# The Wireless Constructor

6D MONTHLY

EDITED BY
PERCY W. HARRIS. M.I.R.E.
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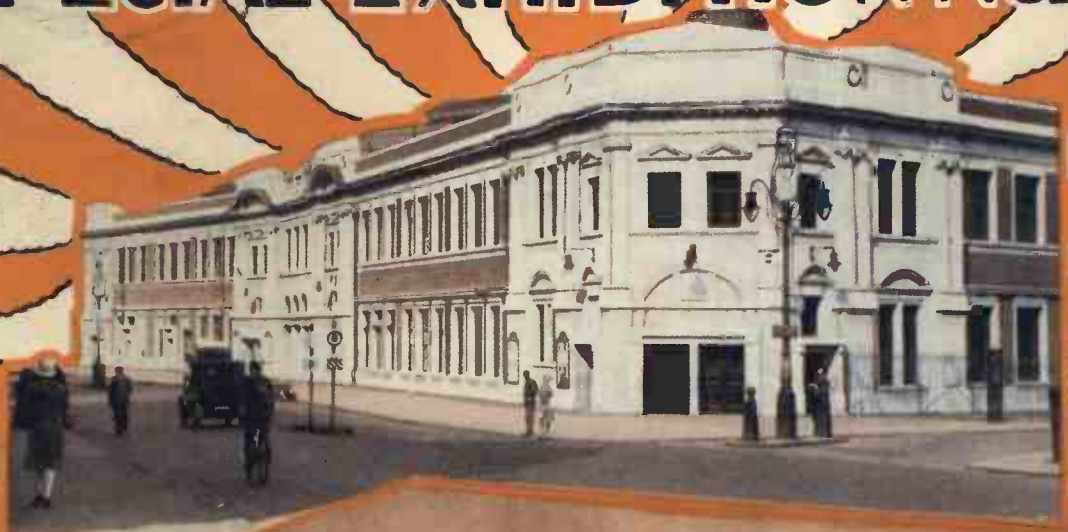

*In This Issue*

## THE "PUSH-PULL" FIVE

BY PERCY W. HARRIS M.I.R.E.

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*As some of the arrangements and specialities described in this Journal may be the subject of Letters Patent the amateur and trader would be well advised to obtain permission of the patentee to use the patents before doing so.*

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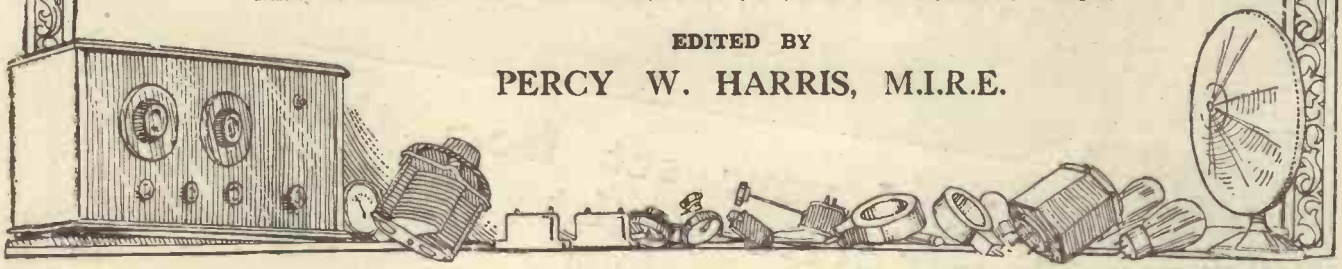

The Met-Vick Model "B" A.C. type Eliminator. H.T., G.B. & L.T. £8 : 0 : 0



H.T. & G.B. MODEL A.C. TYPE 40-100 PERIODS

H.T. & G.B. MODEL A.C. TYPE 25 PERIODS

MODEL B H.T. & G.B. A.C. TYPE 40-100 PERIODS

MODEL B H.T. & G.B. MODEL D.C. TYPE

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SPECIAL 25 CYCLE L.T A.C. TYPE FOR A.C. VALVES

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Do away with the periodical charging of accumulators, and the renewing of dry batteries, by substituting Met-Vick All-Electric valves for your existing valves and coupling the Met-Vick Model "B" Eliminator shown above to your set.

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A MILLION owners of Wireless Sets will welcome this New Cossor Valve which gives such sensational results. For when they fit the New Cossor their Receivers will perform even better than when they were new. Such exquisite sweetness of tone that is a revelation. Such colossal volume that the artiste seems almost to be in the room. Such range that stations hundreds of miles away come in with incredible ease.

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## —it's a wonderful valve!

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THE WIRELESS CONSTRUCTOR

Edited by
PERCY W. HARRIS, M.I.R.E.

Published by the Amalgamated Press, Ltd., Fleetway House, Farringdon St., London, E.C.4.

# THE EDITOR'S CHAT

**In this article Percy W. Harris, M.I.R.E., the Editor of the "Wireless Constructor," discusses the 1929 Radio Exhibition and points out how rapidly progress has been made in the British radio market.**

It is not surprising to those who have carefully watched the progress of wireless that this year's Wireless Exhibition is by far the biggest and most important of any yet held in this country. There are more exhibitors, more stands, more space and still better organisation. It does not need any special gift to prophesy a record attendance—and we are sure all who visit the Exhibition will congratulate the Radio Manufacturers' Association on the splendid work they have done in organising such a fine show.

In this, our annual Exhibition number, we have taken particular pains to present to those readers who will not be able to visit Olympia a review of the various exhibits and an indication of their chief features. The home constructor will, as usual, be fully catered for, and we are delighted to find that the standard of quality, efficiency and finish of the various components offered is higher than ever.

## Considerable Improvement

Variable condensers, low-frequency transformers, valve holders, drum and vernier dials, radio-frequency chokes and grid leaks and anode resistances, to mention but a few of the regularly used components, all show considerable improvement, and in fact we do not know of a single component which is not now satisfactorily produced in England. The new British low-frequency transformers have better frequency response curves than any produced elsewhere, regardless of price, and owing to the fact that in this country we have to deal with two bands of frequencies, the lower and the upper, whereas in America they only have one, the British radio-frequency choke is far superior to anything manufactured on the other side of the Atlantic.

## British Components Best

In the past we have been rather dependent upon America for certain special products, such as heavy-duty variable resistances for use in H.T. mains units, volume controls and the like, but this dependence no longer exists, and, as usual, though rather delayed in its arrival, the British product is of the highest quality and finish.

*How to receive radio programmes in steel-frame buildings is a problem that has held the attention of radio engineers for several years. One system uses the steel skeletons of such structures; re-transmitting the programmes received over the steel so that they can be picked up by sets in any part of the building. At the Hotel Lincoln, N.Y., where the system is in successful operation, six programmes are received on six sets, and all of them are transmitted via the steel framework of the hotel, giving the guests the choice of six programmes to tune-in.*

Another matter which is bound to impress the discriminating visitor to this year's Show is the very low price at which the majority of high-grade components are sold. Particularly is this the case with variable condensers, which are real engineering jobs. In the field of manufactured receivers the performance, quality and appearance have all greatly improved, while prices have simultaneously fallen. And here it will not be out of place to refer to the debt the industry as a whole owes to the home-constructor.

## Home-Constructor Helps

It is a self-evident fact that the more money the B.B.C. can spend on programmes, the better they will be, and but for the revenue derived from home-constructors' licences the B.B.C.'s income would be much less than half of what it is, and programmes would suffer accordingly. Similarly, the fact that set manufacturers can buy such components as valve holders, grid leaks, variable condensers, etc., at such attractive prices is largely due to the fact that immense quantities of these components are annually purchased by those who build their own sets, thus making it possible for manufacturers to lay down large plant for their production, to employ more efficient factory methods, and to cut overhead costs to a minimum.

# QUEER QUERIES

*Some typical radio faults reviewed and questions answered.*

By P. R. BIRD.

## Calculating Filament Resistances

HERE is an extract from a letter from a Hampstead reader: "If I use a 2-volt screened-grid valve and a 6-volt power valve, does this mean I shall have to have two separate accumulators? I have been told that the same accumulator will do, provided I put in the right resistance, but as I have no means of calculating this, I should prefer to get a second accumulator if that is the best plan."

At first sight there may seem to be nothing queer in that query—but it really is queer. It is rather strange, for instance, that after all these years a listener should be doubtful as to whether it is possible to run 2-volt valves from a 6-volt accumulator, and it is queer that the idea should linger on that there is anything complicated in calculating the necessary resistance in such a case.

## How Many Ohms?

It is really the simplest thing in the world to calculate any required filament resistance for any type of valve using any type of accumulator. Everybody remembers Ohm's law, and it is only a slight variation of Ohm's law that is required to cover any instance of this. You will remember that Ohm's law is expressed by putting down a V for voltage, drawing a line under it and putting a C for current underneath the line, and drawing an "equals" sign followed by a capital R for resistance.

The whole thing simply means that the voltage divided by the current will give the resistance (provided the correct denominations are used, of course). Now for filament resistance calculations we still use $\frac{V}{C} = R$, but we modify the meaning of the letters a little as follows. R will stand for resistance in ohms. The C will stand for the current taken by the valve in question when operated at its correct voltage (that is to say, the figure given by the makers on the carton). V means "voltage"—not the voltage of the accumulator and not the voltage required by the valve, but the *difference* between these two. This is all there is to it, and with those details you can calculate any required resistance for a filament circuit.

### THE TECHNICAL QUERIES DEPARTMENT

**Are you in trouble with your set?**

Have you any knotty little Radio problems requiring solution?
The WIRELESS CONSTRUCTOR Technical Queries Department has been thoroughly reorganised and is now in a position to give an unrivalled service. The aim of the department is to furnish really helpful advice in connection with any radio problem, theoretical or practical.
Full details, including the scale of charges, can be obtained direct from the Technical Queries Department, WIRELESS CONSTRUCTOR, Fleetway House, Farringdon Street, London, E.C.4.
A postcard will do. On receipt of this all the necessary literature will be sent to you, free and post free, immediately. This application will place you under no obligation whatever. Every reader of the WIRELESS CONSTRUCTOR should have these details by him. An application form is included which will enable you to ask your questions so that we can deal with them expeditiously and with the minimum of delay.
London readers please note: Inquiries should not be made in person at Fleetway House or Tallis House.

## A Practical Example

To see how easy it is we will solve this man's trouble straight away. Here a man in Hampstead with a 6-volt accumulator and he wants to run a 2-volt valve from it, and he does not know how many extra ohms resistance he requires in the filament circuit. To calculate it he puts down a V, draws a line under it, and puts down C underneath the line, followed by =R. Thus $\frac{V}{C} = R$.

Beside it we translate that into actual figures as follows:

## The Resistance Required

Above the line in place of V we put down the difference between voltage of the accumulator and that required by the valve; so if it is a 6-volt accumulator and a 2-volt valve, 4 will stand for V. Drawing a line under the 4 we have to put beneath this the equivalent of C. C, as stated, is the current required by the new valve, and if we look at the box we find that this is, perhaps, ·1 amp., so we put ·1 underneath the line. And the answer will be the resistance in ohms; ·1 into 4 goes 40 times, and thus we see that such a valve would require a 40-ohm resistance in circuit always if a 6-volt accumulator is used, in order to keep the current down to ·1 amp. Any other examples can be worked out in the same way.

## Noisy Switch Contacts in House-Wiring

"Is it a fact that faulty switches in the house wiring," writes a Barking reader, "can give rise to loud clicks in the loud speaker? It is not only a question of a click which happens when the switch is put on or off, but there is a loud roaring noise as well, which sometimes starts when the light is switched on or off and completely ruins reception for perhaps half a minute before it properly stops. Would it be something wrong with the wiring of the house, or is it that loud clicks caused by the switch starts something wrong in the set?"

Even if something were wrong in the set there is no reason why a switch should start this off more than ordinary broadcasting reception, so that any reader who finds that when a switch is put on or off it is accompanied by loud scraping or roaring noises in the speaker, can assume that there is something wrong with the switch. Probably the contact is bad, and there is a little internal sparking or arcing. Even if the switch is nowhere near the set itself, it may easily happen that a loud noise will accompany this sparking and ruin reception. In 99 cases out of 100 a moment's work by an electrician or someone who understands switch contacts will completely remove the trouble.

# THIS YEAR AT OLYMPIA

**A summary of the chief exhibits at the National Radio Exhibition, to be held at Olympia, London, from September 23rd to October 3rd inclusive. Hours 11 a.m. to 10 p.m. daily. Admission, 1s. 6d.***

*Except on Tuesdays, when price of admission is 2s. 6d. until 5 p.m.

### AMALGAMATED PRESS, LTD.

**Stands Nos. 246 and 249.**

Those who visit Olympia should make straight for these stands, for here is the centre point of the whole Exhibition as far as WIRELESS CONSTRUCTOR readers are concerned. Publishers of the leading radio journals—WIRELESS CONSTRUCTOR, MODERN WIRELESS and POPULAR WIRELESS—The Amalgamated Press have arranged for some of their well-known experts to be in attendance, to have heart-to-heart talks with readers over the ever-interesting topics of radio.

On view at these stands also will be the originals of many famous receivers, and on no account should the real radio enthusiast overlook this opportunity of renewing acquaintance with the members of the Editorial and Technical staffs to whom his welfare and interest mean so much.

Not only will WIRELESS CONSTRUCTOR and the associated radio papers be on sale here, but constructors can obtain also the various Blue Prints and the ever-popular constructional envelopes from which many thousands of fine receivers have already been assembled by satisfied home constructors.

***This is Type H of the Mullard Pure Music series (Stands 134 to 137) which is priced at six guineas.***

### ATALANTA, LTD.

**Stand No. 234.**

The speciality of this firm is mechanical instruments and useful tools which are sure to take the set-builder's eye. The gadgets have been specially designed for wireless assembly and adjustment, so that the stand merits careful attention from the home constructor.

### AUTOMATIC COIL WINDER AND ELECTRICAL EQUIPMENT CO., LTD.

**Stands Nos. 5 and 6.**

As the name implies, this firm specialises in the automatic performance of the various mechanical jobs in connection with wireless construction, etc., and many handy instruments have been evolved for this end. Apart from constructors with ambitious programmes in front of them for the winter, this stand will be of particular interest to the small dealer and to all radio service people.

### A. BAKER.

**Stand No. 23.**

Loud-speaking devices are the mainstay of this exhibit, the firm being well-known as specialists in moving-coil loud-speaker units and various associated apparatus of a similar nature.

### BEDFORD ELECTRICAL AND RADIO CO., LTD.

**Stand No. 45.**

The well-known "Peerless" wireless portable receivers will be on view here. Those who desire full-volume loud-speaker reception from the local station or from Daventry, with complete freedom from technical complications, will be particularly interested in the five-valve suitcase receiver, which comprises a 2 H.F.-Det.-2 L.F. circuit.

An unspillable accumulator is supplied, the set is fitted with insulating connectors which prevent leads from shorting, and it has a cone loud speaker fitted in the lid. The tuning control is a one-knob affair, the whole being made in models at 15, 16 or 17 guineas, according to finish.

The Peerless four-valve screened-grid receiver has been designed with the object of obtaining really good loud speaking over a considerable receiving range, retaining the essential simplicity of operation. The set is arranged for one H.F. screened-grid valve, detector and two L.F. valves, the latter being respectively R.C.C. and transformer coupled. The aerial, loud speaker and batteries are all contained in the set, the all-in price of the whole receiver being £21, royalty paid.

### BELLING-LEE, LTD.

**Stands Nos. 263 and 264.**

In addition to the insulated indicating terminals beloved of every constructor, a host of new lines is on view at these stands. There are indicating wander-plugs, indicating plugs and sockets, indicating spade terminals, indicating pin terminals, all indicating great care and skill in

***This Edison Bell receiver (Stand 116) can be used for wireless only, gramophone only, or both.***

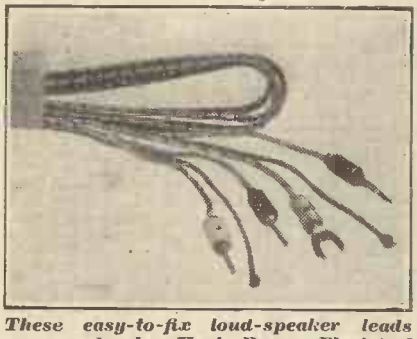
# This Year at Olympia—*continued*

construction and design! Fuse adaptors for use with any Belling-Lee wander-plugs, fuse holders, battery cords, terminal mounting brackets, and the comically named "Radiolegs" make this a not-to-be-missed-at-any-price display.

### BENJAMIN ELECTRIC, LTD.

**Stand No. 31.**

Handy gadgets of special interest to the home constructor are the feature of this stand, the prices ranging from 1s. (for a valve holder) to



***These easy-to-fix loud-speaker leads are made by Hart Bros. Electrical Mfg. Co., Ltd. (Stand 239.)***

7s. 6d. for a turntable for a portable set. This latter has hinged and folding legs, which enable the set to maintain true level even on the most uneven ground.

The valve holders include one equipped with special attachment to permit of its use with a pentode valve. A flexible connection is provided for attaching to the terminal on the cap of the pentode valve, and the price is 2s. 3d. complete.

The Benjamin Earth Plate, available here, is another exhibit of outstanding interest.

### SYDNEY S. BIRD & SONS, LTD.

**Stand No. 155.**

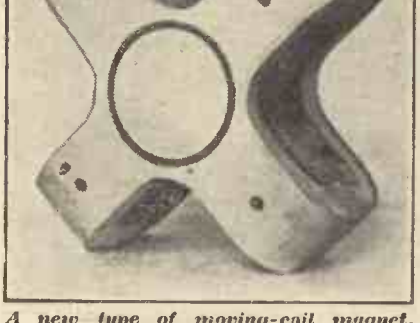
"Cyldon" condensers need no introduction to the home constructor, but even those who consider themselves familiar with the products of this firm will be surprised at the variety and usefulness of the range of condensers displayed here. Ordinary condensers abound, of course, and in addition there are many and various linked, ganged, and screened condensers, for use in high-efficiency circuits, in which the employment of something rather extraordinary in the condenser line is a necessity.

Working three or four in a gang, with thumb drives and all sorts of refinements, every condenser is of interest to the mechanically minded. Nor are all the exhibits of this highly specialised class, for here, too, will be found those small fixed resistances, midget condensers, and similar necessities beloved of every set builder.

### BOWYER-LOWE CO., LTD.

**Stands Nos. 130 & 131.**

At the time of writing we have not received specific details of the Bowyer-Lowe display, but experience of this well-known Letchworth firm's



***A new type of moving-coil magnet, exhibited by Swift, Levick & Sons, Ltd. (Stand 240.)***

activities in the past make it certain that the stand will be well worth a visit to all readers interested in set-building. (The firm has established a name for all its products—from valve holders to complete sets—based, in the first place, on sound and practical design, backed up by quality and good finish.)

### BRITISH EBONITE CO., LTD.

**Stand No. 21.**

Panels of all sizes and shapes are here in great variety, and in addition there are the various Becol gadgets—bases of good quality ebonite, etc. "Becol" formers, for instance, are to be found in great profusion, the various arrangements of ribs, connections, sizes, etc., being so planned that every conceivable need of the constructor in this way is catered for.

### BRITISH RADIO GRAMOPHONE CO., LTD.

**Stands Nos. 156 & 157.**

The British Radio Gramophone Co., Ltd., with expert staff and thoroughly up-to-date plant, is now producing the famous "Keystone" components, by arrangement with the old-established house of Peto Scott.

The large and growing army of gramophone enthusiasts will find here that there is more in this radio-and-the-gramophone combination than they thought. Pick-up specialists will pick up new ideas, needle enthusiasts will come away with sharper appreciation, while the "output fans" will wonder how the control of volume (of business) is effected so smoothly.

### BRITISH THOMSON-HOUSTON CO., LTD.

**Stands Nos. 150 and 151.**

The B.T.H. Co., now with Metro-Vicks allied to the Edison-Swan Electric Co., Ltd., are showing some extremely attractive lines of sound reproducers, for which this firm is justly famed. There are, for instance, the gramophone motor and pick-up, and tone-arm, both of which have been improved since last season, and there is an entirely new pick-up and adaptor for fitting to the standard gramophone.

Again this year the B.T.H. telephones and loud speakers will be showing, the new cone loud speaker being an improved model. There is an entirely new speech microphone also, and loud-speaker enthusiasts will be particularly interested in the junior R.K. units, with the various transformers suitable for use in conjunction with these.

In the radio receiver line there is a new four-valve model, this being an up-to-date modification of the 1928 receiver which proved so popular last year. Altogether a thoroughly interesting display which is sure to be popular with discriminating visitors.

### S. G. BROWN, LTD.

**Stands Nos. 213, 214 and 215.**

So many and diverse are the Brown products nowadays that several stands packed full of radio interest are necessary to show the various activities of this firm. Of outstanding interest is the Brown screened-grid receiver, which is supplied in kit form for home constructors.

Anyone can build one of these sets in an evening by following the clear diagrams, and can work it without previous radio experience. With a Brown loud speaker already assembled and tested in the cabinet, the price, exclusive of batteries or valves, is £12, this including one set of coils for the 200–550-metre wave-band. This receiver is also available in an all-from-the-mains model.

Two other models are available also, but these do not incorporate the loud speaker, though they can be assembled in just the same way in easy stages by a mere novice. There is sure to be enormous interest in these sets and so far as one can judge from appearances they are certainly "the goods."

Another fine Brown exhibit is the moving-coil loud speaker, which is supplied with input transformer in three different types. An entirely new series of Brown loud speakers is on view, these being the "Duplex" range, incorporating two new Brown Mascot features. These are the new Vee Unit which is capable of handling enormous volume without a trace of overloading, and the new Brown duplex cone, and the price of these duplex speakers ranges from £12 10s. down to £5 10s. In addition there are all sorts of Brown Mascot loud speakers, the Brown "Duckling," as well as headphones galore.

Here, too, is the famous Brown Vee Unit, already referred to, which can be supplied with or without a chassis. The Vee Unit is an exceptionally interesting component, designed on entirely new principles, as the result of a very considerable research on the part of Mr. S. G.

***An all-power unit for L.T., grid bias, and H.T. E. K. Cole, Ltd. (Stands 8, 9, 10 and 11.)***

Brown, F.R.S. It incorporates a direct-drive mechanism which cannot possibly become unbalanced, and is adjusted to the correct gap by means of a single adjusting screw so that there is nothing to get out of order.

It is worth noting that Brown's themselves reckon that the Vee Unit is to be one of their big sellers for the 1929–30 season, and a firm that has had their large experience should certainly know something about what the radio public wants.

Other attractive features on view here are the new moving-coil movements, for use with accumulators, and models for D.C. mains, or transformer operation (A.C.), and with permanent-magnet movements. In addition, there is the Brown pick-up, the new Brown L.F. transformer, which already has found favour, and many other interesting lines, including one for the crystal man, who is catered for by the Brown crystal detector, which is of the permanent type, costing 2s. 6d.

### BURNDEPT WIRELESS (1928), LTD.

**Stands Nos. 144, 145, 146 and 147.**

Burndepts have been busy during the summer making very considerable extensions to their factory, as well as planning the new apparatus for the forthcoming season. There will be many additions to the fine range of sets, which at present includes the "Screened" Ethophone (screened-grid, detector and pentode valves). the "Empire Screened" Ethophone, and the Burndept "Screened" Four, the latter being available also in a form to receive short and medium wavelengths.

In addition to these popular lines there will be the new Burndept screened portable receiver, fitted with a new type of loud speaker and tuned by a new drum control, which is sure to be popular. A new H.T. mains model also figures on the Burndept programme, which goes all out for an expensive specification and yet retails at a reasonable price owing to quantity production. The receiver is adaptable for use in chassis form, if desired, for fitting into your own cabinet, as a

***"Varleys" are showing this three-valve mains set. (Stands 154 and 155.)***

radio-gramophone, and in addition to this instrument Burndepts will be showing a new universal screened five for use with open aerials.

These sets, with the new Ethogram radio-gramophone, and the new "needle armature" gramophone pick-up, together with the already famous Burndept lines, make this a noteworthy exhibit.

### BURNE-JONES & CO., LTD.

**Stand No. 125.**

On this stand pride of place will be given to the Burne-Jones range of H.T. mains receivers, radio-gramophones, portable receivers, short-wave receiver and short-wave converter, backed up by the well-known and comprehensive range of Burne-Jones components marketed under the name "Magnum." The short-wave converter, in

# This Year at Olympia—*continued*

which enthusiasts will recognise a direct descendant of the "'P.W.' Antipodes Adaptor," well known to readers of this journal, is supplied ready wired and tested at £4 10s.

As no extra H.T., L.T. or grid bias is required, the owner of any valve set can turn straight over to the short waves with this outfit by simply removing the detector valve from his set and inserting it in the valve holder on the converter, the plug on the converter taking the place of his detector valve. Amongst the components are the "Magnum" reaction condenser now selling for 4s., anode resistances ranging from 2,500 to 500,000 ohms, and the well-known "Magnum" versions of the "Titan" and Standard coils.

### A. F. BULGIN & CO., LTD.

**Stands Nos. 295 and 296.**

A strong selection of new lines will tempt the purchaser at this stand. One very taking device is the automatic indicating control which comprises the unique features of a remote control and a signal device.

When the house is wired up for radio the placing in of the telephone plug fitted to the loud speaker closes the L.T. circuit, puts the set in operation, and flashes a warning glow by the ruby indicator on the relay.

There are literally dozens of different components and gadgets to be seen at this stand, and special mention must be made of the anode current indicator, which is arranged with a milliammeter wired in series with the anode of the valve and H.T. supply, and reads the curfent passing when plugged into any valve holder.

In addition there is a multi-coil which covers all

***This Ferranti moving-coil loud speaker comes out at £10 in the A.C. model. (Stands 74 and 76.)***

wave-lengths from 250 to 2,250 metres, and a vertical grid-leak clip which occupies the space of only 1¼ inches square on the baseboard, and retails at 9d. The Bulgin switches alone are enough to make the constructor's mouth water, and this stand is bound to be "bulgin" with admirers!

### CARRINGTON MFG. CO., LTD.

**Stands Nos. 270 and 271.**

All the popular shapes and styles of cabinets will be found here, as well as a number of new and up-to-date designs worked out to please the most fastidious. Not only is there a splendid variety in the shapes of the cabinets available, but evidently the greatest care has been taken with the finish so as to make the completed article one of which any housewife might be proud.

Just as the styles are made to suit all requirements of modern furnishing, so are the prices arranged to appeal to a wide variety of pockets, and so good is the value offered that it is safe to say that all "cuties" and "beauties" visiting the Exhibition will find a great difficulty in getting away from the attractive display at this stand.

### CELESTION, LTD.

**Stands Nos. 180 and 183.**

This famous loud-speaker firm has recently acquired a much larger and better equipped factory, so that the whole production of loud speakers has been thoroughly reorganised for the forthcoming season. Some of the old instruments, however, have proved so extremely popular and are still in such great demand that it has been decided to continue them, though with one very important alteration. This alteration is merely the very welcome one of a big reduction in price!

Otherwise the instruments are just as good or even better than those at higher prices which found such enormous popularity with the loud-speaker public. For 1929 the Celestion loud-speaker range is being increased by the addition of several new and extremely fine instruments.

The makers claim that the electro-magnetic unit now fitted in the Celestion loud speakers is the most sensitive they have yet produced, incorporating a number of improvements which enable extraordinary results to be obtained. Two new models have been introduced, designated respectively Z20 and the Z25, the latter employing a more expensive and efficient type of movement together with a much improved method of arranging the diaphragm. An important point from the purchaser's point of view is that the cabinet work throughout is up to the recognised Celestion standard.

Home constructors who are thinking of building a speaker will be glad to know that they can obtain Celestion instruments for this purpose which can be fitted into their own cabinets. Constructed to occupy as small a space as possible, these instruments are fitted into enclosed boxes which are sealed, the latter precaution being undertaken by the manufacturers to guarantee the performance of these speakers, which give results much in advance of their predecessors.

These models are designated Z10 for the ten-inch diaphragm, Z11 for the eleven-inch, Z12 for the twelve-inch, and Z14 for the fourteen-inch diaphragm, the prices ranging from £3 5s. up to £5 17s. 6d. In addition, there is the Celestion Woodruffe pick-up, which will be on show, while of especial interest is the introduction of a new speaker known as the "Celestrola."

This is one of the moving coil type, in which the makers have every confidence, either for home use or for cinema work, claiming that this instrument is capable of reproducing both the highest and the lowest frequencies in their truly relative proportion. This instrument, which is quite a new departure for Celestions, is certain to cause a great deal of interest.

### CHLORIDE ELECTRICAL STORAGE CO. LTD.

**Stands Nos. 172 and 175.**

Here will be found a full range of Exide batteries for H.T. and L.T., displayed in an even wider range than last year. The unspillable Exide batteries, which incorporate the Exide acid trap of special design that renders them proof against any loss of acid even when turned upside down, appear to be going from strength to strength.

Another feature of this exhibit is a special large capacity H.T. battery specifically suitable for powerful sets taking a very high anode current. (The firm says that practically every "talkie" in England is operated from an Exide battery.) Of special interest to country users are the "mass" type H.T. batteries, which can be left standing over for long periods without any deterioration. With these the valve anode and grid-bias voltages can be carefully set once and for all and then left alone.

Where L.T. accumulators have to be charged less frequently than once a fortnight, there are the special "Mass" types for this class of work, and it is stated that these cells give more burning hours in relation to first cost than any other battery.

### CLEARTRON (1927), LTD.

**Stand No. 22.**

With its headquarters at 21, Cumberland Street, Birmingham, this firm has become known all over this country and in many places abroad

***The Lissen cabinet cone loud speaker, in oak finish. (Stands 184, 185 and 186.)***

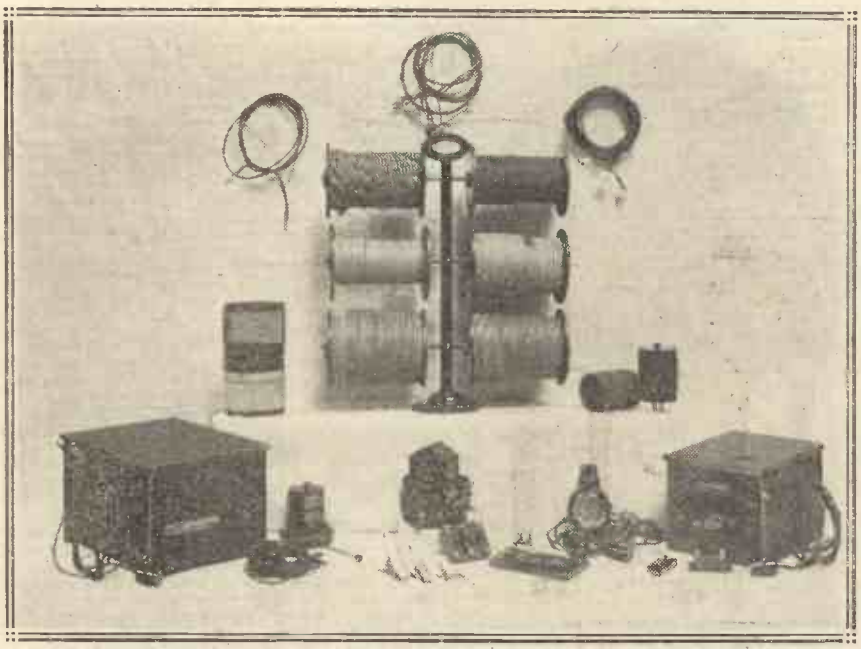
for the low-price Cleartron valves. Full details of all these will be available at this stand, and as the firm courts publicity for its products the interested purchaser can obtain curves, graphs, and all the rest of the weird and wonderful charts and chits beloved of the wily surveyor of the steep slopes.

### CLIMAX RADIO ELECTRIC, LTD.

**Stands Nos. 91 and 92.**

Mains units of all kinds and the associated apparatus such as resistances will be showing at these stands, where instruments for use with A.C. mains and for D.C. supply will be found.

Climax potential dividers are well-known to most readers, but the firm markets a wide



***A representative group of Ward & Goldstone products. (Stand 290.)***

# This Year at Olympia—*continued*

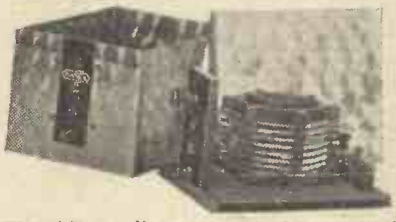
variety of transformers, etc., examples of which, together with the other mains apparatus, will make these stands of especial interest to all listeners who have electric light installed in their homes.

### E. K. COLE, LTD.

**Stands Nos. 8, 9, 10 and 11.**

Right from the earliest days this firm has specialised in utilisation of the electric light mains for radio power, and the wide and varied experience so gained has placed them in the forefront when apparatus of this kind is to be considered.

Advancing with the times, a feature of this firm's present productions are the all-electric sets,



***The "Parex" version of the "P.W." Standard Loading Coil, and a variety of screening boxes, etc., will be found at Stand 206.***

which follow the various H.T. battery eliminators, etc., that have proved so popular and have already received a great welcome from the radio world. If, however, you already have a set and wish to drive this from the mains instead of from batteries, you can utilise the Ekco power unit which derives both its low-tension, high-tension and grid bias from A.C. mains.

For the man who already has an H.T. mains unit and who has decided to get his L.T. also at power rates from the mains, there is an L.T. unit which is capable of providing two, four, or six volts, and of delivering a current of up to one ampere. In this case no alteration need be made to the set used. Apropos of this, clients of this firm will agree that its productions are characterised by their really practicable nature, special attention being paid to the "safety first" precautions and fool-proof design which has done so much to popularise this firm's products.

### COLVERN, LTD.

**Stand No. 99.**

Say "Ninety-nine" if you are looking for six-pin interchangeable coils, binocular coils, coil formers, metal screening boxes, static screens, aluminium panels, or turned brass parts. Colvern's have all these at this stand, and a great many more objects of interest to the constructor and

***Of entirely novel design is this Philips moving-coil loud speaker, to be shown at Stands 169 and 170.***

listener, a special display being made of screened-grid receivers for use with batteries or mains.

Dual selector coils and dual range coils will appeal to all those looking out for a solution to the wave-change problem under the regional scheme, and there are plenty of other objects of interest, including ultra short-wave inductances, transmitting inductances, and various models illustrating methods of receiver construction.

### A. C. COSSOR, LTD.

**Stands Nos. 173, 174, 138 & 78.**

Remember those Cossor bags we all carried out and about last year? Very handy for putting leaflets and things in, weren't they? It's just because of this knack of knowing what the public wants that the Cossor stands this year will be surrounded by interested applicants and spectators. (Cossors pride themselves upon being first to realise just how badly the man-in-the-street wanted 2-volters instead of 4's and 6's.)

Endowed with the meritorious idea of service, Cossors not only provide the valves, but they launched out and gave the public the circuits, too, and now everybody knows what a wonderful success they scored with the "Melody Makers."

Excellent as all these ideas appear to be, the basis and backbone of Cossors is the Cossor valve, and here will be found not only every member of the valve family, but their birth certificates, pedigrees, and in fact everything you can possibly want to know about them. There's no need to say, "Don't miss this stand," for if you go to Olympia at all Cossors will see to it that you are drawn to Stands Nos. 78, 138, 173 and 174.

### DAYZITE, LTD.

**Stand No. 7.**

Here a wide selection of items will be on view, but the two principle ones are the "Musikon" combined musical instrument (which is specially suitable for providing orchestral music for cinemas, dance halls, etc.), and the Dayzite motor generator for giving both high- and low-tension direct from the mains.

Pick-up enthusiasts will find plenty to interest them here, the firm making a speciality of powerful quality reproduction.

### DONOTONE LOUD SPEAKERS.

**Stands Nos. 268 and 269.**

The loud speakers shown here are not only novel in form but are based upon a novel principle in design, and the makers claim that the special features give results which are not only efficient as regards volume, but are particularly pleasing as regards the tone.

### DUBILIER CONDENSER (1925) CO., LTD.

**Stands Nos. 181 and 182.**

Modern radio requires a very wide variety of condensers, and all of these should be of the highest quality if they are to ensure reliability of service as given by the radio station. For some of them efficiency also is of the highest importance, and this fact has long been recognised by the Dubilier company—specialists in all kinds and classes of condensers.

So familiar are the various Dubilier products to the radio man that it seems hardly necessary to call attention to these stands, and yet, for all their familiarity, the Dubilier display is not one to miss.

The variety is astounding to those who associate this great firm only with condensers, for it will be found that here are represented filament resistors, switches, neutralising condensers, H.F. chokes, complete coupling units (with or without valve holders), coils, variable condensers, the famous Duwirohm resistances, the Dumetohm resistances, and all kinds of condenser clips, and associated apparatus.

Finally, there is a complete radio receiving set in the form of the Westminster radio-gramophone, which has a self-contained loop aerial for the reception of radio signals and a switch for long- and short-wave stations. When required, you can switch over to gramophone reproduction, using the turntable which is normally carried in the back of the apparatus.

### C. S. DUNHAM.

**Stands Nos. 47 and 48.**

The Dunham receivers are well-known to a large public, and in this year's "Simplicity Two" set all the popular features of last year's model have been replaced with many great improvements. The set is now housed in an extremely well-finished cabinet with a cut-out oval panel on which is mounted the tuning dial, reaction control and wave-change switch, the wave-length covered being of 235 to 600 metres, and from

***You can charge your own L.T. battery with the Burndept charger (showing at Stands 144-147).***

900 to 2,000. This receiver is available also in an all-mains form, and either of these sets can be made also in a handsome oak pedestal cabinet fitted with a Symphony cone loud speaker.

Probably the most popular of all the Dunham receivers is the "Homing Three," the circuit of which is so arranged that it can be used if desired with the Dunham frame aerial, and even when fitted with this useful accessory the range of the set is quite remarkable. The set can be used also from the mains, there are no coils to change, and a full-wave range of both long and short waves is possible. Here, too, are the Dunham "Portable Five" and the Dunham "Suitcase de luxe" portable, in which provision is made for the reproduction of gramophone records.

Other popular Dunham lines are the mains units and home chargers, the Westinghouse rectifier being fitted in both these instruments. The home charger costs £2 10s., and is suitable for 2-, 4-, or 6-volt accumulator, enabling you to recharge your own batteries at fractional cost.

### J. DYSON & CO., LTD.

**Stand No. 1.**

Airmax and Godwinex specialities are to be found here; the "Airmax" lines comprising two-pin and six-pin coils, chokes, and the screening units, whilst "Godwinex" are represented by valve holders, a new five-pin type of valve holder, and a new type of metal-cased Godwinex H.T. eliminator. In addition, there is the new screened-grid portable set, a new five-valve portable receiver, and several three-valvers, one comprising a combined radio gramophone three-valver, another three-valve all-mains receiver for A.C., and another and new type of three-valve screened-grid set.

### EAGLE ENGINEERING CO.

**Stand No. 77.**

Chakophone radio receivers and components are all the go here, and there are several very notable new lines. Among these is the Warwick junior portable receiver, made in two models, one a four-valver employing pentode valve in the output stage, and the other a five-valve model employing two L.F. stages. Nearby will be found the Warwick radio gramophone, consisting of a walnut cabinet in which is fitted a volume control,

***This Westinghouse dry (metal) rectifier gives up to 20 milliamps for H.T. from A.C. mains. (Stands 13 and 14.)***

which, used in conjunction with the Warwick portable five receiver, converts the whole set into a radio-gramophone.

If the portable set alone is required outdoors, or upstairs, it can be moved out of the cabinet and used as a separate unit. The appearance is certainly everything that can be desired, and the handiness of being able to separate the set from the gramophone outfit is one which is certainly appreciated by a great number of users.

Other new lines include the "Warwick Two"

# This Year at Olympia—*continued*

receiver, in which drum-dial tuning is used to cover the wave-lengths between 250 and 500 metres and 800 to 2,000 metres. For mains enthusiasts the two-valve A.C. set is made also in this type, the price being 15 guineas including royalties and valves.

Popular lines which are being continued are the de luxe tuner at 10s. 6d., the 1929 Improved Junior Two and Three receivers, the standard tuner at 8s., the Chakophone accumulator capacity indicator, and the Eagle H.T. battery.

### J. J. EASTICK & SONS, LTD.

**Stands Nos. 272 and 273.**

Wireless components and accessories of all types and makes, in addition to a full and comprehensive range of the Eelex products, will be displayed to the public on these two stands.

***One of the great features of the Exhibition is the indirectly-heated cathode valve for high-efficiency results from A.C. mains. The one shown here is being exhibited by Cossors at Stands 173, 174, 138 and 78, and uses one of the new 5-pin bases. S.G., R.C., H.F., L.F., power and super-power valves are obtainable in this range.***

Everyone who loves neat little stunts and gadgets, interchangeable pins and clips, treble terminals, aerial switches, lightning switches, lightning arresters, multiple connectors, clips, etc., and similar attractive stunts, will have difficulty in tearing themselves away from this stall, which is packed with practical and pleasing gadgets.

An interesting new line is the Eelex plug and socket which retails at 6d. per pair, and has been designed mainly with a view for use in conjunction with mains apparatus.

### EDISON BELL, LTD.

**Stand No. 116.**

Radio-gram sets to work from batteries or from the mains are an outstanding feature here. One model has screened-grid H.F., Det. and Pentode, with a frame aerial fitted at the back of the cabinet and provision for outside aerial and earth for those who wish to increase the range by this means.

All medium and high wave-lengths are covered, and the speakers are of the cone type with a specially designed unit fitted with volume control to govern the output. Changing from wireless to radio-gramophone is accomplished by merely pushing the switch on the panel of the set, and the door at the side of the cabinet gives access to the batteries. Should these become discharged the gramophone may be used alone.

Other items here include a reaction condenser retailing at 3s. 9d. with a minimum capacity of the extraordinarily low figure of ·0000075, and a maximum of ·00015 mfd.; a plaque loud speaker which can be assembled and hung from a picture rail, wall or bracket; a loud-speaker unit, and a 3s. 9d. volume control that works on the potentiometer principle.

### EDISON-SWAN ELECTRIC CO., LTD.

**Stands Nos. 153 and 149.**

Ediswans, with whom B.T.H. and Metro-Vicks have amalgamated for radio productions, are showing some new and very attractive "all-from-the-mains" receivers, one a transportable for A.C. mains, and two three-valvers, one for D.C. and one for A.C.

A five-pin valve holder for use with the new valves is another new line, and there are also some Ediswan astatic binocular coils, in addition to such good old lines as the enclosed vacuum grid leaks, anode resistances, and cartridge condensers. The home battery-charger which has been so popular with constructors for the past year or so is again to be on show, whilst for the gramophone enthusiast there is a cone assembly and a cone unit, and also an Ediswan volume control, all of which are seeing the light for the first time at Olympia.

For the valve users there are the new range of Edison accumulators and dry batteries, and, more important still, an entirely new range of valves which will be known as the "Mazda" radio valves. These are a show in themselves, and as full particulars will be available at the stands we advise readers to make sure of getting these, for it is an open secret that they are sure to be immensely popular.

It is obvious, from a glance at this attractive display, that while some of the Ediswan lines are so popular that they have to be repeated to supply the public demand, yet in the main there is a constant arrival of new components that is all for the good of the purchaser.

### EVER READY CO. (GT. BRITAIN), LTD.

**Stands Nos. 139 and 142.**

The complete range of all the wireless batteries and accumulators made by the Ever Ready Co. (Gt. Britain), Ltd., will be shown on these stands, and if there is a single wireless need left uncovered from the battery point of view this firm is "ever ready" to learn about it.

So well known is this firm that one might be tempted to pass these stands for more spectacular displays without lingering, but this would be a mistake. An Ever Ready salesman may prove to you that the batteries you have always been satisfied with are not quite as good as another of their lines, which is more particularly designed

***A fine example of B.T.H. design and workmanship, to be seen on Stands 150 and 151.***

for your especial purpose, and in any case the visitor should pause to ask for an Ever Ready catalogue, as some really sound tips are to be found in this up-to-date publication, which shows in detail the many activities of the Ever Ready Co.

### FERRANTI, LTD.

**Stands Nos. 74 and 76.**

In addition to the transformers and low-frequency coupling devices which have made this firm famous all over the world, a wide variety of radio components will be on view at these stands.

In the forefront are some new moving-coil speakers, one for use on the A.C. supply of 200 to 250 volts, and which incorporates a valve rectifier, and the other for use with D.C. The price of the former is £10 and the latter £6 10s., both being exceptionally efficient and built in the anticipation of a very considerable demand.

The Ferranti anode-feed system is already very well known to readers, and now some anode-feed units have been evolved to effect a saving of space and to simplify this system. Two types are available: Firstly, No. 1, which consists of a Ferranti resistance and clip on a moulded base, incorporating the requisite 2-mfd. condenser; and "type 3," which is provided with three resistances—in this case the base incorporating the necessary three condensers.

Another interesting exhibit is the all-mains receiver Model 31, the circuit of which is similar to the Ferranti S.G.3 circuit, the receiver being available in three finishes, either oak, walnut or

***The Brown "Vee" unit and cone chassis.***

mahogany. L.T. trickle chargers and motor-car battery chargers will be on view, together with a full range of moving-coil rectifiers and thermo instruments.

WIRELESS CONSTRUCTOR readers will be especially interested in the Ferranti S.G.3. kit for the use of those who wish to construct the S.G. receiver for themselves, whilst everyone with radio power taken from the mains will be interested in the Ferranti safety box, which has been designed especially to provide adequate protection in such cases. Talkie enthusiasts will view with interest a complete picture amplifier developed by this company, which consists of duplicate amplifiers suitable for use with a gramophone pick-up and to work in conjunction with a photo-electric cell, the output of which has been amplified by one resistance-coupled stage.

Capable of filling an auditorium which will hold 2,000 people, this outfit speaks up for itself in no uncertain terms. Besides the new lines, many old favourites are to be found here.

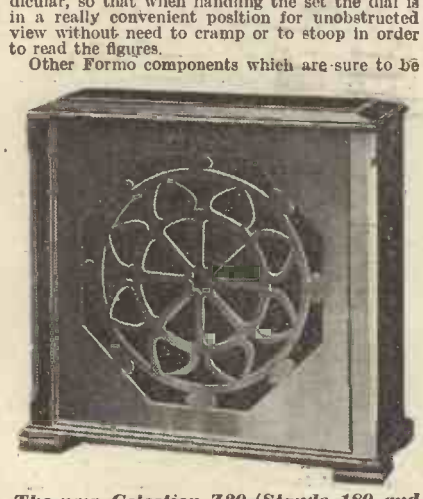
### THE FORMO COMPANY, LTD.

**Stand No. 72.**

The Formo Company's products are already well known to readers, but there are some new attractions at the stand this year that will certainly enhance the reputation of this go-ahead firm.

Among the new lines special attention should be paid to the 1930 Log condenser, a Midget reaction condenser, and the new vernier dial. This latter is a particularly pleasing component, and retails at 3s. in black, brown, walnut or mahogany, to match the panel. One of the most pleasing features of this dial is the fact that the indicating scale is inclined some 30 degrees from the perpendicular, so that when handling the set the dial is in a really convenient position for unobstructed view without need to cramp or to stoop in order to read the figures.

Other Formo components which are sure to be



***The new Celestion Z20 (Stands 180 and 183) is obtainable in oak finish from £7 15s.***

# This Year at Olympia—*continued*

popular during the coming season are the standard six-pin base, the two-range tuner (Reinartz), the output filter choke, the shrouded L.F. transformer, the ever handy "Formodensors," and a first-class selection of variable condensers, including the new Formo differential reaction condenser.

### GAMBRELL RADIO, LTD.

Stand No. 62.

"Hush, hush" tactics are being adopted with regard to the new Gambrell unit which is to see the light at Olympia, and all the particulars that are available point to the fact

*The "Efesca" H.T. unit for D.C mains, on show in the Gallery (279).*

that it will have to do with the reproduction of gramophone records, though further details will not be available till a week before the Exhibition, after these words are in print. Apart from this there will be many old friends in Gambrell components, including the coils, Neutro-vernier condensers, the Volu-vernier volume control, and the very handy little twin fuse units with spare fuses.

Newcomers to the Gambrell range include some mains receivers, one being the Gambrell All-Electric Three, another the Gambrell-all-electric transportable receiver, and an all-electric portable gramophone which embodies some new features, particularly on the gramophone side.

### GARNETT, WHITELEY & CO., LTD.

Stand No. 63.

"Lotus-land" is the place where everybody is happy, and we can quite imagine that the wireless constructor turned loose amongst the Lotus components would feel very much that way; for here he will find all-mains units, power


*Useful stand-up-or-lie-down fixed condensers of this type will be seen at Stand 248.*

transformers, L.F. power chokes, valve holders (in half-a-dozen different types), jacks that would please any "Jill," jack plugs, battery switches, all-wave coils in profusion, L.F. inter-valve transformers, condensers galore (including logarithmic condensers, differential condensers, and reaction condensers), single and dual drum dials, and H.F. chokes. If that does not satisfy, he has only to look round to find single coil holders, four-strand cotton-covered wire, four-strand leads, L.T. relays, L.T. remote controls, eliminator relays, all-mains relays, vernier dials, and, last but not least, an assembled panel. What more could a constructor want?

### THE GENERAL ELECTRIC CO., LTD.

Stands Nos. 85, 86, 87, 88, 89 and 90.

The G.E.C. have this year taken half a dozen stands in order to show their various ranges of products, and a glance at the attractive wares they have to offer shows that these stands will be packed full of interest to the constructor and listener.

No matter what you require: battery receiving set, all-electric set, screened-grid receivers, portable sets, loud speakers, H.T. power units, amplifiers, condensers, transformers, Osram valves, or a "Music Magnet," the Gecophone models will claim the consideration due to one of the leading radio firms in the country. Accessories and components are here in plenty and the new lines alone would make a good show.

Particularly interesting is an A.C. mains two-valve receiver in mahogany cabinet, designed to work from any A.C. mains between 200 and 260 volts. With its illuminated dial and simple switching, this instrument comes in the "quality" receivers, and covers the nearer and more powerful broadcasting stations.

In addition to three- and four-valve receivers of attractive types, there are the new Osram Music Magnet constructors' kits. An entirely new edition of the Music Magnet circuit will figure prominently in the G.E.C. programme this year, and though full details are not yet available, it is understood that it will be a three-valve circuit using one stage H.F.–Det.–1 L.F., as formerly, but with certain new and attractive features incorporated.

Other new lines are the four-valve screened-grid portable set, with its exceptional selectivity, and a power amplifier for A.C. mains which is intended for use with a gramophone pick-up and develops sufficient volume to be used for public as well as for indoor use. An efficient volume control is provided, and the amplifier can be arranged for use with radio sets to take the place of existing amplifiers.

An attractive range of H.T. power units figures also in the new lines, and special mention must be made of the Gecophone "Hiflux" L.F. transformer, evolved as the result of many months exhaustive research. The core of this instrument is made of a new alloy, the permeability of this being exceedingly high.

The high inductance of the primary permits very high amplification to be obtained, and measurement shows that when no direct current is flowing the primary inductance is 140 henries, while with 2·5 milliamps direct current flowing the figure becomes 80 henries, which is an exceedingly good one for average working conditions. Evidently the makers have the greatest confidence in this new instrument, for the "Hiflux" transformer is incorporated in all the new Gecophone sets.

Finally, there are the new Gecophone loud speakers, including a cone senior plaque model, and a cone cabinet model, the latter being obtainable in either mahogany or oak. Over and above all these good things are our old friends the Osram valves, arranged in profusion, with screened grids, valves for A.C. mains (both direct and indirectly heated), new super-power valves, the standard Osram valve for battery receiving sets, and an uncommonly interesting display of transmitting and rectifying valves for high-power and for short-wave working.

This mouth-watering display must be seen to be believed, but if you find a difficulty in getting near the stalls, try at least to bag some of the literature available, for perusal in a quiet hour afterwards, as this is worth leisurely study.

### R. F. GRAHAM & CO.

Stand No. 230.

In addition to some interesting types of Norbex valve sockets, etc., this firm will be showing the Norbex standby valve, a two-in-one reversible detector. This handy little gadget plugs into any receiver instead of a valve, and consists of a crystal arranged to connect up without re-wiring the set, so that it can be used when charging accumulators, etc. Incidentally this stand will be showing the Citex fire extinguishers which are to be installed on all the stands at the exhibition.

### GRAHAM-AMPLION, LTD.

Stands Nos. 164 and 187.

Very interesting developments will be represented on this stand, for after many years successful loud-speaker production Graham-Amplion have decided to launch out into the set-building industry. Here will be found some very attractive models, too, including a radio-gramophone and an all-from-the-mains set.

This latter is intended for use in all cases where A.C. supply is available and for use with outdoor aerial and earth. Five valves are employed, but it is really a four-stage set, for the last stage consists of two super-power valves in parallel to handle the output from the screened-grid H.F., Detector and L.F. stages.

The wave-length covered ranges between 200 and 560 metres, and from 1,000 to 2,000 metres, and a jack is provided for taking the input from an Amplion gramophone pick-up. The price of this no-battery set, complete with valves and all royalties paid, is £50, or £7 15s. down and twelve instalments of £3 15s. 6d.

The Amplion radio-gramophone incorporates the Amplion radio set and the "Lion" speaker, while home and concert models of this are obtainable in oak or mahogany, the whole assembly being impressive as a piece of handsome furniture.

Yet another production is the Amplion cabinet model which, operated from the mains, is entirely self-contained. No external aerial or earth connections are needed, and this makes the receiver ideal for use in residential flats or other situations where outside wires are not permissible. In this receiver there are two H.F. screened-grid stages,

*The "Orphean" L.S. is shown by the London Radio Mfg. Co. on Stand 112.*

the aerial being supported within the hinged panel on the side of the cabinet and covering the wave-lengths of all the medium- and long-wave broadcasting stations.

Apart from these there is the very fine and already well-known selection of loud speakers marketed by this firm, and also the Amplion trickle charger, the Amplion Electravox (gramophone pick-up), and the Amplion gramophone attachment which is designed to be attached to the tone-arm of a gramophone for giving fine loud-speaker results.

### GRAHAM FARISH, LTD.

Stands Nos. 140 and 141.

The Graham Farish exhibit attracted a lot of attention last year, particularly that little "Automaton" which was dishing out leaflets to delighted bystanders! This year again a

# This Year at Olympia—*continued*

particularly attractive range of components is on view, including the new process anode resistance, a three-valve R.C. coupler, and a Graham Farish R.C. unit which the producers proudly claim "gets the bass and top stuff."

Here, too, will be found standard grid leaks at a shilling a time, a very attractive line of fixed mica condensers, a gramophone pick-up and loud-speaker control, and a combined fixed condenser and grid leak, easily arranged for series or parallel connections, which sell at 2s.


***Four ratios are obtainable with this special R.I. output transformer (Stands 122 and 123), which is for use with a pentode.***

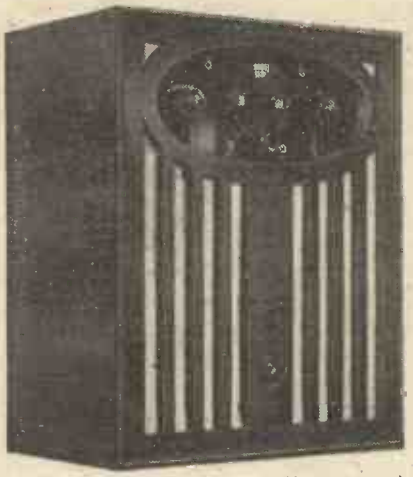
Finally there is a new type of variable condenser called the "Microficient," which is extremely robust in construction and occupies an unusually small space in the set. We are so used to air condensers nowadays that the solid dielectric type will be sure of a trial from many enthusiasts if only for its novelty.

### GROSVENOR BATTERY CO., LTD.

**Stand No. 237.**

This firm of manufacturers is well-known for their standard make of high-tension battery, a very large number of trade sets being fitted with these. The boom in portable sets of recent months has turned the firm's attention to special batteries for these, so that all interested in batteries of various types have plenty to see at this stand.

An interesting side-line here is the new Turn-light Torch, which constitutes a pocket lamp without a case, and is certainly handy if your earth wire goes wonky in the middle of the evening's programme.



***The Truphonic Melo set. (Stand 167.)***

### HARLIE BROS.

**Stand No. 277.**

The Harlie wireless products are well-known to WIRELESS CONSTRUCTOR readers, including, as they do, the various valve holders, coil holders, dials, condensers, and other indispensable gadgets beloved by the Boys of the Soldering Iron. This year a very special line is being shown in the form of the new Harlie "Volustat," which is a resistance of the graphite-mica type.

Besides this there are a number of new lines on show for the 1929-30 season, including some very attractive low-priced five-pin valve holders, a 9d. toggle switch, and a pair of short-wave coils for the Cossor "Melody Maker" retailing at 7s. 6d.

### HART BROS. ELEC. MFG. CO., LTD.

**Stand No. 239.**

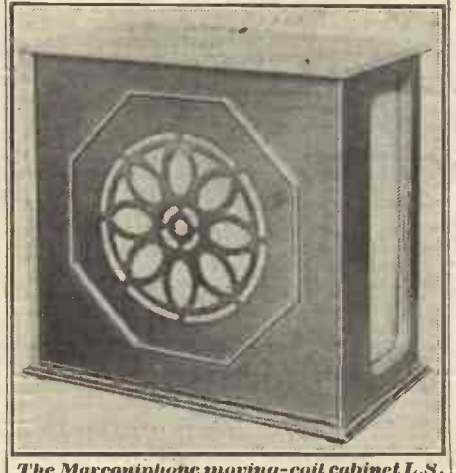
Here are the "Harbro" specialities in electric wires and cables, and very handy they will be found. There is the patent Easyfix flexible wire, which can be run along walls or into panellings by means of specially designed fixing clips. Some patent Harbro loud-speaker leads also claim attention, and those on the look-out for good aerial wire should certainly inspect the Harbro enamelled aerial 7/22, which is packed in cartons of 100-ft. lengths.

Battery cables, frame-aerial wire and multiple battery cords make this display a very interesting one for all tidy souls, and for all who have ever had trouble with battery leads or unsatisfactory wire.

### NORMAN HUNTLY.

**Stand No. 235.**

The "Norma Five" portable receiver and the "Norma Screened-Grid Three" can be seen at these stands, and the constructor will find also a very attractive line of components of various kinds. Amongst them is the Midget log condenser,



***The Marconiphone moving-coil cabinet L.S. (Stands 79 to 84.)***

designed for an efficient, light and small air-spaced variable condenser, particularly suitable for use in portable sets.

Other useful components include a three-point push-pull switch, of the type required for Titan sets, a treble-purpose terminal which will operate as a wander-plug while substituting spade or pin connections, a two-point switch, and a glass-enclosed H.F. choke.

### IGRANIC ELECTRIC CO., LTD.

**Stands Nos. 161 and 162.**

At one time if you said "Igranic" you meant "coils," but nowadays this firm represents not only coils and coil holders, but H.F. chokes, condensers, both variable and fixed, dials and dial illuminators, valve holders of plain and anti-microphonic types, L.F. transformers and chokes, coupling units, resistors, grid leaks, rheostats, and components for mains units.

These, of course, are in addition to sundry apparatus which includes jacks and plugs, "stand-off" insulators, wander plugs, battery and high-voltage switches, battery connectors, output transformers, wave-meters, frame aerials, and other invaluables of that class.

The new apparatus alone is an eye-opener. There are new battery chargers and H.T. and L.T. supply units, incorporating the Igranic-Elkon metal rectifier, and some new dual-wave coils (available in three types), as well as some most attractive new sets. In the forefront of these is the new Igranic "A.C. Three," which is a trans-portable receiver of the all-mains type, with non-directional frame aerial and cone loud speaker. An S.G. valve of the indirectly heated type is used in the H.F. stage, and the detector operates on the leaky grid principle.

The output valve is a pentode, and a switch on the front of the panel switches on and off the mains unit, and thus puts the whole receiver into or out of operation. Housed in a handsome

***The Bulgin multi-coil is shown on Stands 295 and 296.***

bureau type of cabinet, this set is sure to be a winner. It can be supplied also as a combined radio-gramophone set, with Igranic-Pacent Phonovox pick-up fitted in the top of the cabinet.

The Igranic Neutrosonic seven-valver, already famous, will be on the market in a handsome bureau type cabinet, fitted with cone loud speaker and non-directional frame aerial, so that in whatever position the cabinet may be there is no need to move it in order to receive any particular transmission.

***The famous "Lissenola" radio gramophone. (Stands 184, 185 and 186.)***

# Exhibitors at Olympia

| Name of Exhibitor. | Stand No. |
|---|---|
| Aeonic Radio, Ltd. | 73 |
| Atalanta | 234G |
| Automatic Coil Winder and Electrical Equipment Co., Ltd. | 220G |
| B. & J. Wireless Co. | 233G |
| Bakelite, Ltd. | 255G |
| Baker, A. | 23 |
| Beaver Electrical Supply Co. | 287G |
| Bedford Electrical and Radio Co., Ltd. | 45 |
| Belling & Lee, Ltd. | 263,264G |
| Benjamin Electric, Ltd. | 31 |
| Bernard Jones Publications, Ltd. | 19, 20 |
| Bird and Sons, Ltd., S. S. | 155 |
| Bowyer-Lowe Co., Ltd. | 130, 131 |
| British Ebonite Co., Ltd. | 21 |
| British General Mfg. Co., Ltd. | 107 |
| British Radio Gramophone Co., Ltd. | 156, 157 |
| British Thomson-Houston Co., Ltd. | 150, 151 |
| Brown Bros., Ltd. | 34, 35 |
| Brown, Ltd., S. G. | 213, 214, 215G |
| Brownie Wireless Co. (G.B.), Ltd. | 143 |
| Bulgin & Co., A. F. | 295, 296G |
| Bullphone, Ltd. | 60, 61 |
| Burgoyne Wireless, Ltd. | 50, 51 |
| Burndept Wireless (1923), Ltd. | 144, 145, 146, 147 |
| Burne-Jones and Co., Ltd. | 125 |
| Burton, C. F. and H. | 36, 37 |
| Carrington Mfg. Co., Ltd. | 270, 271G |
| Catesbys, Ltd. | 3, 4 |
| Celestion, Ltd. | 180, 183 |
| Chloride Electrical Storage Co., Ltd. | 172, 175 |
| Cleartron (1927), Ltd. | 22 |
| Climax Radio Electric, Ltd. | 91, 92 |
| Cole, Ltd., E. K. | 8, 9, 10, 11 |
| Columbia Graphophone, Ltd. | 94, 96 |
| Colvern, Ltd. | 99 |
| Cook's Wireless Co., Ltd. | 223G |
| Cossor, Ltd., A.C. | 78, 138, 173, 174 |
| Currys (1927), Ltd. | 256, 257G |
| Day, Ltd., W. | 7 |
| De La Rue & Co., Ltd., T. | 260G |
| Dew & Co., A. J. | 26, 27, 28 |
| Dibben & Sons, Ltd., W. | 15, 65 |
| Donotone Loud Speaker | 268, 269G |
| Dubilier Condenser Co. (1925), Ltd. | 181, 182 |
| Dulcetto Polyphon, Ltd. | 278G |
| Dunham, C. S. | 47, 48 |
| DX Coils, Ltd. | 262G |
| Dyson & Co., Ltd., J. | 1 |
| Eagle Engineering Co., Ltd. | 77 |
| East London Rubber Co. | 274, 275G |
| Eastick & Sons, J. J. | 272, 273G |
| Econasign Co., Ltd. | 238G |
| Edison-Bell, Ltd. | 116 |
| Edison-Swan Electric Co., Ltd. | 149, 153 |
| Ellison & Hillman | 29, 30 |
| Epoch Radio Mfg. Co. | 218G |
| Ever-Ready Co. (G.B.), Ltd. | 139, 142 |
| Falk, Stadelmann & Co., Ltd. | 279G |
| Fellows Mfg. Co., Ltd. | 32, 33 |
| Ferranti, Ltd. | 74, 76 |
| Flinders (Wholesale), Ltd. | 282G |
| Formo Co. | 72 |
| Fuller Accumulator Co. (1926), Ltd. | 75 |
| Gamage, Ltd., A. W. | 258G |
| Gambrell Radio, Ltd. | 62 |
| Garnett, Whiteley & Co., Ltd. | 63 |
| General Electric Co., Ltd. | 85, 86, 87, 88, 89, 90 |
| Graham & Co., R. F. | 230G |
| Graham Amplion, Ltd. | 164, 187 |
| Graham-Farish, Ltd. | 140, 141 |
| Gramo-Radio Amplifiers, Ltd. | 247G |
| Grosvenor Battery Co., Ltd. | 237G |
| Gripso Co. (L. H. Reid & Co.) | 227 |
| Halcyon Wireless Co., Ltd. | 168, 171 |
| Hardyson Radio | 158 |
| Harlie Bros. | 277G |
| Hart Accumulator Co., Ltd. | 289G |
| Hart Bros. Electrical Mfg. Co., Ltd. | 239G |
| Hart, Collins, Ltd. | 49 |
| Henderson & Co., Ltd., W. J. | 201G |
| Hobday Bros., Ltd. | 252, 253G |
| Houghton-Butcher, Ltd. | 242, 243, 244, 245G |
| Hunt, Ltd., A. H. | 259G |
| Huntly, N. | 235G |
| Igranic Electric Co., Ltd. | 161, 162 |
| Iliffe & Sons, Ltd. | 38, 39 |
| Itonia Gramophones, Ltd. | 286G |
| Inc. Radio Society of Gt. Britain | 285G |
| Jackson Bros. | 97 |
| J. R. Wireless Co. | 266G |
| Jewel Pen Co., Ltd. | 267G |
| Junit Mfg. Co., Ltd. | 207G |
| Kalisky (Aldgate), Ltd., S. | 24, 25 |
| Keith, Prowse & Co., Ltd. | 228G |
| K. N. Electrical Products, Ltd. | 254G |
| Kolster-Brandes, Ltd. | 176, 177, 178, 179 |
| Lamplugh, Ltd., S. A. | 126, 127 |
| Langham Radio, Ltd. | 59 |
| Lectro Linx, Ltd. | 261G |
| Lever, Eric J., Ltd. | 211, 212G |
| Lissen, Ltd. | 184, 185, 186 |
| Lithanode Co., Ltd. | 232G |
| Lock, Ltd., W. & T. | 202, 203G |
| Loewe Radio Co., Ltd. | 291G |
| London Electric Stores, Ltd. | 293, 294G |
| London Electric Wire Co. & Smiths, Ltd. | 64 |
| London Metal Warehouses, Ltd. | 222G |
| London Radio Mfg. Co., Ltd. | 112 |
| Mainten Mfg. Co. | 226G |
| Manufacturers' Accessories Co. | 236G |
| M.P.A. Wireless, Ltd. | 165 |
| McMichael, Ltd., L. | 101, 103 |
| Marconiphone Co., Ltd. | 79, 80, 81, 82, 83, 84 |
| Metro-Vick Supplies | 148, 152 |
| Mic Wireless Co. | 56 |
| Montague Radio Inventions and Development Co., Ltd. | 52, 53, 54 |
| Mullard Wireless Service Co., Ltd. | 58, 117, 134, 135, 136, 137 |
| New London Electron Works, Ltd. | 67 |
| Odhams Press, Ltd. | 219 |
| Oldham & Sons, Ltd. | 68, 70 |
| Ormond Engineering Co., Ltd. | 118, 121 |
| Pandona, Ltd. | 225G |
| Paroussi, E. | 206G |
| Parr's Advertising, Ltd. | 224G |
| Partridge & Mee, Ltd. | 98 |
| Partridge, Wilson & Co. | 283G |
| Perfectavox, Ltd. | 114 |
| Peto & Radford | 108 |
| Peto-Scott Co., Ltd. | 42, 43, 44 |
| Philips Radio, Ltd. | 169, 170 |
| Pye Radio, Ltd. | 160, 163 |
| Quest Radio Mfg. Co. | 93 |
| Radielle Co., Ltd. | 2 |
| Radio Gramophone Development Co. | 292G |
| Radio Instruments, Ltd. | 122, 123, 124 |
| Radio Service (London), Ltd. | 204G |
| Redfern Rubber Works, Ltd. | 46 |
| Rees-Mace Mfg. Co., Ltd. | 105 |
| Regent Radio Supply Co. | 16, 17, 18 |
| Reproduction, Ltd. | 55 |
| Rolls-Caydon Sales, Ltd. | 166 |
| Rooke Bros, Ltd. | 119 |
| Royal Radio Co. | 12 |
| Selectors, Ltd. | 102, 104 |
| Sel-Ezi Wireless Supply Co., Ltd. | 205G |
| Selfridge & Co., Ltd. | 208, 209, 210G |
| Sells, Ltd. | 216G |
| Siemens Bros. & Co., Ltd. | 69, 71 |
| Six-Sixty Radio Co. | 288G |
| Standard Wet Battery Co. | 57 |
| Stratton & Co., Ltd. | 109 |
| Sun Electrical Co., Ltd. | 250, 251G |
| Swift, Levick & Sons, Ltd. | 240G |
| Sylvex, Ltd. | 231G |
| Symphony Gramophone & Radio Co., Ltd. | 129, 132 |
| Telegraph Condenser Co., Ltd. | 248G |
| Television Press | 241G |
| Telsen Electric Co., Ltd. | 110 |
| Tonex Co. | 265G |
| Trader Publishing Co., Ltd. | 61 |
| Trelleborg Ebonite Works, Ltd. | 281G |
| Truphonic Radio, Ltd. | 167 |
| Tulsemere Mfg. Co. | 276G |
| Turner & Co. | 95 |
| Ultra-Electric, Ltd. | 106 |
| Universal Gramophone & Radio Co. | 40, 41, 100 |
| Vandervell & Co., Ltd., C. A. | 120 |
| Varley (Oliver Pell Control) | 154, 159 |
| Voltron Co., Ltd. | 217G |
| Ward & Goldstone, Ltd. | 290G |
| Watmel Wireless Co., Ltd. | 111 |
| Webb Condenser Co. | 284G |
| Westinghouse Brake and Saxby Signal Co., Ltd. | 13, 14 |
| Whiteley, Boneham & Co., Ltd. | 66 |
| Whittingham, Smith & Co. | 113 |
| Wilkins & Wright, Ltd. | 115 |
| Williams & Moffat, Ltd. | 229G |
| Wireless Constructor | 246, 249G |
| Wingrove & Rogers, Ltd. | 128, 133 |
| Wright & Weaire, Ltd. | 221G |

Note : The letter G placed after stall-numbers indicates that these are in the Gallery.

# DEMONSTRATION ROOMS

| Name of Exhibitor. | Room |
|---|---|
| Baker, A. (Selhurst Radio) | L |
| Bowyer-Lowe Co., Ltd. | W |
| British Radio Gramophone Co., Ltd. | G |
| British Thomson-Houston Co., Ltd. | U |
| Brownie Wireless Co. of Great Britain, Ltd. | X |
| Celestion, Ltd. | C |
| Columbia Graphophone Co., Ltd. | N |
| Cossor, A. C., Ltd. | J |
| Dubilier Condenser Co. (1925), Ltd. | R |
| Edison Bell, Ltd. | S |
| General Electric Co., Ltd. | K |
| Graham Amplion, Ltd. | E |
| Igranic Electric Co., Ltd. | P1 |
| Kolster-Brandes, Ltd. | H |
| M.P.A. Wireless, Ltd. | O |
| Marconiphone Co., Ltd. | D |
| Mullard Wireless Service Co., Ltd. | T |
| Ormond Engineering Co., Ltd. | M |
| Perfectavox, Ltd. | V |
| Philips Radio | A |
| Pye Radio, Ltd. | B |
| Reproduction, Ltd. | Q |
| Rooke Bros., Ltd. | P |
| Ultra Electric, Ltd. | F |
| Universal Gramophone & Radio Co., Ltd. | I |

# This Year at Olympia—*continued*

### JACKSON BROS.
**Stand No. 97.**

Since last season this firm has been getting busy on perfecting every possible point in condenser design that their experience has uncovered, and the result is a display of condensers that not only work easily and efficiently, but are "easy to look at," as our friends across the water say when they want to pay a compliment to looks. Most of us know "J.B." condensers, but few realise the wide variety of the range of these components, and the full merits and advantages of their specialised construction.


***This well-known D.C. H.T. unit is one of the exhibits at Stands 91 and 92.***

### THE J.R. WIRELESS COMPANY, LTD.
**Stand No. 266.**

This firm markets the well-known Sovereign lines, including the Sovereign rheostat, the Sovereign H.F. choke, the Sovereign wave-trap, and the Sovereign six-pin base. There is also a dual-range coil which has been specially designed for fitting into circuits with condenser-controlled reaction on the aerial.

The Sovereign six-pin base is made in genuine bakelite and is fitted with terminals and soldering tags and two extra long sockets giving the lead-in for positioning the coil when plugging in. There is also an attractive line of Sovereign dials, as recommended by Mullards in "Radio for the Million" for the Mullard "Master Three Star" set.

### KOLSTER-BRANDES, LTD.
**Stands Nos. 176, 177, 178 and 179.**

Kolster-Brandes, Ltd., are well represented at Olympia, for not only are the above-numbered stands allocated to them, but they have also the demonstration room in which this firm's loud speakers may be heard by the public.

Particulars of the exhibit show that it will be a thoroughly representative one, and while this contains some of the last year's range of productions, such as the Brandeset and the Ellipticon Speaker, which are still popular items, it also includes several new products. One of these to be released at Olympia is the all-mains receiver K-B 161, which is designed for operation off A.C. electrical supply mains with voltages from 100 to 120 or from 200 to 250 volts, 40 to 60 cycles. This can be plugged into the power or lighting switch, making all batteries unnecessary.

This type of set makes an ideal general-purpose receiver, being simple and economical to instal, simple in operation, and inexpensive to maintain. A reliable volume control permits the volume of reproduction to be varied as required, and by preventing over-loading of the output valve obviates any tendency to distortion.

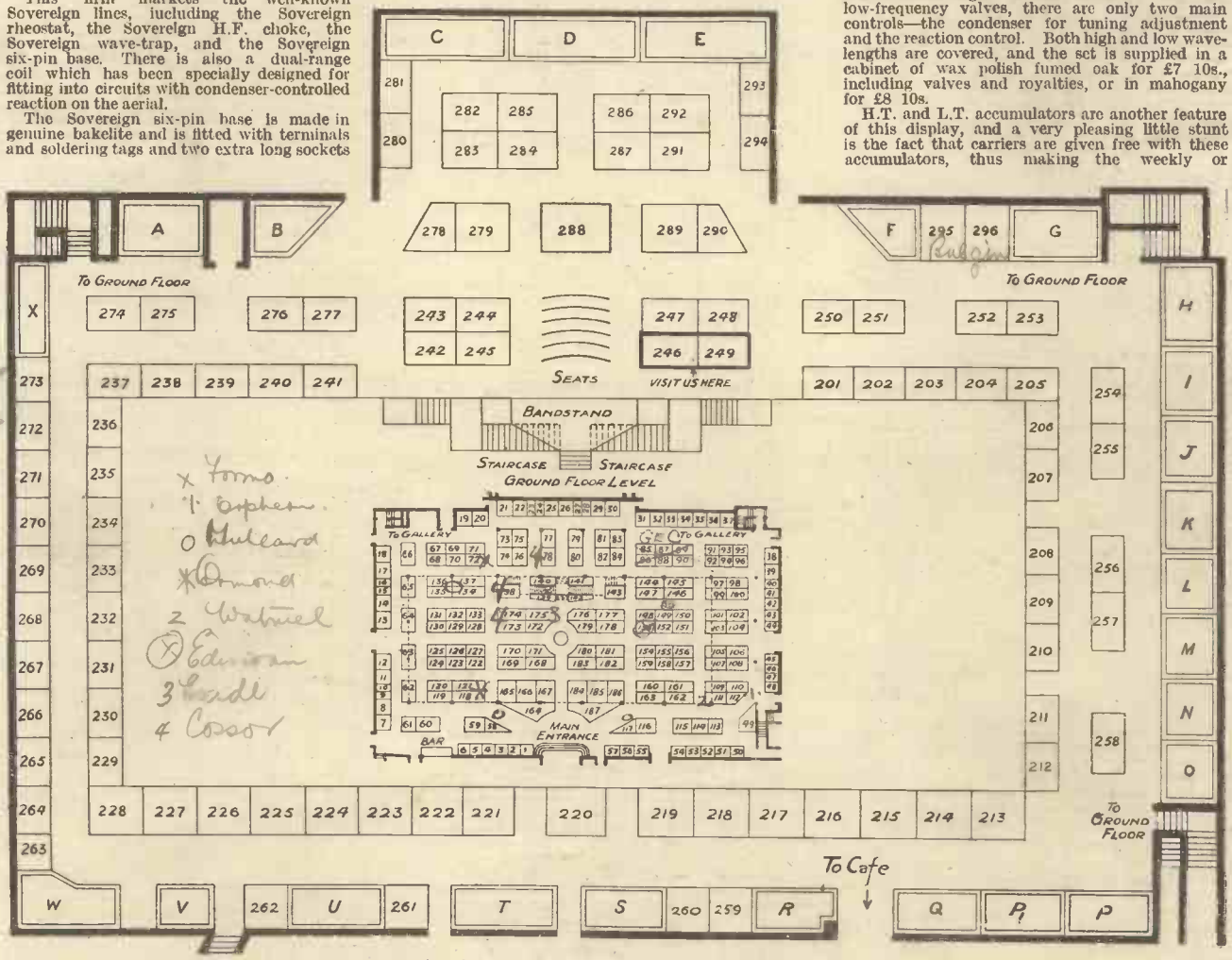
Another very interesting exhibit is the dynamic cone speaker K-B 151. One advantage of this instrument is that it can be used on the largest amplifier or in conjunction with the smallest radio set. Another sure-to-be-popular line is the K-B electric gramophone, which incorporates a two-stage amplifier consisting of an indirectly-heated A.C. valve of high magnification factor, coupled by means of a novel type of intervalve coupling to an output stage comprising two valves in parallel.

***The Igranic exhibit (Stands 161 and 162) includes the "Universal" 5-valver shown here.***

The amplifier, rectifier and smoothing system and dynamic speaker are all accommodated on a common chassis, and the maximum volume is sufficient to fill a small hall. By means of the volume control provided the volume may be reduced to any desired extent, so that the K-B electric gramophone is quite suitable for domestic use.

Among old friends will be noticed the Brandeset 111a, which is capable of giving good loud-speaker reception on a number of British and foreign stations. Arranged for one detector and two low-frequency valves, there are only two main controls—the condenser for tuning adjustment and the reaction control. Both high and low wavelengths are covered, and the set is supplied in a cabinet of wax polish fumed oak for £7 10s., including valves and royalties, or in mahogany for £8 10s.

H.T. and L.T. accumulators are another feature of this display, and a very pleasing little stunt is the fact that carriers are given free with these accumulators, thus making the weekly or



# This Year at Olympia—*continued*


***An Exide unspillable battery for portable sets. (Stands 172 and 175.)***

fortnightly jaunt to the charging station quite a simple matter. A wide range of high-tension and grid-bias batteries, L.F. transformers, and so forth make this an exceptionally interesting exhibit, and, like a good many other firms, Kolster-Brandes have found that would-be purchasers have not always the ready cash, so that facilities are offered whereby a small deposit is paid and the account settled over a period by means of monthly payments.

### K.N. ELECTRICAL PRODUCTS, LTD.

**Stand No. 254.**

Everybody knows that cayenne is "very hot." So is the K.N. soldering iron, and if you don't believe it all you have to do is to pay a visit to this stand where full conviction awaits you. All home constructors who are dissatisfied with their soldering troubles should make a point of calling here.

### LAMPLUGH RADIO PRODUCTS.

**Stands Nos. 126 and 127.**

Quite a new note in receiver design is struck by the "Chassirad" range of receivers on show here. These will be of special interest to those who desire to purchase either a straight detector and one L.F., or a screened-grid-three type of set, to mount in their own cabinets to individual taste.

The sets are complete instruments and can be used as purchased, and being built of pressed steel, finished in black enamel, they are certainly of distinctive appearance.

Here, too, will be found the Silver Ghost receiver, mounted in attractive cabinets of oak and mahogany and built on the new and interesting method of chassis construction in which this firm specialises. Two models are exhibited: one a five-valve self-contained instrument, and the other a three-valve instrument, requiring a good indoor or outdoor aerial and earth.

***On Stand 165 will be shown the whole M.P.A. range, including this handsome loud speaker.***

This firm is showing in addition some all-mains A.C. receivers, while other new lines consist of loud speakers, high-tension mains units for D.C. and A.C., a choke filter output unit consisting of a heavy duty choke and a 2-mfd. condenser built as one unit, and also the well-known "panel-plate" tuner unit and baseboard unit which was a popular feature of last year's exhibition.

### LECTRO-LINX, LTD.

**Stand No. 261.**

The Lectro-Linx people are the proprietors of the "Clix" patent specialities well known to set-builders for their ingenious construction and handiness in use. Apart from the lines which in the past have been so popular, this year we are to have a new engraved all-in plug and socket, special features of which are that all metal parts are completely insulated, no spade or other contacts being required. The flex portions at high voltage values are red, and cannot possibly make contact with panel portions.

These and the various wander-plugs, panel terminals, Clix hook terminals, accumulator knobs, bushes, combined plugs and sockets, wander-plugs and other just-what-you-want wire connectors, make this one of the most attractive stands in the whole Exhibition for the constructor who has only a little money to

***The Metro-Vick people are specialists in mains sets of outstanding design, as this 5-valver (on view at Stands 148 and 152) illustrates.***

lay out. The amazing thing about the Clix specialities is that the prices range from the humble penny up through the 1½d's., 2d's., 2½d's., right bang up to 3d.! If you want to be a real dog you can buy a Clix all-in plug and socket for 8d., while dukes and any of royal blood can purchase Clix multi-plugs of the four- and five-way type which come out at 2s.!

### LISSEN, LTD.

**Stands Nos. 184, 185 and 186.**

Listen! So irresistible has been the demand for this firm's products that Lissen's have decided to go the whole hog in radio, and now make everything that is required for radio reception! Valves, accumulators, eliminators, etc.—Lissen now makes the lot!

It is rather early at the time of writing to say exactly what lines will be on the stands, for it would seem to be impossible to show really everything in the radio line which this firm makes. Probably there will be a complete range of radio gramophones for practically all requirements, and since the last radio exhibition Lissen's have added their Popular model five-valve portable receiver, which retails at 16 guineas.

Probably the chief interest will centre around the complete range of 2-volt valves which will be demonstrated on these stands. In addition prominence will be given to the Lissen Screened-Grid Three receiver, and the battery eliminators

***The Ultra Air Chrome loud speaker employs two linen diaphragms. (Stand 106.)***

(both A.C. and D.C.) which will be on show. At present Lissen's have a popular D.C. eliminator, specially constructed for the average type of three-valve set with a screened grid valve.

There will be also a complete range of Lissen accumulators in glass and celluloid containers, and in addition to the present popular lines of H.T. batteries there will be 100- and 150-volt super-power batteries. New components include the Lissen anti-microphonic valve holder, output choke, wire-wound volume control, portable set turntable, together with grid leaks and push-pull switches, etc.

Other new lines by this go-ahead firm are anticipated, but just at the moment it is too early to say whether they will actually be on show, at any rate at the beginning of the Exhibition. Visitors to Olympia in past years will remember that the Lissen stand is famous for the interesting demonstrations there, and we are given to understand that again this year there will be a special effort made in this way to enable visitors to allow themselves to become familiar with the merits of the Lissen products.

Apart from the purely commercial aspect, quite a bit about general radio practice can be learnt from the very attractive exhibits on this stand, and we do not think the firm is unduly optimistic in announcing that the phenomenal interest shown in previous years will be enhanced during this Exhibition as a result of these many attractive new lines which will be shown.

### W. & T. LOCK, LTD.

**Stands Nos. 202 & 203.**

At these stands in the gallery will be found a full range of "Kabilok" cabinets in oak and mahogany, including the well-known American

(*Continued on page* 382.)

***The "Peerless" portable is a Bedford Electric production. (Stand 45.)***

# CHOOSING A MOTOR FOR YOUR ELECTRIC GRAMOPHONE

*Some points to look out for when choosing the "drive unit" for your "Wireless Constructor" gramophone.*

By K. D. ROGERS.

THE problem of choosing a motor for the all-electric gramophone when a pick-up is employed is not quite such a simple matter as the choosing of the electric motor for an ordinary gramophone using a sound-box.

The main troubles with electric motors are two. First the difficulty of getting a small electric motor to maintain constancy of speed with a record having very heavy passages upon it, and the second the question of silence of running in an electrical sense—that is, absence of sparking on the commutator.

## Uneven Running

The ordinary gramophone motor is of very small horse-power indeed, usually something round about 1-80th, but this motor, assisted by a fairly heavy flywheel in the form of the turntable, will as a rule be quite satisfactory with the average record. Sometimes, however, one gets a record with exceptionally heavy passages in the bass, and if these occur on the outside of the record, where the retardation due to the drag of the pick-up is greater, then a variation of speed, with an alteration of pitch, will sometimes occur and can be very annoying.

So the first stage in the choosing of an electric motor is to make sure that it will stand really heavy use without slowing down. If at all possible, have the motor tested with a turntable and a record and a fairly heavy sound-box, and see that slight alterations of pressure with the finger on the sound-box or pick-up do not have the effect of slowing down the motor in the slightest degree.

If they do, you can discard that motor and look round for one with more power or of better design. Many of the "universal" motors for either D.C. or A.C. are quite suitable, but there are some of them which are by no means suitable and which will not run perfectly evenly.

Cheap motors which have belt drives sometimes suffer in this respect, so if you decide to choose one with a belt drive be very careful that it is of good design and that it has no tendency to slow down. Personally, the writer would advise against inferior belt-driven models as they are sometimes very unreliable good makes must be used for satisfactory results. The next step to consider is the commutator, or other means of power intake.

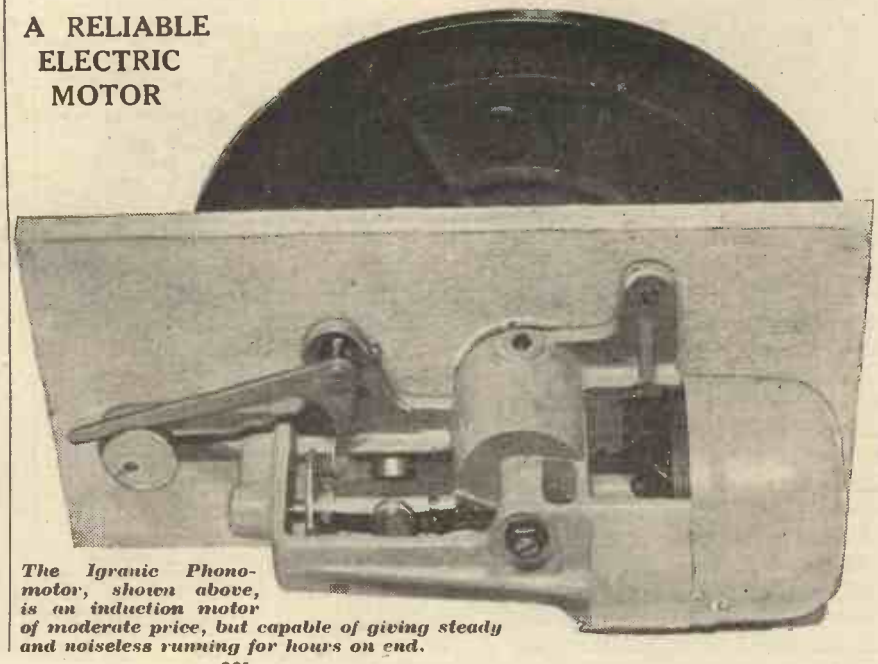
The average motor, of course, uses a commutator and brushes to supply current to the armature, and this may be the source of a great deal of trouble by causing sparking, thereby providing a form of atmospherics in your reproduction. For instance, you switch your motor on and you possibly may hear nothing. Everything may be perfectly silent. But the moment you bring the pick-up into use you may get the most appalling crackles, due to a peculiar transference of energy through the pick-up arm and pick-up wires.

## A Peculiar Fault

Similarly, if there is any mechanical vibration in the motor this may be transferred to the turntable, through the record to the pick-up. The writer had a cheap gramophone motor of the electrical type which was belt-driven, but which apart from a tendency to slow down on very heavy passages was perfectly silent in operation as regards its commutator. On testing it, however, he found the motor had a peculiar vibration of its own which was transferred to the turntable and to the record, and eventually to the pick-up, which immediately turned it into electrical impulses, and the most annoying hum was received through the loud speaker.

This had nothing whatever to do with the electrical frequency of the

**A RELIABLE ELECTRIC MOTOR**



*The Igranic Phono-motor, shown above, is an induction motor of moderate price, but capable of giving steady and noiseless running for hours on end.*

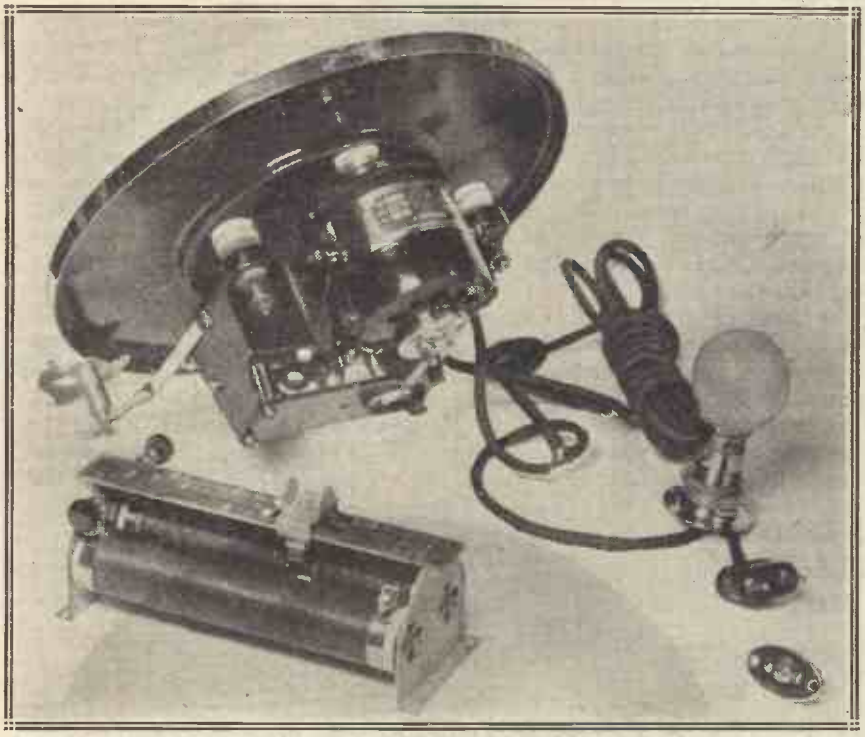
# Choosing a Motor for Your Electric Gramophone—*continued*

A.C. mains or with any other electrical phenomenon in the motor itself, but was solely due to the mechanical vibration of the motor being transferred to the pick-up needle. So you must look out for vibration in the gramophone motor, and see that it runs really smoothly.

Shielding the motor with iron and earthing the iron may do a lot to decrease or eliminate cracklings due to sparking of the commutator, but it is far better to remove this trouble at its source than to go in for all sorts of remedies after you have got the motor.

### Preventing Sparking

If you choose a motor employing a commutator, see that the brushes



*A popular motor sold by the Cromwell Eng. Co., including the Pilot lamp control and regulating resistance.*

are sufficiently wide and that they cover the segments properly. Brushes which are very narrow and only touch part of each section of the commutator are almost sure to give bad sparking, especially if the brushes are not pressing tightly enough.

Make sure also that the brush adjustment is correct, that the design of the motor enables proper oiling to be carried out, for the oiling of an electric motor is quite as important as the oiling of a mechanical motor; and also make sure that the motor will run for a long time without getting too hot.

There are quite a number of motors on the market, such as the G.E.C., B.T.H., etc., which are quite satisfactory if regular attention is paid to them. Such motors should be overhauled at least once every two or three months, dependent upon use, having their bearings oiled properly and the commutator carefully cleaned and the brushes adjusted.

It certainly seems a lot of trouble, but the results are well worth the spending of an hour adjusting the motor, which, if carefully looked after, will give trouble-free running for a very long time.

A dirty commutator will soon make itself known through crackles in the reproduction and possibly uneven running of the motor, but if this is carefully looked after you should be perfectly satisfied with your choice. Incidentally, reliable firms will always back up their products and see you through if anything goes wrong.

Another motor which deserves mention, and which is the only one of its type which the writer has come across, is the Phonomotor of Messrs. Igranic's, which was used in the original all-electric gramophone described by Mr. Percy Harris.

This motor is of the induction type, so that no commutator troubles can occur, and, of course, the motor is confined to use with A.C. mains. It has no sparking, and it is eminently satisfactory for even running even under heavy loads such as are supplied in records of the style of the Philadelphia Symphony Orchestra's recordings, or when deep organ notes are being dealt with.

Such a motor also needs very little attention, except oiling at one or two little places; and as a whole it can be left alone, and it seems to be a very satisfactory solution of the electric motor problem.

### An Interesting Motor

A further motor which is expected upon the market, but which has not yet appeared, is an electric motor only inasmuch as the winding is concerned, for the main drive is clockwork, while the winding mechanism consists of an ordinary electric motor which comes into connection automatically when the motor is a certain part run down or when the turntable is stationary.

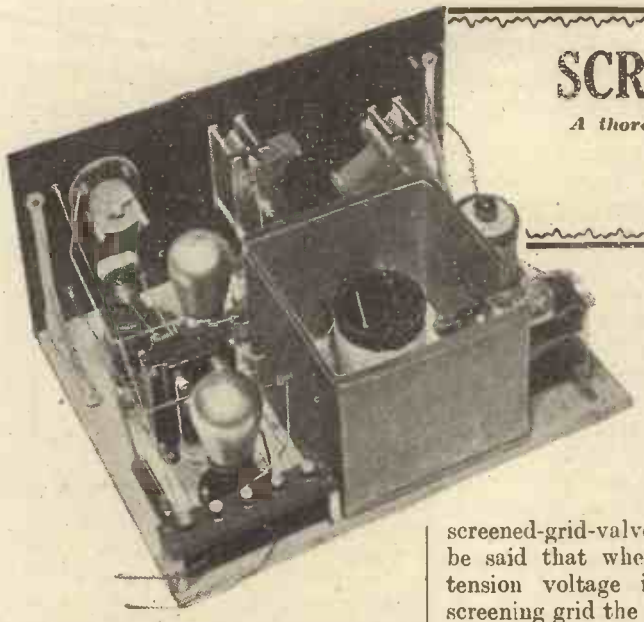
This time of action can be altered at will, and by pre-setting the apparatus can be made to rewind itself only while the turntable is stationary.

One more point. If you buy an electric motor which is of the ordinary commutator type, do not be put off with a small turntable. Have a twelve-inch turntable, for the heavier this is the better will be the running of the motor. It may take slightly longer to gather up speed, but the heavy turntable will enable the motor to get over any dragging passages on the record without slowing down; for it must not be forgotten that the turntable, besides being a support for the record, also acts as a flywheel and is a very important part of the mechanism.

### Constant Speed Essential

The governor only keeps the motor from going too fast, it does not prevent it slowing down. The turntable does a great deal to stop it from slowing down, provided the motor has sufficient power, so do not be put off with an inferior turntable.

The writer prefers a good, heavy twelve-inch turntable for accurate running; and the purchaser of a motor will do well to look into this point.



# SCREENED-GRID CIRCUITS

*A thoroughly practical article which will be of great value to constructors.*

By THE EDITOR.

THE screened-grid valve, when it was first placed on the market, looked as if it might solve most of our high-frequency problems, but like most new inventions hailed as "cure-alls," it soon proved to have its own peculiarities and problems. In the present article an attempt will be made to consider the various circuits used with screened-grid valves, to show how they differ from one

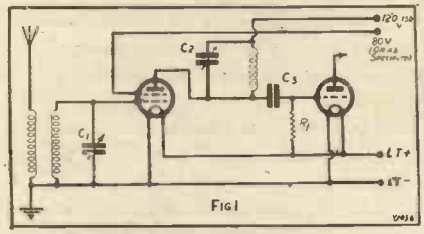


FIG 1

another, and the advantages and disadvantages of their use. Some special points about the screened-grid valve will also be discussed.

## The Chief Difference

The chief difference, so far as the user is concerned, between an ordinary high-frequency valve and a screened-grid valve is that:

(1) A much greater magnification per stage is possible, and

(2) The harmful effects of the capacity between electrodes in the ordinary high-frequency valve, and which cause self-oscillation without some special form of neutralising, are absent in the newer type.

Whereas the ordinary high-frequency valve has a filament, a control grid and a plate or anode, the screened-grid valve has these parts with the addition of a second grid, which is known as the screening grid. Without going into the theory of screened-grid-valve working, it may be said that when a suitable high-tension voltage is applied to the screening grid the valves will act as if there were practically no inter-electrode capacity. Thus as there is practically no feed-back through the valve itself, the need for neutralising in order to get efficient working is absent. Furthermore, it is possible to design the valves to give a much higher magnification than is possible with the ordinary type.

## Feed-Back Problem

In the mechanical make-up of the valve, four pins spaced in the usual way are used, but the pin which is normally connected to the plate of an ordinary valve is in this case connected to the screening grid, while the plate itself is connected to a special terminal at the top of the valve. For this reason, among others, a screened-grid valve cannot be inserted into an ordinary valve holder in a set designed to take the ordinary type of high-frequency valve.

While in this special form of valve troublesome "inside" effects giving feed-back are practically eliminated, this does not mean to say that outside feed-back effects from wiring, fields of coils, etc., are automatically eliminated by it. Just as a man cannot be kept in a prison by locking the door and leaving the window open, so it is useless getting rid of inside feed-back effects if we allow the coils, wiring, and other parts to be so arranged that there is feed-back between them. This is mentioned because some readers seem to think that

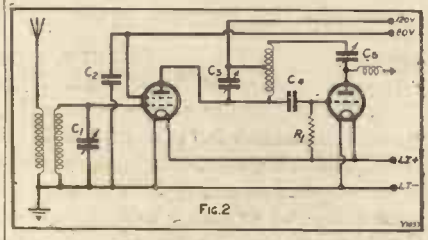
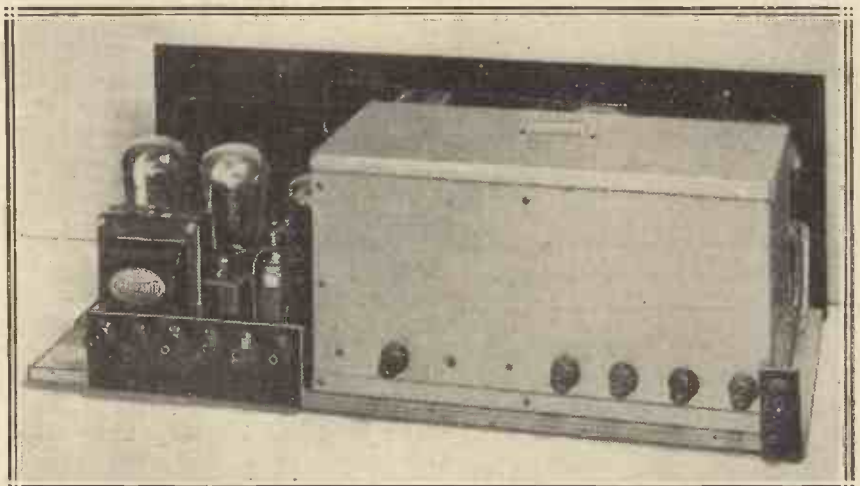


FIG.2

if they build up a set using a screened-grid valve they have no need to worry about stability.

In view of the very high magnification given by the modern screened-grid valve it is impossible to get stable operation unless adequate screening is used.

Circuit No. 1 shows a very simple way of using a screened-grid valve. Here the aerial has a conventional form of coupling to a tuned circuit consisting of a coil and condenser, and the voltages set up across this



*The "Push-Pull" Five (described in this issue) has a screened-grid stage inside the screening box.*

# Screened-Grid Circuits—*continued*

condenser are applied to the normal or control grid of the valve. The screening grid is connected to an 80-volt tapping (or some other voltage according to the specification of the valve-maker), while the plate of the valve is connected by the tuned-anode method to the detector.

It is important with a screened-grid valve to have what is known as a very high impedance in the plate circuit to give high magnification, and to obtain a high impedance with the

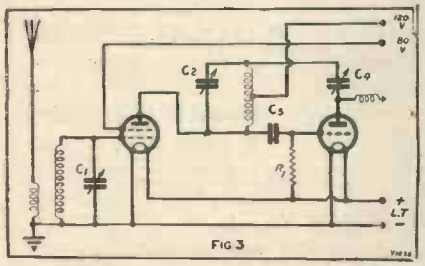


FIG 3

tuned-anode method the coil must be of the low-loss variety, the losses in the variable condenser negligible, and the proportion of capacity to inductance such that the inductance is large and the capacity fairly small.

## High Magnification

Very considerable magnification is obtainable with this circuit, but the effective impedance of the tuned anode is rather lowered by the damping of the following detector valve. Nevertheless, the magnification obtainable is very high.

Early in the history of the screened-grid valve it was discovered that tuning with this circuit was very flat and certainly not sufficient for modern conditions. Indeed, many people will tell you that all screened-grid valves

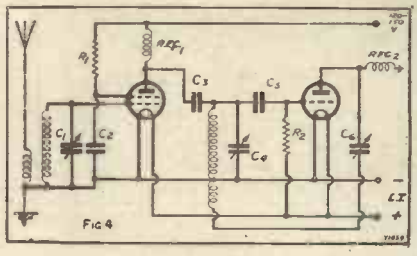


FIG 4

give very flat tuning, a statement which is rather misleading unless all the factors in the position are carefully considered.

The chief reason why a set with one stage of screened-grid magnification seems, and actually is, much flatter than a set in which the *same degree of high-frequency magnification* is obtained with ordinary valves, is that in the latter two stages of high-frequency have to be used as against the one with the screened-grid valve. As each stage has its associate tuned circuit, and as selectivity goes up rapidly as we increase the number of tuned circuits, so we are almost certain to get sharper tuning with the two ordinary valves than with one stage with a screened grid giving magnification equal to two ordinary H.F. valves. If the same number of tuned circuits are used with both forms of magnification then we shall get a much fairer comparison.

## Valve Variations

The second reason for the flatness with some screened-grid circuits is that with ordinary high-frequency valves, even when neutralised, there is generally a certain amount of feed-back which automatically sharpens the tuning of the previous circuit. Even screened-grid valves vary between themselves in the amount of feed-back they will allow, for all have a little inter-electrode capacity left.

A few minutes before starting to write this article I compared two new screened-grid valves in a special receiver where full precautions have been taken to prevent feed-back effects other than through the valve. The magnification given by one valve seemed considerably in excess of that given by the other, but closer examination showed that there was an appreciable amount of feed-back in the first valve, giving a reaction amplification in addition to the normal high-frequency magnification of the valve.

## A Better Circuit

With the second valve, which seemed to be less efficient on the first test, the feed-back effects through the valve were negligible, although the same degree of magnification was obtained when reaction was used. Final tests showed that the amount of amplification obtainable when using reaction was the same in each case, as the second allowed more reaction to be deliberately applied.

Circuit No. 2 shows a modification of Circuit No. 1. We still have the tuned anode, but we now have means of applying reaction to this tuned anode which will considerably increase the magnification. In addition, a condenser $C_2$ is shown between the screening grid and earth. This condenser is quite important and in my experience can well be 1 mfd.

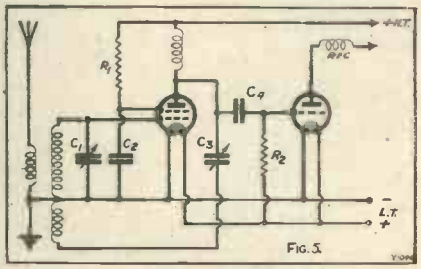


FIG. 5

Smaller values can often be used successfully, but 1 mfd. is distinctly better in some circuits and it has no disadvantages in any. The condenser should be joined as near as possible to the screening grid. The magnification and selectivity obtained with this circuit are considerably greater than those obtainable with Circuit No. 1, for we are able to reduce the damping effects of the detector valve and to increase the impedance in the plate circuit.

## Proper Screening Essential

It is assumed in all these circuits that proper screening is used to prevent interaction between the coil fields, wires, etc.

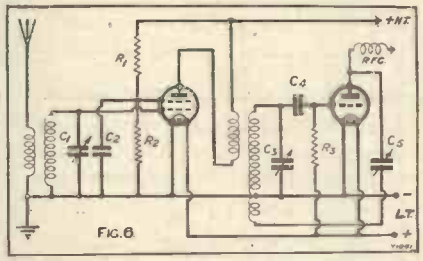


FIG. 6

Circuit No. 3 is one that is very simply assembled by using an ordinary centre-tapped coil in the anode. Reaction is obtained here as in Circuit No. 2 by what is sometimes called the " Hartley " method.

Tuning is sharper than in Circuit No. 2, but the magnification is not so great, as the detector is only connected across half the anode circuit (the high-tension lead can be considered as connected to the filament for high-frequency purposes). It is a useful circuit, however, and will appeal to many experimenters.

In this circuit, as in all others, a condenser should be joined to the screening grid as previously shown.

Circuit No. 4 shows what is generally called the " parallel-feed "

# Screened-Grid Circuits—*continued*

method; there being a fixed impedance in the form of a radio-frequency choke in the plate circuit of the valve, and the voltages set up across this are applied to the tuned circuit connected to the detector. The advantages of this circuit is that while it gives a lower magnification than a well-designed tuned anode, the magnification obtained is still high and tuning is appreciably sharper.

## The Screen Voltage

In this diagram I have also introduced the resistance $R_1$ to show the method of obtaining screened-grid voltage for the valve without a separate tapping, so that one high-tension terminal can be used throughout. It will be seen that the current which goes to the screening grid has to pass through this resistance, and as a certain voltage is required to carry a given current through a given resistance we can use the voltage drop in this resistance to bring down the voltage from the maximum of, say, 120 to the voltage required for the screening grid, say, 80.

If all screened-grid valves took the same screened-grid current, then the resistance could be made the same in all cases provided we used the same anode voltage, but particularly this year S.G. valves vary considerably in the amount of screen-grid current they take. The resistance can often be 100,000 ohms, assuming we are working at a voltage of 120.

## Checking the H.T. Current

If you have a milliammeter you can easily find out what this resistance needs to be for any given set of conditions, and the rule is as follows: First of all apply the correct plate voltage on your screened-grid valve, and then take a separate lead from the screening grid to a tapping on the battery giving the voltage specified by the makers for the screening grid. In this lead insert a milliammeter and switch the set on. You will then get a reading which will vary from half a milliampere to two milliamperes, according to the make of valve. Now find out the voltage you have to "drop."

## Finding Right Resistance

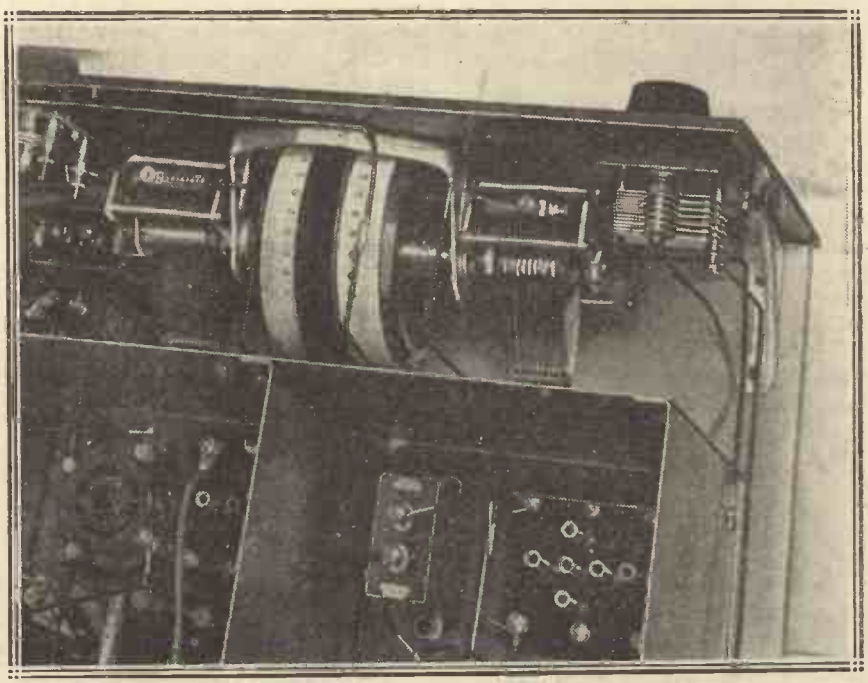
If you are using 120 volts and the specified voltage for the screening grid is 70, you will have to drop 50 volts. Multiply this voltage by a thousand and divide by the screened-grid current in milliamperes. Thus, in the particular case mentioned, if the screened-grid current is half a milliampere and we have to drop 50 volts, you simply divide 50,000 by half and the answer is 100,000. A 100,000-ohm wire-wound resistance inserted at $R_1$ will now bring down the voltage to the required figure and you can use one voltage throughout. Another advantage of this resistance here is that it has a decoupling effect which may be rather useful in sets using more than one screened-grid valve.

Circuit No. 5 shows a very simple screened-grid circuit, first put forward by the writer in the "New Business Man's" Four, published in this journal, and also used later by Mr. G. P. Kendall, B.Sc., in the well-known "Titan" Three, in our contemporary "Popular Wireless." The voltages set up across the choke in the plate circuit of the screened-grid valve are applied to the detector without any tuned circuit.

## One H.T. Voltage

By the use of the resistance $R_1$ in the manner just described, one H.T. voltage can be used throughout, and one tuning control, with a reaction control which remains practically constant over the whole range of the coil. Excellent results have been obtained with this circuit in the "New Business Man's" Four, and if still further selectivity is needed a wave-trap can be inserted in the aerial, as in fact was done in the "New Business Man's" Four receiver.

Circuit No. 6 shows transformer coupling instead of tuned-anode coupling, together with reaction as before. This gives the sharpest tuning of all the screened-grid circuits so far described, but the impedance of the primary in the ordinary radio-frequency transformer is insufficient, and a much larger primary has to be used.



*A close-up of the "Push-Pull" Five, showing the tuning condensers and a corner of the H.F. screening box. Note the bypass condenser for the screening-grid lead.*

## Sharp Tuning Obtained

Normally, if we were to connect a tuned circuit to a screened-grid valve, put a radio-frequency choke in the anode, and apply the voltages set up across this to the detector valve, the amplification would be quite good, but the tuning would be extremely flat, as there would be only one tuned circuit and that without any reaction. To overcome this difficulty reaction is applied to the grid circuit of the screened-grid valve in the manner shown, the condenser $C_3$ being of the neutralising type with a very small capacity. The tuning then becomes quite sharp and one gets H.F. magnification in the screened-grid valve, and an additional build-up through reaction.

# Screened-Grid Circuits—*continued*

### With S.P. Windings

If the ordinary split-primary high-frequency transformers are used, excellent results can be obtained by using the ordinary primary and the neutralising winding in series, and still better results can be obtained with specially wound high-frequency transformers, or with the type (as that used in the "Push-Pull" Five in the current issue) in which interchangeable primaries enable us to choose the right winding for this type of valve.

### Specially Designed Transformers

While the highest magnification is obtainable with a properly designed tuned-anode type of coupling, magnification is not the only feature we require in the high-frequency end of a wireless receiver, and thus there is a growing tendency to use specially designed high-frequency transformers, gaining in selectivity and sacrificing some magnification. It is noteworthy that in this year's American commercial receivers practically all use screened-grid, high-frequency valves, with transformer, and not tuned-anode, coupling.

### Another Modification

Another modification shown in Circuit No. 6 is the potentiometer method of obtaining the voltage on the screening grid. Here we have two resistances in series, $R_1$ and $R_2$, with the screening grid arranged at an intermediate point and the usual condenser $C_2$ to filament. In the case of two resistances in series, if both have the same value the voltage half-way down will be half of the maximum, and if we arrange the values $R_1$ and $R_2$ in the correct proportion we obtain any voltage we want down the scale.

This scheme is preferable to the series resistance when the screening grid current is very small, and the important matter here is the ratio of the two resistances rather than their values. If the resistances are made too small, then the whole potentiometer will take a wasteful amount of current from the high-tension supply.

### An Important Point

Readers who think of trying this scheme should remember that if the resistances are joined in this way, they will always be draining the high-tension source whether the filaments are switched on or off, which means, of course, that we must switch the high-tension off separately to avoid wastage, or else use a double form of switching.

Circuit No. 7 shows two screened-grid valves transformer-coupled. It will be noticed that resistances shunted to earth by a condenser are inserted in the plate circuits of each of the screened-grid valves. These are for decoupling purposes and are strongly recommended when more than one stage of screened-grid coupling is used, although they are often of distinct value in only one stage.

The value of $R_2$ must not be so high as to bring down the plate current of the screened-grid valve too much, and if $C_4$ and $C_6$ are made 1 mfd., $R_2$ and $R_4$ should be 500 ohms at a minimum. It is not a bad plan to bring them up to 1,000 ohms, if the plate current is not too high. Most careful screening of each stage is required in such a set as this, and condensers should be shunted across the filament leads ($C_7$ and $C_8$) close to the screen, to prevent pick-up by filament wires.

### Neutralisation Required?

It requires a very soundly designed receiver to utilise the full magnification of two screened-grid valves, and it is certain that such a receiver cannot be built without some form of neutralisation, in view of the fact that there is still some residual capacity in all screened-grid valves, and this will feed-back enough energy to cause oscillation when such a big magnification is obtained. In multi-valve screen-grid receivers it is customary to sacrifice considerable magnification in order to obtain both selectivity and sensitivity.

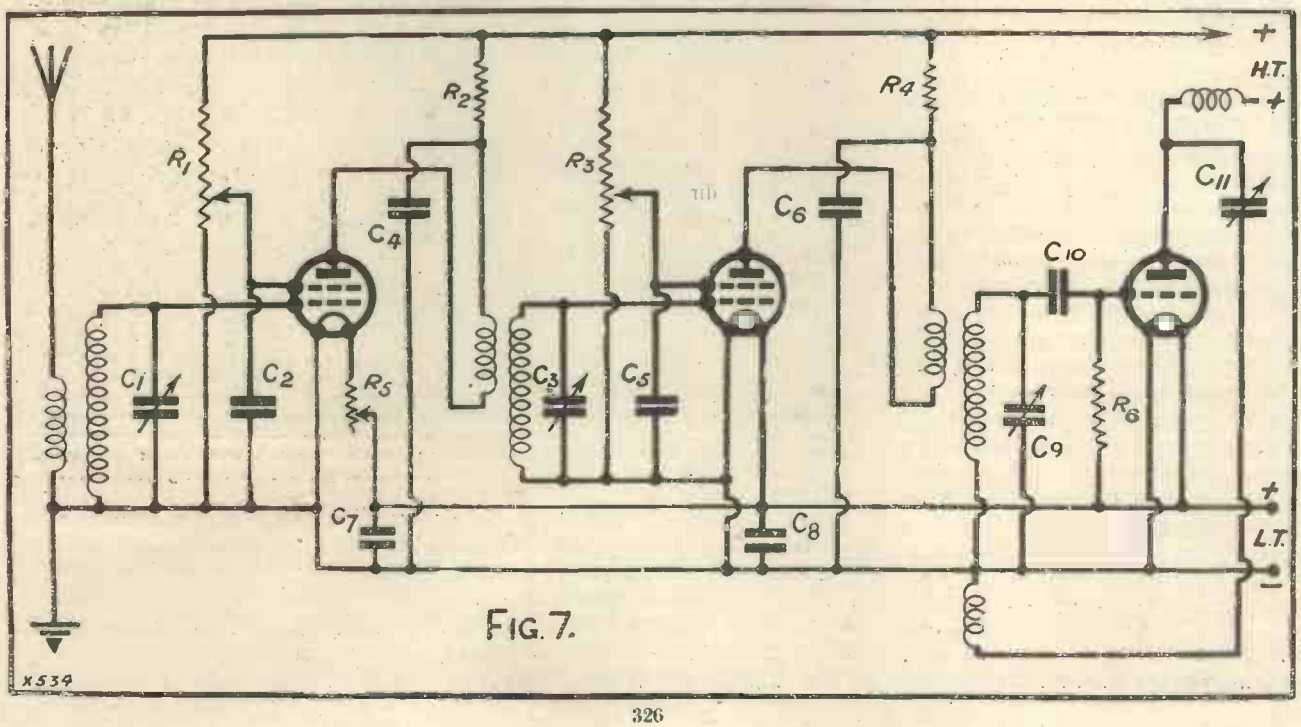



FIG. 7.

# HAPPENINGS AT SAVOY HILL

By OUR SPECIAL COMMISSIONER

## Administrative Developments

HAVING escaped with impunity the short session of Parliament that followed the General Election, the Governors of the B.B.C. are not going to take any avoidable risks with the session that opens next month. There was rather too much talk about "Enquiries" of various kinds during the early summer. The result has been a lot of heart-searching at Savoy Hill, and it is only fair to admit that conditions have materially improved.

There has been some increase in the pay of engineers. There is a good deal less emphasis on iron discipline, and more attention to the "human" side. All of which is decidedly to the good, particularly if it really presages the beginning of a new era. But there still remains as acute as ever the friction between the staff side and the Board, or, in more concrete terms, between Sir John Reith and the Governors.

I do not profess to enough knowledge to take sides in this prolonged and bitter controversy, but I do say it is high time for the strain to be relieved. Broadcasting suffers, and broadcasting is what the B.B.C. is for. If the present constitution simply will not work, then there must be another committee next winter, comparable with the Sykes' Committee of 1924.

## Sponsored Programmes?

Ever since the visit to England last spring of Mr. Aylesworth, rumours have been current about plans of co-operation of various kinds between the B.B.C. and the N.B.C. It has been arranged to exchange programmes on a service basis this winter.

This means that British listeners will occasionally get a complete programme from the land of the Stars and Stripes, relayed through the B.B.C. system. Of course, some of these programmes, and certainly the best, will be sponsored by American firms. Thus the principle of sponsoring will have found its way into Britain indirectly. Foreknowledge of this development has induced several large British concerns to make plans for offering similarly sponsored programmes to the B.B.C.

Meanwhile at Savoy Hill there is some perplexity about how best to achieve real and consistent "alternatives" under the twin-wave system about to be inaugurated. Captain Eckersley and his brother Roger are credited with the opinion that it would be good policy for the B.B.C. to accept the principle of the sponsor for one main set of alternative programmes. Besides bringing in substantial revenue it is claimed that this departure would vastly enrich the programmes.

I should think the Governors of the B.B.C. would "look down their noses" at such a proposal; but if they do pass it, then I fully expect to see Captain Eckersley as the mainspring of the outside sponsored programmes, in direct competition with his brother inside the B.B.C.

## The B.B.C. and the Trade

There is much better prospect this year than ever before of effective co-operation between the wireless trade and the B.B.C. There has been a much more friendly attitude at Savoy Hill and a newly discovered anxiety to fall in with the wishes of the whole industry.

The B.B.C. has gone to a lot of trouble and to substantial extra expense to provide special programmes both for Exhibition Week and for National Wireless Week early in the New Year. I hear that Paul Robeson will be among the programme features of Exhibition Week. Now that relations between the trade and broadcasting are on a satisfactory basis, it is profoundly to be hoped that disturbing factors encountered so frequently in the past will not recur.

## The Struggle for Talent

The struggle for the best musical talent still goes on. The B.B.C. and a leading gramophone company are in direct opposition in forming "national" orchestras on a permanent basis. The B.B.C. was slow off the mark, and lost many points in the early stages, but more recently it has been catching up, and is understood to be drawing level at this moment.

Three-year contracts are being given both to musicians and to artistes and I gather the pay is distinctly good. As far as the programmes are

AN AERIAL LAND-LINE

*A novel method of carrying their land-lines was devised by the B.B.C. engineers at a recent sports broadcast.*

# Happenings at Savoy Hill—*continued*

concerned there should be a marked improvement this autumn, because the established B.B.C. symphony orchestra has already been greatly strengthened, and before Christmas should muster a regular sixty of the most competent musicians in the country. Sir Thomas Beecham will be well to the fore in conducting.

### The Long, Long Trail of Television

Baird Television and the B.B.C. seem constitutionally antipathetic. An episode of apparent friendliness merely marks the brief interval between two terrific quarrels. The breakdown of negotiations on the "three fifteen-minutes" offer, was followed by a particularly intense outburst of mutual recrimination and fulmination.

Then suddenly an unholy calm spead itself over the troubled seas. Some thought this was the peace of exhaustion. But there was rather more in it than that. There was another offer, engineered by the new Postmaster-General, Mr. Lees Smith, M.P., who prevailed on Sir John Reith to let the Baird people have five half-hours a week outside programme time. There was at first no period guarantee attached.

This led to further negotiations, and ultimately to the prospect of television actually getting across experimentally on the B.B.C. system through 2 L O. I believe there will be regular transmissions before the end of the year. But I do not expect the Baird and the B.B.C. teams to work long in harness. The legacy of hate is heavy ; explosive material is super-abundant. As to what will happen in the event of another open breach, I do not profess to know. Perhaps facilities for separate television experiments.

### The Slaithwaite Station

Work on the North Regional twin-wave transmitter is beginning this month. The site is near Slaithwaite. I am told it will take a full year to get the station ready to work.

This puts another unexpected brake on the development of the Regional Scheme. With Brookman's Park beginning on both waves in December next, Slaithwaite a year later, and, the West station another year behind, it will be the spring of 1932 before the Regional Scheme can be in full swing. That is, unless some quite unprecedented spurt is put on by the B.B.C. It will have been about eight years from the promulgation of the plan to its fulfilment.

I know Savoy Hill falls back on the excuse that there was the constitutional change-over in the middle, but this does not hold water. History will not hold the B.B.C. blameless for all this delay. If there had been really incisive belief and conviction at Savoy Hill, the Regional Scheme would have been in existence long ago.

One cannot resist the impression that those in authority at the B.B.C. have not all been as keen as Captain Eckersley on this particular subject. But as I have already suggested, there is still time to expedite matters. There is no longer the excuse of the need of preliminary experimental facilities in twin-wave working. 5 G B and Brookman's Park have provided this experience in plenty.

If the B.B.C. would throw its back into this scheme all the stations could be built simultaneously. Nor will Savoy Hill escape criticism for undertaking the "Palace of Broadcasting" simultaneously, especially as there is the complaint of inadequate funds to take on all the new stations together. The service to listeners should take absolute and continuous priority, and a recognition of this has been one of the chief merits of the B.B.C. in the past.

As work on Broadcasting House has started I suppose they must go on with the job. But ways must be found not to hold up the Regional stations on financial grounds, otherwise there will be very awkward questions to answer in Parliament before long.

## LOOK OUT FOR LEIPZIG

*The main control-room at the Leipzig broadcasting station, that works on 259 metres.*

## HINTS FOR BEGINNERS

THE clearance size drills for No. 2 B.A., No. 4 B.A., and No. 6 B.A. are: 12, 26, and 34 respectively.

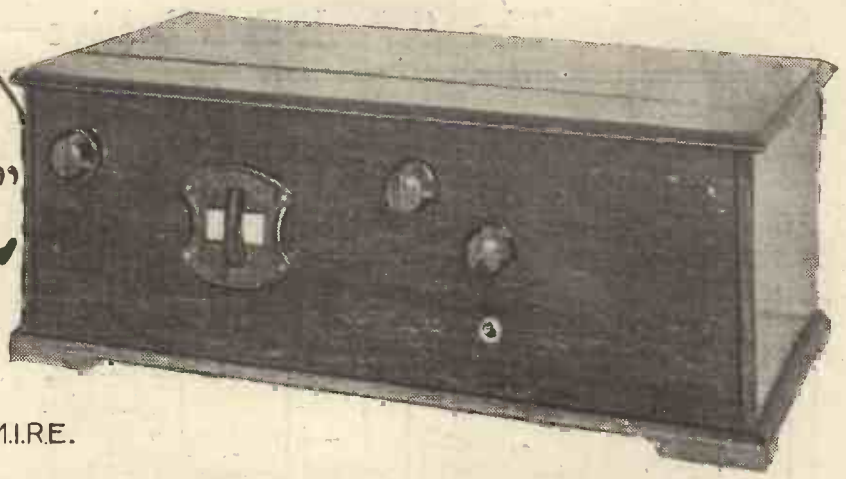
Never try to tighten nuts with a pair of ordinary pliers. Either use a box spanner or a pair of special nut pliers.

In wireless constructional work the same files have often to be used for both brass and ebonite. The latter clogs them up so that they will not cut properly. The clogging may be removed and the file made keen again if a "file card" (a stiff wire brush) is used.

When you are drilling or sawing ebonite, a drop or two of turpentine forms an excellent lubricant, making work much easier. Brass should not be lubricated at all.

# The "PUSH-PULL" FIVE-E

by PERCY W. HARRIS M.I.R.E.



IN the "Push-Pull" Five our aim has been to give readers what may be termed a "balanced" receiver, i.e. one in which the various parts have been co-ordinated so as to produce powerful and undistorted signals from both near and distant stations, with a measure of selectivity suitable for modern conditions. Even if you do not contemplate building such a receiver at the present time, I would ask you to read this article carefully, as it is the policy of this journal not only to describe in detail the construction of its special exclusive designs, but also to deal in the same article with the principles and ideas which led to the adoption of certain methods and devices.

## Careful Experiment

The foundations of such a receiver as this are carefully laid in the laboratory some time before the actual constructional work of the final instrument begins. Thus when it was decided to prepare a five-valve design for the WIRELESS CONSTRUCTOR, the merits and demerits of various possible circuit combinations were weighed with the utmost care.

The first cost of parts, simplicity of operation, selectivity, quality on the local station, sensitivity, suitability for both local stations and distant work, and last, but by no means least, simplicity of constructional work, all had to be carefully considered. In the end it was decided that we should aim at producing a design which would be so simple to operate that any member of the family could get first-class results from several stations without sacrifice of quality. The result is, we believe, a receiver which will give a real thrill to every listener who tries his hand at searching with it, while great pains have been taken to give the whole set a really handsome appearance.

***This receiver is the result of a considerable amount of laboratory experiment, and the design is presented to our readers with the fullest confidence that those who build the set will obtain first-class results.***

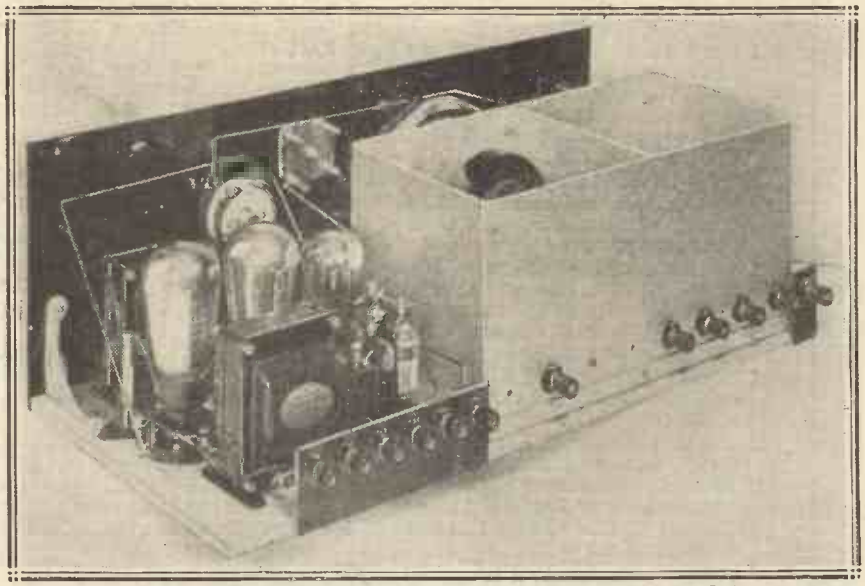
The circuit consists of a screened-grid valve, coupled by a special high-frequency transformer to the detector valve, which in turn is coupled by one of the new transformers to the first low-frequency valve. This is then transformer-coupled "push-pullwise" to a pair of power valves in the output, an output transformer making the necessary connection to the loud speaker.

Thus while it will be seen there is no startling novelty in the circuit arrangement, an examination of the set will show a number of refinements which give the receiver an exceptional power with a convenience of handling which is all its own.

Take, first of all, the aerial connection. Here we find the aerial taken to the fixed plates of a very low minimum ·0001-mfd. variable condenser, the control knob of which is placed on the panel. The moving plates of this are taken to one of three possible tappings on a binocular or "fieldless" aerial coil, which feeds the control grid of a screened-grid valve.

## How Set is Screened

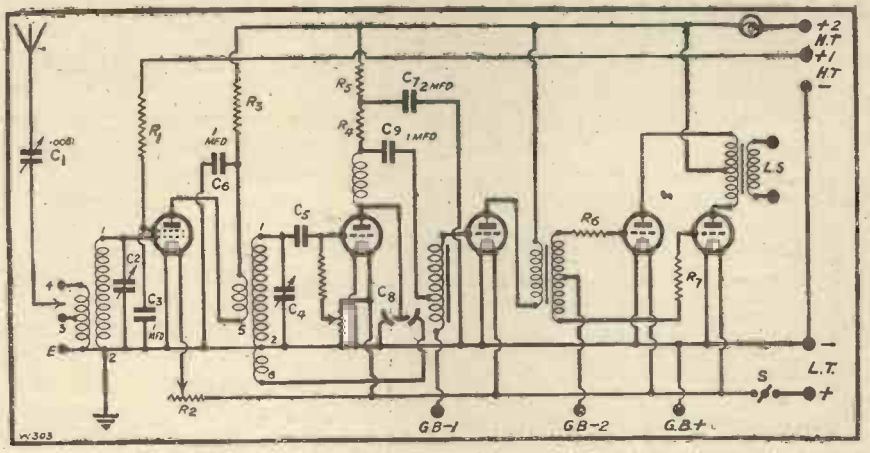
The whole of this stage, with the exception of the tuning condenser, as well as the whole of the next stage other than its tuning condenser, is screened to prevent interaction effects. The tuning condensers are automatically screened from one another by the metal control drums of the tuning arrangements, which are earthed. The simple expedient of bringing this ·0001 variable condenser control knob on to the panel (it will be remembered that such a condenser of the adjustable type is often used



*The two screening boxes contain the H.F. valve and the detector, the L.F. side being to the left of the second screen.*

# The "Push-Pull" Five—*continued*

on the baseboard) gives the set user a control of great value, for not only does it serve to modify volume with smoothness, but also to govern selectivity by reducing the aerial coupling to any degree required.




It is, indeed, a very fascinating adjustment, for after a distant station has been picked up, volume and selectivity can be very nicely adjusted in regard to one another. Normally and for all ordinary work an intermediate tapping on the aerial transformer can be chosen and the selectivity controlled on the knob, but with exceptional aerials (either particularly small or very large) one of the other tappings can be chosen, the best being found by trial.

A second volume control is also provided in the form of a 30-ohm resistance in the positive lead of the screened-grid-valve filament.

This volume control is particularly useful on the local station for reducing the magnification given by the screened-grid valve without introducing any form of distortion. It is also the better volume control for unskilled handling.

### Preventing Interference

The screening of the aerial coil is a considerable help when the receiver is used near a powerful transmitter, and the fact that the aerial coil is of the "fieldless" type is also an advantage in this regard. It might be thought that with this type of coil the stage screening would be unnecessary, but as a matter of fact with the modern, and particularly this year's, new screened-grid valves, the sensitivity is so high and the magnification so great that this screening has been found advisable even with a "fieldless" coil. Less screening could have been used if we had been prepared to sacrifice some of the magnification in this stage, but as we desire to increase it above the average full screening was adopted.

The next refinement, and one of very considerable importance, was the form of coupling between the screened-grid valve and the detector. There are many forms of coupling

## COMPONENTS REQUIRED

NOTE.—The parts illustrated are indicated in brackets. Where other suitable parts can be substituted, this is indicated by typical alternatives.

1 Cabinet to take 21 in. × 7 in. panel, with 10-in. baseboard (Cameo). Pickett, Artcraft, Raymond, etc.
1 Pair small panel brackets (Magnum). Peto Scott, Ready Radio, etc.
1 Panel, 21 in. × 7 in. (mahogany finish Ripault). Becol, Trolite, Radion, Bowyer-Lowe, etc.
1 Double drum assembly, with two ·0005-mfd. condensers (Lotus). Cyldon, Igranic, J.B., etc.

NOTE.—If other makes than Lotus are used, be careful that the assembly does not project more than 4 in. behind the panel.

1 ·0001-mfd. variable condenser (Magnum). Lotus, Lissen, Igranic, Polar, J.B., Utility, Cyldon, etc.
1 ·0001 differential reaction condenser (Lotus). Utility.
1 30-ohm panel-mounting variable resistance (Igranic). Lissen, Precision, etc.
1 On-off switch (Claude Lyons). Benjamin, Igranic, Lissen, Magnum, Ready Radio, Lotus, etc.
1 Special shielding box for this set (Magnum). Ready Radio, Paroussi. (Baseboards are included.)
1 Special valve holder for S.G. valve (W.B.).
4 Sprung valveholders (W.B.). Benjamin, Marconiphone, Igranic, Lotus, Precision, etc.
4 Holders for wire-wound resistances (Varley). Igranic, Ferranti, R.I., Mullard, Dubilier, Precision, Lissen, etc.
1 Wire-wound resistance, 30,000 ohms.
1 Wire-wound resistance, 20,000 ohms.
1 Wire-wound resistance, 2,500 or 3,000 ohms.
1 Wire-wound resistance, value to to suit as indicated in article (Varley). Ferranti, Lissen, Igranic, Mullard, Dubilier, Precision, etc.
3 1-mfd. fixed condensers (Hydra). Any good make, T.C.C., etc.
1 2-mfd. fixed condensers (Lissen). Any good make, T.C.C., etc.
2 6-pin coil bases (Lewcos). Wearite, Colvern, etc.
2 Binocular aerial coils (Lewcos). Colvern.
1 Super coil, C.S.P.5 and No. 10 primary (Lewcos).
1 Super coil, C.S.P.20 and No. 20 primary (Lewcos).

NOTE.—The receiver will work quite well with any of the leading makes of split-primary transformer of either "ordinary" or "binocular" types, but a higher efficiency will be had with the Super coils.

1 Baseboard-mounting potentiometer (Igranic). Lissen.
1 ·0003-mfd. fixed condenser (Lissen). Dubilier, Atlas, T.C.C., Mullard, etc.
1 Grid leak, 2 megohms (Lissen). Dubilier, etc.
1 Leak holder (Dubilier). Lissen, etc.
1 R.F. choke (Wearite). R.I. Dual Astatic, Varley Bi-Duplex, Ready Radio, Igranic, etc.
1 L.F. transformer (Hypermu).

NOTE.—This transformer is connected in a special manner. If other makes are used the wiring of this stage will be different.

1 Push-pull input transformer (Ferranti A.F.5C.).
1 Push-pull output transformer (Ferranti O.P.3C.).

NOTE.—If a low-resistance moving-coil speaker is used, the O.P.3C., which is 1 : 1 ratio, should be replaced by the O.P.4C. (25 : 1).

2 Vertical leak holders (Dubilier).
2 100,000 vacuum resistances (Ediswan).
1 H.T. fuse (Ready Radio). Magnum, Bulgin, etc.

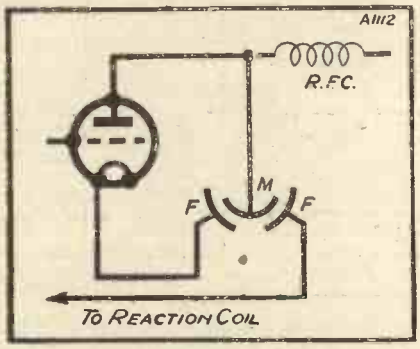
VALVES.

1 Screen-grid valve.
1 Medium impedance valve, such as D.E.L. type.
1 H.F. type.
2 Matched power or super-power types.
12 Indicating terminals, as marked (Igranic). Belling-Lee, Eelex, etc.
1 Terminal strip, 1 in. × 2 in.
1 Terminal strip, 6 in. × 2 in.
Quantity connecting wire.

# The "Push-Pull" Five—*continued*

possible with the screened-grid valve, and in the end the one we choose must depend upon our particular requirements.

Incidentally, in another part of this issue will be found an article dealing in detail with screened-grid




***Differential reaction is obtained as shown above.***

circuits, so there is no need to dwell to any great extent upon them here.

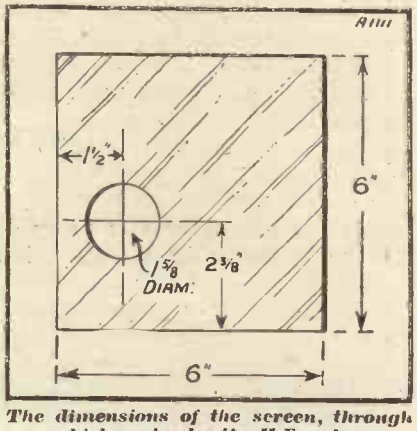
In the end the choice of a special high-frequency transformer with an interchangeable primary was made, so that while we can definitely recommend a particular primary in the set for general purposes, those who desire either to increase the selectivity at the expense of some magnification, or who are prepared to get a little more magnification at some sacrifice of selectivity, can do so with great convenience.

The special transformer, which has a six-pin base, is entirely different in appearance and construction from the ordinary six-pin high-frequency transformers to which we have become accustomed. The "split-primary" method of connecting the pins is adopted so that if it is desired to build a neutralised set then the same high-frequency transformer can be used.

## No Need for Neutralising

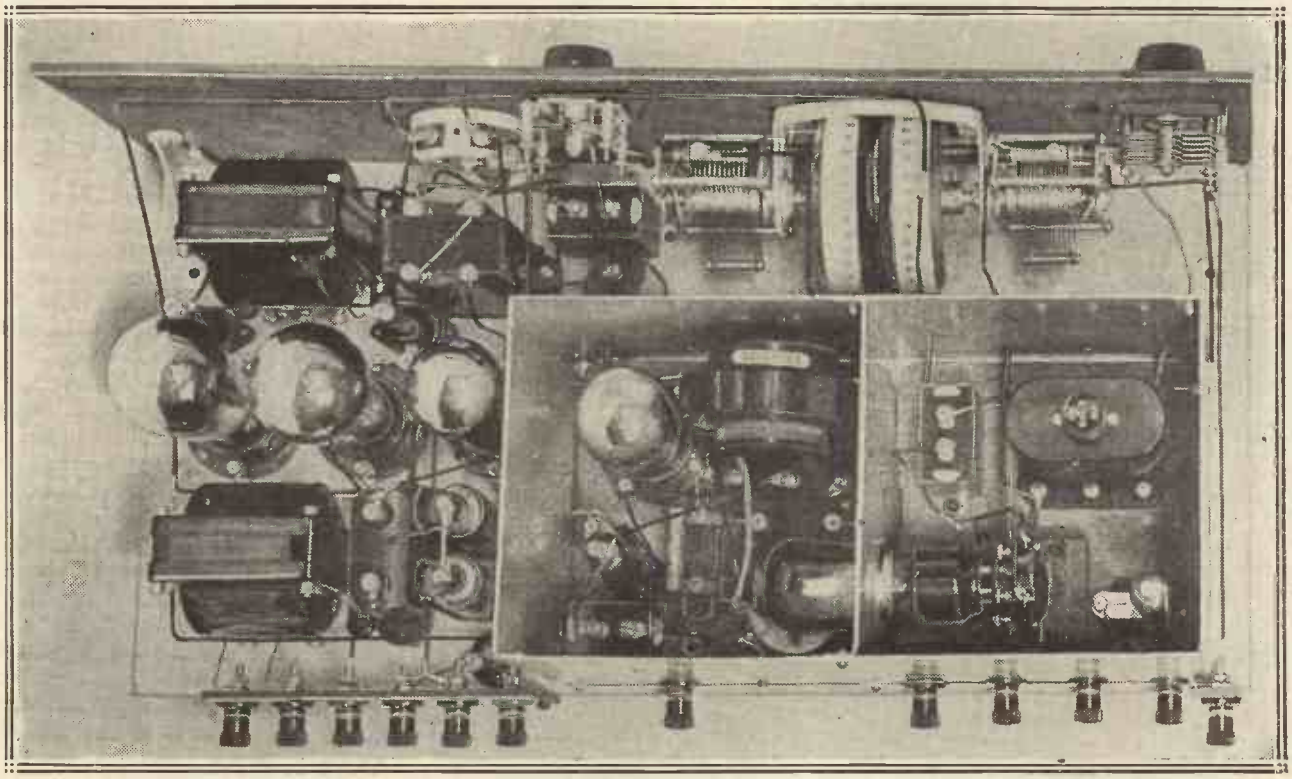
In the present case the whole of the primary winding is utilised for the coupling, and there is no need for any neutralising winding. The choice of the number of turns in the primary has been dictated by the needs of the set and the result of many practical experiments. A fixed reaction winding is also included, and the secondary winding consists of two "pancakes" of very low high-frequency resistance placed within the casing.

The primary, which can be removed in a moment, is made to slip over three split-pins, one of these providing the necessary centre-tap for neutralised circuits. The makers supply a large number of different primaries, and it is very useful, as in the present case, to be able to pick the primary to suit the particular valve and thus gain very high efficiency.




***The dimensions of the screen, through which protrudes the H.F. valve.***

The detector is of the leaky-grid variety, but the grid leak instead of being brought to the positive filament is brought to a slider of a potentiometer on the baseboard of this section. By pushing the slider backwards and forwards the best position for the particular detector valve can be found—generally about



***A general view of the receiver. Note how the screened-grid valve is mounted so that perfect screening is obtained.***

# The "Push-Pull" Five—*continued*

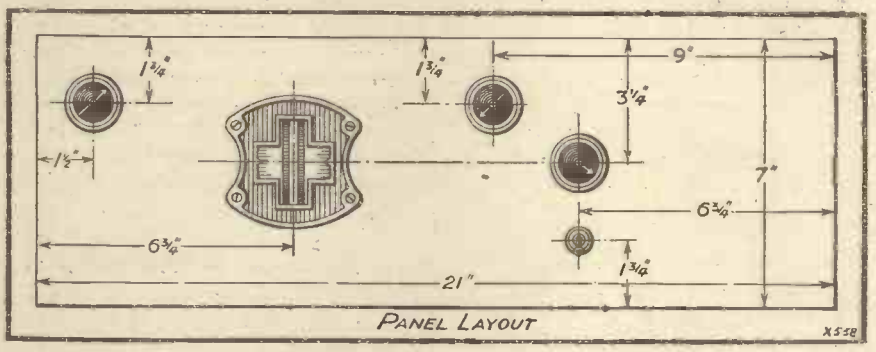
a third of the way round from the positive to the negative side.

Following the detector valve, and outside the screening, is placed the radio-frequency choke to enable reaction to be obtained. The use of smoothly variable reaction is a great advantage, and in the present set a still further refinement is the adoption of a "differential reaction," the principle of which is separately illustrated, and which certainly deserves a paragraph of its own.

## Differential Reaction

In the plate circuit of every detector valve we have both a low-frequency and a high-frequency component. Low-frequency currents result from rectification, and are passed on either to the telephones or to whatever form of coupling is adopted for the next valve. We still, however, have a high-frequency component, for without it it would not be possible to feed back the current from the plate and obtain that building-up or reaction which is so valuable. The purpose of the radio-frequency choke is to allow the low-frequency currents to pass through with facility but to impede the progress of the high-frequency currents, which are deflected round the reaction winding so as to give the "feed-back" effect we want.

It has been found that it is always an advantage to bypass this high-frequency component to the filament through a definite capacity shunt, even when we do not require it for reaction purpose; and experiments in the WIRELESS CONSTRUCTOR laboratory have confirmed that a distinct improvement in signal strength is obtainable in a set without reaction when the high-frequency component is taken care of in this way.

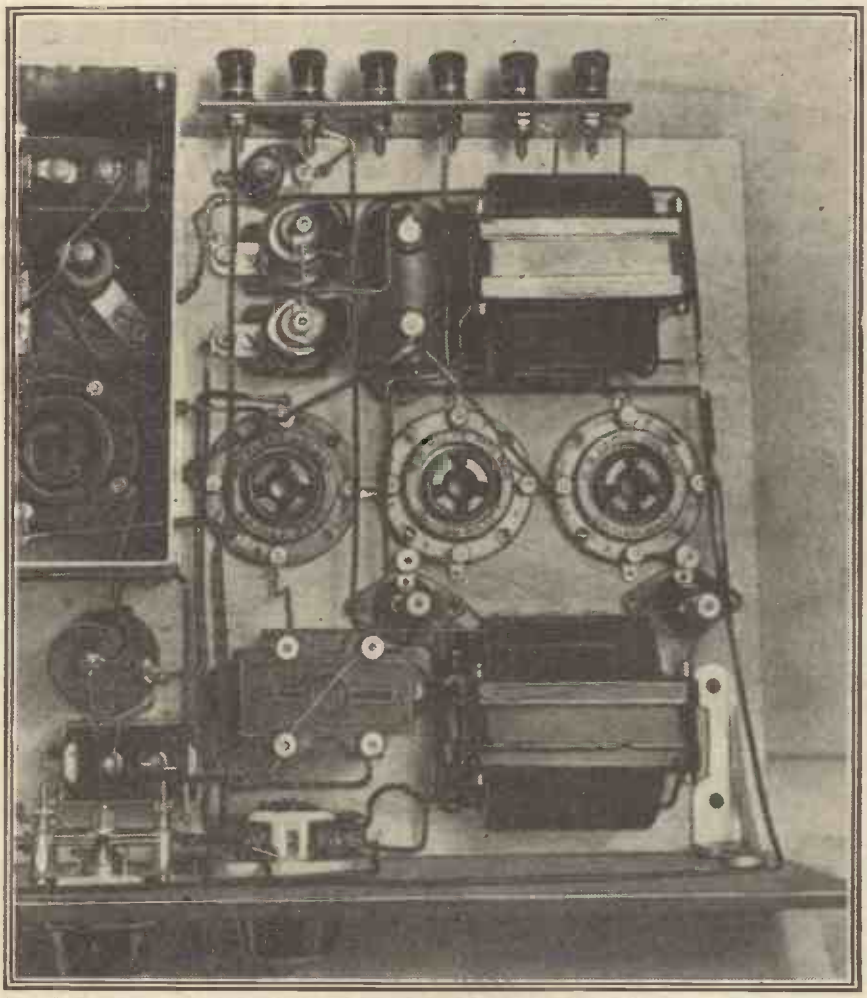


PANEL LAYOUT

In the ordinary reaction scheme the high-frequency component passes round the reaction winding when the plates are interleaved to a greater or lesser extent, but when they are "all out" or no reaction is being obtained there is obviously no path for this component to filament other than by forcing its way through the self-capacity of the choke or transformer, or other form of coupling.

## Always Path to Earth

In the differential reaction scheme, when the reaction condenser is "all out," and no reaction is being obtained, a path is made direct to filament, and, in fact, there is always in the present receiver a capacity of ·0001 mfd. to filament (either directly or through the reaction winding). Thus if you examine the diagram you will see that at the "full reaction" position high-frequency currents pass entirely from the moving plates to the fixed plates joined to the reaction winding, and at "no reaction" position the high-frequency component passes through the moving plates to the other set of fixed plates which are connected direct with the filament, the high-frequency component dividing itself in greater or lesser degree between the two sets of plates at the various intermediate positions.



*The L.F. stage, showing the push-pull transformers, anti-parasitic resistances, and the input transformer for the 1st L.F. valve. Note the connection here from H.T. to G.B. terminals on the transformer.*

# The "Push-Pull" Five—*continued*

There is no difference in the actual reaction control so far as the operation is concerned, but there is always a path either directly or indirectly to filament for the high-frequency component. The necessary condenser for giving this effect is mounted on the panel of the "Push-Pull" Five.

## The L.F. Transformer

Reaction having been obtained, the detector valve is coupled to the first low-frequency valve by a "Hypermu" low-frequency transformer, the makers of which have adopted rather a peculiar form of connection in order to get the wonderfully uniform amplification from low to high frequencies. In the theoretical diagram we have drawn the method of connection in the simplest theoretical way, and an examination of it will show that the anode current of the detector valve passes through a 30,000-ohm resistance (and also through a decoupling resistance which is shunted to filament by a 2-mfd. condenser), whereas the pulsating currents pass through a 1-mfd. coupling condenser to what is really an auto-transformer, so as to give the necessary step-up effect.

This particular form of coupling was first put forward, we believe, by Mr. Kendall-Clough, an American inventor, and Messrs. Radio Instruments are the first to make use of it in this country. It has a number of advantages of very distinct value.

## No Core Saturation

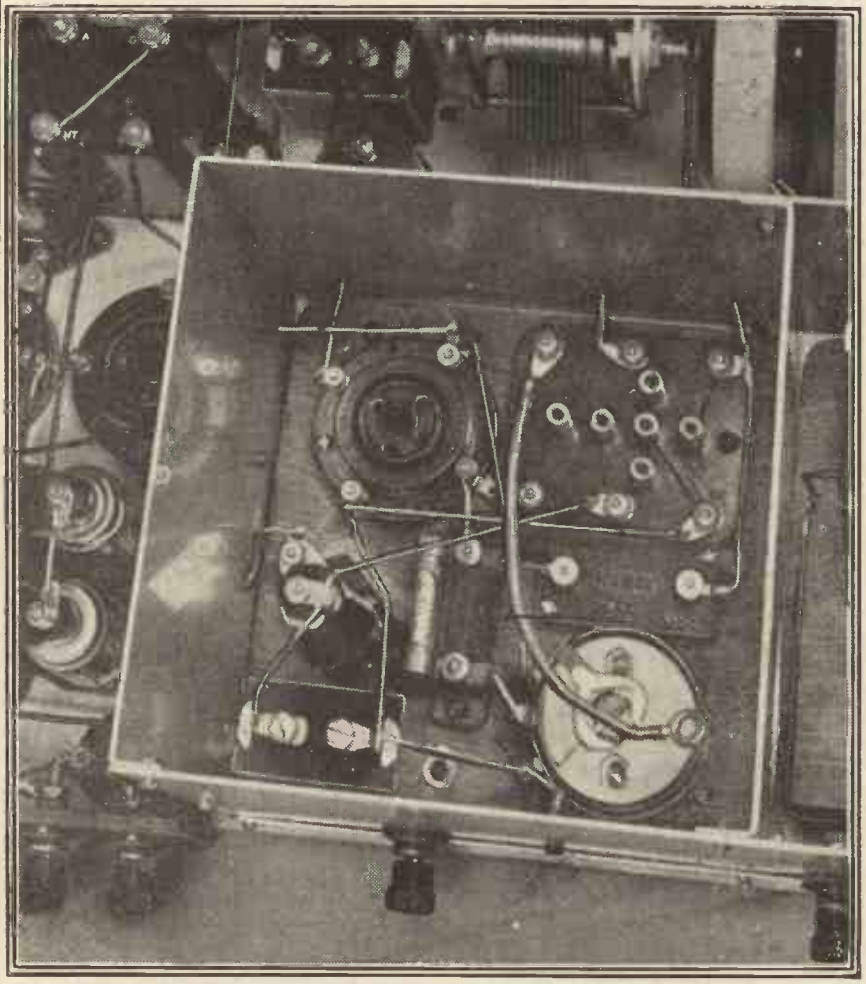
First of all, no direct current whatever passes through the transformer windings, and thus we are delivered from a number of troubles arising from saturation of the core, while by correctly proportioning the windings, using the right value of resistance and coupling condenser, a resonance phenomenon is utilised which raises the amplification where it normally would fall off, namely, at the lower end of the scale, so as to give, as is done with this transformer, practically the same amplification at 25 cycles (which is much below anything we want) up to somewhere in the neighbourhood of 7,000 cycles, which is certainly the upper limits of our needs. The magnification is also extremely high, and this brings us to another point, namely, the prevention of low-frequency interaction effects, due to battery coupling and other causes.

The actual form of coupling needed for this particular transformer is a 30,000-ohm resistance and a 1-mfd. condenser. The addition of a further 20,000-ohm resistance with 1 mfd. shunted to filament is to eliminate battery coupling, motor-boating, and other effects which are likely to arise if we are not careful with a highly efficient design. In view of the peculiar form of coupling adopted, the actual valves used are important, and it should be pointed out that the published curve was obtained with the D.E.L.610. Excellent results are, however, obtainable with other valves of similar characteristics.

The output of this transformer feeds the first low-frequency valve, which in turn is coupled to the output valves through another transformer, so as to give push-pull amplification. The push-pull scheme which has been used on a number of occasions very successfully in the WIRELESS CONSTRUCTOR has a number of virtues, one of the chief of which is that it enables us to handle considerable power without distortion and without the use of excessively high plate voltages, while the use of two valves in push-pull serves to eliminate a number of harmonic effects which otherwise would cause distortion at slight overload.

## Double the Output

Actually, a push-pull arrangement with two valves will give more than twice the output of a single valve, without noticeable distortion, and a further advantage is that battery coupling effects are also largely neutralised in this scheme. Thus by a careful design of the whole instrument, the use of a decoupling

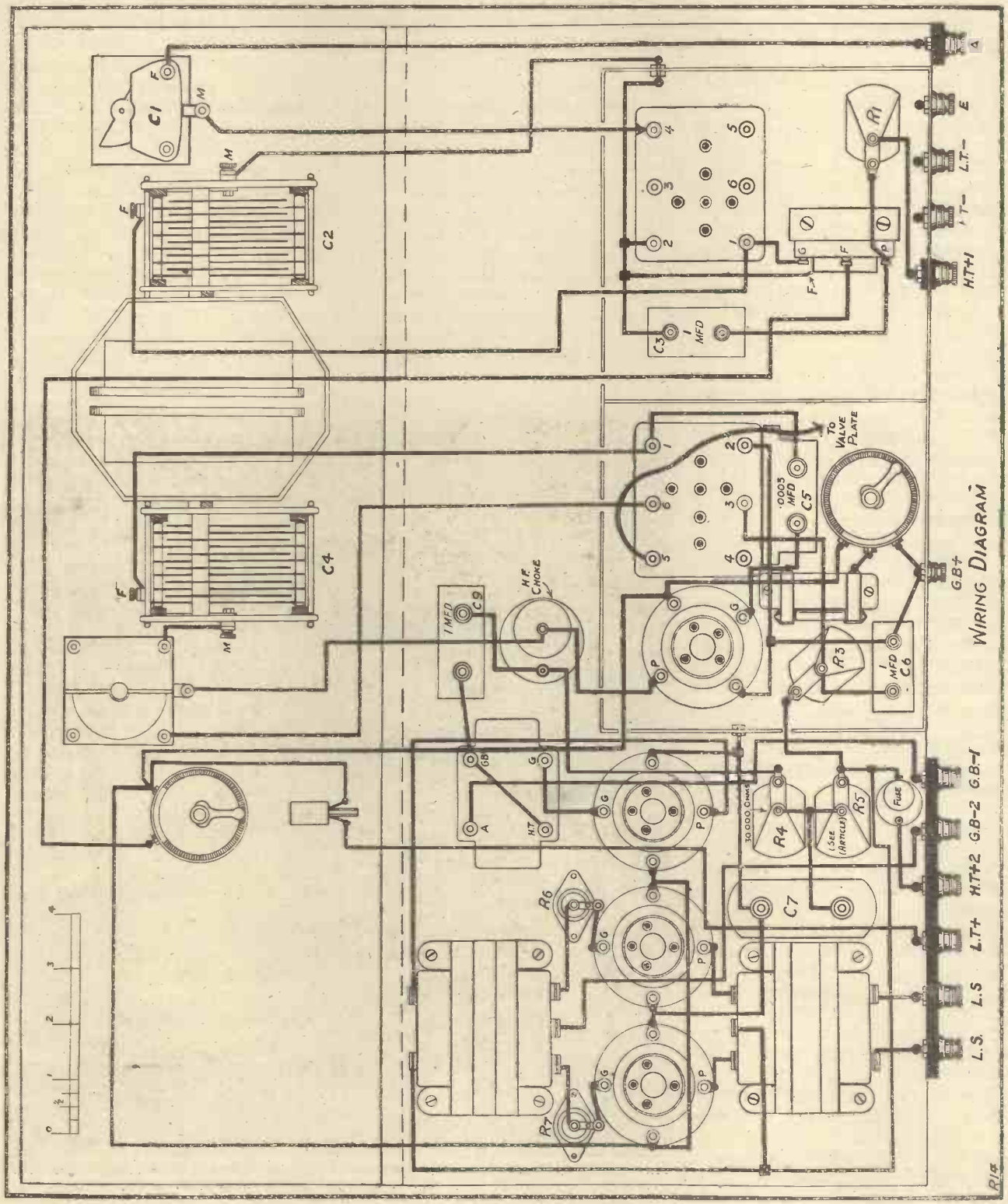


*The interior of the detector screening box. The hole through the screen for the H.F. valve is in the bottom right-hand corner.*

# The "Push-Pull" Five—*continued*

resistance and condenser in the detector stage and push-pull output, we are able to get a substantially uniform magnification over the whole musical range and a very high degree of amplification also. Indeed, it is doubtful whether any other home constructor's design ever published has given so much undistorted magnification at the low-frequency end, and this is one of the great features of the "Push-Pull" Five.

In a push-pull arrangement the two valves should preferably be matched, and all the valve makers will supply a pair of matched power valves for push-pull at no additional cost. In order, however, to allow for



# The "Push-Pull" Five—*continued*

slight difference between valves, and to prevent certain peculiar effects which occur in push-pull if the two valves are not matched, two 100,000-ohm resistances of the grid-leak type are inserted in each grid lead.

### Stopping Motor-Boating

Decoupling devices to prevent battery interaction effects are also used in the screening-grid circuit of the high-frequency valve and in the plate circuit of this same valve, and were found to be essential for best reproduction. By the choice of a suitable resistance in the circuit of the screening grid, the voltage for any given screened-grid valve can be brought down to the necessary figure, thus enabling us to use one high-tension voltage throughout.

Indeed, this method has been adopted for some time in WIRELESS CONSTRUCTOR sets, but an examination of the latest screened-grid valves show that they vary so much in screening current taken that it has been decided to use a separate high-tension terminal for the screening grid. However, as is explained in our screened-grid-circuit article, by the choice of a suitable resistance this terminal can be connected to the other high-tension positive terminals, and one voltage used throughout.

This then is the theoretical story of the "Push-Pull" Five, and now for the practical side. Incidentally, those readers who would like to examine the original instrument will have the opportunity of doing so at the Wireless Exhibition, for it will be on show at the WIRELESS CONSTRUCTOR stand throughout the whole of this period.

### Building the Set

The practical make-up of this set adopts a 21 in. × 7 in. panel, a 10-in. baseboard, and any suitable cabinet to meet the reader's taste. Great pains have been taken to make the constructional work simple without losing efficiency. Nothing essential or advisable is left out to give a spurious simplicity. Indeed, where an appearance of complication exists this is due to the close arrangement of components, and the actual wiring will be found quite easy as a considerable number of connections can be efficiently made without soldering by baring the ends of the wires, bending into loops and screwing under substantial terminals with which many of the components are provided.

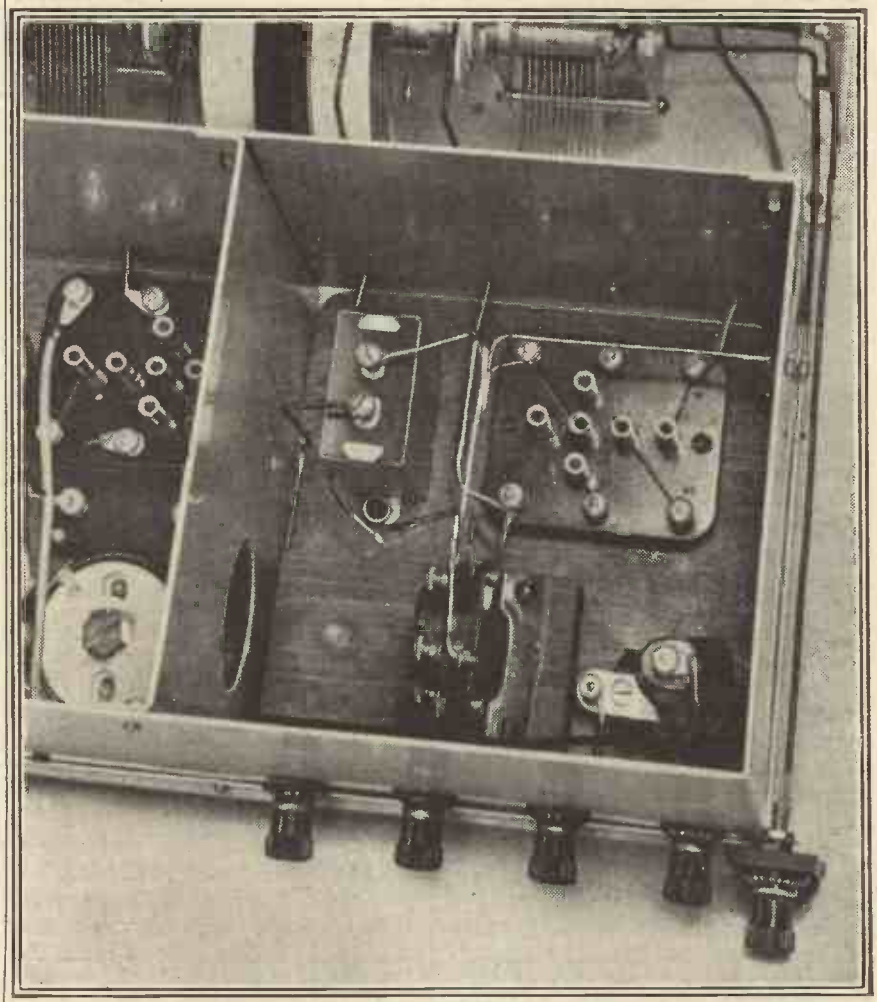
Although the advice has been frequently given in constructional articles in this journal, it is as well to repeat that the set should not be started before *all* the components have been assembled. It is wonderful how rapidly the work will proceed if you are systematic about it, and I would strongly advise you to follow the order of work about to be laid down, which is that adopted in the construction of the actual receiver.

First of all take the two panel brackets and screw them to the baseboard so that the vertical face of each bracket is a continuation of the front edge of the baseboard. Check this up by holding some flat object against the front and push up the panel brackets against it. Be sure that you screw the brackets in such a position that they will not foul the small strips inside the cabinet against which the panel rests.

### The Panel Brackets

When the brackets are in position, lay the baseboard on a perfectly flat surface, and hold the ebonite panel against the brackets in the proper position, being careful that the panel covers the front edge of the baseboard at both ends. Holding this firmly in position, take a sharp instrument, such as a needle pushed into a wood handle, and scratch through the *upper* hole of each bracket on to the panel at the back so as to indicate the positions of the fixing screws.

Do not trouble to mark positions for lower holes, as it is unnecessary in view of the fact that the panel will be secured against the front edge of the baseboard by three screws. Now lay a sheet of paper on the table,



***Six-pin coils are used for the tuning circuits, enabling easy wave-changing to be obtained.***

# The "Push-Pull" Five—*continued*

place the panel face downwards on this, and scratch a line along the lower edge of the panel at a distance from the lower edge equal to the thickness of the baseboard you are using. If readers purchase a baseboard with the cabinet you will generally find the thickness is $\frac{3}{8}$th in.

Next take a centre-punch and a hammer. If you have not a centre-punch you can buy one for a few pence at Woolworth's, or one of slightly better make at any tool shop. Place its point exactly in the centre of the small circle you have scratched through the bracket holes and give it a sharp tap, making an indentation for your drill point.

## Cutting Large Holes

Immediately below each of these marks and half-way between the bottom edge of the panel and the line you have scratched make another indentation for a screw hole; then make another half-way along the panel, also intermediate between the line and the bottom of the panel. These three lower holes will take the round-headed wood screws which will secure the panel to the front edge of the baseboard.

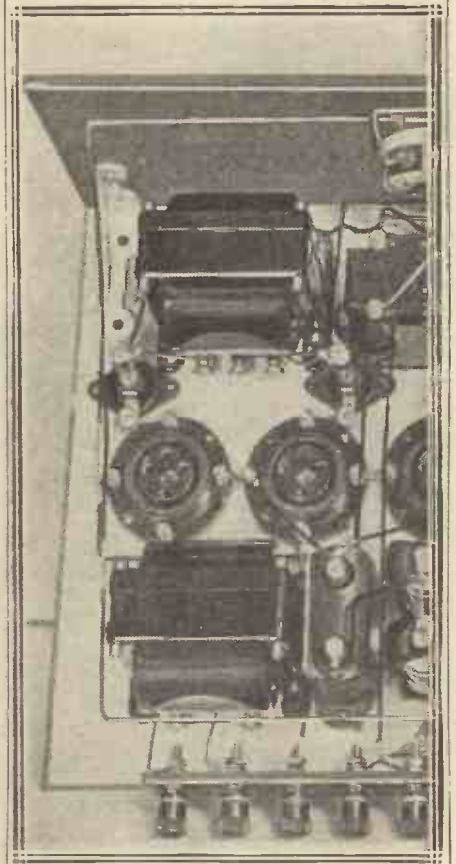
Next, with the panel-drilling diagram, mark out the positions of the other parts. Don't forget you are marking on the back. You will find in the box containing the drum-dial assembly a cardboard template, and if you lay this in the correct position on the panel (securing it with gum temporarily) you can mark with a hammer and the centre-punch the various positions. The card will show you how to cut out the large holes by means of a number of drilled holes, but I have always found this a very tedious process, and it is far simpler to drill a hole at each corner and then to cut out the ebonite with a fretsaw. Cutting ebonite with a fretsaw is very easy, and I never dream of adopting any other method for cutting a large hole in a panel. Although I have bought several tools designed for cutting large holes, yet I find none of them half as good as the ordinary fretsaw.

## Use a Centre-Punch

Whatever you do, avoid trying to drill holes without making an indentation with a centre-punch to take the tip of the drill. Without such an indentation the point of the drill is sure to wander slightly and you will not be able to fit the parts accurately.

I have taken a little more space than usual in telling you how to start on the work, for the panel is the part which shows itself to everyone, and a well laid-out and finished panel gives that professional appearance to a set which we all desire.

Before mounting the various parts on the panel, recess the two upper holes for the brackets with a small countersink bit, or if you do not possess such a tool use the point of your



*The push-pull section of the set is shown above.*

$\frac{3}{8}$-in. drill to make a small conical recess just sufficient to take the countersunk head of the metal screw which will hold it to the panel. I always make this hole a little deeper than necessary and then fill it up with a little black or brown wax which can be very easily smoothed off. This wax is melted in, and when it is set, sliced off flush with the panel with a pocket knife. A rub with a cloth will polish it off and make the holes quite indistinguishable.

Now mount all the components on the panel and fasten it to the front edge of the baseboard with the two screws and nuts as just mentioned and with three round-headed (and preferably japanned) screws along the front. Stand the screening box in the exact position shown in the practical wiring diagram and lay out the baseboard components as nearly as possible as in the illustration. When you are sure you have them all placed correctly, screw them down ready for wiring.

## Screening Box Terminals

The terminal strip should next be cut and screwed into position. You can now lift off the screening box and screw into it the terminals for earth, low-tension negative, high-tension negative, and grid-bias positive in the positions shown. These terminals in a non-screened set would all be joined together, and as the screening box is connected to L.T.— and to earth these terminals are all screwed directly into it, and thus avoid a good deal of wiring.

As, however, the shanks of the terminals will be a little too long as they are, they should be cut off to a length only just sufficient to project through the screening box and to take the locknut. Otherwise they will foul the small baseboards which we want to insert into the screening box.

One terminal, however (H.T. positive 1), is not joined direct to the box, but is insulated from it. This is done by drilling a hole larger than the shank requires and fitting it with insulated bushes. The makers of the screening box will supply you with the necessary bushes for this terminal on request. As this terminal will have a shank which will project farther than the others, it should not be inserted until later.

## Arranging the Components

We must now arrange the components on the small baseboard that goes in the first screening section. This small baseboard will ultimately be secured to the main baseboard by wood screws, which will pass through specially made holes at the bottom of the screening box.

If, as is probable, the holes are already made in the small baseboard, see that you use this the correct way round so that the holes in the small baseboard come immediately above the corresponding holes in the bottom

# The "Push-Pull" Five—*continued*

of the screening box. Also be careful when arranging your components not to cover these holes.

Beyond making sure that the six-pin base is placed in the correct position as regards its terminals, there is nothing calling for special mention in this part of the work except that you must obtain a small block of wood which will raise the special screened-grid valve holder to a height so that the screened-grid valve can be passed through the hole in the screening box into the holder correctly. The makers of the screening box will supply you with the necessary block of wood to suit the particular make of valve holder specified.

## Check Your Wiring

Now proceed to the arrangement of parts on the small baseboard of the second screening section and screw them in position. You will find that you can do a good deal of the wiring on both these baseboards before they are inserted in the box. A flexible lead terminating in a loop should be soldered to No. 5 terminal on the six-pin base of the second part, so as to provide the necessary connection to the plate terminal of the screened-grid valve.

Wiring of the rest of the set should now be begun, and it is a good plan to mark off each wire on the wiring diagram as it is put into place. If you do this with a coloured chalk you will soon distinguish which wires have been done and which have been omitted.

Many people building sets from this journal obtain a second copy, cut out the theoretical diagram and paste inside the lid of the cabinet, and use the practical wiring diagram for marking off purposes, so as not to spoil their file copy. The additional sixpence is well spent in this way.

## Double Insulation

You will find it most convenient to leave the final wiring of the screening box until last, as it can be taken away from the baseboard and thus will give you plenty of room for making most of the other connections. Those connections which pass through holes in the screening box should be very carefully made, and in order to avoid any possibility of short-circuiting I recommend you to cut off short lengths of thick Systoflex or other suitable insulating material and slip them over the wires so that double insulation is supplied at all the points where wires pass through the box.

A little ingenuity will be needed in passing stiff wire leads through the holes and securing them in the correct position, but it will not be so difficult if such leads are made in two pieces and soldered together at some convenient position outside or inside the box.

If this work proves rather difficult for you I would recommend you to use flexible rubber-covered wire for leads which pass through the screening box. The appearance will not be quite so smart, but you will lose nothing in efficiency providing the leads are taken as shown in the wiring diagram.

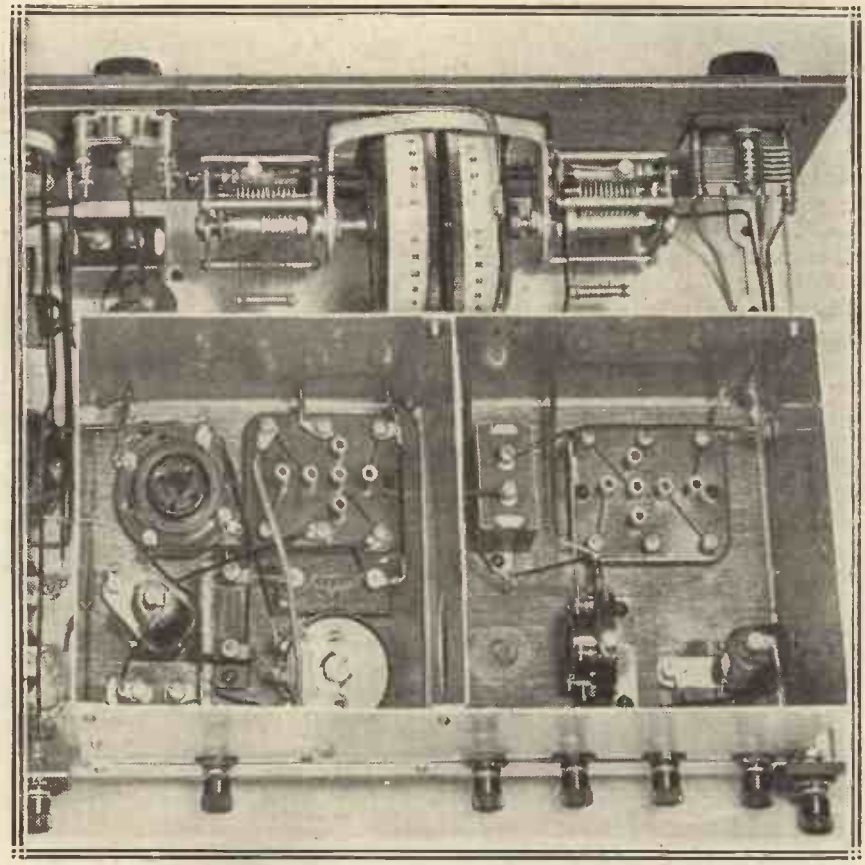
Wherever a connection is made to the screening box itself, take a 6 B.A. metal screw of the cheese-head variety, pass it through a convenient hole, and lock it with a nut, placing a soldering lug underneath the nut before it is screwed into position.

Where in one or two cases connection is made to the screening box at both sides, two soldered lugs will be used, one each side. Do not attempt to solder directly on to the box. You will not be able to do this in any case with aluminium, and it will be very difficult to manage neatly with copper boxes.

## Important Connections

When wiring-up, pay particular attention to the following connections. The low-tension positive goes from its terminal to one side of the on-and-off switch, the other side of which goes to one terminal of the 30-ohm resistance. From *this same terminal* a lead to the detector valve and to the three low-frequency valves is taken. The other terminal of the filament resistance goes to the filament of the screened-grid valve. Thus when the on-and-off switch is on the full voltage is supplied to all valves except the screened-grid valve without interposition of any filament rheostat, this last being solely for controlling the filament current of the screened-grid valve.

(*Continued on page* 376)



***This photograph gives a very good idea of the layout of the H.F. and detector side of the receiver. Note how the components are arranged in the screening boxes.***

# Radiogramophonics

*The electric gramophone—record cabinets—suitable needles.*

By A. JOHNSON RANDALL.

ELECTRIC gramophones are becoming more popular every day. What, then, is the reason for this popularity? At first consideration it would appear that the electric gramophone has no advantages over a good quality sound-box type. Whilst this may at one time have been true, it does not apply nowadays. As a matter of fact, some of the more expensive models of the better makes of gramophones are now electric ones.

The main point where an electrical gramophone scores over the ordinary type is in the question of quality or naturalness of reproduction. This is, of course, provided a superlative loud speaker, such as one of the moving-coil type, is employed.

A first-class electrical pick-up enables one to take advantage of the special features of this type of speaker, which is certainly a point in its favour.

## Several Advantages

Other main advantages are that the volume can be as great as is desired for any purpose, and it can easily be adjusted from a mere whisper to full concert hall strength. Also, if an electric motor is incorporated the tedious job of winding after every few records is completely obviated.

Turning now to the points of attraction to the home constructor, we find that there are several, apart from the advantages outlined above. It is well within the scope of the home constructor to make a really good electrical gramophone, whereas the question of making an ordinary gramophone is entirely beyond the powers of the average enthusiast.

If a wireless set is incorporated with the gramophone it is possible to save a considerable amount of money, since the amplifier can be made to serve both for the records and the wireless. Also, if the apparatus is run off the mains one set of eliminators will serve for wireless and gramophone.

Most people are prepared to go to a large amount ω ensure that they obtain a really good electrical gramophone so that quality will be good. Also they are quite prepared to buy expensive records, but little time or money is spent in looking after records. After all, this is rather silly, because unless the records are in good condition, no matter how superlative the reproducing apparatus is, the results will be disappointing.

If possible a special cabinet should be available for the records, or at least a special compartment provided in the gramophone itself. In any case, all records should be put away in separate covers, as two records rubbing together can do untold damage in an extremely short time. It is also advisable to dust the records occasionally, since otherwise the particles of dust will be ground into the walls of the channels by the needle. Special dusting pads may be obtained very cheaply, and they are very effective. Last, but not least, there comes the question of needles.

With ordinary needles it is worth while to have a new needle for each side of the record, since, as has often been remarked, "Needles are cheaper than records." An ordinary needle is beginning to wear fairly badly after one record, but do not think that the ideal needle would not wear at all. As a matter of fact, it is intended during the first few channels of a record that the needle shall wear itself more or less to the shape of them, so as to make a good fit. At the end of the record, however, it will have worn more than is desirable.

*The Gambrell radio-gram receiver—an example of up-to-date design.*

## Needle Scratch

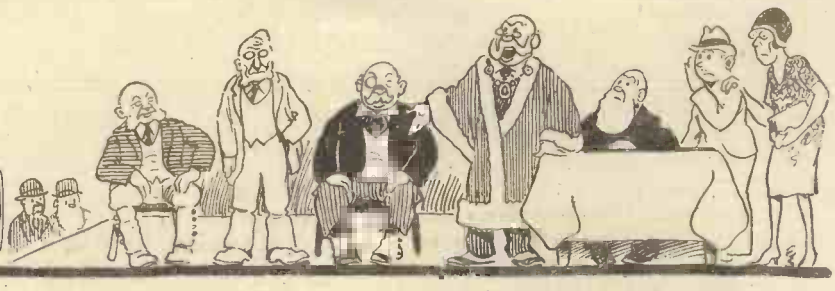
With a needle of the type that will play several records, the needle is probably only just wearing in properly after the first record. Referring to special types of needles reminds us of an interesting query recently received from a reader.

He said that although his radio reception was perfect, when he used his pick-up the amount of scratching noise was terrible, and wanted to know whether the use of an output filter would help. Of course, a good output filter should faithfully pass on all that is in the plate circuit of the last valve, and therefore a cure could not be hoped for along that line.

The use of a scratch filter would have helped, no doubt, but, then, scratch filters as we know them today cut off the very high frequencies (scratch noises come within this band), and consequently are not very desirable.

# IN LIGHTER VEIN

By WIRELESS WAYFARER.



"AND now," said Sir K. N. Pepper, as the Club sat in general meeting round his dining-room table, "I will call upon the treasurer to present his balance-sheet. But where, by the way, *is* Mr. Goshburton Crump?"

I rose to my feet, silencing with a haughty stare those who began to shout "Sit down!"

"Mr. Goshburton Crump," I announced, "was prevented at the last moment from coming, owing to a slight accident to his foot caused by his lawn-mower."

*"He went over it."*

"Did it go over him?" bleated Miss Worple solicitously.

"No," I said. "Mrs. Goshburton Crump left it just inside his workshop door, in the way that wives have, and he went over *it*. Anyhow, he asked me to bring along the accounts and here they are."

"What's our balance?" asked the chairman.

"Two hundred and fourteen pounds seventeen shillings and twopence half-penny," I read out, and really I couldn't help feeling rather proud of it.

## A Slight Mistake

The meeting seemed electrified.

"Are you certain?"

"You are quite sure?"

"You are not making a mistake?"

"We really have got a balance?"

"Well, look for yourselves," I said, laying the document down on the table. They scrambled round it like chickens at feeding-time.

"You silly ass!"

"You blithering goat!"

"You cock-eyed fathead!"

"You worn-eyed, knock-kneed, flat-footed chump!"

That is the kind of thing that his friends say to the most brilliant member of the Club when they become a little heated.

"What's the matter?" I cried.

They all started telling me at once, and it wasn't until the chairman, making a bad shot with his hammer, had rapped soundly upon Professor Goop's knuckles that anything like silence was obtained. Even then it wasn't quite silence, for in a flash the professor, with the light of battle in his eyes, had peeled off one of his elastic-sided boots and leaped, shouting his battle-cry, at Sir K. N. Pepper. Strong men, however, disarmed and quietened him before there was time for much damage to be done.

"It appears," remarked the chairman acidly, "that you don't know the difference between Dr. and Cr."

I hotly resented the insinuendo. I told them that I understood accounts perfectly. All that accountants and such-like appeared to do was to put down as if they were owed by you things that you possessed, and to show as possessions the things that you owed. Then they put down the balance on one side or the other, make both columns add up alike, and that was that.

## "In the Cart"

The chairman sighed and told the meeting that so far from there being a balance in the Club's favour it was actually in the cart to the tune of £214 17s. 2½d.

Everyone looked horrified except me.

"What of that?" I asked.

They all explained that it meant that we hadn't got any money; in fact, we had less than no money.

I told them that I had always been like that, and that only the vulgar rich nowadays were anything else but overdrawn. This, however, did not seem to console them in the least, and the general opinion seemed to be that something must be done about it at once.

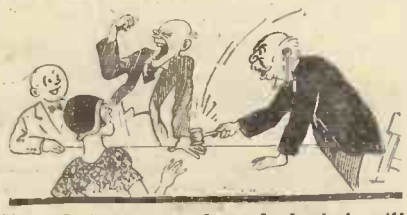
"It is pretty clear," said Captain Buckett, "that we must raise the wind. How is it going to be done?"

All kinds of schemes were suggested. Miss Worple's idea for a regatta was perfectly sound, except for the fact that as a result of the drought no water remained in the canal. The professor offered to test out the virtues of his new high-explosive (made from the emanations collected at Savoy Hill during the sacking of a batch of announcers) by blowing up the vaults of the local bank, but this met with as little support as Tootle's proposal that there should be a whip-round.

## A Wireless Exhibition

When they had all finished airing their silly ideas, I rose once more to my feet. I am sorry to say that again I was bothered with cries of "Sit down!" In fact, I had to put in some pretty shooting with an inkstand and several heavy volumes before the meeting was brought to realise that I deserved a hearing.

"There is only one thing for it," I said; "we must have a wireless exhibition."



*The chairman made a bad shot with his hammer.*

The idea caught on at once. A committee was elected forthwith. I regret to say that I was not upon it, but in accordance with the present fashion the chairman announced that my services would be available in an advisory capacity. It was also unanimously agreed that Captain Chuckersley should be requested to come down and declare the exhibition open.

When the great day dawned—no, let us start again; I am not fond of anything that has to do with dawn. There are queer people who like to see the sun rise over this or over that, but I am not one of them. Give me the good old sun somewhere about due

# In Lighter Vein—*continued*

south when I open my eyes and I know that the world has been well aired before I get up.

Anyhow, when the great day came round I made my way to the scene of the festivities. In the field near the sewage farm I found, to my surprise, not one, but two enormous marquees. The crowd assembled round the platform that had been erected between them was truly terrific. Presently a procession, headed by the mayor in his robes, appeared. When all had made their way on to the platform the mayor rose, and was completely inaudible for sixteen minutes by the clock.

### The Surprise Item

He waved his hand towards a little, fat man on his right, who rose to his feet, pulling at his collar and looking distinctly uncomfortable.

"That's Captain Chuckersley," I murmured to Miss Worple, who had joined me.

"Perfectly sweet!" murmured Miss Worple. "Isn't he *handsome?*"

The little fat man, still tugging at his collar, remarked, so far as I could hear, "Great honour—er—er—er—er—wonderful show—er—hrmph—hrmph — muchpleasureindeclaringtheexhibitionopen."

*"Them's saddle-back pigs from Berkshire."*

When the wild cheering had subsided, Miss Worple, who said that she recognised Captain Chuckersley's staccato style, asked me to take her along to view the exhibits. By using my elbows freely and shouting "Make way for her Ladyship!" I soon had a road cleared towards the first tent.

Just inside the door was a kind of penthouse affair, which looked most intriguing. We examined the outside of it with great interest.

"What can it be?" said Miss Worple.

"The surprise item," I suggested.

By this time our handkerchiefs had come up to our noses.

I can assure you that it really *was* surprising.

"I can't think what it is," snuffled Miss Worple through the folds of her handkerchief.

"Telesmellypathy," I re-snuffled; "the latest wonder of wireless. This, I expect, is a short-wave transmission. It probably comes from Timbuctoo."

"That 'ut dooant," said a bucolic voice at my elbow.

### Something Wrong?

"What on earth do you know about it?"

"Lot more'n you do, so it seems."

"Oh, very well, my good man, perhaps you will tell us?"

"Them's saddle-back pigs from Berkshire. Vinest litter as ever I did zee."

I was about to crush him, when a large mobile ham-and-bacon factory, followed by about seventeen small ones, emerged from the penthouse into the enclosure in front of it with a chorus of grunts and squeaks.

"It certainly *is* a surprise item," said Miss Worple.

We moved on. The next thing that we struck was a stand covered with gigantic vegetable marrows, and after that there came a vast pile of turnips round which numerous yokels clustered lost in speechless admiration.

"Do you think they are all surprise items?" asked Miss Worple.

I told her that it was obvious that the club had arranged a number of these exhibits in order to attract the greatest possible number of rustic visitors. Obviously they would be arranged just inside the entrance. In a moment or two we should come to the wireless part of the show.

We proceeded. Things went from bad to worse. The turnips were followed by cabbages, beans, sheep, cauliflowers, cows, onions.

### Entirely "Wire-less"

"Anyhow," I said, "you will agree that it is an entirely wireless exhibition. So far we haven't seen a single wire. But where can all the rest of the people be?"

Just at that moment Primpleson, looking rather careworn, appeared round the corner of a stall devoted to patent fertilisers.

"Wonderful show," I said.

"Marvellous!" squeaked Miss Worple, now almost in hysterics.

"The broadcasting power of some of these exhibits," I went on, "has to be experienced before it can be believed."

"Astonishing!" yelped Miss Worple.

"It is most unfortunate!" gasped Primpleson.

"What do you mean?"

"Well, you see, our committee didn't quite realise that the Mudbury

*"The tea interval," I remarked.*

Wallow Agricultural Society had booked the field for the same day."

"But didn't Captain Chuckersley conduct the opening ceremony?"

"It all got rather mixed up, and the little man that you doubtless heard was Lord Blottislow, the great agricultural expert."

### The Tea Interval

"But I recognised that staccato style," murmured Miss Worple.

"Why," I cried, "those topical talks on foot and mouth disease, of course! Don't you remember how thrilling they were? But tell me, Primpleson, isn't the club here at all?"

"Oh, yes!" replied Primpleson. "Ours is the other big tent. A wonderful show. Do come along and see it."

"And what," I asked, "is that third tent that I can now see behind the second?"

"That's the tea marquee," said Primpleson.

"The tea interval," I remarked, turning to Miss Worple, "is now clearly indicated, after which I think the innings will be declared closed."

BUILD THE "PUSH-PULL" 5

# The Ready Radio Review & Buyers' Guide

USE THE READY RADIO SERVICE

No. C.1. SERVICE FOR THE MILLION. OCTOBER, 1929.

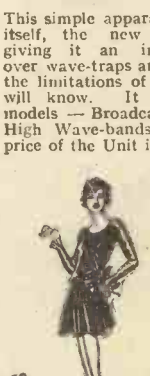
## SELECTIVITY & THE LISTENER

The most interesting event in Radio undoubtedly is the B.B.C.'s inauguration of its Regional Scheme by the opening of Brookman's Park, and we are all now thinking of ways and means of meeting the new conditions.

The Set Designers are creating receivers to meet the Set Constructors' needs; the Manufacturers will soon be producing more selective sets than heretofore, or have by now placed on the market apparatus to meet the requirements of those who wish to retain their present receivers without making experimental alterations. It is acknowledged on all sides that the most interesting development this year is the discovery which made possible the


### *Ready Radio* SELECTIVITY UNIT

This simple apparatus is on a plane by itself, the new principle employed giving it an immense superiority over wave-traps and similar apparatus, the limitations of which most readers will know. It is supplied in two models — Broadcast and High Wave-bands. The price of the Unit is - - **20/-**



SAY SUSIE FOR SHORT

**MEET "SUSIE" AT OLYMPIA, STAND 93.**

## THIS MONTH'S SET

## THE 'PUSH-PULL' FIVE

By PERCY W. HARRIS

## PRICE LIST OF CORRECT PARTS

| | £ | s. | d. |
|---|---|---|---|
| 1 Cabinet 12" x 7" x 10" .. | 1 | 12 | 6 |
| 2 Ready Radio brackets .. | | 2 | 6 |
| 1 Mahogany-finished panel 21" x 7" (Resiston) .. | | 11 | 6 |
| 1 Lotus double-drum assembly with two ·0005-mfd. condensers .. .. .. | 1 | 9 | 6 |
| 1 Lotus ·0001-mfd. variable condenser .. .. .. | | 5 | 0 |
| 1 Lotus ·0001 mfd. differential reaction condensor | | 5 | 0 |
| 1 Igranic 30-ohm panel mounting rheostat .. | | 2 | 6 |
| 1 Ready Radio on-off switch | | 1 | 3 |
| 1 Ready Radio special shielding box with baseboards .. .. .. .. | | 15 | 0 |
| 1 S.G. valve holder .. .. | | 1 | 3 |
| 4 Antiphonic valve holders | | 5 | 0 |
| 1 Varley 30,000 ohms wire-wound resistance with holder .. .. .. .. | | 5 | 6 |
| 1 Varley 20,000 ohms wire-wound resistance with holder .. .. .. .. | | 5 | 6 |
| 1 Varley 2,500 or 3,000 ohms wire-wound resistance with holder .. .. .. | | 5 | 6 |
| 1 Varley wire-wound resistance (value to suit) with holder .. .. .. .. | | 5 | 6 |
| 3 1-mfd. fixed condensers.. | | 7 | 6 |
| 1 2-mfd. fixed condenser .. | | 3 | 6 |
| 2 Lewcos 6-pin coil bases.. | | 5 | 6 |
| 1 Lewcos B.A.C.5 .. .. | | 10 | 0 |
| 1 Lewcos B.A.C.20 .. .. | | 12 | 0 |
| 1 Lewcos C.S.P.5 and No. 10 primary .. .. .. | | 13 | 6 |
| 1 Lewcos C.S.P.20 and No. 20 primary .. .. .. | | 16 | 6 |
| 1 Lissen baseboard mounting potentiometer .. | | 1 | 6 |
| 1 Lissen ·0003 fixed condenser .. .. .. .. | | 1 | 0 |
| 1 Lissen 2-meg. grid leak .. | | 1 | 0 |
| 1 Dubilier leak holder .. | | 1 | 0 |
| 1 Ready Radio R.F. choke | | 6 | 6 |
| 1 Hypermu L.F. transformer | 1 | 1 | 0 |
| 1 Ferranti A.F.5C. push-pull output transformer | 1 | 14 | 0 |
| 1 Ferranti O.P.3C. or O.P.4C. push-pull output transformer .. .. | 1 | 5 | 0 |
| 2 Dubilier vertical leak holders .. .. .. | | 2 | 0 |
| 2 Ediswan vacuum 100,000 resistances .. .. .. | | 3 | 0 |
| 1 Ready Radio H.T. fuse .. | | 1 | 6 |
| 12 Belling Lee indicating terminals (insulated type) | | 6 | 0 |
| 1 Terminal strip 1" x 2" .. | | 0 | 3 |
| 1 " " 6" x 2" .. | | 0 | 9 |
| Quantity of connecting wire, screws, etc. .. | | 2 | 0 |
| **VALVES.** | | | |
| 1 Screened Grid .. .. .. | 1 | 2 | 6 |
| 1 Medium Impedance .. | | 10 | 6 |
| 1 H.F. .. .. .. .. .. | | 10 | 6 |
| 2 Matched Power .. .. | 1 | 5 | 0 |
| Total .. .. .. | £18 | 16 | 6 |

Any of the above components can be supplied separately, if desired

## SERVICE AND SATISFACTION

The two words 'service and satisfaction are inevitably linked together. Without service there can be no real satisfaction. When you buy radio parts you naturally want exactly what you order and you want them quickly. You also would be happier with the knowledge that in the event of subsequent difficulties you can obtain technical advice without trouble.

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## THE EXHIBITION

This year's Radio Exhibition will be even more interesting than its predecessors. We venture to forecast that a great advance will be seen in the production and design of mains-receivers and apparatus. From other manufacturers we have had notices of a number of interesting developments in this respect. We ourselves are introducing a new type of moving coil speaker—the Dynamic Reproducer, which shows a great advance in the quality of reproduction. Its wonderful response to the whole of the musical scale and the crisp reproduction of speech are of great interest to those who are not satisfied with the existing quality of either radio or gramophone reproduction. The incorporation of radio with the gramophone has also made great strides, and models to suit all pockets will be seen at Olympia.

## CATALOGUE INFORMATION

### READY RADIO PRODUCTS OF PROVEN PERFORMANCE

| | s. | d. |
|---|---|---|
| H.F. CHOKE .. .. | 6 | 6 |
| H.T. FUSE & BULB .. | 1 | 6 |
| NON-INDUCTIVE WIRE-WOUND RESISTANCE (with holders) 500, 600, 1,000 .. .. .. .. | 2 | 9 |
| 2,000, 3,000, 4,000, 5,000, 10,000 .. .. .. .. | 4 | 6 |
| 20,000, 30,000, 40,000, 50,000 .. .. .. .. | 6 | 6 |
| 100,000, 150,000, 200,000 250,000.. .. .. .. | 8 | 6 |

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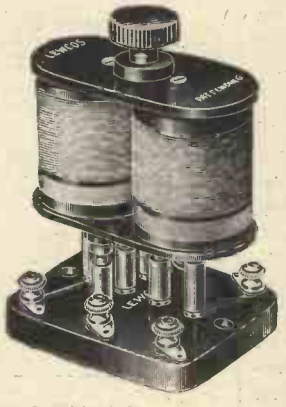
# SELECTIVE TUNING ON ANY WAVELENGTH!



BINOCULAR COIL
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SUPER COIL
(Pat. No. 285,723)

*Lewcos Binocular and Super coils produce a high degree of sensitivity—*

The Lewcos Binocular coils are specially designed to prevent interaction and for use in multi-stage receivers without screening.

| | |
|---|---|
| BAC 5 | 10/- |
| BAC 20 | 12/- |
| BSP 5 | 15/- |
| BSP 20 | 20/- |
| BSG 5 | 10/- |
| BSG 20 | 12/- |

Lewcos Super Coils with interchangeable primaries are designed specially for use with Triodes or screened-grid valves.

PRICE:

| | |
|---|---|
| 250-550 metres | 10/6 |
| 1000-2000 metres | 12/6 |
| Interchangeable Primaries | 3/- and 4/- |

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STAND No. 64

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# WITHIN THE VACUUM

*The winter radio season always brings with it new things—components, sets, mains units, and valves. Here is discussed the new two-volt range of Mazda valves.*

By KEITH D. ROGERS.

FOR this month's article on valves I do not think I can do better than to discuss the new range of 2-volt valves brought out by the Mazda people. These Mazda valves are the result of the amalgamation of very well-known valve companies, and constitute a most noteworthy achievement.

A complete 2-volt range has been brought out, and placed upon the market on the first of this month, under the headings of the H.210, the H.L.210, the L.210, the 215 S.G., the P.220, the P.240, and the Pentode 230. Thus we have seven new 2-volt valves showing some very interesting and valuable characteristics.

## Misleading Nomenclature

Taking them in order, we find we come to the one which is perhaps the least interesting of all—the H.210. Unfortunately the makers have chosen to use the letter H to denote a resistance-capacity valve. Why the letter H is used perhaps they can best explain, for it seems to me only to confuse matters. But there it is.

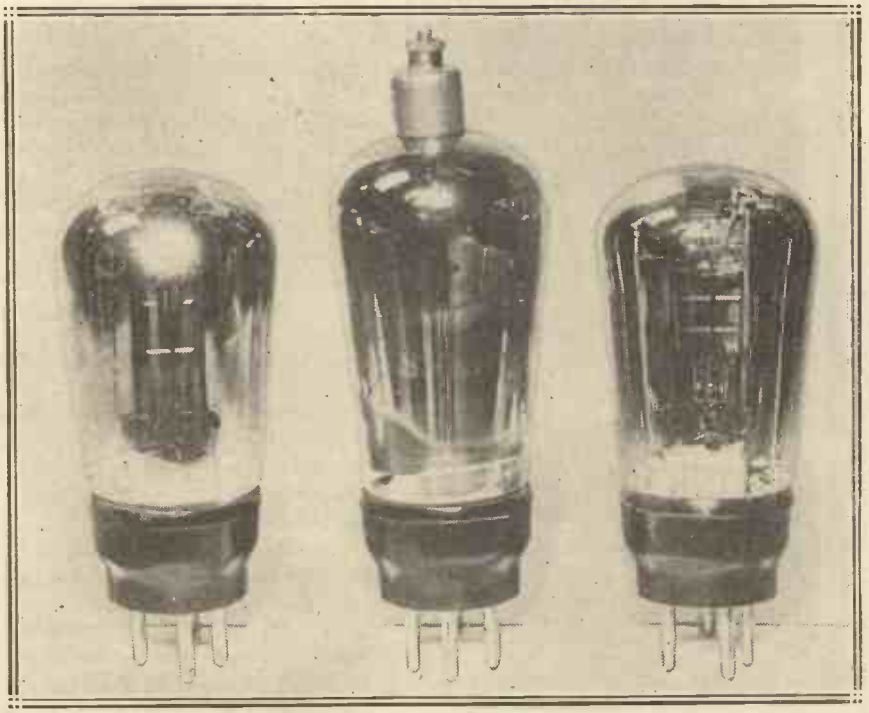
This valve has excellent characteristics, and, of course, in common with most resistance-capacity valves it has a very high impedance. The latter is 59,000 ohms, while the amplification factor is 37, giving a slope of ·8. The grid swing available at about 150 volts is just over the two-volt mark, with a grid bias of about —1 to —1·5 volts. Thus at 100 volts the grid swing is only about just over 1 volt.

## Good Characteristics

The H.L.210 is a much more useful valve, and is of the H.F. variety, though, as its lettering denotes, it can be used in certain circumstances as an L.F. valve. The H.T. voltages may range from anything from 75 to 150 volts, with the bias as an H.F. amplifier from 0 to – 3. As an L.F. or detector this valve acts excellently.

The characteristics are: Amplification factor 26, anode impedance 21,000, giving a slope of 1·25. These are taken with the H.T. voltage at 100 and the grid bias at zero.

Next we come to the L.210, which is a low-frequency valve capable of giving very excellent results indeed, and can be recommended as a most



*The Mazda H.L.210, S.G.215, and P.220 valves—three mighty members of the new 2-volt range.*

# Within the Vacuum—*continued*

valuable valve for all general-purpose sets, either as a detector with grid-leak rectification, or as a first-stage L.F. valve in a two-stage L.F. set.

As a detector, transformer-coupled to the next stage, this makes an excellent valve, but for the output stage it is preferable to use the P.220 type, rather then the L.210, if a medium valve is required.

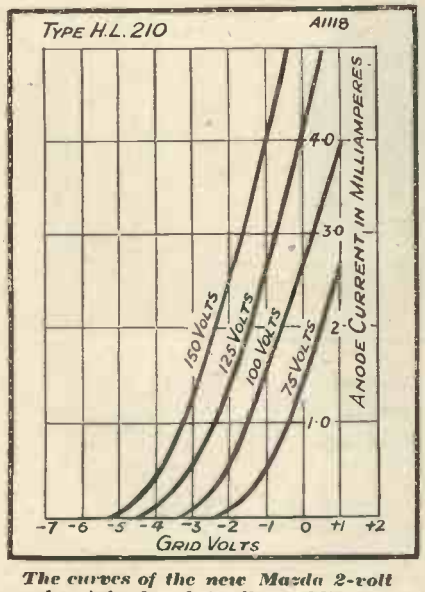
## High Efficiency

The characteristics of the L.210 give us a magnification factor of 15·5, with an impedance of only 10,000 ohms, giving an efficiency factor or mutual conductance of 1·55. These are, of course, excellent figures, and the makers are to be congratulated on putting out a very useful valve indeed.

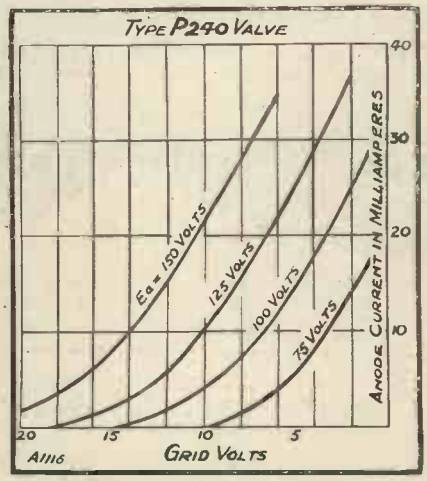
The grid swing is ample, going up to about 6 volts at 150, with bias just over 3 volts, or about 3 to 4 volts at 100 volts, biased at about 1·5 to 2 volts.

And now we will leave the ordinary valves and discuss the screened-grid valve—the S.G.215. This valve is of the ordinary normal type, fitted with the four pins at one end, the screen being connected to the normal plate pin, while the anode of the valve is connected to a terminal at the top of the bulb.

Recommended H.T. voltages are from 120 to 150, and the screened-grid volts should be somewhere about 60 to 75 volts. The characteristics give the valve an amplification factor of 300, with a mutual conductance of 1·1 at 150 volts anode and 60 volts screened-grid H.T.. The effective inter-electrode capacity is only ·005 micro-microfarad, and on test the valve gives excellent amplification, and when adequately screened shows no tendency to self-oscillation. It takes about 4 m.a. from the H.T. supply.




*The curves of the new Mazda 2-volt valve introduced to the public this month.*




*The P.240 is a very useful super-power two-volter and is discussed in this article.*

Finally we come to the power valves, the P.220 and P.240.

The curves are reproduced here and show very good characteristics, the slope of the former being about 3·4, the amplification factor 12·5, and the impedance 3,700 ohms.

## Remarkable Figures

These are very remarkable figures indeed, and quite exceed anything that has yet been produced in the way of 2-volt valves. Naturally the grid swing suffers a little, but the output signal strength can be made up by the amplification, so that really nothing is lost in output volume. Anything up to 150 volts can be used on the plate, and as a last-stage valve for moderately large sets this P.220 can be very confidently recommended.

Incidentally it can be used as an anode-bend rectifier where very large inputs are being dealt with, the grid bias being about −9 volts at 150 under working conditions.

The P.240 is specially designed as an output valve, particularly suitable, as the makers say, for operating cone and moving-coil speakers, and it takes a fairly large grid swing with up to 150 volts H.T. on the plate.

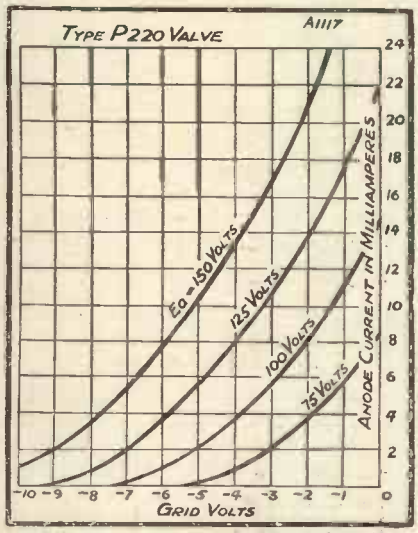
At this voltage the bias is 13·5 volts, thus giving a grid swing overall of at least 26 volts, while the impedance is only 1,900 ohms and the magnification factor of 7 is available.

This is another wonderful valve, which should prove extremely popular among constructors. The mutual conductance, or efficiency factor, as will be seen, is 2·7, giving a remarkably steep slope for a valve of this calibre.

## An Operating Hint

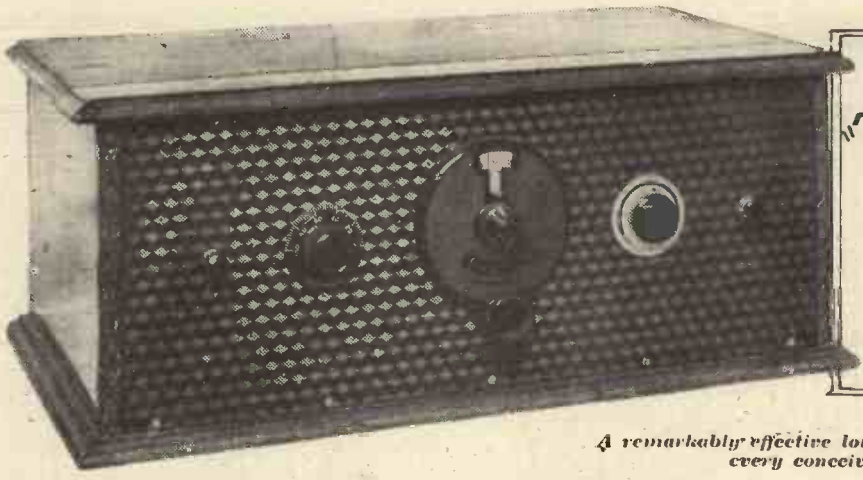
There is one operating hint which the makers give, and that is that the resistance of the loud speaker used with the P.240 valve "should not exceed 2,000 ohms," but this is far too big for direct insertion in the plate circuit. A filter circuit should always be used unless an output transformer is preferred. Low impedance output circuits will provide heavy bass reproduction, and high impedance will reduce the strength of the bass. This is definitely a "bass" valve, and, of course, the transference of energy to the output circuit will be greatest at the lower frequencies.

The pentode (P.T.230) is also a real "go-getter" and gives really excellent results. It came to hand rather later than the others, so it has not had quite such a full test, but there is no doubt that it is fully up to scratch in all respects.




*The Mazda P.220—a 2-volt power valve with remarkable characteristics.*

We have also received a batch of new Cossor valves, which on test give every indication of proving eminently satisfactory. Further and more careful tests have yet to be made, and the full report on these valves will be published next month.



# THE "TWO-WAY" TWO

by G.V. COLLE

*A remarkably effective loud-speaker set incorporating practically every conceivable modern improvement.*

ALTHOUGH the regional scheme has not come into operation at the time of writing, yet from tests conducted on the new wave-lengths some weeks ago by the B.B.C. it appears that the owners of detector and low-frequency sets utilising normal tuning arrangements, are in for a difficult time. Even allowing for wider separation of the main regional wave-lengths than contemplated, the higher-power transmissions must in certain localities inevitably produce chaos in the smaller and rather flatly tuned receivers.

## Problems of Interference

Anticipating this state of affairs, manufacturers have produced selectivity units and wave-traps.

Now the primary function of each of these is to cut out the local station when it is desired to tune to others on nearby wave-lengths. Most of the units simply prevent the local station "spreading" over the tuning dial by confining it to a narrow band, but whether they will overcome the new troubles is a debatable point. It must not be forgotten that once the local transmission is eliminated there is another high-power station capable of forming an equal amount of interference somewhere higher up the tuning scale, and unless we can sharply tune it the probabilities of receiving Continental stations will be as remote as ever.

## Modern Methods

It is obvious that both stations have to be wave-trapped, and if not simultaneously (a difficult business) then successively, because there is also the possibility of the two themselves clashing. Both problems were borne in mind when designing the two-valve set forming the subject of this article. The receiver consists of a detector operating on the usual grid rectification principle, followed by an L.F. stage transformer-coupled to either a pentode or ordinary power valve, whichever is desired by the constructor.

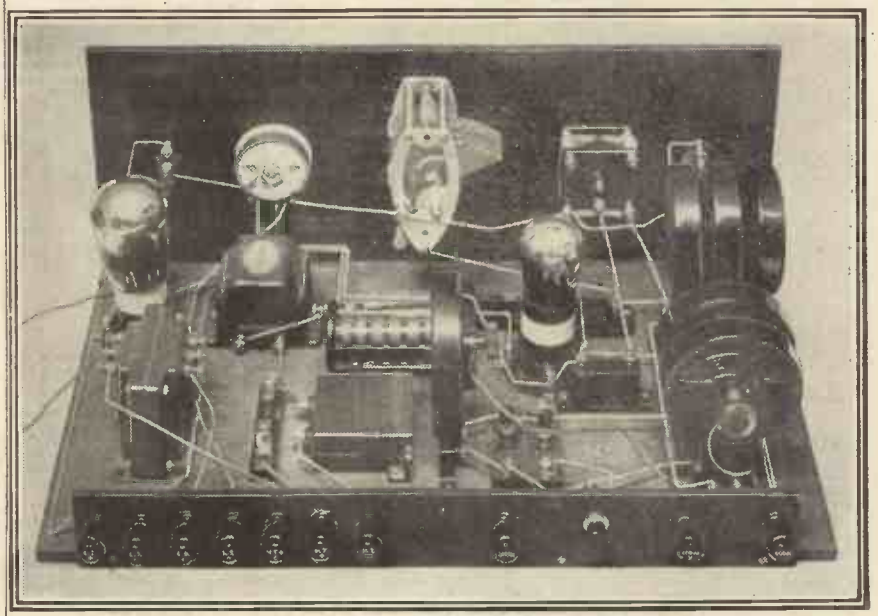
Practically every conceivable modern refinement has been applied to the set, including differential reaction control, grid-leak biasing, anti-motor-boating device for the detector, output transformer for pentode or ordinary power valve (and allowing for various loud-speaker resistances), wave-changing by a simple switch, and last but not least a wave-trap covering both the proposed regional wave-lengths, with a switch to change over from one to the other. Referring to the photograph of the front of panel, it will be seen that the tuning condenser occupies the central position with the differential reaction condenser and 400-ohm potentiometer on either side of it, the wave-change switch being to extreme right of the panel and the L.T. switch to the left.

In consequence of the layout of the controls just described, a neat and symmetrical appearance is given to the panel assembly. At the same time this assists in preserving the comparative simplicity of the wiring. Although there are five knobs, only two are in constant use as the main controls, these being the tuning and reaction condensers, the remaining three serving as useful refinements for occasional use, as will be described later.

## The Circuit Employed

Meanwhile the reader is advised to turn to the theoretical diagram given elsewhere in order to follow closely the action of the circuit.

The tuning of the set is accomplished by the usual primary and secondary coils ($L_1$, $L_2$), reaction being applied by means of a differential condenser, which acts as a Reinartz control plus further advantages. In the first place, the extra set of fixed



*As you will see, the layout is arranged both for highest electrical efficiency and ease of assembly.*

# The "Two-Way" Two—*continued*

vanes provides an easy path for H.F. currents to earth when the moving vanes overlap them. Further, the H.F. by-passing effect of the reaction condenser under the conditions named is equivalent to connecting a small fixed capacity between plate and

**COMPONENTS REQUIRED.**

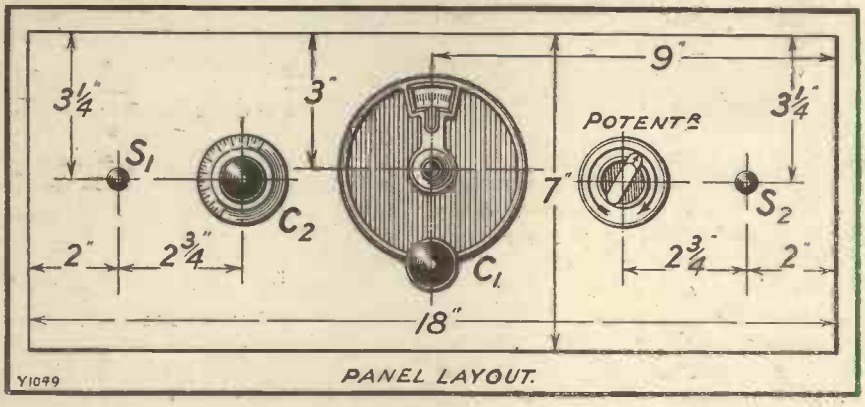
1 Panel 18 in. × 7 in. × ¼ in. or $\frac{3}{16}$ in. (Trolite). (Becol, Resiston, Pilot, etc.)
1 Cabinet, to fit, 10 in. deep, complete with baseboard (Raymond, Artcraft, Camco, Caxton, etc.).
1 ·0005-mfd. variable condenser (Lissen). (Igranic, Formo, Lotus, J.B., Polar, etc.)
1 ·0001-mfd. differential reaction condenser (Pye). (Lotus, Utility.)
1 Three-point wave-change switch (Wearite). (Magnum, Bulgin, etc.)
1 400-ohm potentiometer for panel mounting (Igranic). (Lissen, Precision.)
2 L.T. on-off switches (Benjamin). (Lotus, Raymond, B.A.T., etc.)
2 Sprung valve holders, one with special pentode connections, though this is not essential (W.B.). (Bowyer-Lowe, etc.)
6 Single-coil holders (Lotus). (Raymond, Wearite, etc.)
1 H.F. choke (Varley). (R.I., Lewcos, Ready Radio, Magnum, etc.)
1 L.F. transformer (Cossor). (Brown, Ferranti, R.I., Igranic, Lotus, Varley, etc.)
1 Universal output transformer (Marconiphone).
1 25,000-ohm moulded resistance and holder (Metro-Vick).
1 2-meg. grid leak and holder (Metro-Vick).
1 ·0003-mfd. fixed condenser (Dubilier). (Lissen, Atlas, Igranic, etc.)
1 ·001-mfd. fixed condenser (Dubilier). (Lissen, Atlas, Igranic, etc.)
2 Formodensers, one Type G and one Type F.
1 2-mfd. condenser (T.C.C.). (Dubilier, Lissen, Ferranti.)
1 Ebonite terminal strip, 16 in. × 2 in. × ¼ in. or $\frac{3}{16}$ in. thick.
10 Terminals, see markings on wiring diagram (Belling-Lee).

**ACCESSORIES.**

Coil Nos.: One 25, 35, or 40; one 60; one 40; one 200; one centre-tapped 150 or "X" coil (if available) and one 40 centre tapped.
1 H.F. valve.
1 Pentode or small power valve, 2-, 4-, or 6-volt type.

earth, which is now well-known as materially assisting the rectifying properties of the detector valve.

To switch over to the wave-band between approximately 1,000 to 2,000 metres, two further plug-in inductances ($L_4$ and $L_5$) are provided as loading coils. The coil $L_4$ acts both for primary and reaction on the high waves, and $L_5$ as the secondary loading, and the change-over from the broadcast wave-band is accomplished by means of a three-point switch $S_1$. A fourth contact is made to the same switch with a screw on the centre arm so that the coil $L_4$ may be properly short-circuited.

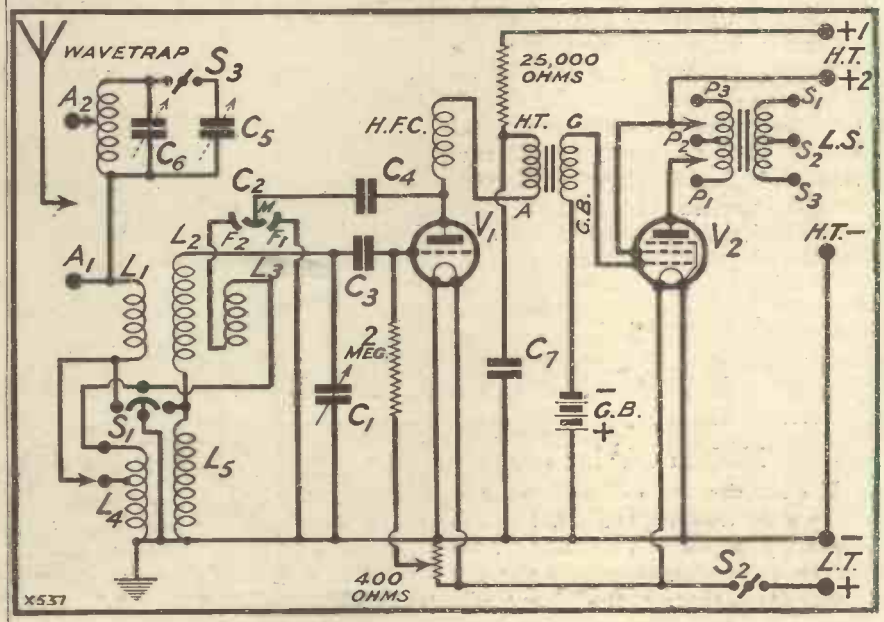



## Coil Considerations

Since the size of $L_4$ is usually a compromise between selectivity and reaction demands, the writer conceived the idea of utilising the tappings provided on certain coils, such as the Lewcos centre-tapped, the Lissen "X," etc. Failing the use of either of these coils, the flex lead intended for the tapping may be taken to the plug of the coil holder $L_4$ and a plain 100 or 150 coil inserted.

With the 150 centre-tapped coil, of course, 75 turns constitutes the high-wave primary and the full 150 on the same coil the reaction. Instead of an "X" coil in the wave-trap coil holder, a 40-turn centre-tapped inductance was adopted for use, as experiments have indicated that this has sharper and better acceptor circuit properties. It is unnecessary to employ a larger coil on the high wave-band, as the only interference that is likely to be met with is that of the local station, probably at the bottom end of the tuning scale.

Turning now to the constructional details of the set, the panel may be marked out from the dimensions given on the panel layout, and the holes drilled or reamered until they are large enough to take the particular single-hole fixing components used. The potentiometer is attached by two screws, and requires three holes,



# The "Two-Way" Two—*continued*

the positions of which can be taken from the metal template.

Next drill the terminal strip, attach the terminals, and screw the assembly to the back edge of the baseboard. Following this, screw the panel to the front edge of the baseboard, and lay the remaining components in the approximate positions shown on the wiring diagram. Then screw the components down with the exception of the coil holders, which should be mounted carefully in relation to each other, bearing the following points in mind.

## Take Care with Coil Holders

First ascertain the distance between the particular coils used so that when the coil holders are screwed down to the baseboard the coils do not quite touch. After this, arrange them so that all the plugs and sockets face each other in rows as shown on the wiring diagram.

Particular attention must be paid to the latter point, especially in connection with $L_4$, otherwise the tappings on the coil may come at the bottom end of the coil instead of at the top. It is, by the way, an excellent plan always to employ the same types of coils throughout the receiver, as then one may be reasonably certain that the coils are in correct relation to each other from a reaction point of view.

Having drilled the panel, mounted the components, and screwed the panel to the baseboard, the wiring may next be undertaken. No. 18 or 20 S.W.G. tinned copper bare wire may be employed to wire the receiver, but to make an easy job and to ensure that no two wires are accidentally short-circuited together, Systoflex of 2 m.m. diameter may be used to cover the wire, or ready insulated wire employed,

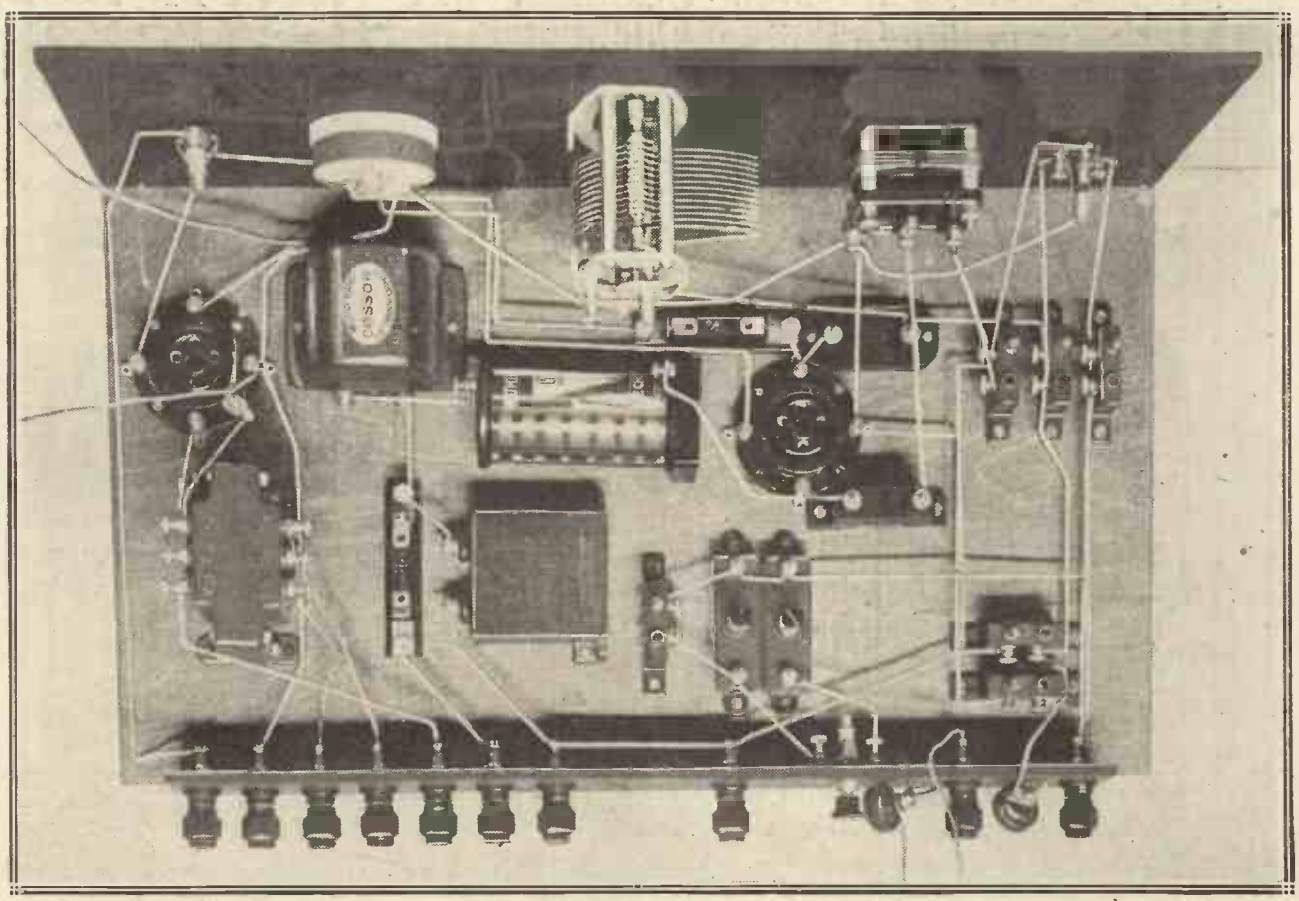
After wiring, the leads may be checked off against those shown on the wiring diagram, the latter being crossed out as they are identified. If everything is found to be O.K. the receiver may be given its initial test with the following coils and valves:

Insert a 35- or 40-turn coil in the $L_1$ coil holder, or a 25-turn coil if a high degree of selectivity is required on the lower broadcast wave-length band. $L_2$ can be a 60- or 75-turn coil, and $L_3$ a 40-turn coil, the latter depending upon the particular detector valve used.

## The Valves Required

$L_5$ is a plain 200-turn coil, and $L_4$ either 150 centre-tapped, or a 150 "X" coil (if available), the particular coil chosen again depending upon the degree of selectivity and reaction demands on the high wave-band. Probably a 150 "X" coil would suit the purpose better, since there will be a smaller reduction in the number of primary turns, which should, after all, be kept as large as possible if the maximum volume is to be obtained on the high waves.

The remaining coil should be inserted in its coil holder. This is the centre-tapped 40 for the wave-trap position, after which follows the insertion of a detector valve of the



*A general view of the receiver, showing how the components are laid out on the baseboard. The spacing of the coil holders is an important feature.*

# The "Two-Way" Two—*continued*

usual H.F. type; and a pentode or ordinary power output valve in the $V_2$ socket. Lastly, do not forget to arrange the primary terminals of the output transformer to suit the particular power valve used, nor yet to adjust the two flex leads from the secondary terminals to the requirements of the loud speaker.

## The H.T. Supply

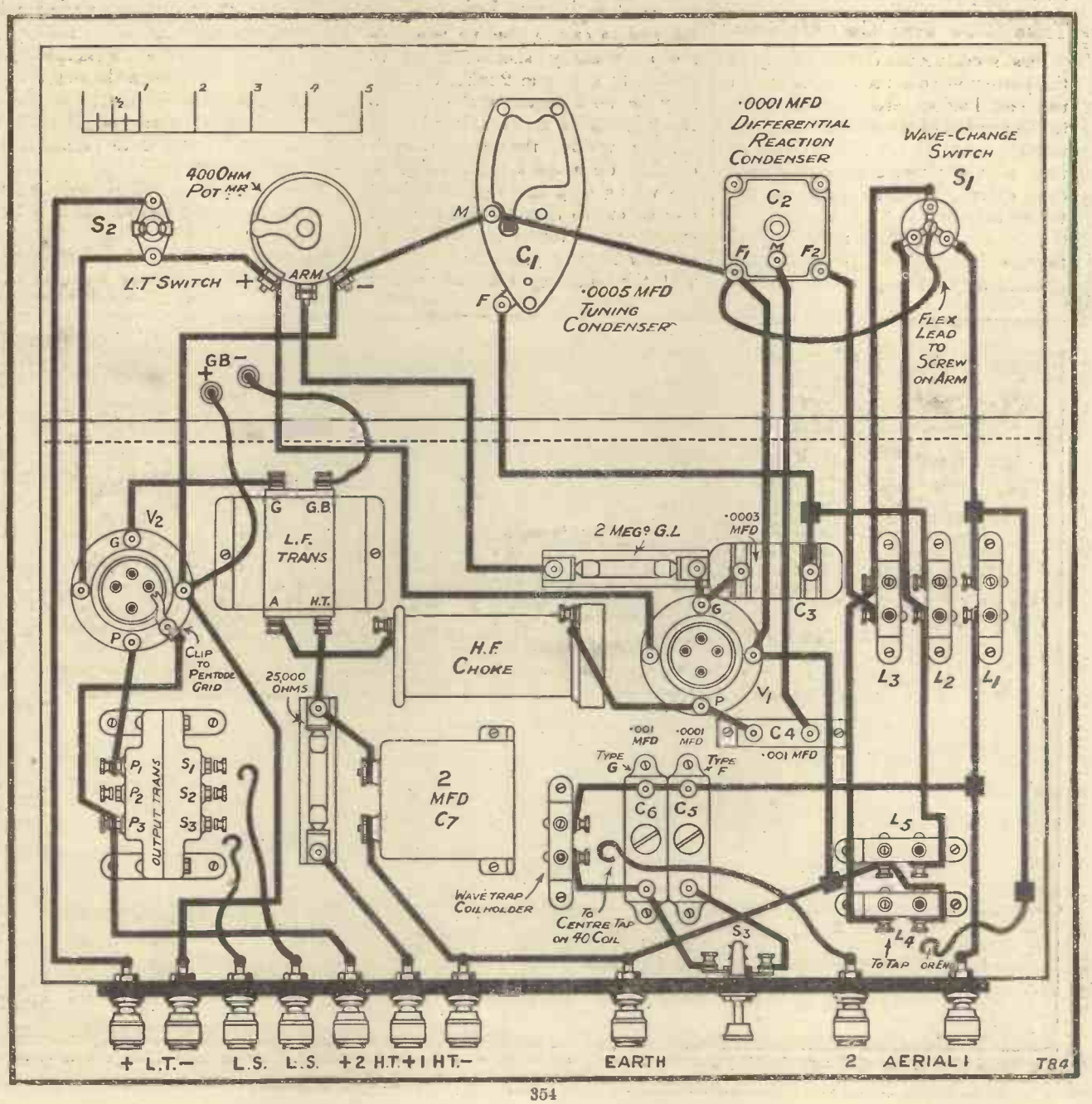
In common with all receivers of this type it is permissible to employ 2-, 4-, or 6-volt valves in the set, the choice being governed more or less by reasons of economy or the views of the constructor. An L.T. accumulator of a voltage equivalent to that taken by the valves can now be connected to the set, as well as a loud speaker, and high-tension supply.

Regarding the latter, it is advisable to employ one having the highest voltage consistent with the maximum working conditions of the valves, especially if the full volume is to be obtained from the receiver Needless to add, the H.T. battery should have a current delivering capacity quite equal to the demands made upon it. Those readers who use mains eliminators of either the A.C. or D.C. type will have less need to study this point, because in all probability their eliminators will be capable of delivering the requisite current.

## Voltage Requirements

In every case, though, it will be advisable carefully to adjust the grid-bias voltage before applying H.T., as this will prevent loss of emission due to over-running the valve. The H.T. voltage to the H.T. + 1 terminal will be between 60 and 90 volts, and that of H.T.+2

(*Continued on page* 330.)



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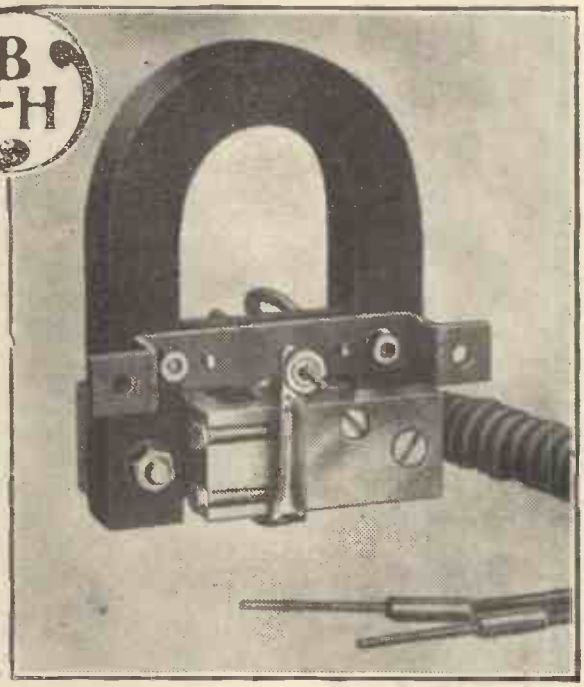

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# EDISWAN RADIO PRODUCTS

W.15

# CHATS AT THE WORK-TABLE

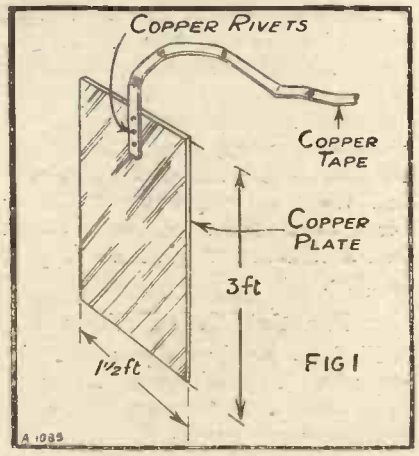
*Many points of practical interest to amateurs and set constructors are dealt with under this heading.*

By R. W. HALLOWS, M.A.

## A First-Rate Earth

ONE simple and very useful job that the constructor can undertake during the fine weather is the installation of a first-rate earth. In times gone by many writers, including my unworthy self, have sung the praises of the seven-pound biscuit-tin, the zinc bath, and the sheet of corrugated iron.

All of these answer well enough up to a point, though none of them can be regarded as completely satisfactory, particularly if the soil is of a somewhat acid nature, as is often the case. The reason is this: the "tin" of which biscuit boxes are




made is really *sheet iron* with a thin plating of *tin*. Here we have two dissimilar metals. If to this we *solder* a *copper* earth lead we add at least three more metals and probably several others. Place dissimilar metals in intimate contact in damp ground of an acid nature and electrolysis is sure to follow, for the metals form what are in effect numbers of small electric cells.

The result is that the connections and even the earth plate itself may become eaten away with astonishing rapidity. Not long ago I dug up a biscuit tin which had been buried only just over a year, to find that nothing remained but the beaded rim and a few flakes of rust. Similar considerations apply to every kind of earth connection; in fact, to any earth plate in which soldered connections are made.

## A Good Tip

Supposing that we use bolts instead of solder for the joints, we are no better off, since we have, say, iron, tin, brass and copper. What is to be done about it?

Here is a method that I have found completely satisfactory. It does not cost much, the job is an easy one to carry out and it *does* provide a first-rate and practically everlasting contact with earth. Obtain from a dealer in metal a piece of sheet copper (which need not be of very heavy gauge) measuring 1½ by 3 ft. Discard the stranded earth wire and use instead a piece of stout copper tape. Fix this to the earth plate, not by solder but with three copper rivets. You now have an exceedingly good joint containing no metal but copper.

Fig. 1 shows the earth plate complete with its lead. Bury the earth plate vertically in the ground, right under the aerial if you can, taking care that you dig deep enough to get well down.

Measure off a length of the tape long enough to reach the earthing switch; cut off, drill and screw down. Insulate the earth lead, in order to prevent its coming into electrical contact with anything between the ground and the earthing switch, by giving it two or three coats of quick-drying stove enamel.

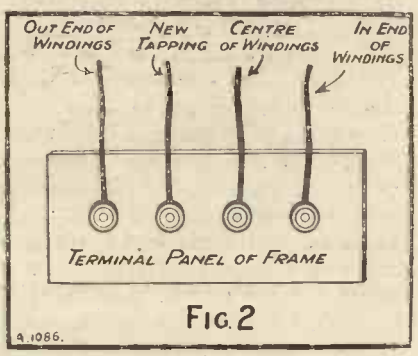
## Avoid This

Whilst we are on the subject of earths, do not imitate those well-meaning but misguided people who habitually use two earth contacts of different kinds with the idea that such an arrangement makes a better earth connection. If you bury a copper plate here, and a piece of zinc galvanised iron or "tin" just over there, and join the two to the same earth lead, or at any rate to the same terminal of the earthing switch, you are contriving quite a neat electric cell with its two plates of dissimilar metals, its electrolyte composed of the moisture and acid in the soil and its outside circuit consisting of the earth leads.

A micro-ammeter (or even a milli-ammeter in some cases) placed in one of the earth leads will indicate a flow of current, and this current can be produced only by disintegration of one of the plates. Further, such an arrangement may quite possibly be the cause of background noises in a sensitive receiving set.

## For the Set Constructor

Here is a tip which I always find exceedingly handy. Whenever you build a new set from any of the WIRELESS CONSTRUCTOR descriptions always make a copy of the practical wiring diagram, and either paste it to the inside of the lid of the cabinet or fix it



# Chats at the Work-Table—*continued*

on with drawing-pins. A copy of the diagram, by the way, is very easily made with a sheet of tracing paper.

## Altering Coils

When the Prague Plan came into operation, involving as it did one or two big changes in the wave-lengths of British stations, many people found themselves rather in a difficulty. Until recently such a thing as a British station working on a wave-length below 250 metres was never thought of, and it followed that the majority of proprietary sets, both portable and stationary, were not designed to tune down below this limit.

On Sunday, June 30th, Belfast started work on 242 metres, whilst Leeds dropped right down to the bottom of the broadcast band with a wave-length of only 200 metres. Further, quite a number of desirable foreign stations are now transmitting on very low wave-lengths, and it is tantalising, to say the least of it, if one's apparatus is incapable of receiving them. Luckily, the majority of sets are very easily altered to meet present-day conditions.

In the case of a stationary set it may be necessary to provide a new set of coils, though if those already in use will tune *up* to well beyond 550 metres, they can be made to tune *down* to the neighbourhood of 200 by the simple process of stripping off a turn or two. Coils of the plug-in type with one plug and one socket $\frac{9}{16}$in. from centre to centre are still very widely used, and the business of reducing the inductance of these is quite straightforward.

## The New Sizes

So far as I know, the "out" end of the windings is always attached to the socket.* Remove the thin ebonite band (if there is one) which covers the windings, and if there is a further covering of Empire tape take this off also. With a small soldering iron disconnect the end of the wire from the socket, remove as many turns as may be necessary and resolder. Try out the coil, and if it now goes down low enough replace the coverings.

As a rough-and-ready guide it may be stated that for each turn removed the maximum tuning of the coil with a ·0005-mfd. condenser in parallel will be reduced by about ten metres and its minimum by about four metres. Where home-made coils are employed it is on the whole much better to make a second set, reserving this for use on wave-lengths between 200 and 300 metres. For closed circuits coils with about 35 to 40 turns on 3-in. formers will be found satisfactory.

With many modern stationary sets a frame aerial is used instead of the outdoor wire, and the frame is, of course, universal in portables. Since in many cases the frame will not tune with its associated variable condenser to much more than 550 metres, we cannot afford to sacrifice one or more turns by stripping them off, and the alternative of making or purchasing a second frame of lower inductance for use upon the shorter wave-lengths is not alluring.

Here are some ways in which the difficulty may be surmounted. Let us take, first of all, the case of the frame aerial for use with stationary

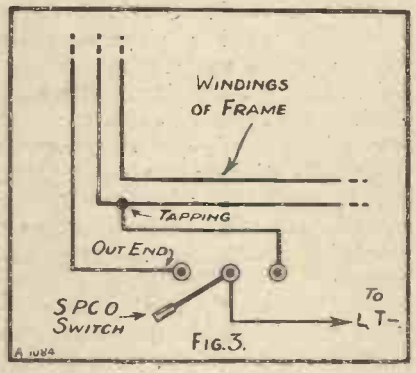


FIG. 3.

sets. This, as a rule, has three terminals, going respectively to the "in" and "out" ends of the windings and to a centre-tapping. Add a fourth terminal between "centre" and "out" and to this fix a lead connected to a tapping made at the first or second turn from the "out" end, as seen in Fig. 2.

In speaking of frames, by the way, the "out" end is taken to be that which is connected to the earth or low-tension negative terminal of the receiving set. With this small addition made to the frame the ordinary "out" terminal is used for reception on wave-lengths above about 250 metres, but when it is desired to go down to the bottom of the broadcast band the lead from the earth terminal of the receiving set is connected instead to the new terminal on the aerial panel.

This throws the unwanted turns out of action and reduces the minimum wave-length of the tuned circuit formed by the frame and its variable condenser.

## For Portables

This arrangement, however, will hardly be suitable for most portable sets. A way in which some (those which have an entirely separate winding for reaction) may be dealt with conveniently is shown in Fig. 3. A midget double-pole change-over switch is mounted in a suitable position near the frame. Low-tension negative is disconnected from the "out" end of the frame windings and connected instead to the arm of the switch. The "out" end of the windings is taken to one of the clip contacts of the switch, whilst from the other runs a short wire connected to a tapping made in a turn near the "out" end of the windings.

An examination of Fig. 3 will show that when the switch is turned over to the left the whole of the frame is in action, whilst if it is thrown to the right the turn or turns not required for short-wave reception are cut out. A rough-and-ready idea of what we may call the "value per turn" number for a frame aerial may be obtained in the following way before tapping is done.

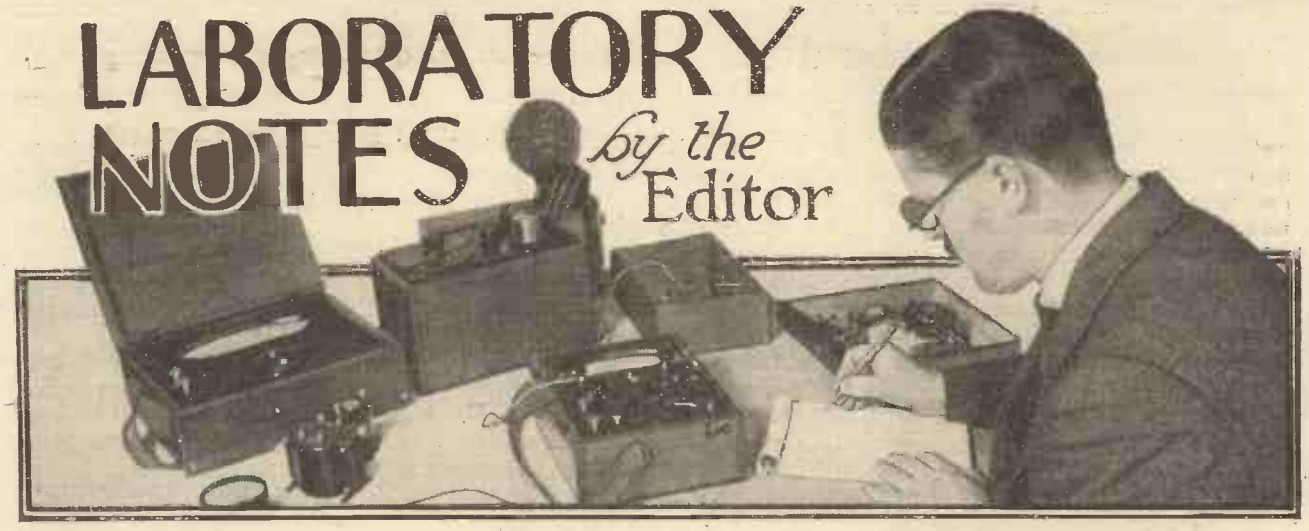
## Practical Calculations

Find as nearly as you can the maximum and minimum limits of the frame as it stands with its associated condenser by tuning in the highest and lowest stations in the list that can be received. Let us suppose that the upper limit is found to be approximately 560 metres and the lower 360 with a frame containing fifteen turns.

Dividing 15 into 560 we have in round figures 37, whilst 15 into 260 gives approximately 17. Each turn therefore has roughly a tuning range of from 17 to 37 metres. If therefore a tapping is made at the second turn from the "out" end, we may expect to reduce the lower tuning limit of the frame by about 34 metres and its upper tuning limit by about 74. These calculations are, of course, only rough approximations, but they may nevertheless be found of practical utility.

*Atlas coils are an exception.—Ed.

# LABORATORY NOTES by the Editor



*Under this heading the Editor discusses some of the many interesting points revealed during experiments carried out in the "Wireless Constructor" laboratory.*

To use a slang phrase in a strictly scientific manner, we can say that we have now reached a stage in radio when "things will begin to hum." The hum will be connected with mains working, and particularly with the use of sets operating with valves running on unrectified A.C. As it is very easy to be misled on the subject of hum, a few notes on the subject may be helpful here.

## Heating A.C. Valves

There are two methods of heating A.C. valves, or rather there are two types of A.C. heated valves, known respectively as the "directly heated" and the "indirectly heated." We shall understand these better if we remember the sole purpose of applying heat to the filament of a valve is to cause the material of which the filament is made to emit electrons. Variations of temperature bring about variations in electron emission, and if the temperature of the filament rises and falls, say, 100 times per second (this is the case if we pass 50-cycle alternating current on the filament), a nasty 100-frequency hum will be super-imposed on our reception.

## Thick Filaments

Now if we choose for the filament a material which is sluggish in the way of temperature change, it will not cool off appreciably between pulsations once it is properly heated up, and therefore the electron emission will remain approximately constant. The thicker the filament the better its heat-retaining properties (other things being equal) and a short, thick filament is better than a longer, thinner one. Thick filaments take a good deal of current.

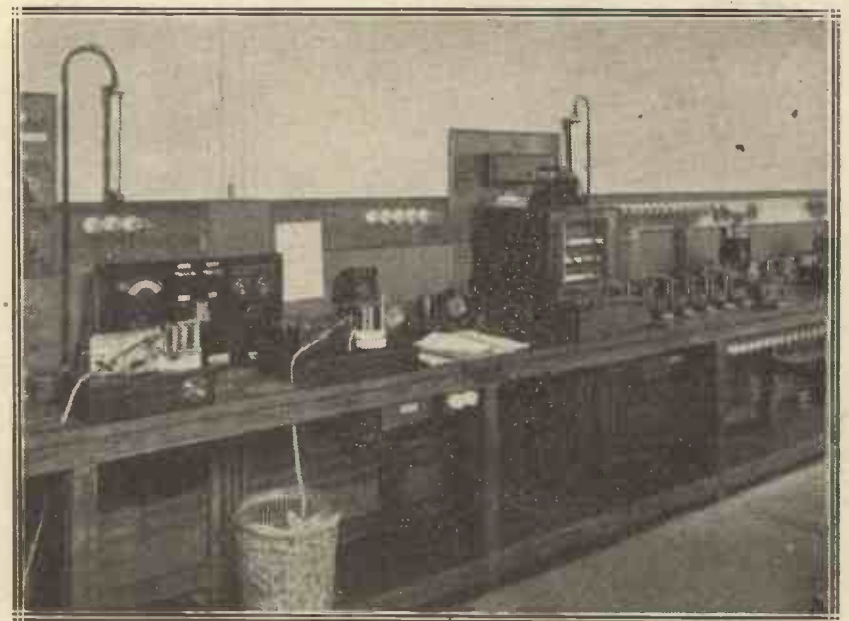
Most super-power valves have fairly thick filaments taking quarter ampere or more, and if these are heated by raw ordinary A.C. not much hum will be noticed—at least, if these valves are used in the last stage. Remember that a slight hum in the preceding stage will develop into quite a loud hum when one stage of low-frequency has been added, while certain peculiarities of the detector valve circuit make it necessary to have particularly uniform electron emission from the filament in that part of the set.

"Directly heated" A.C. valves are made with short, thick filaments running with a comparatively large current, and once they are heated the temperature changes very little so long as the A.C. current persists. The large current consumption of these valves does not much matter, as we obtain our current by stepping it down from the alternating current mains, and even so the actual *power* consumption is not high, as the large current is obtained at a small voltage. For instance, no more *power* is consumed by a 1-volt 1-ampere filament than by a 4-volt ¼-ampere filament.

## An Interesting Type

An interesting line of valves of the directly-heated variety uses ·8 of an ampere at ·8 of a volt, except the detector valve, which uses 1·6 amperes at ·8 volt. The power consumption of these valves is therefore ·64 of a

## SPANNING THE WORLD



*A section of the Dorchester Beam transmitting station which carries out "traffic" with South America. It has seven transmitters electrically linked by land-line to Radio House, London—the main Marconi Telegraph Office.*

# Laboratory Notes—*continued*

watt and 1·28 watts respectively. As a 6-volt ¼-ampere battery valve consumes 1·5 watts, it will be seen that even the detector valve is by no means so extravagant in power consumption as it appears at first sight. The filament power consumption of a three-valve set using these valves is 2·56 watts, whereas the power consumption of an accumulator-driven set using two ·1-amp. valves and one ·25 (all at 6 volts) is 2·7 watts.

## Indirectly Heated A.C. Valves

The temperature maintaining powers of these valves is remarkably uniform. Another series uses 4 volts. In the United States 1·5 volts have been popular for directly-heated filaments.

In the indirectly-heated valves the filament does not itself emit any electrons (or at least none it is desired to make use of) and serves merely to radiate heat to a thin insulating tube surrounding it. This tube is covered on the outside with special active material which itself radiates electrons powerfully under the influence of the heat from the filament within.

Electrical connection is made to this cathode and it is treated as the filament for grid return purposes. In the past it has been the custom to use an indirectly-heated valve for the detector, whereas directly-heated valves have been quite suitable for the other stages.

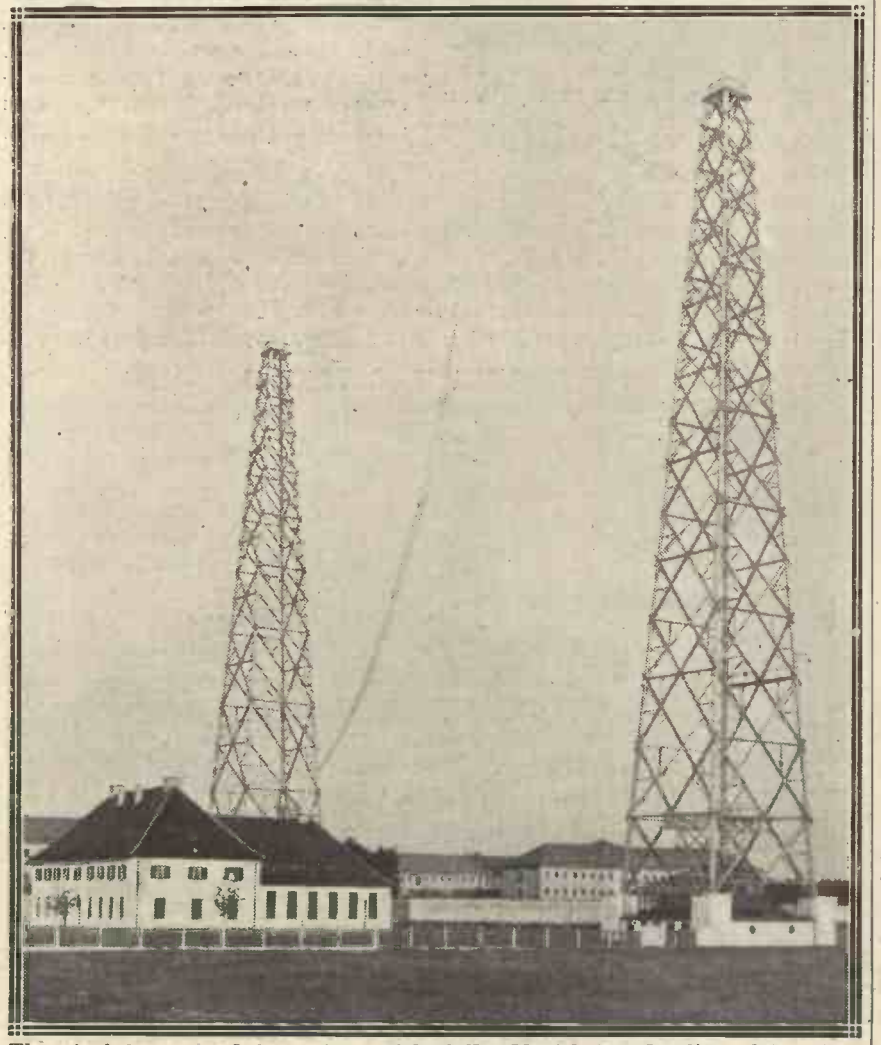
The electrical efficiency of a well-designed indirectly-heated A.C. valve can be made very high, and better characteristics have been obtained from indirectly-heated A.C. valves than from any of the battery-heated models.

Hum in the output of an A.C. operated receiver can come from:

1. Fluctuations of filament temperature, and therefore emission;
2. Ripple in the high-tension supply through bad smoothing;
3. Field of the A.C. step-down transformer used for filament heating or high-tension supply (or both) interlinking with low-frequency stages;
4. Hum picked up from the mains by loud-speaker leads.

There are one or two other causes, but these are the chief ones. If you use a moving-coil loud-speaker the hum in your output may be coming from irregularities in the field current supply.

## TWO GERMAN GIANTS



*The giant towers and four-wire aerial of the Munich broadcasting station (533 metres).*

## Cutting Out "Hum"

When a manufacturer is designing a set for operation on A.C. throughout, he can avoid a good deal of hum trouble by using forms of low-frequency coupling, such as a poor transformer, which will cut off and fail to reproduce frequencies as low as 100, which, as readers know, is that of 50-cycle A.C. hum.

Similarly, he may use a loud speaker which does not go down so low as this, and you would be surprised if you were to investigate the matter how few loud speakers go down as low as 100. If neither set nor loud speaker will reproduce notes as low as that of the hum present in the filament or plate supply, then you will not hear it in the loud speaker. Nor, for that matter, will the frequency response of the set be as good as it should be!

## Awkward Alternatives

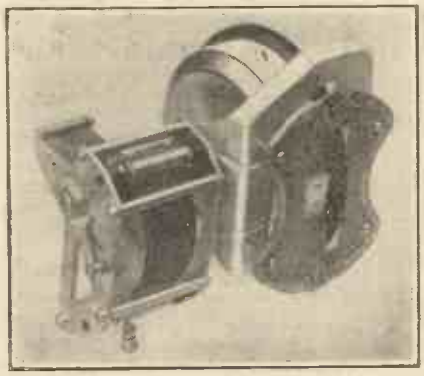
It does happen sometimes that we are faced with the alternatives—shall we design a set with an excellent frequency response and a small amount of A.C. hum, or one with no hum and a poor response? It is also a point worth noting that the lower the frequency response of the receiver, the greater will be the tendency to motor-boating if there is instability in the low-frequency end.

Practically all A.C. driven receivers have a slight hum in the output, but as this is not noticeable when programme items are being received, most listeners are quite prepared to put up with it.


## Lotus Drum Condensers

THE Lotus variable condensers have earned a very good name for themselves among home constructors, both in regard to efficiency and price, for the losses in these condensers are negligible, the mechanical construction good, and the action very smooth. We are therefore pleased to see that the makers, Messrs. Garnett, Whiteley & Co., Ltd., have added to their line drum-control devices, one of which, the single-drum vernier dial, complete with variable condenser, is illustrated in our photograph, and another, a double drum control, is incorporated in the "Push-Pull" Five, in the current issue.

The Lotus drum controls are more than usually easy to fix to the panel, have handsome escutcheon plates, and an excellent vernier control by means of which a comparatively large movement of the drum brings about a relatively small movement of the condenser, thus enabling fine tuning to be done with accuracy. A good cardboard template is provided with each drum control, and the control, together with condenser or condensers, is easily mounted on the panel by means of four securing screws.



*The Lotus Drum-Drive Condenser.*

The edge of the drum itself and the scale show through a hole in the panel, which need not be cut very accurately provided it is large enough, as the escutcheon plate covers any irregularities. This is a point we are sure will appeal to the home constructors who use simple tools. Both drum controls proved to be very satisfactory, well-made and with very smooth operation, while the handsome appearance will, we are sure, appeal to all our readers. Visitors to the Wireless Exhibition should certainly make a point of examining these new Lotus products which can be fully recommended.

**OUR MONTHLY REVIEW OF TESTED APPARATUS**

**Note: All apparatus reviewed in this section each month has been tested in the Editor's private laboratory, under his personal supervision.**

## An Interesting Variable High-Resistance

From the Oliver Pell Control Co., makers of the Varley components, we have received specimens of their new variable high-resistances which are of more than ordinary interest. Three terminals are provided so that these units can be used either as potentiometers or as series resistances, the value being continuously variable from a low minimum to the maximum.

The actual construction consists of a cylinder carrying a single layer of fine resistance wire, across which a slider runs, this slider being carried on a pivoted arm connected to the control knob. A particularly interesting and useful point is that a slight rotation of the cylinder enables the slider to run over an entirely new path, thus avoiding excessive wear in any one place in cases where the resistance is varied frequently.

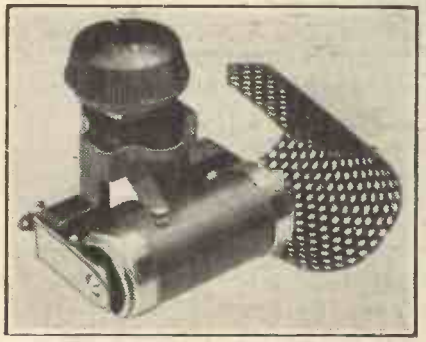
Heat dissipation is well provided for by winding the wire on heat-resisting tube, which is hollow and open at the ends for air circulation. Protection of the resistance element is normally afforded by a perforated metal cover, and it is the work of a moment to unclip this, remove the resistance unit and substitute a different value if desired. The experimenter will appreciate this point, which is not only very convenient, but allows a number of different combinations at low cost—the one holder, slider and the casing serving for all—and the only additional parts required being other resistance units.

The unit is very substantially made in an excellent bakelite moulding, enabling either baseboard or panel mounting to be obtained, while a well-finished knob with arrow is of great help in making a fine adjustment. Tests showed that the movement is smooth, contact is continuous throughout, and after the rather drastic test of a thousand movements across one section of wire the action was as

*A very useful variable resistance.*

# What's New—*continued*

smooth as ever and the efficiency of the device in no way impaired. Seeing that the slightest touch of the finger will rotate the resistance unit, so bringing the slider over an entirely new section of wire, the life of this



*The Varley resistance, reviewed on this and the preceding pages.*

unit intelligently used would appear to be indefinite, for the amount of friction given to this unit in our laboratory tests was much more than would normally occur in several years. We foresee a wide use of these resistances in mains units for smooth control of output voltage, and in all cases where continuously variable medium and high resistances capable of carrying appreciable currents are required.

## Formo Improvements

The Formo Company have always held a leading position in the production of thoroughly sound variable condensers at reasonable prices, and we are pleased to welcome their new model called the 1930 de luxe Log Condenser submitted to us for test and report. While superficially resembling the 1929 model, which itself was an excellent condenser, the new

*The new Formo Variable.*

model is even more rigid, terminals are brought out in a more convenient way and the general finish is still further improved.

Special features of this condenser we are glad to see retained are the concealed pigtail carried within the spindle and establishing direct metallic contact between the terminal and the moving plates, and the simple screw adjustment by which the degree of stiffness of turning the shaft may be regulated without in any way affecting its very smooth action. Another noteworthy point is their very small amount of panel space occupied.

At 6s. these condensers represent excellent value, while their electrical characteristics on test were found to be of the previous high standard.

## Labels for Identifying Battery Leads

The annoyance of trying to identify long, unmarked leads underneath a table is obviated once and for all by the use of "Coltags," manufactured by Messrs. Collett, and consisting of small pieces of metal clearly marked, which clip round the wire it is desired to identify. These useful little devices are obtainable in a large number of different markings, as shown in our photograph, and being quite inexpensive certainly fill the purpose for which they are designed. One of these tags, connected to a lead, is shown in the upper left-hand corner of the illustration.

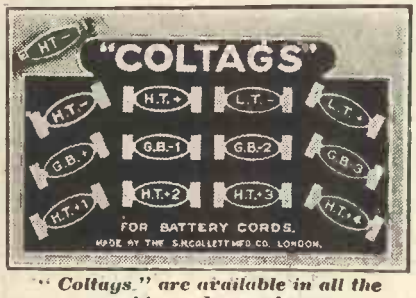
## Important New Metal Rectifiers

Readers of this journal will be very glad to hear that the Westinghouse Brake & Saxby Signal Co., Ltd., makers of the well-known metal rectifiers, have now produced two new models known respectively as the H.T.3 and the H.T.4. The H.T.3 and H.T.4 units, examples of which have been sent to us for test by the manufacturers, are particularly valuable to our readers as it is now possible to use the Westinghouse metal rectifiers for high-tension supply at a very reasonable cost.

The H.T.3 unit is designed to give a maximum output current of 20 milliamperes at 120 volts, the input voltage from the secondary of the mains transformer being 135. Half-wave rectification is used with this unit, but no hum will be found with a satisfactory smoothing circuit of the conventional type. The price of this unit is only 21s.

The H.T.4, which appeals to us strongly, uses a new circuit with full-wave rectification, giving a maximum output of 50 milliamps at 150 volts. With a lower output the voltage rises so that at 30 milliamperes 180 volts is given, a very useful output for a modern set of high quality.

It is interesting to note that, although the unit can be made to give a smooth output of 30 milliamperes at 180 volts, the voltage applied to the rectifier from the secondary of the transformer is only 135 volts, the circuit used being of the "voltage doubling" type. No centre-tap is




*"Coltags" are available in all the markings shown above.*

necessary on the secondary of the transformer.

In addition to the rectifying unit, and before we come to the smoothing of the output, we require for this particular circuit two 4-mfd. high-voltage condensers. Full particulars of how to use the rectifier with these condensers and the smoothing circuit are given in the leaflet which accompanies the H.T.4 unit.

Briefly, the method of operation can be said to be the charging of a condenser on each half-cycle, simultaneously with the passing to the filter of a pulse of current. On the other half-cycle the condenser discharges and its voltage is added to that of the next pulsation going to the filter circuit. Inside the casing of the H.T.4 are two separate rectifiers and each rectifier carries a double load at each half-cycle, one-half of this load going to the filter and the other to charge the condenser.

The price of the H.T.4 is 37s. 6d., and a pair of 4-mfd. high-voltage condensers will cost about 15s. to 18s. In this regard it must be pointed out that the A.C. peak voltage to which these condensers will be subjected will be in the neighbourhood of 200 volts, and therefore the ordinary small

# What's New—*continued*

receiving Mansbridge condensers are not strong enough. It is a sound rule in connection with condensers of this kind not to work them at more than half of the test voltage, and therefore


*One of the batteries reviewed below.*

the condensers chosen should be at least 400 volts D.C. test.

Both of these units are noteworthy additions to the Westinghouse line and, we are sure, will meet with a wide welcome.

## For Higher Selectivity

From the Ready Radio Co. we have received the "Ready Radio Selectivity Unit," which is a neat and well-finished device measuring only 4½ in. by 3 in. by 2½ in. overall, designed to improve the selectivity of any set with which it is used. Tested on a set which was particularly flat in tuning and with which normally 2 L O came in over the whole scale at seven miles distance, the Selectivity Unit provided complete elimination of the London station over the whole of the band other than a few degrees, and enabled several stations very close to 2 L O to be brought in without the slightest interference from that station.

*The Ready Radio Selectivity Unit.*

Further tests were carried out with a fairly sharp tuning set with the idea of finding whether, by carrying out the instructions given, the unit seriously reduced the strength of the reception from stations against that it was desired to eliminate. We were agreeably pleased to find that the efficiency of the unit was quite high in this regard, the reduction in strength near to the station being "trapped." being extremely small.

All devices of this kind vary somewhat in their efficiency with different aerials, but so far as our tests have gone we have formed the opinion that it should work excellently in practically all situations. It is also free from certain defects often found in wave-trap devices. The price of the unit is 20s., and it can certainly be recommended to our readers.

*This is the Ekco combined unit for supplying L.T., H.T. and grid bias from the mains. Various H.T. and grid-bias voltages can be tapped off, and it will be seen that a voltmeter for checking the L.T. supply is incorporated in the instrument.*

## Pep H.T. Batteries

Messrs. R. Cadisch & Sons sent us recently two specimens of their "Pep" high-tension batteries, one with a nominal maximum of 60 volts and the other a nominal 100 volts, the actual readings being slightly higher. Tests over reasonable periods indicate that these batteries have a good performance, an even discharge, and a satisfactory life, being quite free from noises during their normal discharge period. They are, in fact, satisfactory batteries at reasonable prices.

## Interesting Mains Units

Messrs. E. K. Cole, Ltd., manufacturers of the "Ekco" devices, have recently issued two interesting new units. One is an L.T. unit designed to run from A.C. supply and operates on the principle which was first explained to the public by the Editor last year in the famous "Stedipower" units, of which this unit under review can be considered a commercialised form.

It is designed to give a maximum current of one ampere at two, four or six volts, and was found on test to cover the range specified and to function satisfactorily on all tests to which it was subjected. The appearance and make-up of this unit, as is the case with all this maker's products, is neat and pleasing, and we imagine that it will find a ready sale.

The other unit is a combination of H.T. and L.T. and G.B. supply, the L.T. side operating as in the case of the single L.T. unit, but giving only half an ampere maximum, and the H.T. having three non-adjustable voltages, the first being marked "S.G." for a screened-grid valve's grid, the second 60, and the third 120 to 150. These are, of course, nominal voltages, and will vary somewhat according to the load.

Provision is also made for supplying grid-bias voltage with a maximum of twelve, which is about right for a 2-volt super-power valve at the output voltage this unit will give, but is somewhat on the low side for a 6-volt type. Several other tappings are given to suit lower values of grid bias.

In fairness to the makers, however, it should be pointed out that this particular model (Model C2A) is intended for medium-sized sets, and those readers who want to go in for larger sets and higher supplies can obtain the Model C1A, which will give a maximum of one ampere L.T., has seven tappings up to 21 volts for grid bias, while the H.T. will supply a heavier current than is the case with the C2A model.

# OUR NEWS BULLETIN

***Some of the More Interesting Happenings in the Radio World this Month.***

### Tendencies In Talks

SOME good talks are due in the autumn. There are two distinct series in the programmes for Mondays and Wednesdays at 9.15 p.m. Mondays will be devoted to a symposium of views on "Modern Tendencies," and talks will be given by Mr. H. G. Wells, Mr. George Bernard Shaw, Sir Oliver Lodge, Dean Inge, and Professor Haldane. The Wednesday series will include famous authors, such as Andre Maurois, Virginia Wolff and Harold Nicholson. They will describe miniature biographies of real or imaginary people.

### While London Sleeps

Another series of talks under the general title of "While London Sleeps" will also be broadcast. The B.B.C. has arranged for various night-workers, such as a Covent Garden porter, a coffee-stall keeper and a river policeman to broadcast accounts of their nightly jobs. These entertaining talks will be heard on Tuesdays at 7 p.m., alternately with fortnightly talks for motorists.

### Interesting New Station

Have any of our readers heard the new Czecho-Slovakian station, Moravska-Ostrava, just above Newcastle's wave-length? This seems to be rather a mysterious station, for it has been heard at odd intervals, but not regularly. It has a power of 10 kilowatts, so there is no reason why, with reasonably decent conditions, it should not be picked up at good strength in this country.

### Charlot's Schemes

André Charlot, the well-known play producer and conductor of Charlot's Hour, and the originator of many entertaining B.B.C. broadcasts, recently wrote an article with the intriguing title of: "If I Ran the B.B.C."

It appears that one of Mr. Charlot's first moves would be to have a station broadcasting dance music from noon to midnight! That would give every dance enthusiast the chance of arranging his radio party, wrote Mr. Charlot, whenever he wanted to. I should also think that it would be a perfect boon to shoe repairers!

### U.S.A. Short-Wavers

Have any of our readers heard W 2 X K, the new American short-wave transmitter? Like others of the short-wave group in America, this station usually relays programmes of W G Y. The wave-length is roughly 24 metres. Relays from W 2 X A D, W 2 X O and W 2 X K are all coming over pretty well these days. They usually relay the afternoon programmes of W G Y. The best of them seems to be W 2 X O, and W 8 X K, of Pittsburg, gives a 62-metre relay which is often worth hearing.

### Russian Wave-lengths

Here are some Russian stations which are worth picking up:

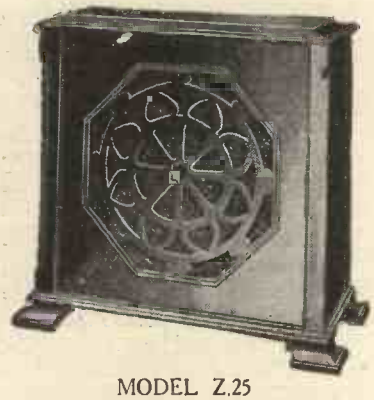
(*Continued on page* 372.)

MODEL Z.20

| | | | |
|---|---|---|---|
| Oak | .. .. | £7 | 15 0 |
| Mahogany | .. | £8 | 5 0 |
| Walnut | .. | £9 | 0 0 |

(to special order only)

Size 19½ ins. by 18 ins. by 8¾ ins.
Resistance 750 ohms (other resistances to order, at 5/- extra).

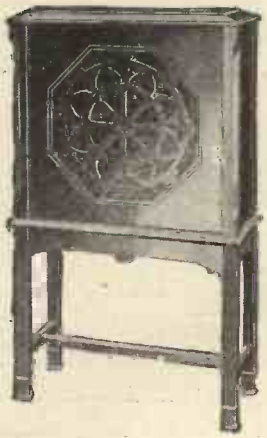


MODEL Z.25

| | | | |
|---|---|---|---|
| Oak | .. .. | £15 | 0 0 |
| Mahogany | .. | £15 | 15 0 |
| Walnut | .. | £16 | 16 0 |

(to special order only)

Size 24 ins. by 24 ins. by 14 ins.
Resistance 750 ohms (other resistances to order, at 5/- extra).



"CELESTROLA" Moving Coil Speaker

6 v. D.C. complete
Oak £24 0 0; Mahogany £25 0 0
110 and 220 v. A.C. complete
Oak £25 10 0; Mahogany £26 10 0
110 and 220 v. D.C. complete
Oak £24 12 6; Mahogany £25 12 6
Size 24 ins. by 40 ins. by 11½ ins.
(Without Cabinet Stand. £1 5 0 off the above prices).

# incomparably superior

We claim of the new Celestion that every detail of tone is re-created flawlessly. The proof of our claim is in your hearing. So confident are we of the outstanding merit of all Celestion models, that we ask you, unhesitatingly, to call at any radio dealers and hear for yourself a COMPARATIVE DEMONSTRATION of Celestion and other makes. Every reputable radio dealer stocks and demonstrates Celestion—a sure indication of its acceptance in all radio circles. An interesting and beautifully illustrated booklet on loud-speaker reproduction awaits your postcard.

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## OUR NEWS BULLETIN

—*continued from page 370*

| | | |
|---|---|---|
| Leningrad .. .. | 351 | metres. |
| Kharkov .. .. | 427 | „ |
| Moscow PTT .. | 825 | „ |
| Leningrad (again) . | 1,000 | „ |
| Kharkov „ .. | 1,304 | „ |
| Moscow „ .. | 1,481 | „ |

### Brookman's Park Calling

By the time this issue of the WIRELESS CONSTRUCTOR is on sale our readers should be hearing plenty of test transmissions from the new 2 L O at Brookman's Park. I paid a visit there the other day, and found that the station has been built on about 30 acres of land some five miles north of Potter's Bar.

An interesting little legal argument is going on because it appears there is a right of way right across the B.B.C.'s land. The B.B.C., it is said, wants to shut up a footpath or something, and the local council have strong objections. Exactly what the result will be it is hard to say, but the law with regard to rights of way is very curious.

### Right of Way

I know of one case where a right of way can be established across a field if the owner of the field refrains from closing the field to the public for one day in a year. By closing the field to the public for one day, he successfully retains legal control of the field; but if, by any chance, he allows 365 days to pass by without forbidding the public to use the field, then a right of way is established.

However, to revert to the new 2 L O, the first Regional transmitter will employ a maximum power of 50 kilowatts—roughly 25 times as much as is employed by the present 2 L O. Eventually, two separate and distinct transmitters, each sending out different programmes on a different wave-length, will operate.

The first "twin," which is all we shall hear for some time to come, will transmit on 356 metres, while No. 2 will eventually transmit on 261·3 metres.

### Extending 2 L O's Range

The difference between the two stations will be roughly 306 kilocycles, and although that separation is enough for listeners with up-to-date sets, there is no doubt readers with old sets which are not particularly selective will find eventually that the two stations will overlap. It is estimated that the new station will increase the range of the present 2 L O from twelve to fifteen miles up to between eighty to a hundred miles.

### Wipe-Out Worries

There has been a lot of talk lately about the wipe-out area for the new station, and, of course, there is no doubt that listeners within the wipe-out area will be able to hear little else but 2 L O all the time. But some critics seem to think the wipe-out area is going to be much bigger than it really will be. It will vary, of course, according to the type of set used, and there is no doubt that the new 2 L O will stimulate a good deal of research work in selectivity circuits during the course of the next twelve months.

### Good for Artistes

The B.B.C. has decided to increase the fees of many variety and theatrical artistes who broadcast performances which seem to appeal to listeners. A B.B.C. official said recently that, "after the second or third performance of an artiste, we may decide from the

(*Continued on page 374.*)

# One or More FORMO Components

ARTHUR PREEN & CO LTD

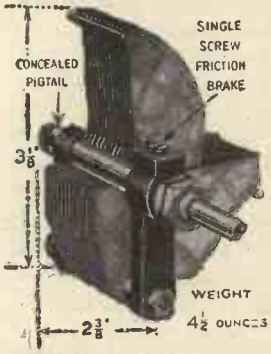
## SPECIFIED

In every NOTABLE CIRCUIT PUBLISHED during past year.

# "1930" CONDENSERS

**For COMPACTNESS, EFFICIENCY and RELIABILITY UNEQUALLED.**

### "1930" LOG (mid-line) CONDENSER

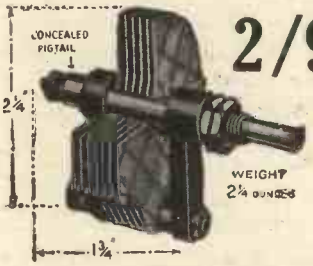



·0005
·00035
·00025
·00015

**4/6**

NOTE.
·00015 Double spacing for Ultra Short Wave

### "MIDGET" REACTION CONDENSER

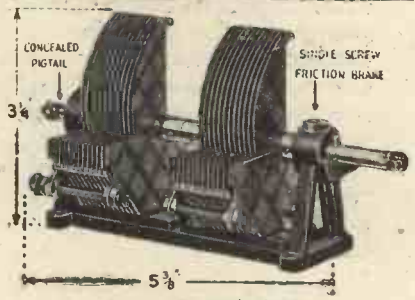



·0002

**2/9**

Can be supplied with Insulated Spindle
**Price 3/-**

### "1930" DUAL GANG CONDENSER




·0005 **15/6**

## FORMO Patented INTERNAL NOISELESS "PIGTAIL" is incorporated in ALL FORMO CONDENSERS

As mechanically and electrically perfect as the Formo Condensers of the last season of which we had to treble anticipated production to meet demand.

The patented features are obtainable only in FORMO CONDENSERS. The method of construction is such that the amount of solid dielectric is reduced to negligible quantity.

The "Pigtail" passes through a central hole practically the full length of the spindle, and is securely fastened to the end bearing, which is integral with the Rotor Terminal. The means employed completely overcomes the noises associated with the generally used clock spring and similar loose external devices.

The terminals are placed conveniently accessible. All brass parts are plated.

Small, elegant, but robust condensers of perfect design and workmanship and of highest efficiency.

The patented constructional features of this Gang Condenser (obtainable only in Formo Condensers) permit individual adjustment of each condenser, **thus enabling us to perfectly balance one condenser with another at all positions of the condenser movement**, without destroying the logarithmic curve. The usually-employed method of balancing condensers is by a small auxiliary condenser. This method, however, corrects errors in one position of the condenser only, and as a result the curve of the condenser is destroyed. **By the Formo method, the gang when balanced in any one position remains correctly balanced over the whole scale.**

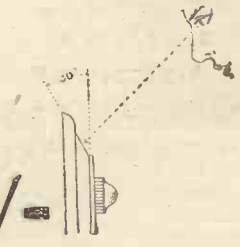
## *The Finest* VERNIER DIAL *obtainable.*

BLACK, BROWN, **3/-** MAHOGANY, WALNUT.

MECHANICALLY PERFECT. POSITIVE BRASS CONTACT drive on SOLID BRASS SCALE ensuring smooth movement, with absolutely NO BACKLASH, NO SLIP, ROBUST in Construction and Trouble Free.
SMALL. EXTREMELY ELEGANT. EFFICIENT.


**Price 3/-**

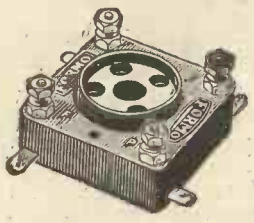
## TUNING WITHOUT IRRITATING, UNCOMFORTABLE CROUCH OR STOOP,




As depicted here, the scale and aperture are inclined at an angle of 30° from perpendicular, thereby permitting convenient unobstructed view of scale without need to crouch or stoop.

Black, Brown, Mahogany, Walnut (*Black supplied unless otherwise stipulated*).
(*Centre knob nickel plated*).

### Anti-Microphonic VALVE HOLDER



First-Grade BAKELITE including BASE PLATE Practically DUSTPROOF
**Price 1/3**

### FORMO-DENSOR

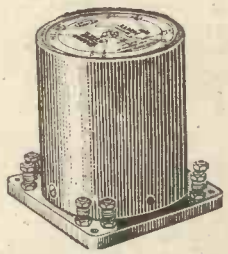
The finest article of its kind on the market.

| *Ref.* | *Max.* | *to Min.* | *Price.* |
|---|---|---|---|
| F | ·0001 | ·000005 | 2/- |
| J | ·0003 | ·000025 | 2/- |
| G | ·001 | ·0002 | 2/- |
| H | ·002 | ·001 | 3/- |

### TWO-RANGE TUNER

**Price 10/6**
Six-Pin Base - 2/-

### COMBINATION L.F. UNIT.



"TRUE SCALE" - 25/-
"TRANSFORMER
"CHOKE" - - 25/-
"TWO STAGE" - 30/-
(Send for full details).

### SHROUDED L.F. TRANSFORMER

The First Shrouded Transformer on the market
Ratio 1-3 1-5 Price 8/6

SEND FOR CATALOGUE. **THE FORMO CO., CROWN WORKS, CRICKLEWOOD LANE, LONDON, N.W.2**

## OUR NEWS BULLETIN

—*continued from page 372*

correspondence from listeners that certain artistes are successes, and consequently their payments will be increased."

### The Annoyance . . .

A funny story came from New York recently which is well worth repeating here, especially as it happens to be absolutely true.

In a certain cabaret near the home of an Acting County Judge of Texas, there was an outdoor loud speaker which caused the Judge considerable annoyance. He complained that it was disturbing him and his children, who were ill. However, his complaints fell on deaf ears, and nothing was done about it.

Now in London that sort of complaint might have led to a County Court summons, but nothing terribly serious.

### . . . And the Shots

However, the County Court Judge didn't waste any time when he saw his complaints had no effect. He picked up his rifle and plugged the loud speaker with three good shots. The loud speaker collapsed and never moaned again. The Judge, however, has been well rewarded. Not only has he achieved silence, but he has received congratulations from all over Texas. One message read:

"Congratulations on your heroic deed. We think a long-suffering public should give you a hearty vote of thanks. Come to us and duplicate your noble deed."

### New Regional Hopes

It is understood that progress is now being made with the plans of the new North Regional Station at Pole Moor, Slaithwaite, near Huddersfield. A B.B.C. official said recently that the test transmission experimental stage had been passed, and that the Corporation engineers were satisfied with the results obtained.

Furthermore, the Post Office authorities were convinced that the site was a good one and that the transmission lines will work satisfactorily.

### One Wave-length At First

It is reckoned that about a year will be required to erect the station and, like the new 2 L O, it will at first probably work only on one wave-length.

It is interesting to note that when an ordinary station is being worked, about ten or a dozen mechanics and labourers are usually needed as a permanent staff, but when the twin-wave-length system is adopted the staff has to be increased to fifteen or twenty.

### Some "Hook-Up"

A big step forward will be taken in the history of broadcasting in Canada this winter by the completion of arrangements now being made by the Canadian National Railways for the regular relaying of weekly programmes from the Atlantic to Pacific coast—a distance of 3,500 miles. To make this possible, the Company will use 15,000 miles of telegraph and telephone wires and will link sixteen broadcasting stations, thirteen of which, as the largest single broadcasting organisation in Canada, it owns or operates direct.

### Concerts for Canada

This technical achievement will be accompanied by an equally notable advance in the programmes; arrangements having been completed for the Dominion-wide broadcasting of a series of twenty-five symphony concerts.

## THE "PUSH-PULL" FIVE

—*continued from page 337*

High-tension positive 2 terminal goes to one side of the high-tension fuse, the other side of which has three connections; one going to the screening-box, the other to one of the wire-wound resistances, and a third round to one terminal of the push-pull input transformer, a branch wire being taken off on the way to the high-tension terminal of the push-pull output transformer.

### A Few Final Points

Note particularly that I have taken the lead to the terminal marked "anode" of the push-pull input transformer, that marked H.T. positive being taken to the plate of the preceding valve. The reason for this is that I find this reversal of connections gives slightly better results.

The two 100,000-ohm resistances in the grid leads of the push-pull valves are inserted in the Dubilier vertical grid-leak holders, and if you desire to experiment with different values here (though you will not find anything better than 100,000 ohms) it is wise to make the upper connection a flexible one, otherwise it can be wired-up with stiff wire.

Notice that the high-tension positive and the grid-bias terminals of the Hypermu transformer are joined together in the particular connection used. This is as recommended by the makers.

Two terminals of the differential reaction condenser are left blank, and the lower two on the two sets of fixed plates are those used. One goes to the moving plates of the second variable condenser, as this is the simplest way of taking it to low-tension negative, for the two sets of moving plates are connected together and to the screening-box, which, as you know, is joined to low-tension negative.

Do not place the push-pull input transformer too close to the panel, otherwise you will have difficulty in getting your fingers behind it to tighten up the connections.

### Choice of Valves

Either 2-, 4-, or 6-volt valves can be used, but best results will be obtained from the 6-volt variety. The first valve will obviously be of the screened-grid variety, the second should preferably be one of the type of about 7,000 ohms impedance, such as the D.E.L.610, while any good L.F. valve will suit for the first low-frequency stage. The output valves should be purchased matched for push-pull use, and can be any of the well-known makes of power or super-power. Be sure to use not less than the specified grid bias for the two low-frequency valves.

### The H.T. Voltages

With regard to high-tension, 120 or 150 volts should be used, preferably the latter figure. The total high-tension consumption, using six-volt valves with 150 volts, will be about 40 milliamps if full super-power valves are used, and this will require a good mains unit, but only when exceptionally loud, undistorted signals are required need such valves be used.

Good results will be obtained with a pair of power valves in the output, and with these real super-power quality will be obtained when the total high-tension consumption is not more than 25 milliamps if the correct grid bias is used, and a little more grid bias than that specified by the makers can be used quite satisfactorily for push-pull, thus economising still further in high-tension current.

(*Continued on page 378*)

## THE "PUSH-PULL" FIVE

*—continued from page 376*

In screened-grid valves this year's models vary very considerably in plate current and screened-grid current. The resistance in the first screening box and connected to the screened grid serves two purposes.

### How Many Ohms?

Firstly, it is a decoupling resistance, and, secondly, it can be chosen of such a value for the particular valve that it will break down the voltage of your supply from the maximum figure to that required for the screening grid. Thus with the correct resistance chosen, H.T.1 terminal could be joined to H.T.2, and 120 or 150 volts connected to the lot. To calculate the resistance required here it is only necessary to find the difference between the screened-grid voltage and the voltage of your supply (for example, if the S.G. voltage is specified by the makers as 70 and you are using 150, the difference will be 80 volts), multiply this figure by a thousand and divide by the screened-grid current in milliamps.

Thus if the screened-grid current is 1 ampere, the answer will be 80,000, and an 80,000-ohm resistance will bring the voltage down as required. Similarly, if the screened-grid current is 2 milliamperes (as happens to be the case with the Marconi or Osram S.610), and the recommended screened-grid voltage is 60 to 90, then any resistance between 30,000 and 45,000 ohms will suit. However, you may like to experiment with different makes of screened-grid valves, and, if so, it is better to have an adjustable tapping on your high-tension supply. In such a case I would recommend you to make this a 2,000- or 3,000-ohm resistance, and adjust your tapping to suit the valve.

The resistance in the second box which is placed in series with the *plate* of the screened-grid valve is the decoupling resistance, and can conveniently be 3,000 ohms. It should not be much higher than this as some of the new screened-grid valves take rather a heavy plate current, and too large a resistance here will mean too great a voltage drop.

Of the two resistances connected to the plate of detector valve, that connected to the radio-frequency choke must be 30,000 ohms, while the second in series with it should be 20,000 ohms, and not more.

Of the coils, the first should be a binocular aerial coil for the particular band, and the second a Lewcos Super coil with interchangeable primary. For general work, a No. 10 primary will be found suitable for the lower band, and a No. 20 for the upper.

### Operating the Set

Operation of the set is extremely simple. First of all set the aerial adjustable condenser (the upper knob on the left) to maximum, and the reaction condenser to zero (as far as the knob will go to the left). Set the volume control to full on (as far as the knob will go to the right).

The slider of the baseboard-mounting potentiometer in the second screened stage should be placed somewhat nearer the positive end than the mid point. H.T. positive 1 should be connected to a suitable tapping on your high-tension supply, unless you have chosen a wire-wound resistance for the particular screened-grid valve value.

Do not forget that this set is on show at the Wireless Exhibition on the WIRELESS CONSTRUCTOR stand, where an expert will be in attendance to give you any information you may require.

## THE "TWO-WAY" TWO

—continued from page 354

between 120 and 150 volts, depending on the type of power valve in use.

To complete the external wiring, connect the earth lead to the earth terminal and the aerial lead to $A_2$, if the wave-trap is to be introduced, or to $A_1$ if it is to be excluded. Before switching on the L.T., make certain the panel controls are set as follows:

### Cutting Out the Local

The wave-change switch $S_1$ should be pulled out for the short waves and the reaction condenser should be set so that the moving vanes are overlapping the fixed vanes, for minimum capacity; the 400-ohm potentiometer should be set to the positive end, and the tuning condenser to about 90 degrees. Now switch on the set and turn the tuning condenser $C_1$ until the local station comes in. At the same time note if it "spreads" over the dial.

If so, disconnect the aerial lead from $A_1$ and reconnect it to the $A_2$ terminal, and adjust the Formodensor $C_6$ until the station completely disappears, except at a definite point where it tunes-in on $C_1$. For the lower part of the wave-band the switch $S_3$ can be pushed in so that only the condenser $C_6$ is in operation. A further attempt may be made to tune-in a station higher up the tuning scale on the condenser $C_1$, the reaction condenser also being increased until the set begins to oscillate. By the way, it may be mentioned that the differential reaction condenser as fitted on the set works in an anti-clockwise direction, from the smallest part of the vanes to the largest part. Should the condenser you purchase operate in the opposite direction—that is, clockwise—then it will be advisable to reverse the leads to the $F_1$ and $F_2$ terminals.

Slightly floppy reaction effects may be avoided by careful use of the potentiometer, turning the arm away from the positive end, though if this fails to effect a cure the high-tension to the H.T.1 terminal can be reduced slightly in value.

### The Longer Waves

Having covered the short-wave operation, we can now turn our attention to the higher wave-band, and the wave-change switch $S_1$ can be pushed in for the purpose. On switching over, it may be found necessary to retard the reaction condenser slightly, as the reaction winding may be found slightly too big for a similar setting on the high waves. Do not forget that you can vary selectivity on the high waves by shifting the tap on the coil in the $L_1$ position, and, further, if the local station tends to come in on the bottom end of the high-wave dial, a further slight readjustment to the Formodensor $C_6$ may have a beneficial effect, but whatever the setting it will be extremely fine and should be carried out with a long screwdriver.

### Loud-Speaker Results

Readers constructing this set should experience no difficulty whatsoever in obtaining loud-speaker volume on at least five stations, with, of course, many more during the winter months. The original receiver was tested in North London, about four and three-quarter miles from the existing 2 L O, and when worked off a rather poor 30-ft. outdoor aerial it brought in quite a number of foreign stations, in addition to 5 G B, 2 L O, 5 X X, and Radio-Paris, on the loud speaker, the quality being excellent, as it normally is on a single stage of L.F. amplification.

## THIS YEAR AT OLYMPIA

*—continued from page 320*

type cabinet in various patterns, pedestal and table models, moving coil cabinets, and cone-speaker cabinets especially suitable for the Blue Spot and other well-known cone units.

Here, too, will be a special display of the Mullard S.G.P. Transportable and table model cabinets, the Master Five portable cabinet, and other cabinets well known to home constructors. In addition, there will be a new pedestal-pattern radio-gramophone cabinet on show, with ample provision for any make of motor and gramophone pick up, together with loud speaker, battery or eliminator.

### LOEWE RADIO CO., LTD.

**Stand No. 291.**

This firm is well known in connection with the famous Loewe Multiple valve, in which three or even more valves can be crowded into one bulb, thus economising space and providing a valve which only requires a tuning unit and aerial and earth attached to it in order to make a complete receiver.

It is not so well-known that this firm markets also two interesting types of loud speaker, one in mahogany finish for home use, selling at £2 10s., and the other a large instrument for use in public buildings. The former employs the balanced magnetic system connected to a large conical diaphragm, so that the sounds vibrated are transmitted directly to the air and without the interposition of a horn. These and the famous Multiple valves (of which two varieties will be showing) are sure to attract many admirers.

### LONDON ELECTRIC STORES, LTD.

**Stands Nos. 293 and 294.**

This well-known firm is a purely wholesale concern so that it is representative in its lines of the trade as a whole. Endeavours are being made to show the best selling lines, so that retailers should on no account miss this display.

### LONDON ELECTRIC WIRE CO. AND SMITHS, LTD.

**Stand No. 64.**

Lewcos products are so well known to every coil owner that there is no need to advise a visit to this stand, for every well-trained constructor will find his feet making for there without premeditation. No matter what you want in the coil line you will find that Lewcos components and lines are out to cover your requirements. It would be impossible to name them all, but the Lewcos Super six-pin coil will be a very special attraction to all those interested in experimentally obtaining the best possible result from the new types of valves.

One bit of "Lewcos" good news is that of price reductions, many of which come into force this month.

### LONDON RADIO MFG. CO., LTD.

**Stand No. 112.**

Orphean loud speakers are the principal feature here, ranging from a Gem model at 30s. and the Orphean cone loud-speaker at 29s. 6d. to the Orphean Super Cabinet Cone at £6.

Listeners will note with interest that the standard model of the Orphean speakers has been reduced from 50s. to 40s., and the de-luxe model from 70s. to 50s., with corresponding reductions in the various gramophone attachments. Plug and jack connectors and drive units will also be on display.

### MARCONIPHONE CO., LTD.

**Stands Nos. 79, 80, 81, 82, 83, and 84.**

The Marconi valves alone would be an exhibit in themselves, but when we remember that this remarkable and right up-to-date range is backed up by a wide variety of other good things for the listener and the constructor, it will be realised that six stands are going to be well-packed if they are to be representative of the best that Marconiphone people can do.

The complete receivers alone seem to cater for every kind of circumstance that besets the puzzled buyer of a broadcast set, right down to the detail of deferred terms. Sets that incorporate from two up to eight valves are available, and advice and all possible asststance will be given to would-be purchasers.

Other Marconiphone lines are accumulators, headphones, H.T. batteries, loud-speakers, power amplifiers, power units, trickle chargers, and the famous Marconiphone transformers.

### METRO-VICK SUPPLIES.

**Stands Nos. 148 and 152.**

Battery eliminators, chargers, and components are a strong feature of the displays on these

(*Continued on page 383.*)

## THIS YEAR AT OLYMPIA

*—continued from page 382*

stands, some of the models being old friends with up-to-date improvements and others being entirely new. An interesting line which is making its appearance for the first time this year is an all-electric power eliminator, and here in profusion will be found L.F. chokes, wire-wound resistances for eliminators, transformers, and the M.-V. tapped choke for push-pull amplification.

Listeners on the look-out for bargains will also appreciate the elastic aerial unit, permatone condensers, R.F. chokes, and the silicon R.C.C. detector unit, all of which have proved popular in the past and are to be features in Metro-Vick's campaign during the coming season.

**M.P.A. WIRELESS, LTD.**
**Stand No. 165.**

This firm, well-known in connection with loud speakers, is now doing a number of other radio lines, including an "all-electric two" mains receiver which (with detector, and pentode output) receives local stations and at least two main broadcasting stations. There is a change-over switch for the long and medium wave-lengths, and the set is built in an attractive and polished oak cabinet, which is provided with a jack for gramophone.

Suitable for all A.C. voltages, the mains unit is entirely self-contained and is perfectly safe, complying in all respects with I.E.E. regulations. An interesting addition to the M.P.A. loud speakers is a permanent-magnet moving-coil type which requires no separate energising current, and is claimed to be made on entirely new principles. Capable of handling the full output of a 2 L.F. five-valve set without distortion, the price complete in cabinet is 17 guineas.

There are several newcomers also in the small loud-speaker line, one the M.P.A. Popular plaque being an entirely new model. Mounted on a wooden base, and fitted with the New Mark VI unit, this retails at 25s. Another newcomer to the M.P.A. line is the Popular Cabinet, which is also fitted with the new Mark VI movement in a containing case which is specially designed for the elimination of box resonance.

M.P.A.'s are putting up also an all-electric screened-grid transportable four, which has a range of 200 to 2,000 metres by means of a single switch, and will give a choice of many programmes from the self-contained aerial and speaker.

***The Marconiphone A.C.3 H.T. Unit uses a receiving valve for half-wave rectification.***

**MULLARD WIRELESS SERVICE CO., LTD.**
**Stands Nos. 134, 135, 136, 137, 58 and 117.**

If you want to realise the advances made in valve manufacture during the last few years, take a look at these stands, displaying 40 different types of valves! Ranging from the humble 2-volter, the Mullard lines go up to A.C. valves, one of which has a magnification factor quoted at the staggering figure of 1,000! This is the S.4.V., which is a screened-grid valve, with independently-heated cathode.

Apart from the valves, Mullards will be showing some dozen or more lines of bang-up-to-date 1929–1930 season stuff, including "Permacore" L.F. transformers, loud speakers, R.C.C. units, H.T. units, filament transformers, wire-wound anode resistances, P.M. grid leaks and holders, P.M. condensers, and a potential divider designed to enable many different voltages to be obtained from a D.C. supply.

The general Mullard exhibits will be on Stands Nos. 134, 136, and 137, together with a demonstration room in the gallery (Room T). Stands 58 and 117 are for "Radio for the Million."

(*Continued on page* 384.)

## THIS YEAR AT OLYMPIA

*—continued from page 383*

### NEW LONDON ELECTRON WORKS, LTD.

**Stand No. 67.**

Are your results "Superial" to other people's? If not, you should drop into the New London Electron Works, Ltd., stand, and have a look at their "Superial" wire, which they contend is the best aerial it is possible to put up.

This stand is especially interesting to the crystal set user (whose results depend upon a good aerial more in proportion than those of the valve-set owners), but every listener and experimenter will be interested in the wares displayed here.

### OLDHAM & SON, LTD.

**Stands No. 68 and 70.**

Oldham accumulators need no introduction to readers of the WIRELESS CONSTRUCTOR, who have been familiar with this firm's products from the time when they fixed their first valve holder in place, and this year's display is quite in keeping with the reputation of this famous radio firm.

Here are to be seen plenty of the old, familiar friends, as well as a number of new lines designed particularly to conform with the up-to-date requirements of the radio constructor, both in the matter of heavy current supply required by the larger sets and also in the economical and long service line demanded by the man who runs a set in the country, right away from charging facilities.

Whatever your radio requirements may be in the way of current, it is sure that Oldhams can cover your needs from one of their lines; so if you are in any way in difficulty about the current supply, do not fail to visit this stand.

### ORMOND ENGINEERING CO., LTD.

**Stands Nos. 118 and 121.**

At one time the name of the Ormond Engineering Co. was always associated with condensers, and though this firm still specialises in all kinds of these for the radio enthusiast, they have branched out also in many other lines with great success.

So well-known are the products of this firm to WIRELESS CONSTRUCTOR readers that they will need no persuasion to look over this stand, especially when they learn that a number of new lines are being shown at Olympia for the first time. There are far too many of these to detail them, but of particular interest are the lever type anti-capacity switches, a line of small fixed condensers, half-a-dozen new jack switches, and the new Ormond receivers. These take the form of a valve set which can be obtained in suit-case form, or in walnut, mahogany, or oak.

Five valves are employed, and although the main consideration was quality, particular attention was paid to effective range, to ensure not only one or two alternatives, but a wide variety of British and Continental programmes. The set is supplied complete, including the loud speaker, five 2-volt valves, Ormond 108-volt H.T. battery, 9-volt grid battery, and 2-volt unspillable accumulator, for £15.

### E. PAROUSSI.

**Stand No. 206.**

The products of this firm will be familiar to a very great many readers of the WIRELESS CONSTRUCTOR, in connection with their special screens in aluminium and copper, highly polished and mottled, finished to any size and shape as required. Many constructors have found these invaluable when building an outsize set, and is addition this go-ahead firm caters for the more popular special coils of the types described in this journal and in its contemporaries, "Popular Wireless" and "Modern Wireless."

A good instance is the well-known "Titan" coil, special features of the Paroussi version of this being the plugs and sockets for the tapped primary circuit instead of crocodile clips. Another distinctive feature of this coil is its small ebonite tube for separating primary and secondary winding, and the plug-in long-wave coil, wound entirely of D.S.C. wire.

Another attractive feature is the wave selector made on somewhat new lines. The coil for this is made on a six-pin former and entirely screened in a well-finished aluminium box with a lid. There are three tappings to give various degrees of selectivity.

Another good feature at this stall is a vertical valve holder which is intended for use primarily for screened-grid valves. Made of highly polished ebonite this is retailed at 2s.

### PARTRIDGE & MEE, LTD.

**Stand No. 98.**

The "Parmeko" people make a speciality of mains apparatus, so that the listener with electric

(*Continued on page 385.*)

## THIS YEAR AT OLYMPIA

—*continued from page* 384

light in his house will be sure to find plenty of interest on this stand. Apart from the mains transformers, smoothing chokes, and various H.T. and L.T. eliminators, there is an attractive range of mains transformers for use with the metal rectifiers.

All sorts of inputs and outputs and voltages are covered, and in addition there is a very useful collection of radio accessories for use in mains units, such as condensers, resistances, Bradleyohms, rectifying valves, and metal rectifiers. Incidentally this firm publishes some very instructive and useful leaflets showing circuits for their apparatus.

### PETO AND RADFORD.

Stand No. 108.

Makers of the P.R. accumulators, this firm has had many years' experience in providing full power batteries for radio work. Of special interest is the P.G.F.5, a 2-volter in a glass case which may be obtained with indicating floats, giving an accurate indication of the state of the charge.

### PETO SCOTT, LTD.

Stands Nos. 42, 43, and 44.

There are some extremely interesting exhibits here, and all WIRELESS CONSTRUCTOR readers will be interested in the Peto Scott version of Mr. P. W. Harris' "New Roadside" Four (the description of which he first wrote in the WIRELESS CONSTRUCTOR, May issue).

At these stands there will be the usual Peto Scott service, and full information regarding their own receivers, and in addition particulars may be obtained of the great variety of other lines now handled by this go-ahead firm.

(*Continued on page* 386).

## THIS YEAR AT OLYMPIA

*—continued from page 385*

### PYE RADIO, LTD.

**Stands Nos. 160 and 163.**

At these stands will be found the select but large range of Pye products, and the transformers and chokes, portable sets, and speakers, etc., which in the past have found such favour with the public will again be to the fore.

This firm now has some very notable all-electric sets, in which sensitivity of a high order gives a wide choice of programmes. The Pye range is so complete nowadays that even the purchaser of very limited means can aspire to Pye productions, as is shown by the Pye "Popular Two," which costs less than a fiver.

### RADIO INSTRUMENTS, LTD.

**Stands Nos. 122 and 123.**

Whatever else our eyes may be tempted by, there is sure to be the usual keen interest in this famous firm's popular products, which include the reactive anode unit, P.M. detectors, standard retroactive tuners, and the aperiodic tuner. No amount of new lines will shake the constructor's confidence in some of these lines, for he has proved them in the past, but, however conservative his inclinations, the R.I. new lines will be found to interest him.

Among these are the new astatic high-frequency choke, specially introduced for screened-grid circuits, the chokes for smoothing in mains units and output filters (carrying up to 100 milliamps), and the adjustable heavy-duty choke, the inductance of which is changed by turning an adjusting screw that varies the air gap in the centre of the core.

There is a comprehensive range of power transformers for mains operation, for use with every type of dry rectifier made by the Westinghouse company, both for half-wave and full-wave rectification. Then there is the "Hypermu" L.F. transformer, which employs the new magnetic alloy and was the subject of a test by the N.P.L., a very impressive characteristic curve resulting therefrom.

R.I.'s show also a complete range of battery eliminators, using the Westinghouse rectifier and electrolytic condensers. Finally, there are two new R.I. receivers of which glowing accounts have been rumoured for some time. One of these is a three-valve receiver using indirectly-heated Cosmos valves in the A.C. model, while in the D.C. model ordinary valves are used, of the screened grid, detector and pentode types.

This receiver is run entirely from the mains, and gives a wide choice of programmes without the use of aerial and earth. (Provision is made for connection to an external aerial and earth if the owner desires to increase the range of the instrument and the choice of programmes.)

A valuable feature is that the mains part of the instrument is fitted in a separate department below the set and the latter is fully screened, the whole of the mechanism being contained in the screening box, so that on lifting the lid of the instrument the aluminium plate or panel alone is seen.

The two-valve receiver is either "all-electric" or fitted for battery operation, and has single-dial tuning, the dial being set at an angle of 45 degrees. This set will give sufficient power to operate a moving-coil loud speaker, and the makers are particularly proud of the bakelite construction, claiming this as one of the finest examples of this kind of thing ever produced.

### READY RADIO.

**Stand No. 93.**

Here the Ready Radio people are exhibiting two new and most interesting products in addition to their standard range. The Ready Radio Selectivity Unit (familiarly known as "Susie"), will make a particularly strong appeal to all who are affected by the transmissions from Brookman's Park and the other new regional stations to be opened under the B.B.C.'s scheme. Two models are made (for "broadcast" and high waves), and in addition there is a new type of loud speaker of which the firm is very proud, and which they will be glad to demonstrate at the showrooms in 159, Borough High Street, London Bridge, S.E.1.

### REDFERN RUBBER WORKS.

**Stand No. 43.**

Well known for the quality of their products and the high standard of excellence attained in large-scale manufacture, this famous firm's products will always be of interest to the discriminating purchaser. In addition to a wide variety of panels, there will be a comprehensive display of mouldings, ebonite rods, and tubes.

(*Continued on page 387.*)

## THIS YEAR AT OLYMPIA

*—continued from page 386*

**SIEMENS BROS. AND CO., LTD,**
**Stands Nos. 69 and 71.**

Continuous experiment and research, combined with a long and comprehensive experience of manufacturing, have enabled Siemens to produce batteries that rank very high in the regard of radio constructors. This year's display will include H.T. batteries of small-capacity and of large-capacity types, as well as super-radio H.T. batteries of extra large capacity.

Competitive lines of dry batteries, of negative G.B. batteries, and of inert H.T. batteries will be represented, and also of testing instruments. For L.T. purposes there are the Siemens dry cells and batteries, and the L.T. Sac Leclanche cells.

*The famous Amplion "Lion" loud speaker.*

**SIX-SIXTY RADIO CO. (THE ELECTRON CO., LTD.).**
**Stand No. 288.**

Six-sixty valves cover radio requirements in 2-, 4-, and 6-volt types, and many old admirers, as well as new adherents, will be interested in the types showing this year. Of special interest is the S.S.230 P.P., which is a pentode for use with 2-volt accumulator.

A feature of the manufacture is the duo-triangular filament suspension, full details of this and of the characteristic curves being obtainable here upon request.

**STANDARD WET BATTERY CO.**
**Stand No. 57.**

Well known to listeners who have paid particular attention to the question of L.T. and H.T. supply to their receivers, this firm is starting the new season with several attractive lines, added to their already comprehensive list.

A new cartridge pattern of standard wet battery is now available, and instead of a number of separate parts the working element is a single cartridge unit made up of sac, zinc, and insulation. The cells are connected together simply by snapping the zinc rods by means of a patent connector on the carbon cap with a special tool supplied.

The batteries are made ready by filling jars with standard fluid, inserting the cartridge inside, and, after adjusting the level of the fluid, a well-fitting cork is pressed over the carton into the neck of the jar. Requiring no attention whatever, it is claimed that the standard battery greatly reduces the

*(Continued on page 388).*

# THIS YEAR AT OLYMPIA

—*continued from page 387*

cost of H.T. current and gives improvement of reception, with no running down of battery when not in use.

Realising that good maintenance is half the battle, this firm is now marketing some very useful testing instruments.

The three-in-one test-meter has a reading from 0 to 150 volts, 0 to 6 volts, and from 0 to 30 milliamps, and is supplied for 8s. 6d. with full instructions ready for use.

### TELEGRAPH CONDENSER CO., LTD.

**Stand No. 248.**

The name of this firm indicates that they are specialists in one particular line, and millions of satisfied users of the products made by T.C.C. will testify as to the excellent results obtainable from specialisation in manufacture, carried out with such care and thoroughness as in this instance. A pleasing feature of this famous firm's policy is that the "new" lines (such as the whole of wireless manufacture must have appeared to be a few years ago) receive attention and care in design equal to that bestowed upon the very large condensers for high-power work which are contracted for by this world-famous organisation.

Even in the smallest details the design has been carefully thought out, so that the smallest condensers shall stand securely upon their bases and fit easily, as well as be efficient for their particular job, in just the same way as the large condensers have to be turned out with every detail of finish, etc., acting as a selling point in a keenly competitive market.

Every constructor who has had experience of the trouble and expense caused by a dud fixed condenser will be attracted by the display at this stand, knowing that not only does it look good, but that every component is due to a firm which many years ago were finding out all the snags in telephone condenser construction.

### TELSEN ELECTRICAL CO., LTD.

**Stanl No. 110.**

The Telsen people are the Birmingham transformer manufacturers, and here will be found displayed the well-known "Radiogrand" models. Being entirely British-made, the quality is everything that can be desired in a transformer of this type, the instruments being shrouded and provided with good, solid terminals, easy of access and thoroughly dependable in action. Made in both 5 to 1 and in 3 to 1 ratios, you should not fail to enquire of Telsen's if you are trying to ensure quality in radio reproduction combined with low price and long performance.

### THE TRELLEBORG EBONITE WORKS, LTD.

**Stand No. 281.**

Here will be found machined and turned components and accessories all manufactured from Trelleborg ebonite, in the form and at just the price to please the home constructor. The display includes not only panels, but formers, bobbins, switches and lead-in tubes, in great profusion.

### ULTRA ELECTRIC, LTD.

**Stand No. 106.**

The Ultra Electric, Ltd., are makers of the new Ultra Air-Chrome loud speaker, which has already established a high reputation for good quality reproduction. Readers of the WIRELESS CONSTRUCTOR have already been introduced to this interesting production, the dominating principle of which is the double diaphragm.

One of these diaphragms is comparatively small to reproduce the higher frequencies, while the other, being larger, deals with the low notes. Both diaphragms are simultaneously operated by a true balanced-armature movement of excellent design, and specially prepared and treated linen forms the material of which the diaphragms are made.

A great feature of the Ultra Air-Chrome loud speaker is the fact that it is made in chassis form so that it can be fitted into an already existing cabinet, or made easily by the home constructor to fit in with his own conditions.

### VARLEY CO., LTD. (Oliver Pell Control).

**Stands Nos. 154 and 155.**

Many and varied are the Varley components for the forthcoming season, the whole range having been revised and brought right up to date to conform with the very latest requirements of radio. As everybody knows nowadays, this firm is interested in a wide variety of broadcast receiver components, including R.C.C. units, anti-motor-boating units, chokes, resistances and holders, rheostats, potentiometers, volume controls, gramophone amplifiers and pick-ups; in fact, in most of the constructor's requirements.

Of very special interest are the new 10-watt power resistances which, constructed upon a new principle, allow for expansion and contraction without the liability of breakdown in insulation between adjacent turns of the winding. Complete with holder, these run about 6s. 6d. each, and everyone who knows the difficulty in getting wire-wound resistances to carry round about 100 milliamps will apppreciate what a great boon this new Varley line will be.

Very attractive, too, are the new lines of rheostats and potentiometers, one variety of the latter costing only 3s. 6d., whilst a potentiometer principle volume-control device with a total resistance of half a megohm is now being produced for 6s. 6d. Special activity has been shown by this firm with regard to chokes and transformers, and at this stand will be seen the latest lines, i.e. pentode, metal rectifier transformers, power transformers for valve rectifiers, and the new Nicore low-frequency intervalve transformer which, as the name indicates, employs a nickel iron alloy of exceptionally high permeability. Apart from the famous components, this firm will be showing mains receivers, battery receivers, and radio-gramophones, all of which must be seen to be appreciated.

### WARD & GOLDSTONE, LTD.

**Stand No. 290.**

Advance information of the lines which this firm is exhibiting at Olympia shows a very attractive range of components both for the constructor and for the ordinary listener without technical experience or how-to-make ambitions. A feature of the display for the latter class is the Negrolac aerial.

This aerial consists of a large number of enamelled stranded wires, with a strong outer covering over which a number of applications of Negrolac enamel has been applied, so as to render the whole aerial extremely good in severe weather conditions. One of the main specialities of this firm is wire of all kinds, so that the constructor will find a large variety of silk, cotton, and other covered wire, as well as a wide range of plug-in coils to suit all sets, such as the Titan, Cossor Melody Maker, Mullard Master Three, etc.

Besides these various indoor and outdoor aerials, at this stand will be found a variety of "Quick-grip" connectors, and also special terminals, leading-in tubes, accumulator carriers, etc. Loud-speaker and telephone cords are another speciality, whilst among the components will be found H.F. transformers, chokes of various kinds, and fixed condensers, and an interesting line of Morse keys and sounders.

Other directions in which this enterprising firm is interested are radio meters for testing and maintenance, and also high-tension batteries. The above, together with the well-known H.T. battery eliminators and other "Goltone" products, make a thoroughly attractive display.

### THE WESTINGHOUSE BRAKE AND SAXBY SIGNAL CO., LTD.

**Stands Nos. 13 and 14.**

Metal rectifiers in a surprisingly wide and comprehensive variety will be found here, and, in addition to the established models which were exhibited last year, certain new rectifier units will be on show.

The rectifiers, of course, are of the famous dry type in which chemicals are used, and as there is absolutely no liquid to spill, nor paste to go wrong, the popularity of these units is increasing by leaps and bounds. A very wide range of these instruments is available for L.T. charging, or for those who wish to eliminate altogether the L.T. battery, and other types either for high-tension chargers or for high-tension eliminators. The rectifiers are already well-known as an extraordinarily good method of obtaining from A.C. supply both high- and low-tension current for radio purposes.

This new series of rectifier units is offered to enable trickle chargers and eliminators to be constructed without using either rectifying valves or electrolytic cells. As the efficiency of the rectifying unit is high (of the order of 60 to 65 per per cent) they do not need unduly large transformers. The Westinghouse metal rectifier is suitable for full-wave rectification without using separate tapped transformers, and being noiseless in operation, sold in metal cases, and easily assembled, they are sure to find great favour with home constructors during the coming season.

Readers of the WIRELESS CONSTRUCTOR will be glad to know that a booklet of instructions for building high- and low-tension chargers and eliminators can be obtained at the stand. It is called the "All-Metal Way," and is packed full of valuable information about these most interesting appliances.

The Westinghouse Brake and Saxby Signal Co. are also making a feature of their universal charging set, and if all goes well we are informed that this will not only be on view, but will actually be in operation at this stand during the Exhibition.

### WILKINS AND WRIGHT, LTD.

**Stand No. 115.**

The "Utility" no-capacity change-over switches, designed to combat one of the greatest sources of loss of signal strength, will be on view here, as well as numerous other useful forms of switch and switch-ganging. Variable condensers, too, will be available in wide variety, including "Mite" gang condensers and drum-dial and thumb-control types.

Another attractive line by this famous Birmingham firm is the Log Triple condenser, whilst for neutralised circuits there is an attractive N.C. which can be mounted above or below the base-board.

### WRIGHT AND WEAIRE, LTD.

**Stand No. 221.**

Useful components are the mainstay of this display, including the well-known anti-capacity switches, which, by the way, are being used by a large proportion of set manufacturers to-day. Samples of coils, including the famous "Titan," are a strong feature here, and the A.C. mains man will find 5-pin valve-holders, heavy-duty H.F. chokes, etc.

The Wearite All-Wave Tuner, introduced some three years ago, has been improved and is more popular than ever. In addition a full range of chokes (including iron-cored H.F. chokes), decoupling resistances, rheostats, and screens will be on view, together with Paxolin panels and formers.

## INDEX TO ADVERTISERS

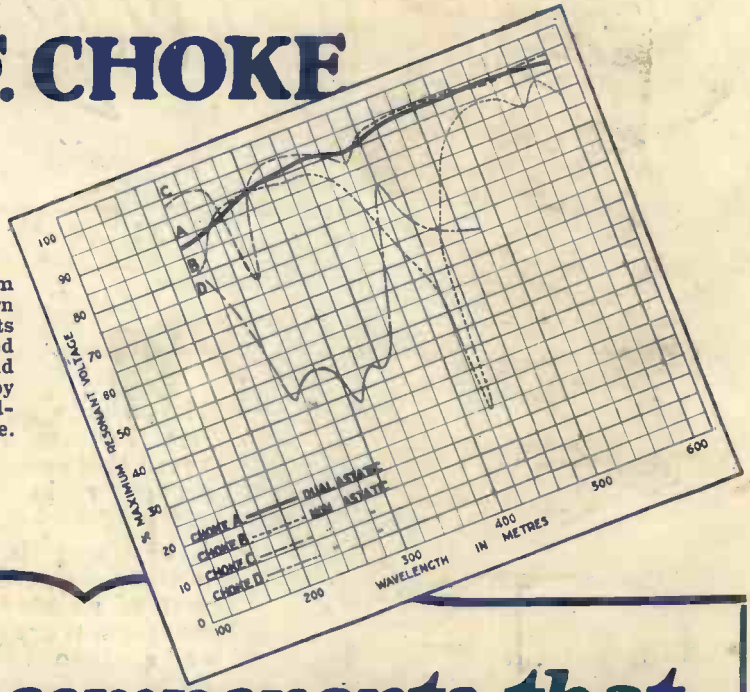


*All communications concerning advertising in "Wireless Constructor" must be made to John H. Lile, Ltd., 4, Ludgate Circus, London, E.C.4. Telephone: City 7261.*



R/R


# The DUAL ASTATIC H.F. CHOKE



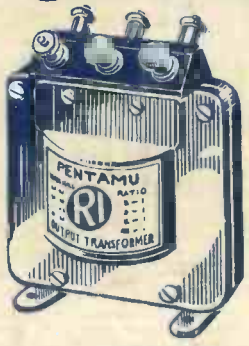

**The Dual Astatic is the first H.F. Choke free from absorption and the most efficient choke for all modern valves (including screened grid) and modern circuits using parallel choke feed. The curve reproduced here clearly indicates the efficiency of this choke and its superiority over other commercial types, by reason of its non-resonant operation over the broadcast waveband. Overall height 3¼ ins. Base 2 ins. square.**

**7/6**

*Write for "Dual Astatic" Choke Folder.*

## *and other R.I. components that make for set efficiency*


*SEE THESE COMPONENTS at the RADIO EXHIBITION*




*STANDS 122, 123, 124 Ground Floor Main Hall*


### THE "HYPERMU"

The remarkable modern nickel alloy transformer, giving the highest and most uniform amplification from 25 to 6,000 cycles. It is the first metal screened transformer encased in Bakelite. Weight 14 ozs. Size 3 in. by 1½ in. by 3 in. A midget in size—a giant in performance. **21/-**

### THE "PENTAMU"

A new output transformer specially designed for use with pentode valves. It has four ratios—2:1, 3:1, 6:1, and 25:1. Suitable for any type of loudspeaker. **21/-**

### 28/14 HENRIES L.F. CHOKE

The choke adopted as the standard for modern smoothing and output filter circuits. Universally employed, and recommended by the technical experts. 28/14 Henries; 100 m.a.; D.C. Resistance 260 ohms. **21/-**

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