metal case. Price 35s.

Model D.C.3.

The modern method of L.F. Amplification

Marconiphone Amplifying Devices build up whispers into voluminous sound, yet never do they sacrifice tone purity for the sake of volume. Incorporate them in the L.F. stages of your receiver, and it's just as if the music has come much nearer. Volume is the only thing that's added—harshness and distortion have no place in a Marconiphone-built receiver, specially if Marconi Power Valves are used.

For the first L.F. stage use one of the new Marconiphone R.C. Units. Remarkably compact, they maintain their stated value under all conditions with absolute silence. There are two types: Type "A," for valves of medium impedance, 8s. Type "B," for high magnification valves, 7s. 3d.



Above—R.C. Unit
Below—"Ideal" Transformer

Follow this with the famous "Marconiphone" Ideal Transformer—proved distortionless throughout the musical scale and guaranteed against electrical and mechanical defects for twelve months. In ratios 2.7 to 1, 4 to 1, 6 to 1, 8 to 1, 25s. each.

Send for full particulars of all Marconiphone Wireless Apparatus.

THE MARCONIPHONE COMPANY, LIMITED

210-212 TOTTENHAM COURT ROAD, W.1

MORE RADIOGRAMS

(*Continued from page* 150)

ON February 4 Daventry 5GB will feature a cheery vaudeville programme including the two M's, Mable France, in Aunt Marie sketches, Stainless Stephen (entertainer), and Jack Venables and his band.

The tribunal of Brussels has decreed that a tenant may erect a wireless aerial on the roof of the building he occupies, despite the objection of the landlord. This decision was brought about in a controversy between a radio listener and the owner of an apartment building, who had forbidden the use of his roof for wireless aerials.

Readers possessing multi-valve sets may be interested to learn that the Berlin studio has arranged to broadcast a radio ball on February 11 from 8 p.m. until midnight. The programme, which includes cabaret turns, will be relayed from the Berlin Zoo Festival Hall to most German broadcasting stations, including the new Zeesen super-power transmitter.

Station 9CAA, owned by C. R. Stedman, 1641 Albion Street, Denver, Colorado, sends messages free of charge to any part of the world. This amateur has been heard in many foreign countries and distances up to 8,000 miles have been worked. The station is using 75 watts in a coupled Hartley circuit and is equipped to operate on all useful waves assigned to the amateur. Mr. Stedman handles an average of 150 messages every month.

Success has greeted the first attempt to transmit press messages by radio telephone between Europe and Asia. The feat was accomplished recently by the Dutch telephone administration, which placed Batavia, on the north coast of Java, in communication with the Hague in Holland for more than two hours.

A High-frequency Circuit !

The French PTT authorities are effecting tests with a new transmitter at Lyons on a wavelength of 39.50 metres. Broadcasts are made daily (Sundays excepted) between 5 and 6 p.m. G.M.T., the call of the station being given out in the French, German, and English languages.

An explanation of the considerable interference from morse signals emanating from French sources would appear to lie in the fact that, from official statistics published at Paris, more than 250 French trawlers, in the North Sea and English Channel, are equipped with wireless transmitters.

According to estimates by the Swedish Telegraph Administration's laboratory, a flash of lightning is worth about £15 in electricity consumed !

Although but little is heard of the Finnish broadcasting system, the republic now possesses 39,673 registered licence-holders. The principal station is that of Helsingfors, operating on 375 metres, but its programmes are also relayed to Bjoerneborg (304 m.), Tammerfors (390 m.), Abo (256 m.), and Viborg (214 m.). Apart from these official transmitters, smaller locally-owned plants have been installed at Mikkeli, Jakobstadt, and Jyvaskyla. A new high-power transmitter is under construction at Lahtis.

The number of amateur transmitting stations in the U.S.A. increased from about 15,000 last year to 17,000 this year ! Nearly all these stations are operating on wavelengths on or below 80 metres.

BRITAIN'S "FAVOURITE THREE"

(*Continued from page 146*)

Two grid-battery clips (Bulgin).
Three wander plugs (Lissenin or Clix).
Grid-bias battery (Lissen).

The Layout

With these parts on hand, do not be tempted to start straight away and assemble the receiver, but finish reading this article! Our main object in interpreting the chosen circuit in a practical form was to keep down the cost of construction to a minimum, and this, we think, readers will agree has been achieved.

Essentially the layout does not differ from the conventional three-valve layout; that is to say, the main controls are accommodated on an ebonite panel, screwed at right angles to a baseboard sufficiently large to accommodate the remaining components. On the panel are the two variable condensers and variable filament resistance together with the four terminals marked: "Aerial," "Earth," "L.S.−," "L.S.+." The tuning condenser occupies the central position on the panel, and on its left is the variable reaction condenser and on the right the variable filament resistance. To maintain the symmetry of the panel layout we have used a small control knob on the reaction condenser, although a refinement for those who do not mind an unsymmetrical panel would be a 3- or 4-inch dial.

(*Continued on page 156*)

VALVES TO USE IN BRITAIN'S "FAVOURITE THREE"

Make	Detector			1st. L.F.			2nd. L.F.		
	2-v.	4-v.	6-v.	2-v.	4-v.	6-v.	2-v.	4-v.	6-v.
B.T.H.	B8	—	—	B210 L	—	—	B215 P	—	—
CLEARTRON	215H	—	CT25 B	CT15	—	CT25	CT15 X	—	CT25 X
COSMOS	SP18 B	—	SP50 B	SP16 R	—	DE50	SP18 RR	—	SP50 RR
COSSOR	210 RC	410 RC	610 RC	210 Det. & L.F.	410 L.F.	610 FP	220 P	410 P	610 P
EDISWAN	RC2	RC 410	RC 610	GP2	PV 410	ES5 L.F.	PV2	PV 410	PV 610
MARCONI	DEH 210	DEH 410	DEH 610	DEL 210	DEL 410	DEL 610	DEP 240	DEP 410	DEP 610
MULLARD	PM1 A	PM3 A	PM5 B	PM1 L.F.	PM4	PM6	PM 252	PM 254	PM 256
OSRAM	DEH 210	DEH 410	DEH 610	DEL 210	DEL 410	DEL 610	DEP 240	DEP 410	DEP 610
SIX-SIXTY	SS 210 RC	SS 4075 RC	SS 6075 RC	SS 210 L.F.	SS 240 P	SS 610 P	SS 215 P	SS 425 SP	SS 625 SP

"BRITAIN'S 'FAVOURITE THREE'"

(*Continued from page 154*)

The small knob provided is quite effective for all ordinary purposes. Conforming with our usual practice the aerial and earth terminals are on the left of the panel and the loud-speaker terminals on the right.

Looking from the back of the panel, as in the blueprint, the grouping of the components is as follows. On the right, the two single coil-mounts, grid-leak, and condenser, detector, valve-holder and H.F. choke. Near the back of the baseboard almost in a direct line with the tuning condenser, the first L.F. valve-holder and R.C. coupler. The L.F. transformer, second L.F. valve-holder and the grid-bias battery clips are grouped on the left, as indicated. The small terminal strip shown in the blueprint on the extreme left of the baseboard carries the H.T.+, L.T.— and L.T.+ terminals. The simplification of the terminal-strip arrangement is due to two things.

(1) The incorporation of the grid-bias battery in the receiver itself, thus eliminating three terminals from the strip, and (2) the "commoning" of L.T.— and H.T.—, which leads are both clamped under the terminal shown as L.T.—.

[*The concluding instalment on the construction of Britain's "Favourite Three," together with notes on its operation, will appear in our next issue.*—ED.]

The American Television Demonstration

AMERICA'S latest television sensation —the broadcasting to homes achieved by the General Electric Company in conjunction with the Radio Corporation of America—is interesting to those who know a little of the inside of television methods, but not unduly exciting.

The apparatus which Dr. E. F. W. Alexanderson has lately been working on, after eight years of television effort, was not used. His own device is a large drum with twenty-four mirrors round the circumference which zig-zag seven spots of light over a four feet screen.

The apparatus which made the recent broadcasting possible was the spinning disc which has been known to experimenters for years. Baird has tried the idea, and the G.E.C. mechanism seems identical with that used by the American Telephone and Telegraph Company in their New York-Washington demonstration on April 17, 1927.

In the latest achievement a disc with forty-eight spirally arranged holes revolved eighteen times a second before a strong light. The result was that a beam was made to cover the face of the young man in front thoroughly and rapidly; and in the usual manner the light reflected was caught by a photo-electric cell and transformed to electric currents of a corresponding strength.

At the receiving end was another disc, similarly holed, spinning in exact synchronism before a neon tube. In a three-inch square aperture could be seen the wavering image of a young man laughing and smoking. The voice of the young man came through on a loud-speaker on a wavelength of 379.5 metres, compared with the 37.8 metres used for the television signals.

The "home sets," which were placed in three houses several miles distant from the transmitting station, were about the size of a gramophone cabinet. They had to be big enough, obviously, to house the spinning disc and an electric motor to drive it.

Ridley Components for "Melody Maker": In the Cecil Ridley advertisement in our last issue the cost to build the Cossor "Melody Maker" was given as £4 1s. 3d. This was, of course, a printer's error and should have read £5 1s. 3d.

The "Dynaflex": In the list of components of the "Dynaflex," which was described in AMATEUR WIRELESS, No. 292, a ·0005 microfarad variable tuning condenser is specified, while in the wiring diagram and theoretical circuit the value ·0003 microfarad is given. The latter is correct.

A NEW Exide H.T. BATTERY

WH 10-VOLT

PRICE 7/6 9d. per volt

CAPACITY - 5,000 milli-amp. hrs.

The Exide WH Battery is the best H.T. battery ever produced. Hitherto offered only in 24-volt units at 24/- (1/- per volt), it is now available in a new, improved, and much handier 10-volt unit at 7/6—or 9d. per volt. A really heavy duty 5,000 milli-ampere hour H.T. battery at this greatly reduced price creates a record in value, even for Exide.

This super battery for H.T. must now appeal to everyone—obviously to users of powerful sets taking large currents (for the WH has long been the professional choice for really heavy work)—and equally to those whose current requirements are more modest, for its large capacity will greatly prolong the periods between recharges—while its new price places it within the reach of all.

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Obtainable from any Exide Service Agent or your local dealer

WH 40-VOLT

In polished wood container with detachable wire carrying handle.

WH 60-VOLT

In polished wood container with detachable wire carrying handle.

		Dimensions	Weight	PRICE Uncharged
WH 10-volt unit		2 7/16 in. × 7 in. × 5¼ in. high	6½ lbs.	7 6
WH 40-volt	Complete in crate as illustrated	6⅛ in. × 15½ in. × 6½ in. „	27½ „	£1 17 6
WH 60-volt	Complete in crate as illustrated	8¼ in. × 16½ in. × 6½ in. „	41 „	£2 14 0

5,000 Milli-amp-hrs. at 9d per volt

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R.C. and H.F.	*General Purpose.*	*Power.*
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Max. H.T. V. 150	Max. H.T. V. 120	Max. H.T. V. 120
10s. 6d.	10s. 6d.	12s. 6d.

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All-in-all One-valver	A.W. 13	1 0
Hartley DX One-valver	A.W. 27	1 0
Alpha One*	W.M. 26	2 3
Reinartz Plug-in One-valver	A.W. 46	1 0
The Dynaflex (One-valver)	A.W. 69	1 0
Constant-coupled One	A.W. 65	1 0
Long Range Hartley One	W.M. 54	1 0
Economy One	A.W. 71	1 0
TWO-VALVE SETS		
Wide World Short-wave Two	A.W. 11	1 0
All-wave Two-valver	A.W. 15	1 0
Reinartz Two	A.W. 21	1 0
One-dial Two	W.M. 23	1 0
Empire Short-wave Two	A.W. 28	1 0
"Next-step" Receiver	A.W. 34	1 0
Girdle Two*	W.M. 30	1 3
Centre-tap Two	A.W. 42	1 0
Mains-fed Two	W.M. 37	1 0
The Rover Two	A.W. 53	1 0
British Broadcast Two	W.M. 44	1 0
General Purpose Two	A.W. 55	1 0
All-wave Two	A.W. 57	1 0
The "Yule" Two	A.W. 59	1 0
The 30/- Two-valver	A.W. 61	1 0
Economical Two	A.W. 66	1 0
Two-programme Two	W.M. 56	1 0
THREE-VALVE SETS		
Continental Three	W.M. 7	1 0
Victory Three	A.W. 9	1 0
M.C.3 Star	A.W. 16	1 0
Wave-catcher Three	W.M. 19	1 0
Split-primary Three	A.W. 24	1 0
Purity Three-valver	A.W. 33	1 0
A Modern Tuned-anode Three	A.W. 35	1 0
Tetrode Three for Shielded Valves	A.W. 36	1 0
Alternative-programme Three	A.W. 38	1 0
A "Mains" Three-valver	W.M. 31	1 0
Screened-grid Three	W.M. 20	1 0
"Simpler Wireless" Special Three-valver	A.W. 41	1 0
"Home Station" Three	A.W. 45	1 0
The "Economy" Three	A.W. 48	1 0
Five-guinea Three	W.M. 29	1 0
Dominions Short-wave Three	W.M. 39	1 0
Short-wave Three	A.W. 50	1 0
The Ether Searcher Three	A.W. 52	1 0
Three Continent Three	A.W. 54	1 0
Tuned-anode Three for the Mains (D.C.)	W.M. 43	1 0
The Standard Three	A.W. 56	1 0
Straight-line Three	A.W. 60	1 0
Screened-grid Short-waver	W.M. 51	1 0
Hartley DX Three	A.W. 63	1 0
Metropolitan Three	W.M. 48	1 0
Everyday Three	W.M. 52	1 0
THREE-FOUR-VALVE SETS		
A Tuned-anode Three-four	A.W. 49	1 6
Concord Three-four	W.M. 45	1 6
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M.C. Four	A.W. 8	1 6
Household Four	A.W. 17	1 6
Revelation Four	W.M. 24	1 6
"A.W." Gramo Radio	A.W. 40	1 6
All-purpose Four	A.W. 43	1 6
All-wave Roberts Four and copy of "A.W."	A.W. 47	0 7
C.T. Four	A.W. 58	1 6
Simplicity Four	W.M. 49	1 6
Astral Four	W.M. 53	1 6
"Simpler Wireless" Four	A.W. 70	1 6
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1927 Five	W.M. 6	1 6
Two-volter's Five	W.M. 11	1 6
Individual Five	A.W. 25	1 6
Exhibition Five	W.M. 33	1 6
Phœnix Five	W.M. 42	1 6
1928 Five	W.M. 46	1 6
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Short-wave Super-six	A.W. 67	1 6
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Simpladyne Seven (Super-het.)	W.M. 22	1 6
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Two-valve D.C. Mains Amplifier	W.M. 16	1 0
Range Extender (H.F. Amplifying Unit)	W.M. 38	1 0
True-tone Amplifier	W.M. 47	1 0
Utility Two-valve Amplifier	A.W. 68	1 0
PORTABLE SETS		
Springtime Portable (Two-valver)	W.M. 12	1 0
Countryside Four	W.M. 17	1 6
Motorists' Portable Four-valver	A.W. 14	1 6
M.C. Three Portable	A.W. 22	1 0
Handy Three	W.M. 27	1 0
Holiday Portable (three-valver)	A.W. 32	1 0
Club Portable (three-valver)	A.W. 30	1 0
CRYSTAL SETS		
Crystal Set for the R.C. Enthusiast	W.M. 13	0 6
Two-programme Crystal Set	W.M. 25	0 6
Half-Hour Crystal Set	W.M. 28	0 6
Centre-tap Crystal Set	W.M. 20	0 6
Super Crystal Receiver	A.W. 64	0 6
MISCELLANEOUS		
Made-to-measure Wave-trap	A.W. 19	0 6
New Current Supply Idea	A.W. 26	1 0
DX One-valve Unit	A.W. 37	1 0
Volume Control Unit	W.M. 40	0 6
Battery Eliminator for A.C. Mains	W.M. 41	1 0
"Simpler Wireless" Rectifying Unit	A.W. 62	1 0
A.C. Mains Adaptor (for any "Simpler Wireless" Set	W.M. 57	1 0
H.T. Supply from A.C. Mains	A.W. 73	1 0
Cone Loud-speaker	W.M. 55	1 0

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"The Thermionic Family"

(Continued from page 136)

Kallirotron is not a single thermionic device, but a combination of two resistance-coupled valves, cross-connected plate to grid, or head to tail, one might say, in such a way that any initial impulse is magnified practically indefinitely.

The circuit connections are shown in Fig. 7 from which it will be seen that the plate of valve V is connected through a resistance R and biasing battery directly to the grid of valve V1, whilst the plate of the latter is coupled back through a resistance R1 and biasing battery to the grid of the first valve.

When an incoming signal causes the grid of valve V to become more positive, the plate current in that valve increases. The potential of the point P therefore falls, in accordance with the rule that the voltage drop across any resistance R equals the product of the resistance and the current flowing through it.

Accordingly the voltage of the grid of valve V1 also drops because it is connected to the point P, and the plate current from that valve likewise falls off. But this plate current passes through the resistance R1 and, in accordance with the rule just mentioned, the potential of the point P1 (which is connected to the grid of the first valve) must rise.

This new rise in potential is clearly added to the original signal voltage on the grid of valve V, so that the plate current of that valve increases accordingly. In sequence the grid of valve V1 falls still more, and so the process goes on, until the resultant current obtained from the amplifier V2 rises to a value many thousand times greater than that of the originally applied impulse.

Mr. David Sarnoff of the Radio Corporation, of America, has been confidently prophesying the general use of television receivers in America by five years' time

A publicity department of the B.B.C. has been inaugurated in Scotland, with headquarters at present at the Edinburgh station.

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General Correspondence is to be brief and written on one side of the paper only. All sketches and drawings to be on separate sheets. **Contributions** are always welcome, will be promptly considered, and if used will be paid for. **Queries** should be addressed to the Editor, and the conditions printed at the head of "Our Information Bureau" should be closely observed. **Communications** should be addressed, according to their nature, to The Editor, The Advertisement Manager, or the Publisher, "Amateur Wireless," 58-61 Fetter Lane, London, E.C.4.

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Red and Black Flex, per doz. yds.	1/6	Lissen or Edison Bell Grid Leaks ...	1/-
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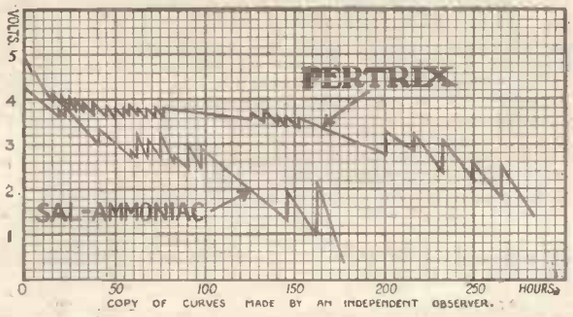

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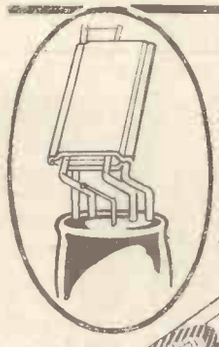

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Voltron Valve Works, Queensway, Ponders End, Middlesex.

"Are You Getting the Best from Your Set?"

(*Continued from page* 139)

Large Mansbridge-type condensers of at least 2-microfarad capacity should be connected across every H.T. tap on the receiver. This usually has the effect of minimising the battery feedback due to the presence of this common resistance, although it does not always prove effective. In a serious case of battery feedback no amount of condensers will assist, and the addition of further condensers will indeed aggravate the defect rather than decrease it. Generally, however, the connection of 2-microfarad condensers across each H.T. tap, as suggested, proves a decided advantage.

Large H.T. Batteries

It is always sound economy to use large high-tension batteries. Batteries are usually made in three sizes, viz., standard, large, and extra large (or some similar nomenclature). The standard size is suitable for small sets taking a few milliamps only, and one- or two-valve sets can safely be used on a small battery. The medium size is suitable for three- and four-valve sets, and the large size should be used for any receiver having more than four valves.

The correct adjustment of the grid bias has a great bearing on the life of the battery. For a given value of high-tension voltage, the greater we make the negative grid voltage, the less is the anode current consumed. In fact, if we make the voltage negative enough, the current is reduced practically to nothing. This is clearly carrying matters to extremes, for in such circumstances the value would become inoperative, and we must adopt some intermediate value. It is a matter for adjustment, therefore, to find the best operating position. The greatest grid bias possible should be used without causing distortion, since this will reduce the current consumption from the high-tension battery and will result in a longer life. The manufacturers of sets and the valve-makers publish figures with their valves showing correct values of grid bias to employ under different conditions of high-tension voltage. These figures should be followed as a guide, and it will be found that operating under the correct conditions will usually result in a distinct improvement in the quality of reproduction.

If a milliammeter is available, then simple tests can be made as to whether the receiver is operating properly. A milliammeter should be inserted in the negative lead from the high-tension battery. The negative terminal of the milliammeter should be connected to the negative H.T., when the needle will be found to read

(*Concluded on page* 164)

"Are You Getting the Best from Your Set?"

(*Continued from page 162*)

correctly. Now notice the reading of the meter when a transmission is actually in progress. The needle flickers and fluctuates violently; then heavy distortion is indicated, and the grid bias should be adjusted until the needle is steady. If there are several valves in the receiver, it is necessary to adjust one valve at a time until the best conditions are obtained. One particular adjustment may not completely eliminate the fluctuations, but the best condition should be found, and then the next valve should be adjusted. In this manner, the various valves can be adjusted one after the other, the receiver being gone over several times until the milliammeter reading is steady.

If no position can be found at which a steady reading is obtained, then it indicates that certain valves are being overloaded. As a check on this, the signal strength on the input to the amplifier should be reduced, which may be done by mis-tuning the receiver. It should then be found that the milliammeter needle will steady down, and this will confirm the fact that the valves in the receiver are overloading. An actual test to indicate which valve is overloading involves inserting the milliammeter in each valve circuit, and this is a little more difficult to do.

"More about the 'Simpler Wireless' SPECIAL FOUR"

(*Continued from page 140*)

choke, and connect one of the windings in series with each lead from the mains, and then connect a 2-microfarad or 4-microfarad fixed condenser across the two windings on the receiver side of the choke. The choke and condenser should, for safety, be included in the set, and there will be plenty of room on the baseboard for them if the two Watmel chokes are spaced a little further apart than in the original set.

It should hardly be necessary to mention that the set should never be taken out of its cabinet, or any attempt be made to change valves or coils, without first, in the case of D.C., disconnecting the set from the mains, and, in the case of A.C., from the rectifying unit.

"Simpler Wireless" and the Gramophone

As several readers have written, at various times, to ask whether the "Simpler Wireless" system is applicable to the amplification of gramophone music, it may be of interest to record the results of a test with a G.E.C. pick-up used in conjunction with the last two stages of the "Special Four."

The leads to the Watmel choke, coupling the second and third valves together were removed and the pick-up was connected directly across the grid and filament of the third valve. All the coils were removed, but the first two valves were left in position.

The gramophone used was a cheap one, never noted for good reproduction; but the music which came from the loud-speaker was as near perfection as could be desired. The reproduction was certainly better than could have been obtained from *any* gramophone, however expensive. This was partly due to the excellence of the pick-up and partly to the direct-coupling between the two valves. The pick-up was also tried on three valves, but the loud-speaker was then badly overloaded.

TRADE BREVITIES.

WE learn that Messrs. Wingrove and Rogers, Ltd. (who recently acquired the broadcasting business of Radio Communications, Ltd.), are now the sole concessionaires for wireless batteries for the D.P. Battery Co., Ltd., of Bakewell, Derbyshire.

Polar Receiving sets are described in a booklet from Wingrove and Rogers, Ltd., of Arundel Chambers, of 188-189 Strand, W.C.2.

TEKADE VALVES

WITH reference to the paragraph which appeared on page 80 of issue dated January 14, Messrs. W. F. Dennis & Co., of 70 Queen Victoria Street, E.C.4, point out that in error they described Tekade valves as "gas-filled" whereas actually these valves are not in any way gas filled.

PREPAID ADVERTISEMENTS.

Advertisements under this head are charged THREEPENCE PER WORD, minimum charge THREE SHILLINGS.

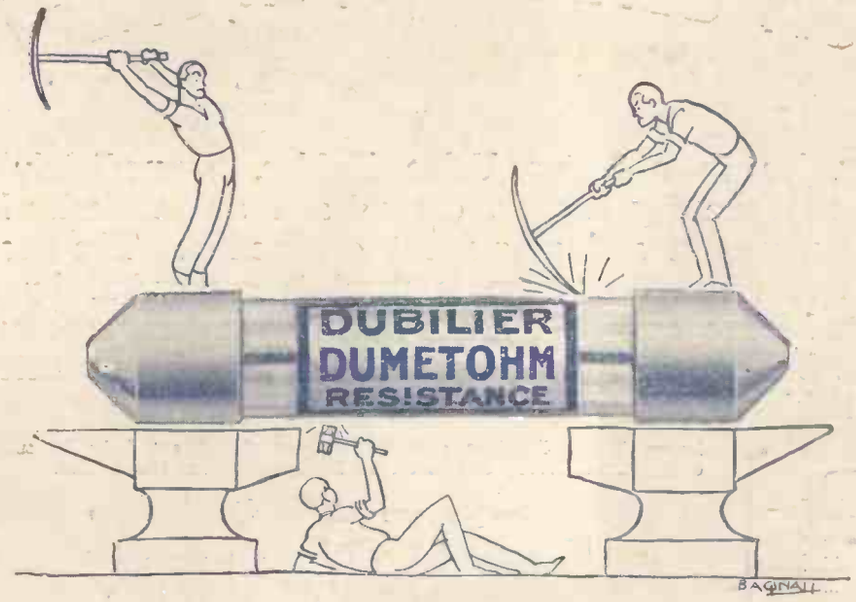
DEPOSIT SYSTEM

As the Publishers cannot accept responsibility for the bonafides of advertisers in this publication, they have introduced a system of deposit which it is recommended should be adopted by readers when dealing with persons with whom they are unacquainted. It is here explained.

Intending purchasers should forward to the Publishers the amount of the purchase money of the article advertised. This will be acknowledged to both the Depositor and the Vendor, whose names and addresses must necessarily be given. The Deposit is retained until advice is received of the completion of the purchase, or of the article having been returned to and accepted by the Vendor. In addition to the amount of the Deposit, a Fee of 6d. for sums of £1 and under, and 1s. for amounts in excess of £1, to cover postage, etc., must be remitted at the same time. In cases of persons not resident within the United Kingdom, double fees are charged.

The amount of the Deposit and Fee must be remitted by Postal Order or Registered Letter (Cheques cannot be accepted), addressed to

"AMATEUR WIRELESS,"
ADVERTISEMENT DEPARTMENT,
58/61, FETTER LANE, LONDON, E.C.4



What would Happen?

THIS is not an invitation for you to have a Dumetohm broken up to find out what would happen "if the air gets in" or to see what's inside.

In the first place the air is there already—it was never taken out. And if you do break the glass you won't find any form of carbon resistance inside—that type went out when arks were popular.

All you will see is a straight golden rod which has been metalised by a very special process to give just that smooth, unvarying resistance so essential to clear Radio reproduction. Neither temperature nor voltage affects it appreciably, it has no self inductance, no self capacity and is *"easily the most popular resistance in the country"* as your dealer will tell you.

See that the Dumetohm figures in every set you build.

All Dubilier Products are fully described in the catalogue shown here. In addition there is a lot of information which you may find interesting. If your dealer has run out of copies we will forward you one free.

Dubilier Dumetohm Resistances. .25, .5, 1.5, 2, 3, 4, 5 and 10 megohms. Price 2/6 each.

Dumetohm Holders. Price 1/- each.

DUBILIER

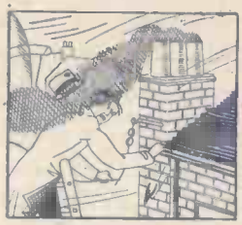
REGISTERED DUBILIER TRADE MARK

DUBILIER DICTA

No. 6.

Have you Electric Light? If so why put up with an outside aerial which implies ladders, masts and much precarious scrambling on the roof?

The Ducon is simplicity itself to use. Plugged into a lamp holder and connected to the receiving set it forms a highly efficient and selective aerial, consumes no current is perfectly safe, eliminates risks from lightning and reduces morse and atmospheric interference.



"much precarious scrambling."

To meet all the variety of wiring systems and reception conditions with which we are blessed in this country it is only natural that provision should be made for connecting the Ducon in many different ways. Try them through according to the full instructions supplied with each Ducon.

For instance, your Ducon may give best results when the switch controlling its lamp holder is turned off. It may be found that reception is improved by connecting the Ducon to the Earth terminal as an auxiliary to the existing earth (it is tested at 2,500 volts!)

In short, there are numerous ways in which the Ducon will prove an invaluable thing to have by you if only as a "stand-by" in case your aerial carries away. Send us a P.O. for 5/3 to-day (or order C.O.D.) mentioning this paper. We guarantee you satisfaction—or your money back—and you will find it the best investment in wireless you have ever made.

Incidentally, if you only have one lighting point in the wireless room, your electrician can supply you with a two-way holder enabling you to use both Ducon and light.

Advt. of The Dubilier Condenser Co. (1925) Ltd., Ducon Works, North Acton, London, W.3.

T.C.111

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