SPECIAL CHRISTMAS & NEW YEAR NUMBER

# The Wireless Constructor

6d

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

Vol. VII. JANUARY, 1929 No. 27.

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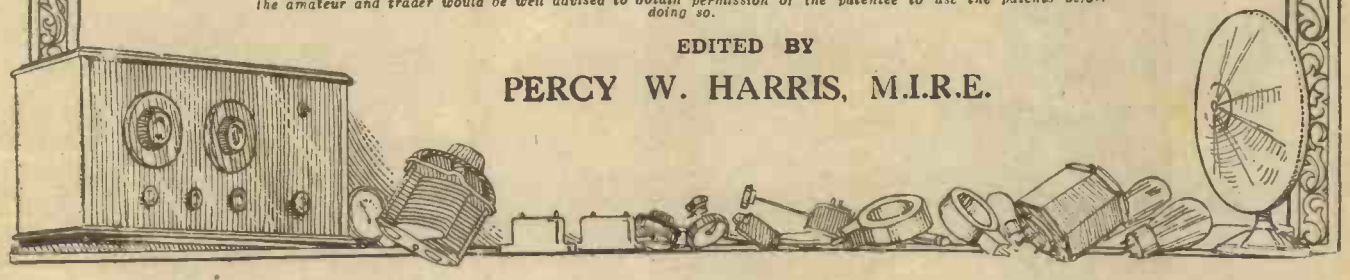
PERCY W. HARRIS, M.I.R.E.



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Transformers.
R.C.C. Units.
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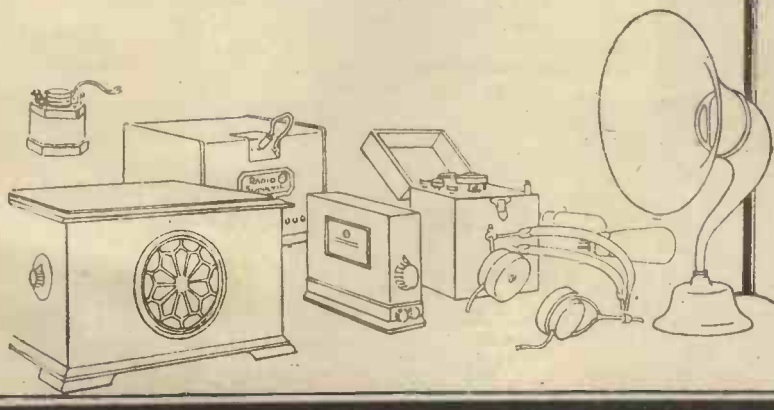

B T-H

# APPARATUS

*The British Thomson-Houston Co. Ltd., Crown House, Aldwych, London W.C.2.*

The WIRELESS CONSTRUCTOR

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

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# THE EDITOR'S CHAT

**In which Percy W. Harris, M.I.R.E., the Editor of the "Wireless Constructor," discusses the special Xmas fare presented to readers in this issue.**

A HAPPY Radio Christmas and New Year to every reader of the WIRELESS CONSTRUCTOR at home, abroad, and in the most distant parts of the Empire. Here, at home, we may or may not have snow during the festive season, but at least it will be cold; but there are many readers of this journal who will spend their Christmas under a burning sun. Some of these, notably in parts of South Africa, will receive their copies of the WIRELESS CONSTRUCTOR in time for this Christmas holiday, but many others in more distant parts will receive these greetings rather late. Yet, late or early, on behalf of WIRELESS CONSTRUCTOR readers in the home country we extend to them all our heartiest greetings.

### An Important Feature

Perhaps the most important feature in this month's issue is the new development in connection with the screened-grid valve, exemplified in the New "Business Man's" Four. Here we have a set which combines the high sensitivity of the screened-grid valve with the constant-reaction scheme applied in the original "Business Man's" Four, and which made possible a sensitive receiver with only one tuning condenser, and other distinct advantages. The new set is far more sensitive than any receiver incorporating only a detector and two low-frequency stages with reaction, even when the set is manipulated and the reaction critically adjusted by the most expert hands.

Its selectivity is very high, the manipulation ridiculously simple, and the quality up to a very high standard. The test report published in this issue was compiled in the short space of an hour merely by turning the one tuning dial and waiting for identification (which takes time with many Continental stations), no reaction adjustments being made during the whole tests.

Added to this, the tests were made with 2-volt valves throughout, and the loud speaker used was one which is not famous for high sensitivity. Had we cared to spread the testing time over several hours, or two or three evenings, the number of stations listed could easily have been doubled or trebled, but as we know readers are much more interested in knowing what they are likely to get under average conditions, the form of test report given was considered to be the best.

## PARIS RADIO EXHIBITION


*A small delivery van built in the form of a radio receiver is the latest idea of a prominent Paris wireless firm.*

# The Editor's Chat—*continued*

Continuing our policy of providing sound and well-tested designs for sets working entirely from the mains, whether alternating or direct current, we publish this month a D.C. design as promised in the Editor's Chat last month. By the use of the "Stedipower" L.T. Unit described in previous issues of this journal, any ordinary set can be operated from the A.C. mains, but to run receivers from direct current mains requires a special design. Further D.C. designs will be published from time to time, and before long we shall be publishing a super-"Stedipower" unit designed to give much larger current than the one ampere which is the maximum with the standard "Stedipower" L.T. Unit.

## The Free Book

Also as promised in our last issue we are beginning in the present number a series of articles dealing with Thirty-One More Tested Circuits, described in our last month's gift booklet; while a practical make-up for one of the smaller devices, the volume and tone control unit for loud speakers, is also published.

The exceptionally favourable atmospheric conditions generally found during the Christmas season are described in an article entitled, "A 'D.X.' Christmas." These articles, together with many others, make up a thoroughly varied Christmas menu suitable for the tastes of all to whom the art of wireless makes any appeal.

We hope to publish shortly the results of a series of tests conducted in the WIRELESS CONSTRUCTOR laboratory with the Fultograph method of receiving wireless pictures. The Fultograph system, it may be said at once, is distinct and different from television, for while the aim of the latter is to present upon a screen an animated image of events taking place simultaneously at the transmitting end, the Fultograph system receives on a piece of white paper a replica of a photograph, drawing or chart, attached to the transmitting apparatus.

Several minutes are occupied in the reception of any one picture, which is gradually formed on a drum to which a sheet of prepared paper is attached. Unlike television, which has yet to be proved a practical proposition for home reception, the Fultograph system is sound and practical, the results being extremely good, while, of course, the pictures are far more permanent.

## THE D.X. SEASON

IT is not possible completely to describe the thrill of first hearing an American announcer speaking. It must be experienced to be fully appreciated. Reception of American broadcasting on short waves is quite a simple matter nowadays, and is not bound up with very special coils and wonderful skeleton receivers.

Short-wave plug-in coils which plug into ordinary coil sockets may now be purchased from several manufacturers. Those who have sets without H.F. amplification, and use ordinary plug-in coils, should try short-wave reception for themselves.

There is just one point to mention: a semi-aperiodic aerial circuit is required, and the coil used for this must be loosely coupled to the tuned grid coil. It should be somewhere about 4 in. away, and one end must be connected to earth and one to aerial. No earth connection should be made to the set itself. The object of this very loose coupling is to reduce the damping effect of the aerial and earth system which might easily prevent the set from oscillating on the very short wave-lengths. A neutralising condenser fixed in the aerial lead will be found useful.

## Hand-Capacity Troubles

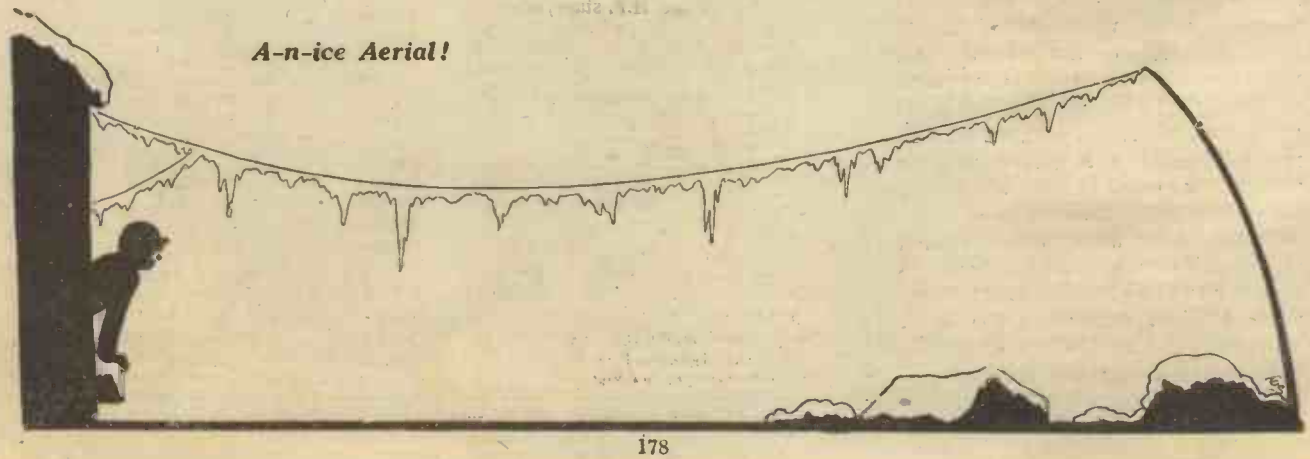
Most of us are familiar with the trouble of hand-capacity upsetting the tuning adjustments of the set. When the removal of the hands from the tuning dials alters the wave-length to which the circuits are tuned, distant reception becomes very difficult, if not impossible. It is obvious, therefore, that it is desirable to avoid the trouble of which the symptoms are outlined above.

There is one important thing to be remembered when making up a set. The moving vanes of all variable condensers should be connected to the lower high-frequency potential side of their circuit. For instance, all grid-tuning condensers should have their moving plates connected to one side of L.T.; the negative, if possible, when negative is earthed.

## Reaction Connections

In the case of a tuned-anode circuit, the H.T. + side has the lower high-frequency potential.

It is advisable, when possible, to have the variable reaction condenser on the filament side of the reaction coil instead of the plate side, because if it is connected in the latter position the moving vanes are bound to have a certain high-frequency potential to earth, due to the reaction coil.



# The New "Business" Man's Four

*A remarkable new version of a famous receiver described some time ago.*

By PERCY W. HARRIS, M.I.R.E.

THE problem of simplification not only in set design but in set manipulation has always interested me. So long as there are two dials to be manipulated simultaneously, some people will always get better results than others, while if a third control is brought in use the question of real skill looms up.

Some people, it is true, seem to drop into the habit of manipulating a wireless set skilfully with very great ease, just as some people soon learn to make a quiet gear-change on a car; but some of us, alas, remain to our dying day what our American cousins call "Ham-handed Henries," not because the level of our intelligence is any lower than the more successful set operators, but just because we are not "built that way."

Despite sundry exaggerated claims put forward from time to time, really successful long-distance reception—not occasional, but regular—needs a stage of high-frequency or, better still, two stages.

## Screened-Grid Advantages

Reaction in the detector circuit, provided it is not overdone, is a very great help both in sensitivity and selectivity. Wonderfully good results are now obtainable using modern valves in a circuit using one stage of high-frequency, a detector, and reaction on the detector. Still better results are obtainable with a screened-grid high-frequency valve, while, of course, we can add one or two stages of low-frequency as desired. One pentode will often take the place of two ordinary low-frequency stages, but the pentode has its own problems and it is early days to decide just what we can best do with this valve.

Now, all regular readers of the WIRELESS CONSTRUCTOR know that the actual building of sets has been simplified by this magazine in a multitude of ways, one of the most prominent being the use of designs in which the reader has wide choice of components to suit pockets and taste, much improved layout to avoid complicated wiring, and last, but not least, the "Radiano" system. Yet with all these improvements and simplifications, the fact still remains that in the majority of cases there are three separate controls in a set using a stage of high-frequency, a detector and reaction on the detector. By using special components, matched to one another, by extremely careful—almost micrometric—construction, and by the careful choosing of valves, it is possible to combine the two tuning controls for single manipulation, but

## COMPONENTS REQUIRED

Cabinet with 10-in. baseboard (Camco). (Caxton, Artcraft, Kay Ray, etc.)

Panel, 21 in. × 7 in. × $\frac{3}{16}$ or $\frac{1}{4}$ in. (Resiston Gold Corners). (Ebonart, Becol, Trolite, Ripault, etc.)

·0005-mfd. drum condenser (Dubilier K.C.). (Cyldon, Bowyer-Lowe.)

On-and-off switch (Magnum). (Decko, Duco, Lotus, Benjamin, Bowyer-Lowe, etc.)

Panel-mounting neutralising condenser (Harlie).

SPECIAL NOTE.—This condenser must be of the screw-up-and-down type, and must have a very small minimum. If other than Harlie is used, see that it does not foul coil.

Standard wave-trap (Lewcos or Magnum).

6-pin base (Lewcos or Colvern).

4 Valve holders (Lotus). (Benjamin, Bowyer-Lowe, W.B., Igranic, etc.)

Standard screen (Magnum). (Parex, etc.)

1 1-mfd. condenser (Dubilier, T.C.C., Ferranti, Lissen, Hydra, Polymet, etc.)

2 2-mfd. condensers (ditto).

1 ·0003-mfd. condenser and clips (T.C.C. S/P.). (Dubilier, Mullard, Atlas, Lissen, etc., with grid-leak holder.)

1 ·0002-mfd. condenser (ditto).

1 2-megohm leak (Lissen). (T.C.C., Dubilier, etc.)

2 H.F. chokes (Magnum).

SPECIAL NOTE.—One of these can be any good H.F. choke, but the one in the H.F. stage must be suitable for this particular circuit. For this, Magnum, R.I.-Varley and Wearite are specially recommended.

1 R.C. unit (Marconiphone). (Dubilier, R.I.-Varley, Mullard, etc.)

1 ·25-megohm grid leak (Pye).

1 "Antimobo" (R.I.-Varley). (Alternatively one 20,000-ohm wire-wound resistance and one additional 2-mfd. condenser.)

1 L.F. transformer (Lissen Super). (Ferranti, R.I.-Varley, Mullard, Philips, Igranic, Pye, Marconiphone, etc.)

1 L.F. output choke (R.I.-Varley 28/14). (Ferranti, Igranic, Pye, etc.)

12 Terminals, as marked.

3 Terminal strips.

2 Panel brackets.

1 Reinartz transformer for 200-600 metres. (Long-wave coil will be described next month.)

### ONE HOUR TEST REPORT.

(Constant-Reaction Setting.)

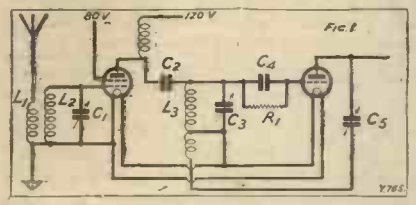
| | |
|---|---|
| Budapest | Dublin |
| Milan | Rome |
| Daventry Experimental | Brussels |
| | Vienna |
| Kattowitz | Munich |
| *Cork | Madrid |
| Hamburg | Toulouse |
| London | Barcelona |
| Leipzig | Munster |
| Gleiwitz | Stuttgart |
| Bournemouth | Belfast |
| Breslau | Cologne |

*NOTE.—This station varied from full loud-speaker strength to nothing in a short time. It is very rarely received at Wimbledon, and has not been heard again since the test evening. (Long-wave report next month.)

# The New "Business Man's" Four—*continued*

there still remains the reaction control, which cannot be ganged in any but a "freak" circuit.

For general home construction I do not generally advocate ganging (although, if properly carried out, excellent results are obtainable), as




either sensitivity or selectivity has to be sacrificed if the design has to be made simple enough for general assembly. WIRELESS CONSTRUCTOR designs are all aimed at giving the reader the maximum chance of success without assuming too high a degree of skill.

## Constant-Reaction Results

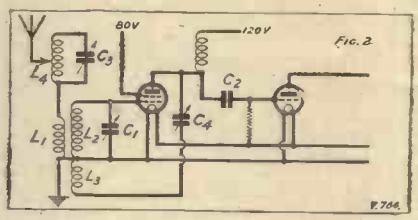
About a year ago I published in this journal a design for the "Business Man's" Four, a set with a new circuit I had evolved in the laboratory in which high-frequency amplification was combined with constant reaction, to give with only one tuning condenser results which previously had required two if not three operating controls. This set was very successfully demonstrated not only to a number of wireless societies but also to the British Broadcasting Corporation.

## A Big Improvement

In the last year a very large number of "Business Man's" Four receivers have been built up, for, as our regular readers will remember, this set enabled anyone without previous experience of a wireless set to turn a single tuning control and pick up a number of stations on the loud speaker. Naturally, the number of stations picked up depended on local conditions, the time of the year, whether or not you are situated in a good locality for reception, what stations are working at the time, and a whole host of factors which are still beyond the control of the listener.

With the arrival of a screened-grid valve, much greater amplification than was previously obtainable in high-frequency stages was obtainable, and a number of readers wrote to me to ask whether it would not be possible to bring out a new "Business Man's" Four incorporating a screened-grid valve, and experiments to this end have been proceeding for some time in my laboratory. I am now pleased to say that the new "Business Man's" Four, described for the first time this month, is a very big improvement on the original design, with certain features which add considerably to its appeal.

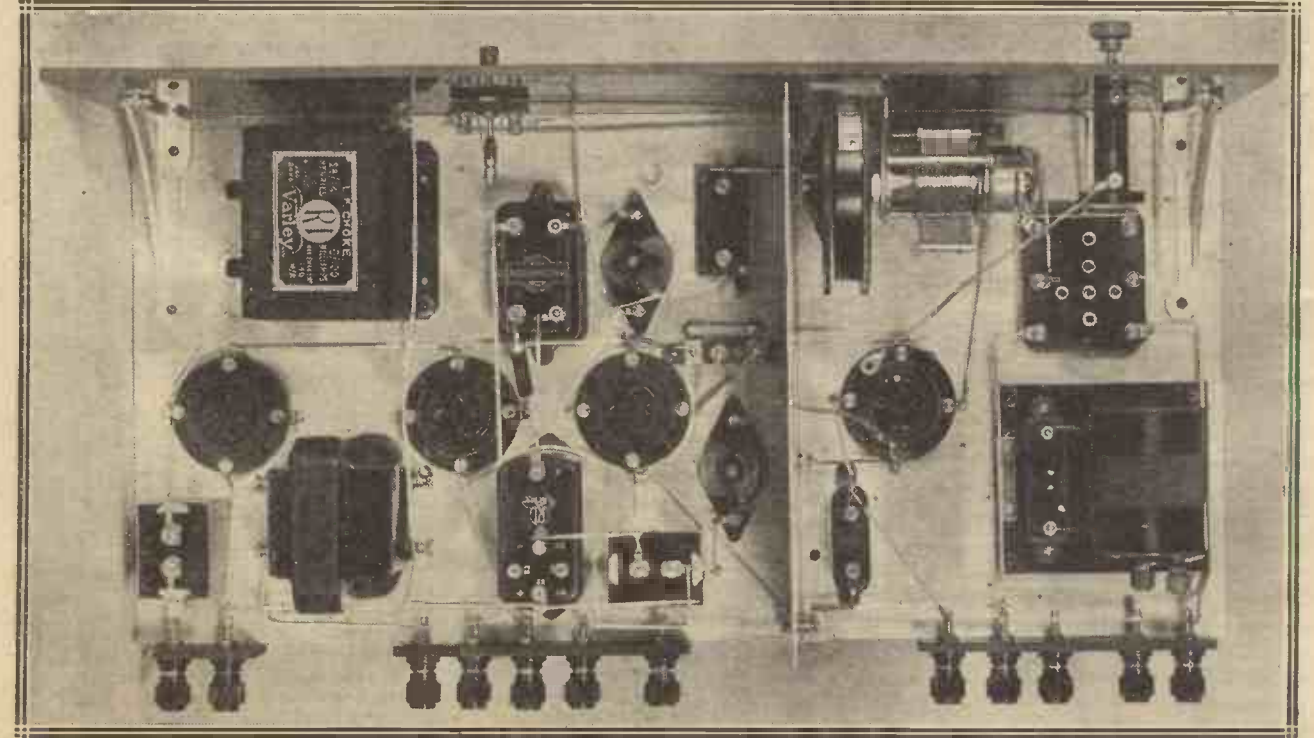
A screened-grid valve is incorporated, it is still operated by one control, a large number of stations can be picked up on either the 200 to 600 or the 1,000 to 2,000 band, and I have added a small knob, which can be used when the reader becomes well




accustomed to the set, to add still further to its sensitivity and selectivity. This knob, which is seen to the left of the tuning control, can be ignored in all early work with the receiver, for it is adjusted when the set is first built, and need not be touched until skill is acquired.

## The Finishing Touch

At the same time, if, as I am confident will be the case, the set is




***You will have no difficulty in arranging the components if you study this photograph, which should be used in conjunction with the wiring diagram.***

# The New "Business Man's" Four—*continued*

built by many readers who have had a little experience in handling a wireless set, this knob will prove a boon, for it gives just that fine finish to the reaction control which the more experienced reader finds so useful.

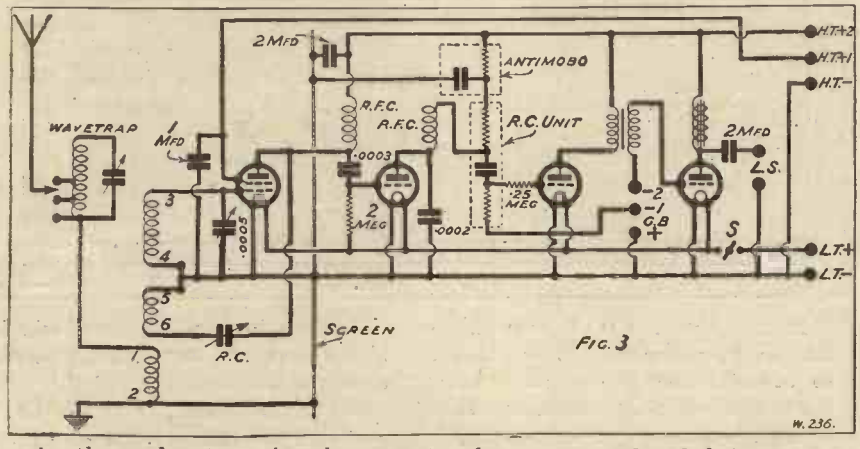



FIG. 3

Another advantage in the new "Business Man's" Four is that the rather critical balancing of reaction on the two circuits described at length in the original article is dispensed with, while the construction is even simpler than that of the previous design. The circuit used is slightly different, and on the low-frequency side additional refinements are added—to wit, an anti-motor-boating device and an output filter so that really efficient results are obtainable with the very latest super-power valves and loud speakers, as well as on all mains units.

And now a word or two about the circuit chosen. The new reader who is intent only on building the set can skip this portion and continue his reading where the actual construction work begins, but I know a very large number of WIRELESS CONSTRUCTOR readers like to learn the whys and wherefores of the set described, so to them this portion of this article is specially dedicated.

## Voltage Variations

In an ordinary high-frequency circuit, the grid circuit is tuned and certain signal voltages applied to the grid and the filament of the valve. Varying voltages on the grid of the valve bring about a varying internal resistance of the valve between the plate and the filament, and the plate is connected, of course, to the high-tension supply. If in the plate circuit of this valve we connect the primary of a high-frequency transformer, the secondary of which is connected to the next grid circuit, the varying currents due to the varying internal resistance of the high-frequency valve produce varying voltages in the secondary of the high-frequency transformer, the voltages so produced being greater than those of the first grid circuit.

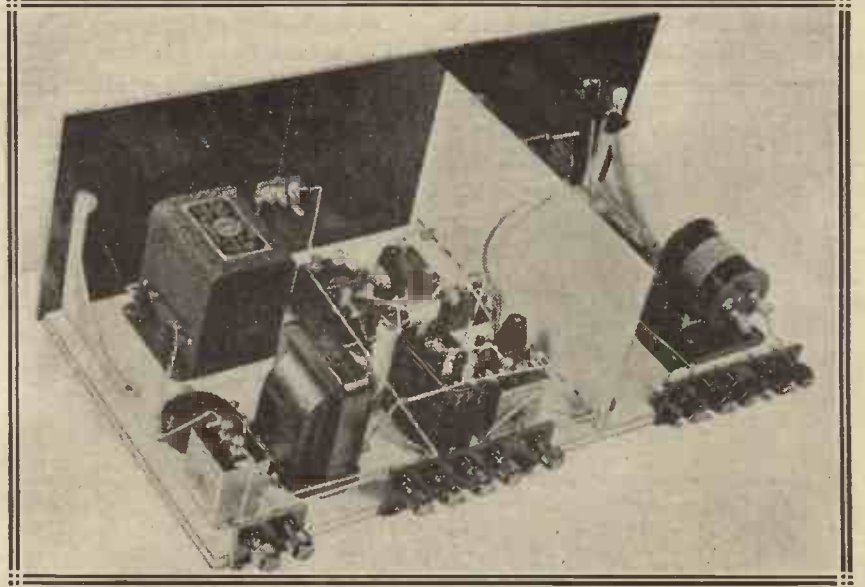
## The Coupling Connections

In the case of a resistance-coupled high-frequency valve as used in the original "Business Man's" Four, the plate of the high-frequency valve is connected through a fixed condenser to the grid of the next valve, and at the same time current is supplied to the plate of the valve through a high-resistance connected to the high-tension battery. If we think for a moment, we will see that the plate of the high-frequency valve is joined to the filament of the same valve, through the high resistance and the high-tension battery, and as the filament of the high-frequency valve is joined to the filament of the next valve, and as, moreover, the plate of the high-frequency valve is joined (through the condenser) to the grid of the next valve, the grid and filament of the second valve are obviously joined across to the high resistance. (You may forget the high-tension battery for a moment as its internal resistance is negligible compared with the high resistance.) To follow this better, refer to the original diagram.

## "Parallel Feed"

The fixed condenser, of course, prevents the direct voltage from the high-tension battery reaching the second grid, but it allows radio-frequency currents to pass through it quite easily, otherwise it would be useless. From Ohm's law we know that as the current through the high resistance increases, due to the fact that the circuit's resistance is lowered, so the voltage developed across the resistance must be increased, for, obviously, with a resistance of a given value any increase of current through it can only be brought about by an increase in voltage.

We now come to the point I want to make, namely, that any variation of voltage across the grid and filament of the high-frequency valve will bring about variations of voltage across the high resistance in the plate of the high-frequency valve, and, as the next



*Another view of the set which shows how neat is the back-of-panel appearance and how compact the layout.*

# The New "Business Man's" Four—*continued*

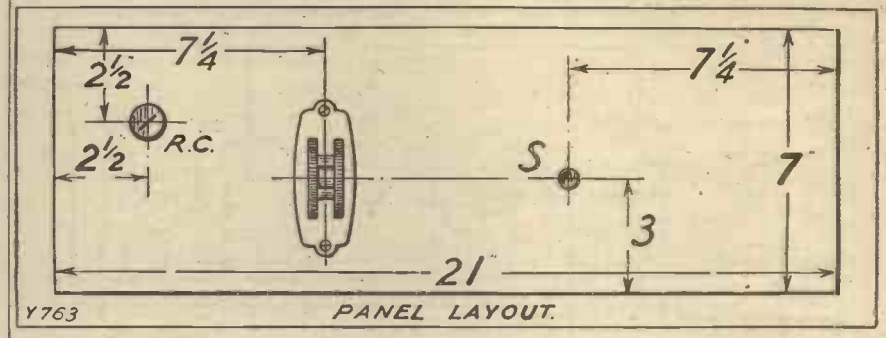
valve is joined across this high resistance, amplified high-frequency voltage changes will be imparted to the second grid. This is how high-frequency amplification is obtained with resistance coupling.

And now look at Fig. 1, which shows what is known as the parallel-feed method of using a screened-grid high-frequency valve. The same method, of course, is equally applicable with an ordinary valve, the difference being merely that the screened-grid valve gives a higher amplification. How this valve works has been explained several times in this journal, but briefly it may be stated that its additional amplification is due to special construction and to the introducing of a second grid. As this second grid is joined straight to a tapping on the high-tension battery, giving 80 volts or so, it does not come into the high-frequency circuit we are discussing, so that readers need not feel confused by the fact that a screened valve is employed.

## H.F. Choke Coupling

It should be noticed that in the plate circuit of this valve a high-frequency choke is introduced, while connected to the next valve is a tuned circuit, the coupling between the plate of the screened-grid valve and this tuned circuit being provided by a fixed condenser, this condenser preventing the high-tension battery being shorted to earth through the winding of the tuned circuit.

While the radio-frequency choke has comparatively low direct-current resistance, it offers a very high impedance to radio-frequency currents, and so we have voltages set up across it just as we had across the high resistance in the resistance-coupled high-frequency circuit just explained.




In fact, with an ordinary high-frequency valve it would be possible to combine the two circuits, using instead of the radio-frequency choke a high resistance; but in many circuits it is preferable to use the radio-frequency choke. One advantage of this is that the high-tension battery voltage can be kept lower than would be the case with a high resistance.

Reverting for a moment to the circuit we have explained but not illustrated, namely, the resistance in the plate of the ordinary high-frequency valve and the voltages applied to the next valve, it is obvious that within limits all frequencies of the broadcast band will be amplified to approximately the same degree.

## Station Separation

When, however, we use the parallel-feed method illustrated in Fig. 1, frequencies other than that to which the second circuit is tuned will be cut out, or considerably reduced, for the tuned circuit will not resonate to them.

It will thus be seen that the selectivity of a set using a second tuned circuit (as in Fig. 1 circuit) will be higher than one in which the second circuit is not tuned.

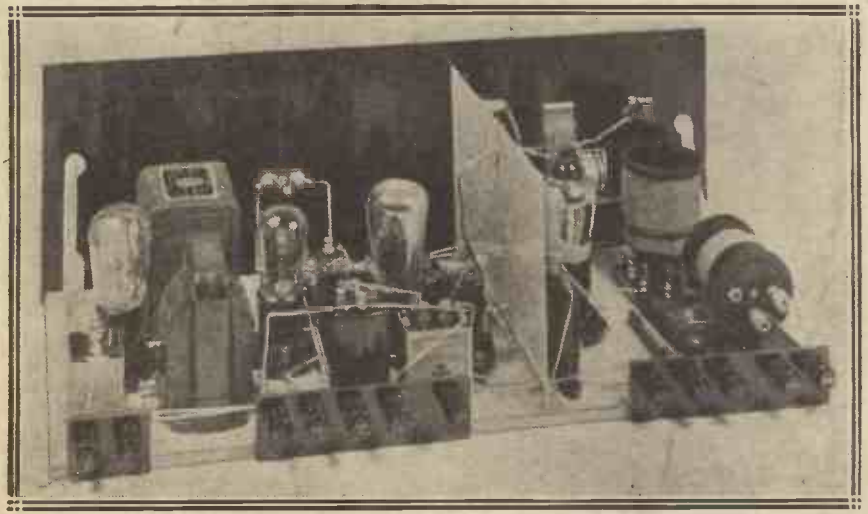
There are two kinds of selectivity we have to consider. Firstly, the selectivity necessary to separate stations from one another, when the signals from the stations to be separated are both of medium strength, and, secondly, the type of selectivity required to cut out a very powerful local station which swamps everything over a wide band.

The selectivity of a set using reaction is generally much higher than in one in which reaction is not used, but many sets, while being easily swamped by the local station, are quite selective enough to separate stations of medium strength In the original "Business Man's" Four a very high selectivity was given to the first tuned circuit by the use of constant reaction, while the swamping effect to the local station was nullified by the introduction of a wave-trap permanently adjusted to the station to be cut out.

## Reaction with S.G. Valve

Now look at Fig. 2, which shows you the screened-grid circuit I have adopted for the new "Business Man's" Four. Here we have a radio-frequency choke in the plate circuit of the screened-grid valve, no tuned circuit in the grid of the detector valve, but reaction applied to the *first* tuned circuit and a wave-trap incorporated in the aerial, for getting rid of the swamping station.

It is, I think, the first time that a screened-grid valve has been used in a reaction circuit like this, and the values are naturally different from those



*The New "Business Man's" Four, with valves and coil on board.*

# The New "Business Man's" Four—*continued*

obtaining with an ordinary valve. For example, taking the standard Reinartz high-frequency transformer on a six-pin base (not the Reinartz aerial coil, for a reason I will explain in a moment). With an ordinary H.F. valve a variable condenser of at least ·0001 maximum is generally required to obtain the necessary reaction effect.

## Coil for the Aerial

Owing to the very high amplification obtainable with the screened-grid valve, I find that a very small neutralising condenser gives complete control of reaction with this coil, and, in fact, when the set is built up as described the reaction remains practically constant over the whole range.

In this case it has not been necessary to add a feed-back from the plate of the detector valve, and by placing the reaction control knob on the front of the panel the more experienced reader can use the limit of fine reaction control to get a most wonderful selectivity and sensitivity with the set. This circuit, too, considerably simplifies the preliminary balancing of the set.

As it is very easy to get confused about coils, and as there are so many different standard windings for the six-pin base, let me say clearly that the coils used in this set are the standard Reinartz high-frequency transformer coils, and are *not* the standard Reinartz aerial coils, although used in the aerial. If your dealer says to you, "Mr. Harris must mean a Reinartz aerial coil here, because it is used in the aerial," point this paragraph out to him!

## The Reaction Control

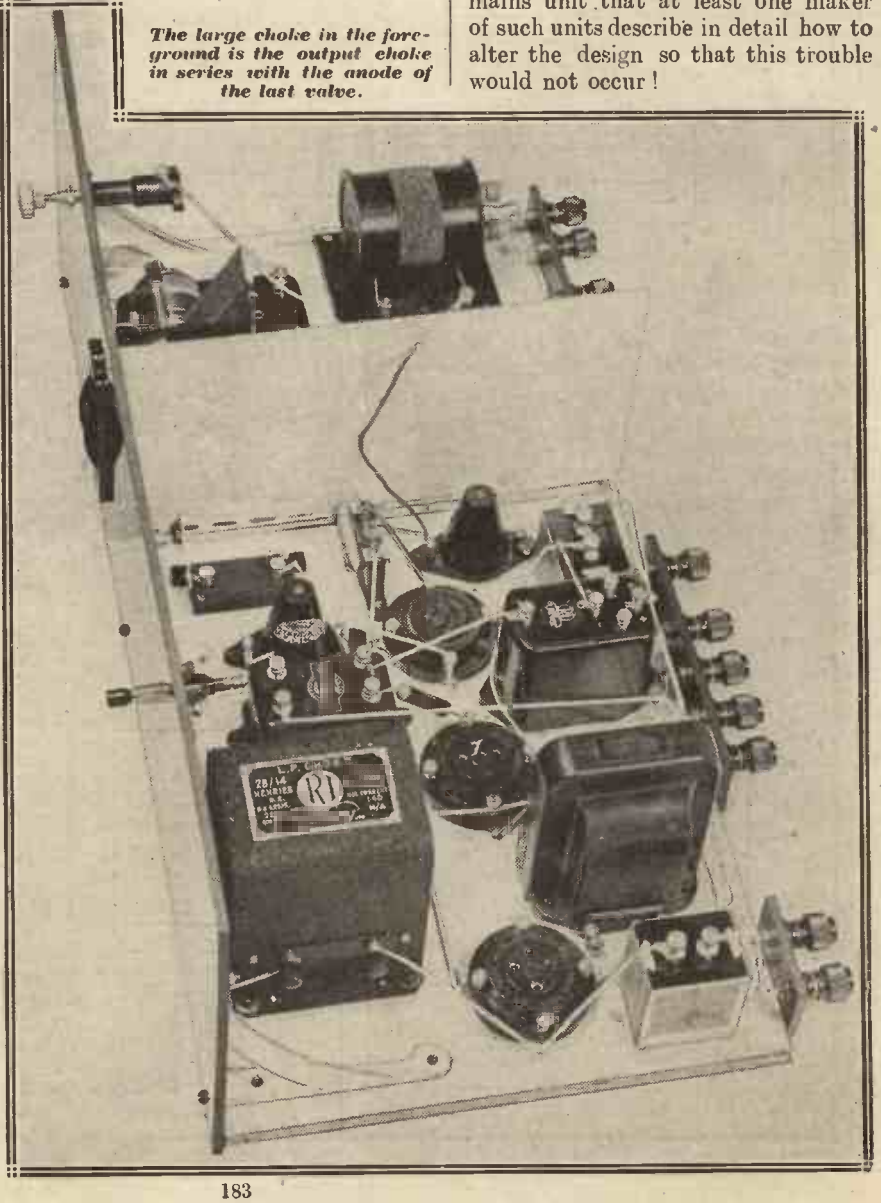
The Reinartz aerial coil is a better coil in many ordinary circuits, but this is a special circuit in which I want to get the tighter aerial coupling given by the high-frequency transformer type of winding. The experienced reader who knows all about the different connections and is prepared to work out the numbers for himself and make experiments can, of course, try; but if you are building up this design as described by me, you will need a Reinartz high-frequency transformer coil.

It would, of course, have been possible to have introduced a feed-back from the detector valve to the grid of the first valve to give a slightly more constant-reaction effect, but the capacity necessary for this would have been almost incredibly small, and therefore the chances of error in building up this set would have been much greater. After a number of experiments, I have found that the "degree of constancy in coupling," if one can use the term, is quite enough to give a large number of stations on the dial, and the addition of the front panel control for the more experienced gives all the results obtainable with a laboratory-built constant-coupling scheme.

So much, then, for the high-frequency side, which I have used successfully with all the makes of screened-grid valve at present on the market. The layout, you will see, is clean and simple, and the set is less susceptible to slight changes in wiring than the original design. In the detector and low-frequency circuit there are few changes, the important one being the addition of an anti-motor-boating device.

## Prevention of Motor-boating

With the growing use of mains units this device is of great importance, for many sets work splendidly on batteries but give a great deal of trouble on mains units. Indeed, one commercial set is so susceptible to motor-boating when used with a mains unit that at least one maker of such units describe in detail how to alter the design so that this trouble would not occur!

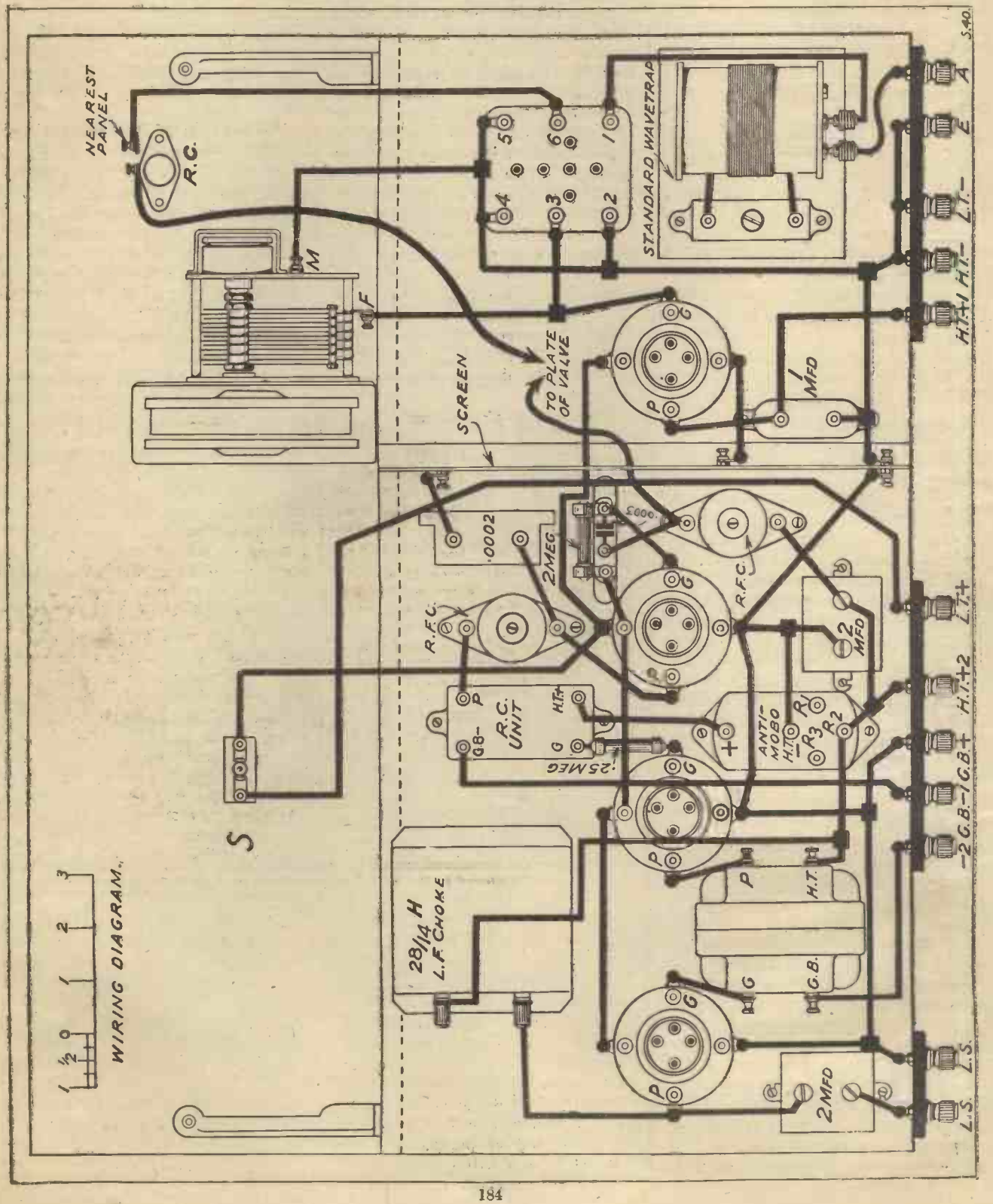


***The large choke in the foreground is the output choke in series with the anode of the last valve.***

# The New "Business Man's" Four—*continued*

The causes of motor-boating are complex and are sometimes due to the design of the set, and in others to the design of the mains units. Sometimes they are due to a combination of both. Sets including resistance-coupling are always more liable to give trouble than if two transformers are used. This, incidentally, is one of the reasons why practically all of the American factory-built sets are made with two transformers!

However, the number of experiments I have conducted in the laboratory show that with the particular



# The New "Business Man's" Four—*continued*

arrangement of circuit I have included in the New "Business Man's" Four the set will work satisfactorily with all the reputable mains units, while at the same time giving better results on high-tension batteries than if these particular devices were not included.

It cannot be too often pointed out that with the latest super-power valves it is very inefficient to include the loud speaker directly in the plate circuit, as the comparatively high resistance of the loud-speaker windings will absorb a good deal of the high-tension battery voltage, so that the actual voltage supplied to the valves will be far less than you may think. A good output choke, such as that used in the New "Business Man's" Four, or one of the alternatives mentioned in the list of components, will serve the triple purpose of giving a minimum drop in high-tension voltage, keeping the comparatively heavy direct current out of the loud-speaker windings, and last, but not least, very largely cutting down the tendency to distortion or even motor-boating due to battery coupling.

## The Output Filter

Much distortion in the past has arisen not only from inefficient forms of coupling or bad transformer curves, but from low-frequency reaction due to coupling in the battery. The combination of an anti-motor-boating device, such as that shown in this design, plus the output filter, is a very big step forward in improvement of quality. Another small device of importance in this receiver is the inclusion of a quarter-megohm grid leak between the grid terminal of the resistance-capacity coupler and the grid to which it is joined.

We now come to the point where the reader who is not particularly interested in the whys and wherefores can once more pick up the threads of the story, and start the constructional work of the receiver.

To build it, we shall require the components mentioned in the list in this article, in which it will be seen a number of alternative makes are given. The WIRELESS CONSTRUCTOR is not in favour of designs which cannot be built up unless one particular set of components is chosen, for not only does this type of design prevent the intelligent home constructor from using his favourite components, or some of those which he very likely has on hand, but it is bound to bring about considerable difficulties in the purchase of parts.

## Component Considerations

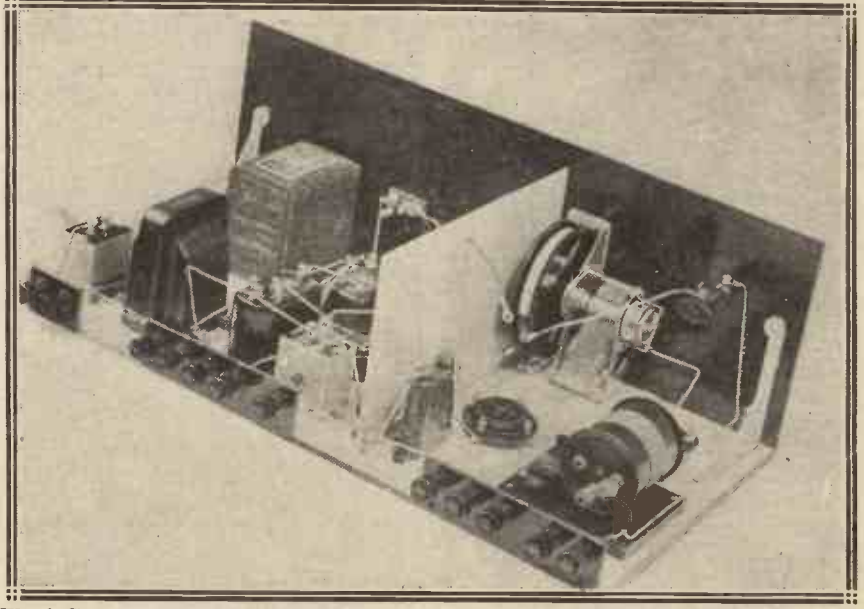
Nothing is more annoying than to find that one cannot get on with a particular design because only a special make of low-frequency transformer will fit into the space available, whereas other transformers equally good are available but cannot be used.

In every case in the WIRELESS CONSTRUCTOR where special components are mentioned, and none other will do, this fact is clearly indicated, but when it comes to such devices as low-frequency transformers, resistance-capacity couplers, valve holders, grid condenser and leaks, variable condensers, etc., etc., the design is always made so that there is a minimum of difficulty in obtaining the parts.

The first step should be to prepare the panel, drilling in it the holes for the reaction condenser, on-and-off switch, and cutting the slot and the holes for mounting the drum condenser. It will save you a good deal of trouble if, first of all, you screw the two supporting brackets on to the baseboard, and then with these in position hold the panel against the front edge and with some sharp instrument mark through the holes in the brackets themselves to give the positions of the holes to take the securing screws. It will be found necessary to drill only one hole for each bracket, as three holes along the bottom front edge of the panel will hold it against the front edge of the baseboard and will remove the necessity for two holes each.

## Fitting the Screen

When you buy the standard screen you will find two or three terminals which can be fitted in slots in the base.



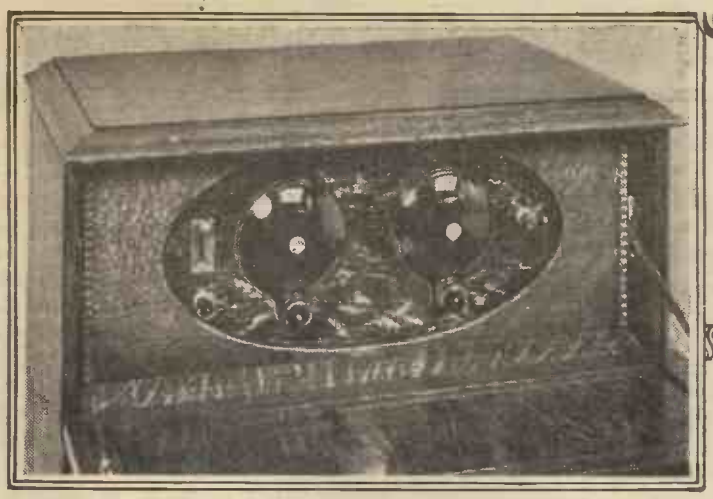
*The S.G. valve is placed in the valve holder shown near the screen, and the two leads ending in tags are connected to the plate terminal of the valve.*

Both panel and baseboard are of standard size and various kinds of cabinets can be obtained according to the taste of the purchaser. A standard Camco American type cabinet is shown in the photographs, The type of cabinet shown for the "Radiano" Four, in a recent issue, and the pedestal type illustrated with "Big Ben," are also good alternatives. Either a plain or a decorated panel can be chosen, and our photographs show a Resiston panel with gold corners.

Notice where these terminals come in the wiring diagram, and insert them in their slots before you secure the screen to the baseboard.

Full instructions are given with the Dubilier condenser with regard to mounting, and if these are followed this task will be considerably simplified. The square opening can either be drilled out by making a number of drilled holes so close to one another that the piece will drop out, or else

(*Continued on page* 239.)



# "BIG BEN" STRIKES THE RIGHT NOTE!

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

"BIG Ben," the striking receiver described in our last issue, is at the moment operating some 25 miles from 2 L O on an indoor aerial consisting of a wire round a loft, this wire being led down the side of the house, into a room on the ground floor. The set itself has been fitted up in "all-electric" fashion, with "Stedipower" Junior, together with a small A.C. mains high-tension unit in the cupboard beneath the set itself, the only external leads being for aerial and earth, and the twin flex leading to the nearest lamp socket.

The set is turned on and off by an ordinary electric light switch and the results given are far better than I expected on the aerial in question.

## Full L.S. Volume

Full loud-speaker volume is obtained not only from London, 5 G B, and 5 X X, but after dark from a number of other stations on the Continent. Most of the time the set is used on 5 X X, as in the particular locality this comes in far stronger than London or 5 G B. The sensitivity of the set has caused much favourable comment, but more has been evoked by the remarkably good quality reproduction, due, as explained in last month's article, not only to the choice of high quality components but to the careful elimination of low-frequency feed-back effects.

Full constructional details were, of course, given in our last issue, but one or two further points may help. It will be noticed that a ·00035 mfd. reaction condenser is used, and some readers have asked whether a ·0003 mfd. will not do, as in the particular make they favour a ·00035 size is not made. A ·0003 mfd. condenser will give ample capacity and, in fact, ·00025 mfd. is practically large enough, so that we may consider the ·0003 or ·00035 interchangeable here. The tuning condenser must, of course, be a ·0005.

## Making the Coils

And now a few notes on the home winding of the necessary coils. As six-pin bases are used it is necessary to use formers on which six pins are properly spaced. Unwound formers can be obtained from a number of firms, or the more ingenious reader can buy six Clix split-pins fitted with nuts for each coil and can mount these on a small piece of ebonite which in turn can be made to carry the former on which the coil is wound.

***Some further details concerning the three-valve all-wave set described last month. Severe tests have been carried out in the "Wireless Constructor" laboratory, and the receiver has come through with flying colours.***

Generally, however, it is more convenient to buy a plain former fitted with the six pins and make the windings yourself. The Colvern formers are among those we can recommend. In the following notes the pin numbers are those corresponding with the numbers on the six-pin *bases*. As every six-pin base is marked with a number against the terminal of a particular socket, the reader can easily transfer these numbers to the pins themselves should they not be marked on the blank formers.

## Three Windings

There are three windings on each coil. Primary or aerial coil, secondary or grid coil, and a reaction coil. Three coils will now be described, the 200- to 600-metre coil, the 1,000 to 2,000-metre coil, and an extra short-wave coil. In all cases the beginnings and ends of the windings go to the same pins. The beginning of the aerial winding is connected to pin No. 4, and the end of the aerial winding to pin No. 2.

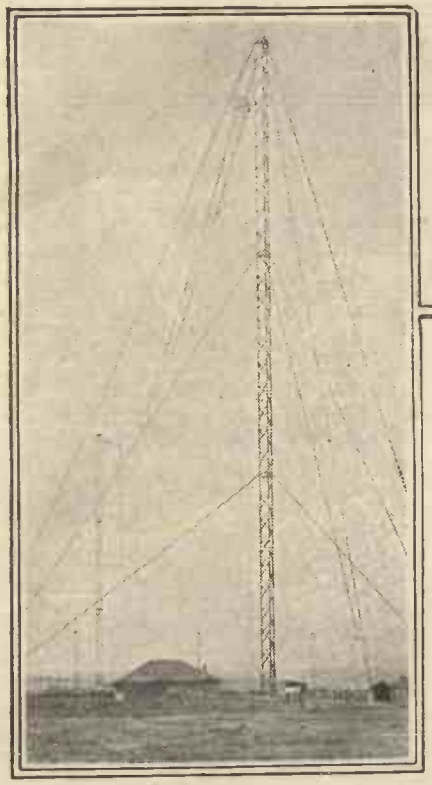
The beginning of the grid winding is connected to pin No. 2, and the end of the grid winding to pin No. 1. Thus the beginning of the grid winding and the end of the aerial winding go to the same pin. The beginning of the reaction winding goes to pin No. 6, and the end of the reaction winding to pin No. 5. In the 200 to 600-metre coil the following turns are used. Aerial, 15 turns of No. 30 D.S.C. wire; secondary, 65 turns of No. 30 D.S.C.; reaction, 25 turns of No. 30 D.S.C. Wind all turns in same direction with turns touching.

For the 1,000 to 2,000-metre coil: aerial, 100 turns No. 34 D.S.C.; secondary, 250 turns No. 34 D.S.C.; reaction, 120 turns No. 34 D.S.C. A slotted former should be used, wound with 2 slots of 50 turns for aerial, 5 slots of 50 turns for grid, and 3 slots of 40 turns for reaction.

## Short-Wave Coils

For the short-wave coil which will be most used, namely, that which runs down to 20 metres or so: aerial, 3½ turns at the lower end of the former, a space of ⅜ in., then secondary, 5 turns, space-wound 12 turns to the inch; and reaction, 6 turns close-wound, leaving a space of ⅛ in. approximately between the end of the secondary and the reaction coil. For this coil No. 26 D.S.C. should be used throughout. Readers who are experimentally inclined may like to make several short-wave coils with different numbers of turns, and to test them with the short-wave wave-meter to be described in the next issue.

SPECIAL NOTE: There is a slight difference between Lewcos and Colvern coils for this set. Lewcos have an additional tap at (3) on the aerial coil, whereas Colvern have not. When using Colvern coils, or home-wound coils as described above, the lead from the switch to (3) on the coil base nearest the panel should be taken to (4) on the same base and (3) left vacant.



# A "DX" CHRISTMAS

*Holidays—long evenings—plenty of stations on the ether—Christmas festivities—and a good set, what more could a radio fan want? What a chance for real "D.X."*

By R. W. HALLOWS, M.A.

CHRISTMAS is the one occasion when the wireless man who is enthusiastic about long-distance reception has a real chance of operating his receiving set on two or three consecutive days at the time when reception conditions are at their best. All the other holidays in the calendar fall, unfortunately, during the lighter months, when both signal-strength of stations and the ranges that their transmissions cover are distinctly on the poor side.

Christmas coincides very nearly with the shortest day of the year. At this time of year, therefore, there is almost the maximum allowance of darkness that is so dear to the wireless man's heart and the minimum of daylight that is his bane. Fading is usually absent, except, possibly, for a short time just at dusk, and genuine atmospherics are not very often troublesome.

## Statics From Snow

I say "genuine" atmospherics because sometimes when fine snow is being driven by the wind against the aerial, the latter will sometimes collect charges whose passage to earth through the coils produces sounds exactly resembling atmospheric discharges of the most violent nature. It is only on rare occasions, however, that anything of the kind happens, and I can remember it only on two or three nights during the last ten years.

Best of all, there is none of that ether "deadness" in winter which we associate with summer-time reception. During the lighter months, even with a sensitive set one may sometimes turn the condenser dials through quite a number of divisions without picking up anything except, perhaps, some faint and distorted signal. In winter the set seems to be full of life. Stations come in all round the dials, and a single evening's search may produce a huge "bag" of well-received transmissions.

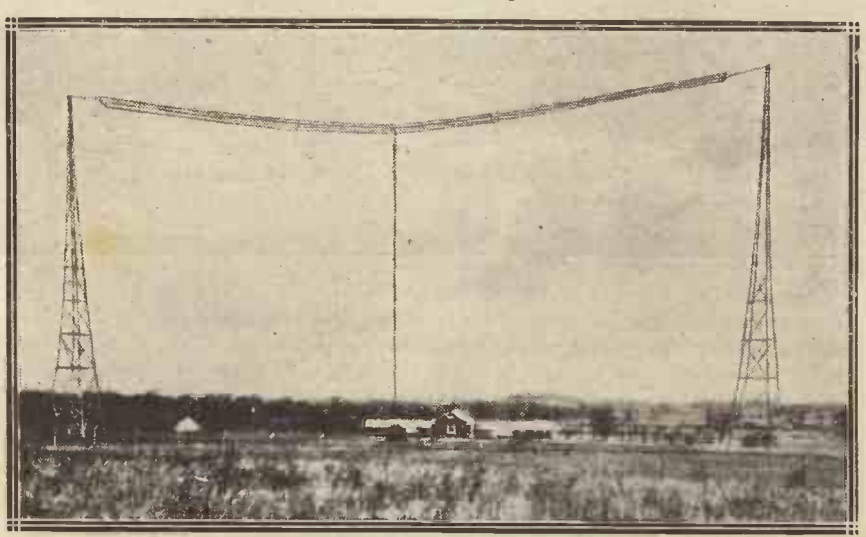
It is at Christmas-time that we may look for the best quality in loud-speaker reception of distant stations. It is not always realised that if a signal is weak the very finest set in the world cannot bring it in in such a way as to give first-rate loud-speaker reproduction.

The reason is this. Interference of some kind is present practically at all times and upon all wavelengths within the limits of the broadcast band. If the wanted signal is strong enough to drown the unwanted, then nothing whatever is heard of the interference, and reception is not marred in any way. But suppose that we have to apply a great deal of amplification at high frequency to a small signal in order to bring it up to sufficient strength to enable the rectifier to function properly?

## Amplifying Interference

In that case we cannot help amplifying at the same time any interference that there may be, such as tiny atmospherics (these are always present), distant Morse signals and mush from the harmonics of big commercial stations. The result is that when further low-frequency amplification has been applied the loud speaker delivers the signal plus the interference, and quality goes by the board.

Further, where signals are weak a considerable amount of use must always be made of reaction, which means often that the set is being worked in a very sensitive condition, which makes it too selective for real quality; the side-bands are cut out to a greater or less extent and music



*The experimental station at Wippany, 3 X N, is said to be the last word in broadcasting transmitters.*

# A "DX" Christmas—*continued*

does not come through faithfully. At Christmas-time we are not troubled by these things. A single efficient H.F. stage will often suffice to give all the radio-frequency amplification that is required, and no great use need be made of reaction.

Both the old hand and the newcomer to wireless may find Christmas-time long-distance work simplified and their results improved if they care to make use of a few hints, which are the outcome of many years' experience of listening to foreign stations with receiving sets of all kinds. First of all, remember that no receiving set is of any use for long-distance work unless its reaction control is smooth.

## Reaction Control

Should it be fierce you will find little pleasure in listening yourself, for there is no more annoying piece of apparatus to use than the set which flops into oscillation just as signal strength is building up nicely. Don't forget, too, that with this kind of receiver you are bound to cause interference to other people, and that you will probably ruin the wireless Christmas of your friends and neighbours. In a poor set fierce or floppy reaction is often incurable, since it is caused by bad design.

Different values of grid leak can be tried, and often a smoother control can be obtained by regulating the filament potential. When a transformer follows the detector valve it is often important that the shunting condenser should be of just the right value. In anode-bend detectors fierceness may be caused by incorrect grid bias, H.T. voltage or filament voltage. If a resistance-coupled stage follows, as it should, the resistance will generally require a shunting condenser of suitable capacity.

It should be noted that though modern valves are very closely standardised, individuals do differ a little from one another. If, therefore, you have more than one valve of the medium-impedance class generally used for rectification it may pay you to try different ones in the detector holder. Some valves respond much more smoothly than others to the effects of reaction.

One rather important point (it might seem too obvious to mention, but there are certain to be many who will neglect it): make sure before Christmas comes along that your batteries are up to the mark. Have the accumulator charged if necessary, and give yourself as a Christmas present a new high-tension battery if the old one is at all questionable. A wastes a lot of time. Using it, one hears, of course, many of the more powerful stations, but heaps of others are missed altogether. By far the most satisfactory method is to spend a preliminary hour or two in obtaining a rough idea of the calibration of the set.

## Stepping Stones For Tuning

It is particularly important to do so in case of receivers which have two or more tuning controls, for the dials rarely read exactly together in all parts of the band, and unless one has something to go by it is most difficult to keep all the tuned circuits in resonance whilst searching is in progress. The best method that I know is to begin by tuning in certain of the big stations which are particularly easy to find.

The wave-lengths of the stations and the settings required are carefully noted, and then one uses them as stepping stones. We might, for example, begin by picking up three stations only: the first near the top of the band, the second in the middle of it, and the third down near the bottom.

Three excellent transmissions for the purpose are 5GB, 2LO (or Glasgow, Manchester, Cardiff, Bournemouth, Newcastle, or Belfast), and

*Father "DX"mas*

The reaction control in a good set may sometimes not be so good as it should be because certain points have not received proper attention. In such cases a little trouble taken will generally produce an enormous improvement. If the rectifier is of the grid leak and condenser type, try, first of all, the effect of different high-tension voltages. Frequently a change will make a world of difference.

high-tension battery that is on its last legs is likely to lead to "battery-spherics," instability, low-frequency howling, inconstancy in reaction control, "end-of-the-evening" distortion—and bad language.

## Don't Search at Random

Don't search at random over the whole broadcast band. This is never a very profitable method, and it

at the bottom Nurnberg, which is such a tremendous signal that it is almost as easy to pick up as one's local station. Nurnberg is easily identified, for it relays the Munich programme and the announcer frequently gives out: "Hier ist die Deutsche Stunde in Bayern. Muenchen, Kaiserslautern und Nuernberg." (pronounced approximately: "¡Here ist dee Doytsher Shtoonder in

# A "DX" Christmas—*continued*

Byern. Meenchen, Kyserslautern oont Neernberg").

Armed with the readings for these three stations we are now in a position to work from them as reference points and to obtain others that will be of the greatest use. From 5 G B's readings we move a little upwards and will hardly fail to find Brussels, whose new 8-kilowatt transmitter should be in full service by Christmas-time.

A little above Brussels, Vienna is certain to be found, whilst continuing upwards from him we shall have no difficulty in recording Milan and Budapest. Once the readings for these last two stations have been obtained a rather more careful search between them will bring in Munich.

## Powerful Pointers

We turn next to our middle station, whatever it may be, and cover roughly first of all the space between its settings and those of 5 G B. During the first rather hasty trip we can rely upon picking up Hamburg, Frankfurt and Langenberg, for all of these are very powerful.

Having carefully noted their settings the finer work begins once more. Supposing that the middle station is 2 L O, we have a very excellent little band to explore between 361·4 and 396·8 metres. Stuttgart is the first station to look for, his settings being somewhere about midway between those needed for 2 L O and Hamburg.

Having got him we shall not have much trouble in finding Leipzig at any time when 2 L O is not working, or Madrid Union Radio rather late in the evening. Between Stuttgart and Hamburg, Toulouse will be discovered.

## Finding Smaller Stations

In the same way we explore the areas between Hamburg and Frankfurt, Frankfurt and Langenberg and Langenberg and 5 G B. The bigger stations having been tuned in and their settings recorded it becomes a comparatively simple business to obtain many of the smaller ones, since the field of search is so much narrowed down.

In the lower part of the band we continue on the same lines, picking up in our first rough traverse probably Kiel, Cologne, Breslau and Barcelona, and then filling in the gaps.

As more and more stations are recorded it becomes an easy business to plot out a tuning chart for the set. With the help of this desired transmissions can be tuned in quickly or stations that have been picked up can be identified, often with certainty.

## Thirty "Possibles"

For loud-speaker reception on the medium band there are at the present time about thirty "possible" stations. By "possible" I mean stations which in normal circumstances will supply the required signal strength. A list of the best should be made, with their condenser settings.

The actual members of the list of thirty or so will vary somewhat according to the locality; in the north, for example, the Scandinavian stations are very well received, though they do not come through so well in the south, whilst the south scores over the north in the matter of French and Italian stations. Not every one of the selected number will be good on every night.

Some will be heterodyned, others may be jammed by spark signals or mush; but with a list of this kind one can always be sure of finding rapidly several stations from which first-rate loud-speaker reception is possible. Such a list comes in very handily when visitors ask to hear what the set can do.

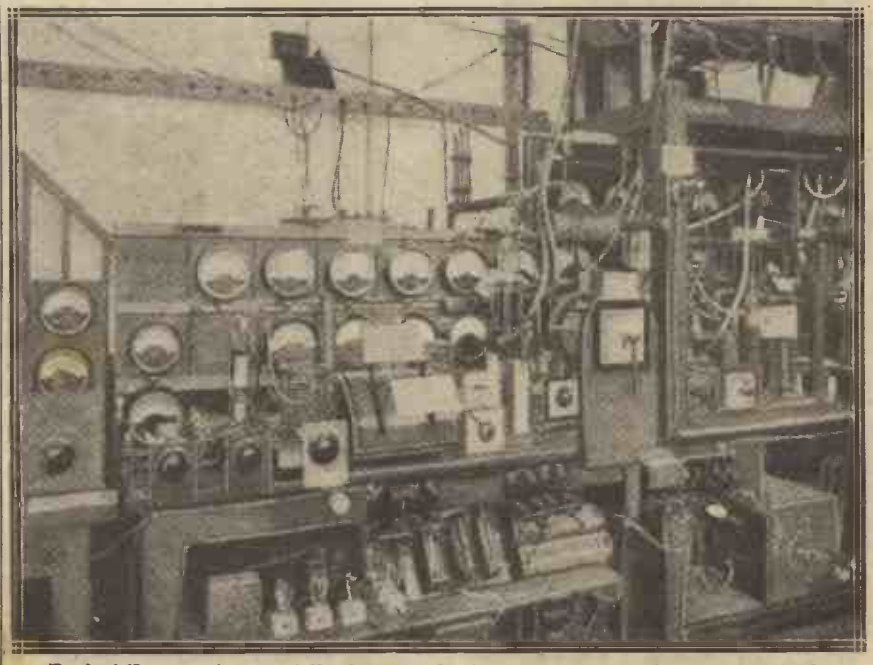
Here is a hint which will be found extraordinarily useful. You wish to hear, say, the Langenberg programme, but find either that the station is heterodyned or that 5 G B's wipe-out is so much in evidence that you cannot hear one station without interference from the other. Langenberg actually is relayed by three stations: Aix-la-Chapelle on 400·5 metres, Cologne on 283, and Muenster on 250 metres.

## Langenberg's "Three Strings"

The first of these is useless, owing to the 400-metre group wave-band. The other two, however, are both excellent transmissions which come in powerfully and are very seldom interfered with. For Langenberg therefore one has three strings to one's bow. Similarly, Berlin, if the 483·9-metre wave-length is unsuitable, may be received either from Koenigswusterhausen on 1,649 or Stettin on 236·5 metres.

## Robust Relays

Breslau is often better from Gleiwitz on 329·7 metres than from the parent station. Copenhagen is relayed by Kalundborg on 1,680 metres, Hamburg by Hanover on 298·2 metres, and Kiel on 254·6 metres, Munich by Kaiserslautern on 279·4 metres, and Nurnberg on 242 metres, Oslo by Frederikstad on 435·4 metres.



*Part of the gear in use at the famous short-wave station, P C J J, in Holland.*

# A "DX" Christmas—*continued*

The more important P T T programmes are relayed by many well-received French stations, Stockholm is relayed by Motala on 1,363·6 metres, Gothenberg on 416·6 metres, and Malmoe on 260·1 metres. If a main station is not good always, see whether there is not a relay that will do.

### A Tuning Tip

A word must be said about the short waves. There is sure to be plenty to hear, quite apart from the big stations, for the amateurs are certain to be busy over Christmas-time, and the excellence of their transmissions will come as a revelation to those who are not familiar with them. Big stations to look for just now are K D K A, 2 X A F, 2 X A D, 2 X A G, W R N Y, 3 L O, A N H, A N E, P C J J, Vienna, Rome and Berlin. Searching over the short waves may be conducted on the lines suggested for the medium band, powerful stations being tuned in and their settings used as reference points to work from.

Lastly, do not forget if conditions are at all favourable to try for America on the broadcast band; Two of the best received stations, W G Y and W E A F, work exactly on wave-lengths used by European stations. Tune your set to Stuttgart's wave-length early in the evening and only tiny adjustments will be needed when you switch on after midnight to bring in W G Y, if he is coming through.

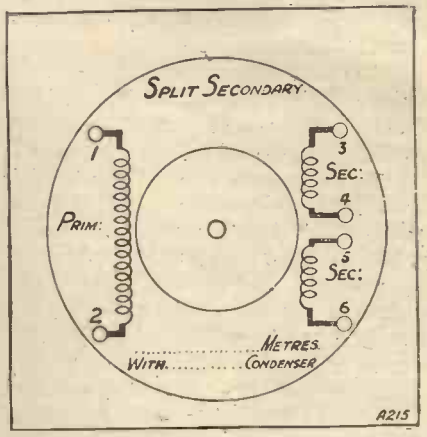
Similarly, W E A F can be found by leaving the set tuned exactly to 5 G B. Other Americans that have been well heard at the time of writing are K D K A, W B Z and W J Z.

*Why not try for Australia? The well-known Melbourne short-waver, 3 L O, is to be heard very well at about 5.30 p.m. at this season.*

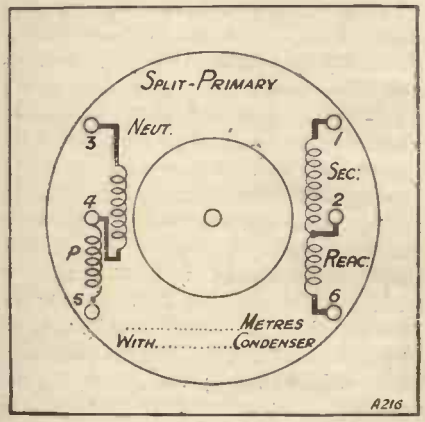
## Six-Pin Coil Indicators

THE six-pin coils which have been standardised for H.F. circuits are very convenient to handle, but you may have discovered a disadvantage which they possess. Some "enclosed" types of former have no indication on them of the distribution of the ends of the windings to the pins. Memory is apt to be treacherous when you are dealing indiscriminately with split-primary and split-secondary coils, and a wrong connection may be disastrous.

It is true that you can refer to published data on the subject, but there is a better way. On the top of the coil former there is usually a knob. You can use this knob to secure a card disc to the top of the former,



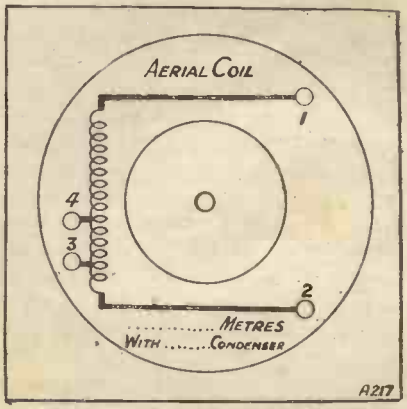

with the winding arrangement drawn on it. Suitable discs of this kind are reproduced on this page. These are of the correct size to fit the tops of the formers, so that you can copy them and cut them out, stick them




to pieces of thin card and fix them on the formers.

You must add the wave-length range which the particular coil is designed to cover, and the value of the tuning condenser required. A glance at the coil will then give you just the information you want.

A. V. D. H.



# HOW TO USE YOUR CIRCUIT BOOK

*Some practical notes upon "Thirty-One More Tested Circuits," the Gift Book presented to all readers last month.*

BY THE EDITOR.

THE first four circuits in "Thirty-One More Tested Circuits," presented free with the last issue of the WIRELESS CONSTRUCTOR, are specially designed for those set users who desire the high quality of reproduction necessary to do justice to the best moving-coil and other speakers now available.

## Circuit No. 1

In dealing with these four circuits in a more extended form than was possible in the book it will be convenient to group them, for they have several features in common, and by considering them together we can not only compare merits but see what further combinations are possible by using some parts of one circuit with other parts of another.

The first circuit—a five-valve receiver with a single high-frequency stage of push-pull output—should really be considered in the four-valve class, for the output valve is really duplicated so as to enable us to handle more power without distortion than would be possible using a single valve of the same type. The detector is preceded by a stage of neutralised high-frequency so as to give good distance-getting qualities, while one transformer and one resistance-coupled stage is the low-frequency combination.

## The H.F. Stage

Dealing first with the high-frequency stage, we can use separate plug-in coils quite efficiently for $L_1$ and $L_2$, provided these are of good make. With the advent of specially wound single-layer coils some listeners were led into believing that the old "pin-and-socket" type of plug-in coil is hopelessly inefficient. This is far from being the case, for, although for the very highest efficiency properly designed and well-made single-layer coils are better, the difference between the two types is not astonishingly great. For example, the high-frequency resistance (the most important point) of the average commercial single-layer interchangeable coil is probably in the neighbourhood of five to seven ohms, while there are half a dozen makes of "pin-and-socket" plug-in coil having a high-frequency resistance not more than half as great again. The figures given are for coils having an inductance of 200 microhenries, corresponding with that of coils used in such a circuit as $L_2$—$C_1$ in the circuit book. High-frequency losses, of course, are not confined to coils, for they exist in condensers (although in most cases these losses are very small), in valve sockets (where losses between the grid and filament pins may be quite appreciable), and in coil bases, whether of the "pin-and-socket" or "six-pin" variety.

## Several Advantages

The advantages of using the separate pin-and-socket plug-in coil for $L_1$ and $L_2$ are that we can change the aerial coil not only in number of turns but in spacing between $L_1$ and $L_2$ to suit our particular experiments. Aerial transformers on six-pin bases including $L_1$ and $L_2$ are available in the leading makes, and in a few cases interchangeable primaries are available so that the aerial turns may be varied.

## Concerning Screening

A metal screen, copper or aluminium (not iron), should be used to separate the high-frequency stage and its coils from the detector stage and *its* coils. A vertical sheet as high as the panel (minus the thickness of the baseboard), and as deep as the baseboard from front to back, should be chosen, preferably of the type which has slots along the bottom, through which wires can be threaded. $L_1$, $L_2$, $C_1$, the valve and valve holder, and $C_4$, should be on the left of the screen, the rest of the apparatus being on the right. Arrange your co ponents carefully, so as to keep the leads short, and avoid placing the coils $L_1$ and $L_2$ too close to the metal screen. The high-frequency transformer, which is of the "split-primary" pattern, can be purchased ready-made in the six-pin variety, as these are rather tricky to wind at home unless a considerable

*The wireless operator at work in the radio room of the "Città di Milano," where he received the famous S.O.S. from General Nobile, in the Polar airship "Italia."*

# How to Use Your Circuit Book—*continued*

amount of experience has been gained in high-frequency transformer making.

If a good deal of reception from a station very nearby is indulged in it is not a bad plan to make the resistance $R_1$ variable, using for this purpose a 30-ohm panel-mounting filament resistance.

### Reducing Volume

Then, after the set has been properly neutralised, $R_1$ can be used as a volume control. When a nearby station is being received it is preferable to operate the volume control in this way rather than to use a device which controls volume after the detector stage, for particularly when a high-frequency valve is used the signals from a nearby station can seriously overload the detector and produce distortion there, and any reduction in volume following the detector will not in any way reduce this distortion. On the other hand, when the filament of the high-frequency valve is dimmed the amplifying powers of this valve are reduced. When the filament is very dim, scarcely any energy will be passed through the high-frequency stage. In such a case, the voltage applied to the detector can always be kept below the "detector distortion" point.

It will be noticed that the conventional values of ·0003 mfd. and 2 megohms are given for the grid condenser and leak. These are good average values for home and distant work, but if the user of this set is situated so far from the nearest station that there is no possibility of proper reception without the high-frequency stage, then it is a good plan to increase the value of the leak to four or five megohms.

### An Important Point

$R_{11}$, the resistance in the anode circuit of the detector valve, is given as 100,000 ohms, although a greater magnification can be obtained from an R.C. valve when a resistance of a quarter of a megohm is used. At the same time, however, it is held by many that the purity of reproduction is not so good with the higher value, particularly for local station reception. Experiments here are illuminating, and for low values it is best to use wire-wound resistances.

The condenser $C_6$ is of first importance and on no account should the paper type of condenser be used, for unless the insulation is of the highest quality very bad distortion may be set up. I recently had brought to me a receiver which was thoroughly unsatisfactory both in regard to sensitivity and quality. The sole fault turned out to be the use of a Mansbridge type of condenser in the resistance-capacity coupler. This must not be taken as a general condemnation of the Mansbridge type of condenser when used in its proper place. These condensers, however, are not intended for use in high quality resistance-capacity-coupling units, and the mica type should always be used. Any of the leading condenser makers will sell you good mica condensers of a suitable value for this position. Although the price is higher than that of the paper type the expenditure is well warranted.



The resistance $R_8$, which is being increasingly used in grid circuits following the detector valve, is not a grid leak in the ordinary sense of the word, although a grid leak type of resistance is frequently used. Its purpose is to prevent stray high-frequency current from reaching the grid of the low-frequency valve, and it is frequently a cure for troubles erroneously ascribed to other causes. This resistance is not included in all the circuits in the book, but its adoption can never do harm.

### L.F. "Parasitics"

Following this first low-frequency valve we find a transformer, the secondary of which is centre-tapped for grid-bias connections, the two ends of the secondary going to the grids of the output valves. You will notice that here, too, we have resistances in the grid leads, their presence being to prevent parasitic oscillations which can occasionally be set up in such a circuit when the valves are not quite matched. Their function is slightly different from that of the resistance $R_8$.

### The Output Question

There are often two schools of thought in regard to output valves, some stoutly maintaining that push-pull is the best and others that it is better to use the valves in parallel. Personally, I prefer the push-pull method, although the difference in the results (assuming the same high-tension voltages in each case) between push-pull and parallel is not very great. A push-pull arrangement is shown in Circuit 1, and the parallel arrangement in Circuit 3, and either scheme can be used in Circuit 1, and either in Circuit 3, provided the components are properly chosen. Some output device is, of course, necessary with push-pull or parallel valves, and in Figs. 1 and 3 an output transformer is used.

Circuit No. 2 is designed purely for local reception. It has very poor distance-getting qualities, there being neither high-frequency amplification preceding the detector, nor reaction.

Circuit No. 3 is intermediate in sensitivity between No. 2 and No. 1.

It will be noticed that two transformers are used here. Two transformers of good make will give better magnification than one resistance stage and one transformer stage, but there will be a greater tendency to howling due to low-frequency reaction, and the transformers will have to be chosen with care. If, at first, transformers howl with this arrangement, it can generally be cured by inserting an anti-motor-boating device in the leads from $T_1$ to $C_5$, this device consisting of a wire-wound resistance of, say, 5,000 or 10,000 ohms, shunted to earth at the transformer side of the resistance by a 2-mfd. condenser.

### Another Cure

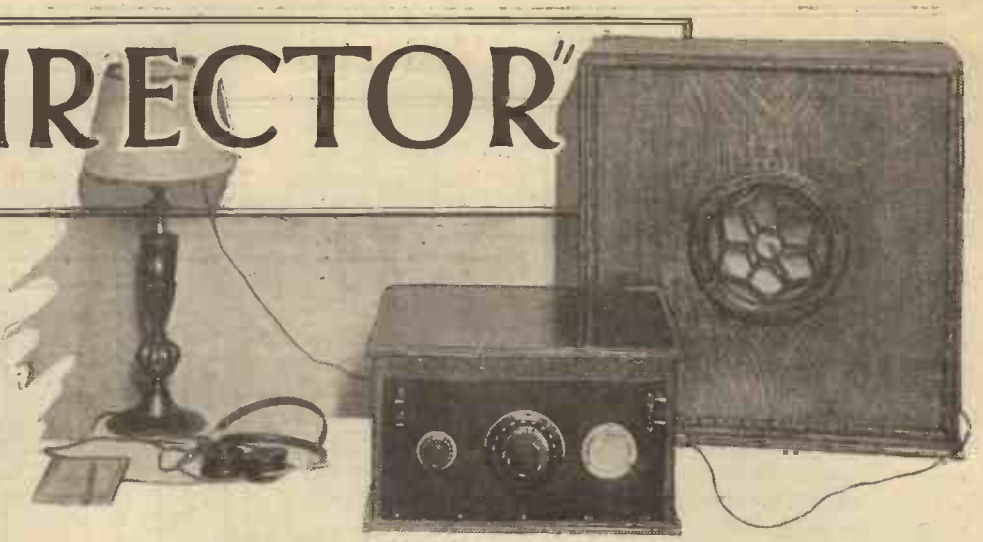
A further help in eliminating howling troubles of this kind is the use of choke output instead of transformer output, the arrangement for this being shown in Circuit No. 31B.

Circuit No. 4 requires little explanation after the previous notes have been perused, and it is designed purely for gramophone reproduction.

# The "DIRECTOR"

by

G.V.COLLE



*A D.C. mains two-valver which takes L.T., H.T. and grid bias from the electric light supply.*

FOLLOWING up the writer's theoretical article on D.C. mains receivers in last month's WIRELESS CONSTRUCTOR, it is now possible to give full constructional details of the most simple of the sets shown therein, namely, the two-valve det. and L.F. receiver.

## Extremely Efficient

It will be remembered the circuits were only given as being suitable for practical experiments, but it was not suggested that the particular arrangements shown would hold for the finished receivers, as the writer has been able to simplify to some extent and improve upon the two-valve set, although the theoretical circuit given last month made excellent material on which to base experiments.

However, it is very gratifying to describe a set which has surpassed all expectations, from the point of sensitivity, ease of control, absence of hum, reasonable cost and versatility in the choice of valves.

Readers who are interested in this receiver will doubtless be pleased to learn that any combination of 2-, 4-, or 6-volt valves can be employed, providing the filament current is ·1 ampere (100 m/a) in each case. Odd valves of suitable characteristics can, therefore, be found of service, since no alterations whatsoever are necessary to the circuit wiring.

Initial adjustments to the set are extremely simple, as you may judge from the following. First decide the type of rectification you require from the detector valve, whether anode-bend or grid rectification. If the latter, you simply join the bottom end of the grid leak to the positive filament leg of the first valve holder. The next step is to choose valves taking ·1-amp. filament current, the detector valve having an impedance of 20,000 to 30,000 ohms (a lower impedance valve can be used with a slight drop in amplification), and the L.F. valve an impedance of 6,000 to 12,000 ohms. Both valves are inserted in their respective valve holders and the valve-maker's figures for grid bias for the L.F. valve are then studied.

## Obtaining Grid Bias

The 400-ohm potentiometer near the L.F. valve holder in the set is for obtaining grid bias and will give 40 volts if necessary. With the arm half-way round from the side marked "+" you can obtain 20 volts, and a quarter of the distance 10 volts, and so on, according to the position of the arm.

## COMPONENTS REQUIRED

1 Panel, 14 in. × 7 in. × ¼ in. or ⅜ in. thick (Ebonart, Resiston, Becol, Trolite, etc.).

1 Cabinet, 14 in. × 7 in. × 12 in. deep, complete with baseboard (Caxton, Arteraft, Camco, etc.).

1 ·0005-mfd. variable condenser, with slow-motion dial (J.B. used in set. Any good make).

1 ·00015-mfd. variable reaction condenser (Igranic, Peto-Scott, Cyldon, Bowyer-Lowe, etc.).

1 0–300-milliammeter, moving coil type preferably, but moving-iron instrument can be substituted if desired (That shown is a Sifam moving-coil milliammeter, while other good makes are Weston, Rothermel, Hydra, Ferranti, etc.).

2 28/14-henry L.F. chokes (R.I.-Varley).

1 Output filter choke for loud-speaker circuit (That shown is an Igranic type F, the two sections of the windings being joined in series to make a single choke).

1 Batten mounting-type lamp holder, standard size, complete with plug to fit, for D.C. mains input to set.

1 L.F. transformer (Lissen, Ferranti, R.I.-Varley, Brown, Igranic, Royal, etc.).

1 Anode resistance holder and 80,000-ohm anode resistance (approximate value). To find the value of resistance required for your own set, read text. (Lissen, R.I.-Varley, Ferranti, etc.)

1 H.F. choke (Lewcos, Lissen, Magnum, Climax, R.I.-Varley, Igranic, Dubilier, etc.).

2 Sprung valve holders (Any good make).

1 400-ohm baseboard-mounting potentiometer (Igranic, to carry ·1 ampere).

1 30-ohm baseboard-type rheostat, arranged as a potentiometer (see text). (Igranic.)

1 1,500-ohm resistance, to carry at least ·1 ampere (100 m/a). The resistance must be wire-wound. (Truvolt T15 is shown in set.)

1 2-meg. grid leak and holder (Dubilier, Lissen, Mullard, etc.).

2 ·001-mfd. fixed condensers (Dubilier, T.C.C., Mullard, Lissen, Atlas, etc.).

1 ·0003-mfd. fixed condensers (Dubilier, T.C.C., Mullard, Lissen, Atlas, etc.).

3 Single coil holders.

8 2-mfd. Mansbridge type condensers of reliable make (Those shown are a combination of Lissen and Mullard).

4 Fully-insulated terminals, markings according to diagrams (Belling and Lee, Igranic, etc.).

Quantity of Nos. 18 or 20 S.W.G. tinned copper wire and thin Systoflex, or, alternatively, Glazite.

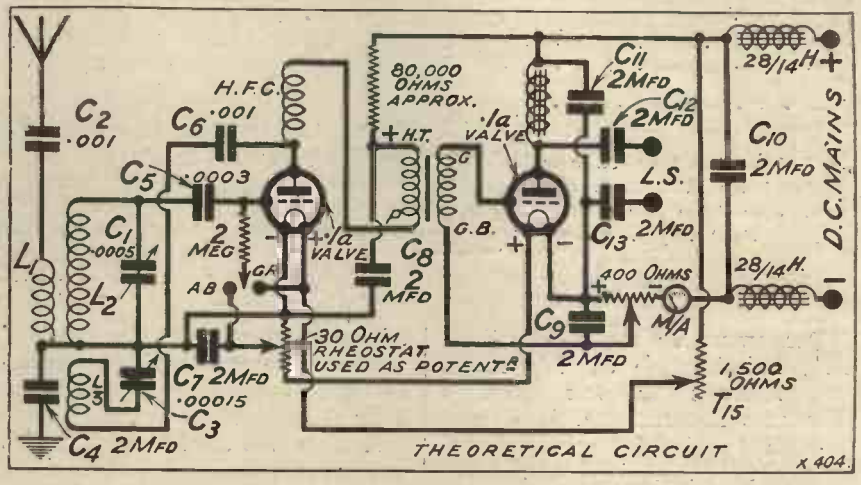
# The "Director"—*continued*

Naturally, one must know the H.T. voltage applied to the anode of the L.F. valve to decide on the grid bias needed, and this can be calculated by subtracting 100 volts from the voltage of the D.C. mains, the remainder being approximately the H.T. applied to the L.F. valve through the L.F. filter choke.

## Current Regulation

Before connecting the set to the mains, ascertain whether the arm on the 1,500-ohm Truvolt on the baseboard is set to maximum resistance, that is, set to the right, away from the 28/14-henry L.F. choke, as this will prevent overrunning of the filaments of the valves. Now insert the mains plug with the valves in their sockets, but be ready to switch off if the milliammeter kicks in the wrong direction, off the scale. If so, simply reverse the plug so that it reads correctly and adjust the Truvolt until the needle of the milliammeter shows 100 milliamperes.

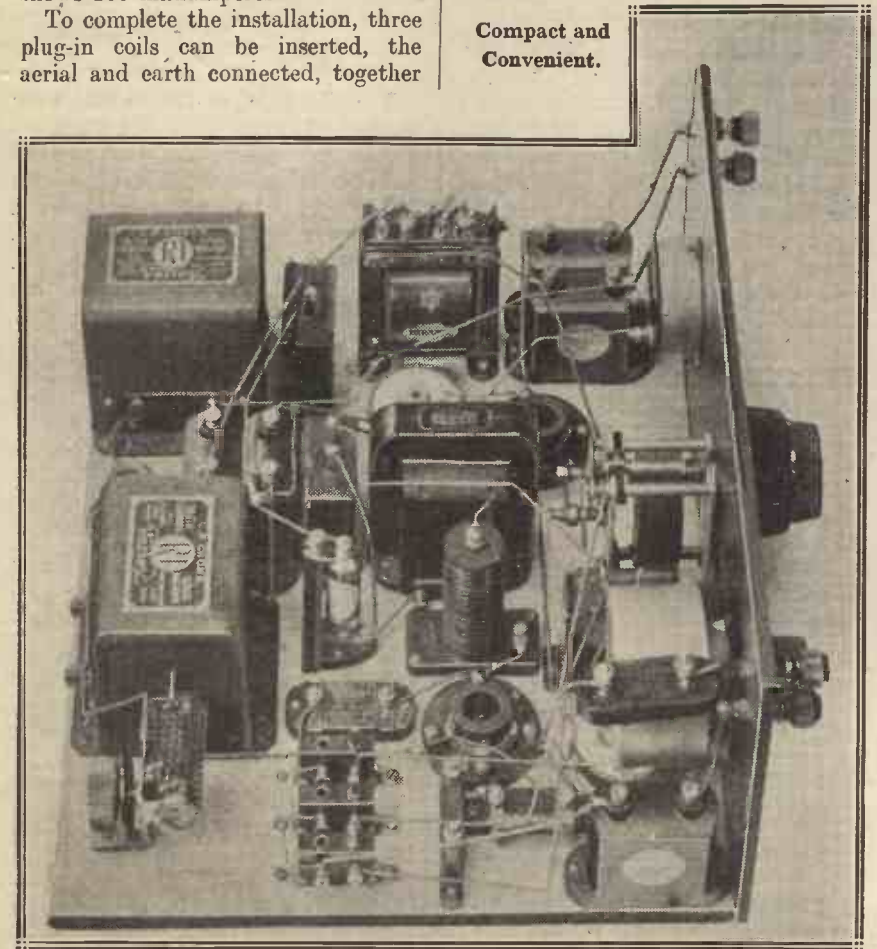
To complete the installation, three plug-in coils can be inserted, the aerial and earth connected, together with the loud speaker, to their respective terminals and the receiver tuned to the desired transmission. Probably a minor adjustment of the




400-ohm potentiometer may be necessary to vary the grid bias slightly, but beyond this there is little to go wrong, the actual time taken to adjust the set being less than 10 minutes, if it can be assumed everything is at hand, ready for use.

Doubtless, certain constructors would desire to make further tests, to satisfy themselves that the filament voltage of any one valve was not abnormal, so that all they need is a fairly accurate voltmeter reading 0—8 or up to 20 volts, which can be connected across the negative and positive filament terminals on the valve holders, while the valves are in position and the mains switched on. Incidentally, this test also serves as an indication of whether the polarity of the mains is correct for grid biasing purposes, because if the leads to the milliammeter happen to be reversed and the mains plug adjusted so that the needle reads correctly, it does not follow the current would be flowing in the right direction for the positive grid bias to become common to negative L.T. What would happen in this case would be for negative grid bias (extreme end of winding) to become joined to positive L.T.

**Compact and Convenient.**



*Three plug-in coils are used for aerial, secondary and reaction, while on the left is seen the Truvolt current regulator, which controls the filament current.*

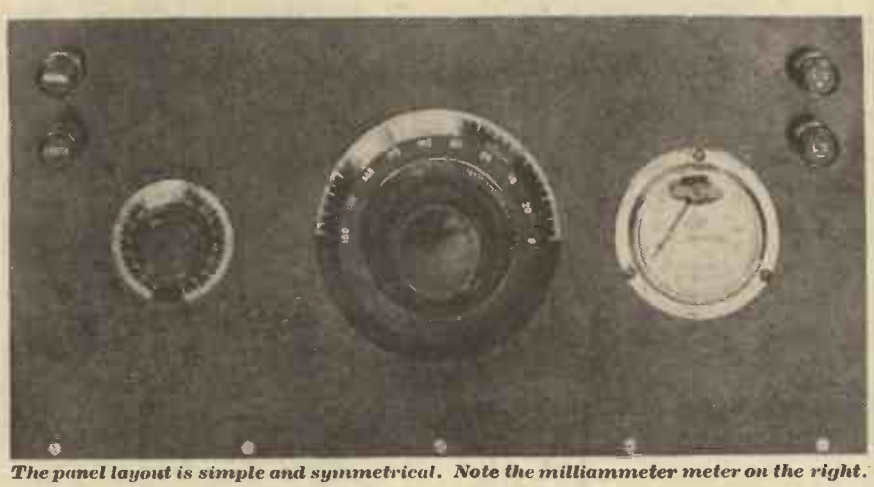
## Milliammeter Connections

Constructors can check the accuracy of the arrangement when using a *milliammeter* which is not marked for polarity by first placing the hand voltmeter across the filament terminals of any one valve holder and noting the voltage (which, if not quite correct, can be rectified by a slight readjustment of the Truvolt), and then observing whether the positive side of the voltmeter is in contact with the positive filament terminal on the valve holder. If this is *not* so, after observing whether the milliammeter is reading on the scale, then it will be advisable to switch off,

# The "Director"—*continued*

reverse the leads to the milliammeter, reverse the mains plug, and then switch on again.

The writer has gone to the trouble of explaining this fully, because if a constructor should purchase a milliammeter which is unmarked for polarity, the above notes will serve as an indication of what is wrong and how to rectify it. It should be understood, however, that there is little likelihood of this happening if a milliammeter similar to the one used on the original set is incorporated, or else one which is clearly marked.



*The panel layout is simple and symmetrical. Note the milliammeter meter on the right.*

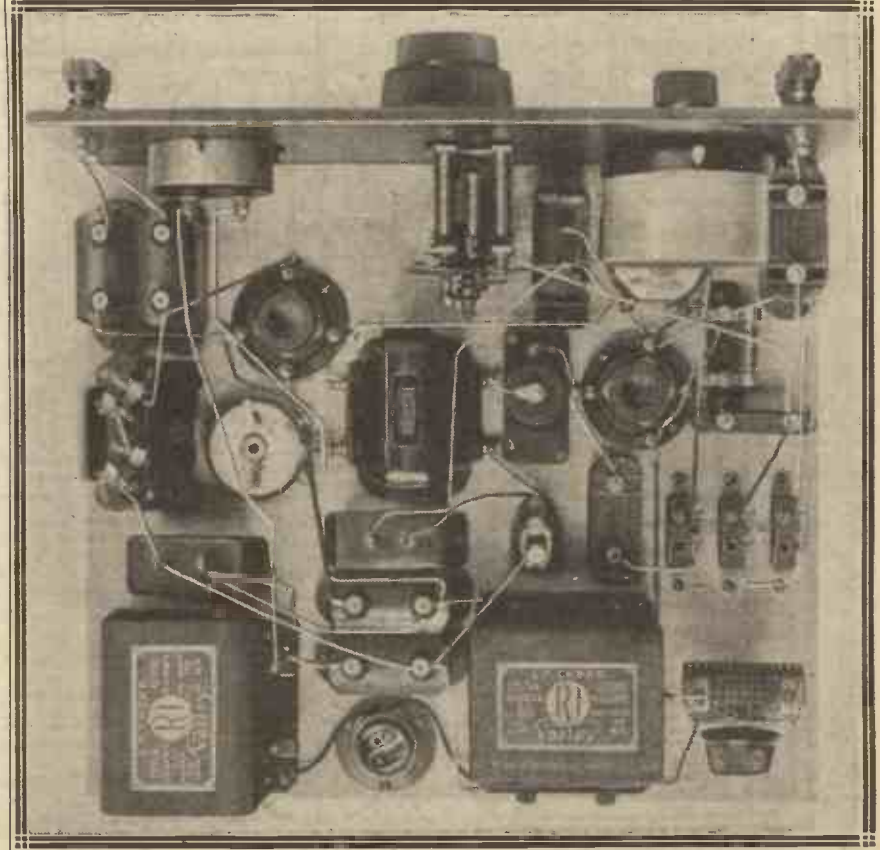
## Unusual Receiver

When a writer sets out to describe a receiver, it is usual for him first to give an idea of results, then point out the simplicity of the tuning arrangements, after which follows invariably the constructional details and operating notes. In this case, however, the writer feels he must be excused if he places the cart before the horse, since it is his contention that being a somewhat unusual receiver its details require unusual treatment. The object in mentioning operating details before constructional details is to give the uninitiated constructor of mains receivers some idea of what is expected of his abilities, so that if he feels he can successfully negotiate this part of the proceedings, then the rest is but the acme of simplicity.

Results which can be expected are somewhat interesting and yet perfectly standard, since the output as regards volume compares very favourably with the best detector and L.F. receivers of standard deisgn. In reference to the word "interesting," the writer uses it with all due caution, although undoubtedly the results are worthy of such an expression, because one can don a pair of 'phones and work on D.C. mains where the positive is earthed, and yet hear but the minutest hum, using reaction at the oscillation point. The absence of hum is, of course, a great asset, and cannot be fully appreciated until one has worn a pair of 'phones for some hours. Needless to add, the use of 'phones will add to the "log" of stations, many of which would not otherwise be heard on the loud speaker.

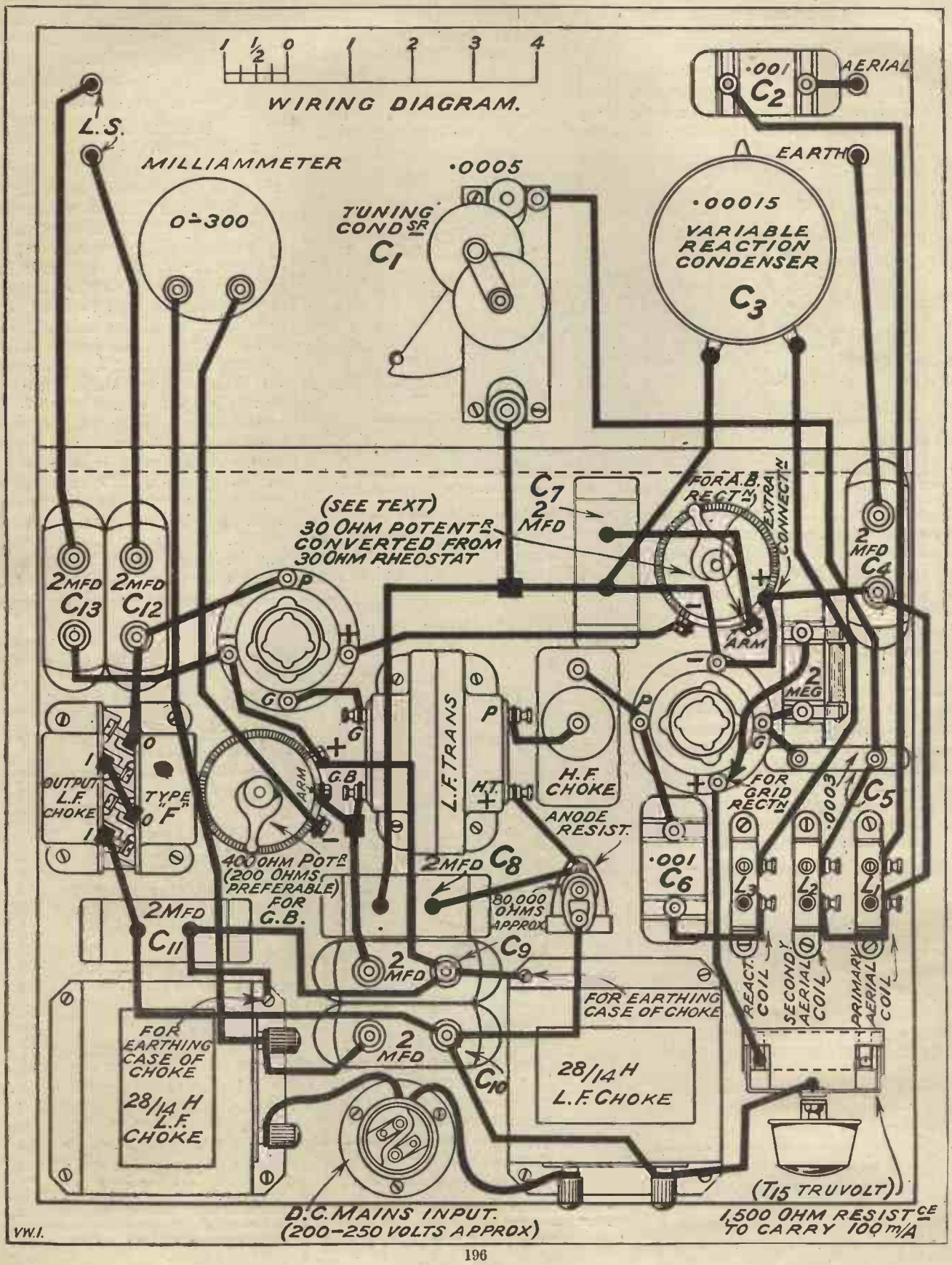
## Results Obtained

Loud-speaker volume is a "stretched" phrase at the best of times, so it would be as well to add to the above facts that the loud-speaker volume obtainable is sufficient to fill a medium-sized room comfortably, the number of stations giving this volume depending on the efficiency of the aerial and earth system. Tests conducted at the writer's home in North London, about four and three-quarter miles from 2 L O, show that 5 G B is easily separated from the former station, with plenty of free space on the tuning dial for other transmissions. Selectivity can be adjusted to suit particular localities and aerials by the simple expedient of trying various sizes of coils, ranging from 25 to 50, in the aerial primary circuit. The set is extremely sensitive for its type and will give pleasure to those who are "D.X." inclined.



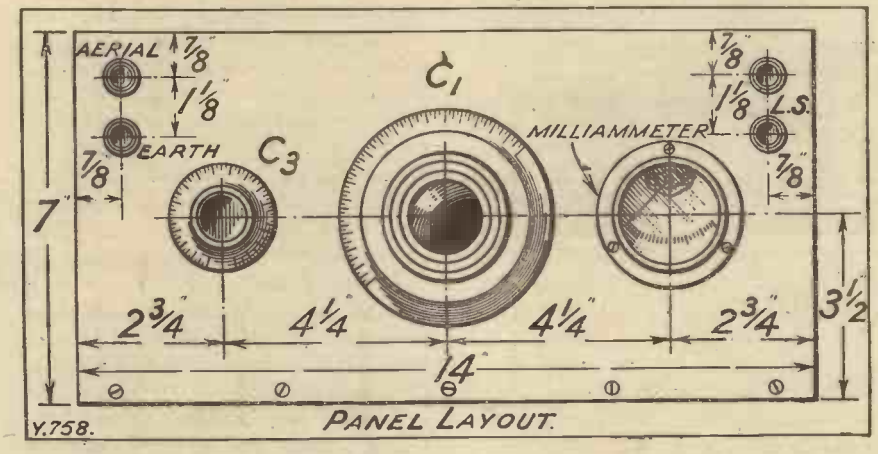
*The general arrangement of the apparatus can be seen in this photograph, which will dispel any doubts concerning the wiring and baseboard layout.*

# The "Director"—*continued*



# The "Director"—*continued*

Turning now to the constructional details, one or two things stand out beyond the others, namely, the compactness of the receiver, the simplicity of the panel layout, and the small amount of drilling to be done. It is true a large hole has to be made in the panel for the milliammeter, although it can either be accomplished by means of a brace and an expanding bit, which can be purchased for a couple of shillings, or else by the firm supplying the panel, if so requested. Should the constructor undertake the panel drilling, he is advised to cut the large hole for the meter from both sides of the panel, to prevent the ebonite splintering at the edges of the cut. Further, make the hole only sufficiently large in diameter to admit the meter, as sufficient ebonite must be left to take three screws which pass through the flange on the meter, through three holes in the ebonite, and which engage with nuts at the back.




## Mounting the Components

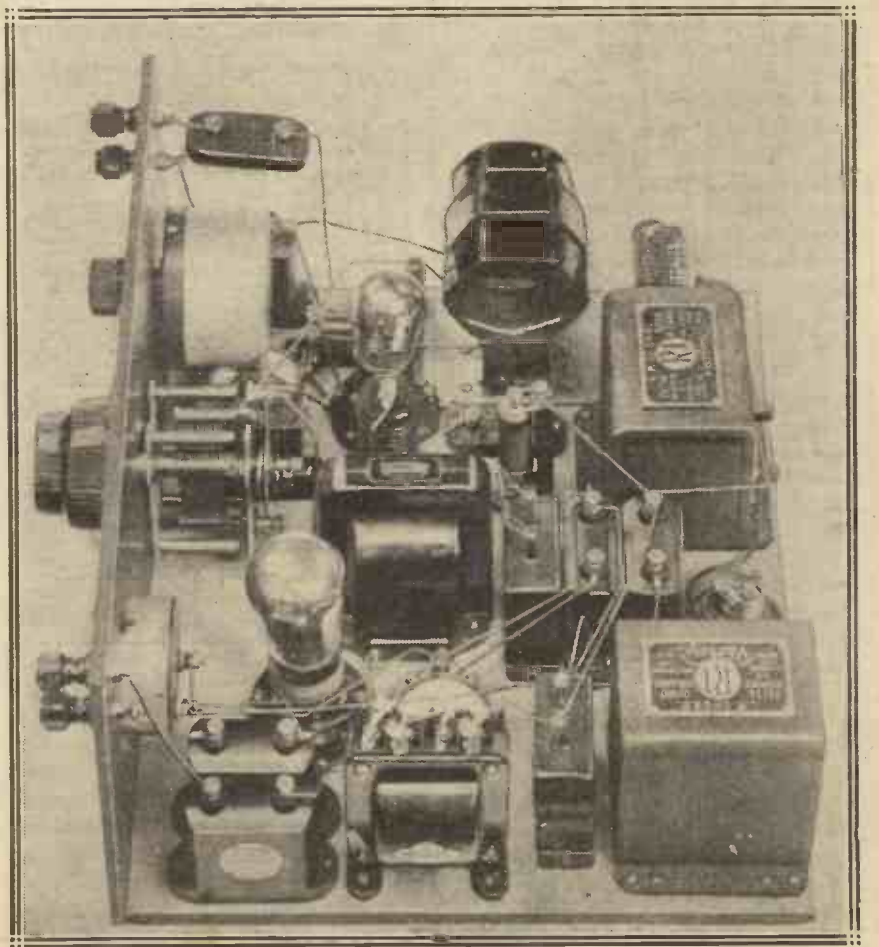
When the panel drilling is completed, the components can be fitted to it and the whole screwed to the baseboard, ready for the baseboard assembly. There is nothing really difficulty about the latter job, for it consists of fitting the components in approximate positions to those shown in the photographs and then screwing them to the baseboard. The one outstanding component which requires a little special treatment is the 30-ohm rheostat, as this has to serve the purpose of a low-resistance potentiometer, as explained in the article in last month's WIRELESS CONSTRUCTOR. On the Igranic baseboard rheostat two nuts are provided for connection, one going to one end of the resistance element and the other to the arm. To convert the rheostat to a potentiometer the "free" end of the resistance element nearest the nut which connects to the arm must be pulled out, so that the resistance wire lies between this wire and a nut, the remaining nut going to the arm.

If the constructor remembers a potentiometer consists of a length of resistance wire wound to form an element (both ends being connected), with an arm or slider arranged to slide over the bared surface of the wire, he will understand how to convert any suitable type of baseboard rheostat. The 30-ohm potentiometer is screwed under the variable reaction condenser, and is used as a source of obtaining up to 3 volts grid bias for the detector valve, should one desire anode-bend rectification instead of the orthodox grid rectification.

## Easy to Wire

The wiring of the receiver is quite straightforward and can be carried out in a variety of ways, according to the taste of the constructor. Bare wire alone on no account must be employed, for obvious reasons. When completed, carefully check the connections for errors and then omissions,

(*Continued on page* 241.)



*The L.F. end of the "Director," showing the output choke and condenser and also the valves and coils in position.*


*Some typical faults and remedies reviewed.*

By P. R. BIRD.

Now that the evenings are long, the set-building fever is raging in the land and the soldering iron hardly ever gets cold, the queer story of a Birmingham set builder is well worth telling. He was building a short-wave two-valver and completed it late at night.

"After about three-quarters of an hour searching," he says, "I picked up an American station, which was held at quite good 'phone strength from about 11 p.m. till about 2.15 a.m. The following morning, from 11 a.m. till 1 p.m., I heard several amateurs and numerous Morse stations. Since switching off that morning I have been unable to get a sound on the short waves, but when the earth lead is removed from the coil plug, 5 G B and 5 X X can be heard together!

"Apart from this I can get nothing at all. I have dismantled the set and rewired it. The grid leak and the ·0002-mfd. condenser have been renewed. The transformer has been changed and three coils have been wound. The moving condensers do not appear to short when tested with a battery and lamp, and the valves, earth and aerial work perfectly on an ordinary set."

## Alterations and Adjustments

As this reader lives just outside Birmingham, his distance from 5 G B is so little that almost any set, even with a serious fault, would bring in signals, and the only question is where to look for the serious fault. Even without seeing the set there are two remarkable features about it that call for comment.

Being a new set we know it is extremely unlikely for a fault such as is caused by long use to have developed in one of the components. Another fact is that the trouble evidently has nothing to do with the spacing or the positions of the components, because these have not been altered since the set gave good results and brought in America. In fact, the really important thing to notice is that as the only thing about the set that has been altered are the various *adjustments*, the fault is almost certain to be in one of the moving contacts.

Even a simple set has several moving contacts, and in such a case as this one the best thing to do is to look at them all methodically. We might first inspect the rheostats, making sure that the filaments are getting their correct current.

If the valve legs appear at all dirty or greasy they should be carefully cleaned. It is essential that all the valve pins should make good contacts with the valve holder and sockets, especially in the case of the grid pin.

## Care with Contacts

If a potentiometer is used, which is often the case with a short-wave set, possibly the slider is not pressing down firmly upon the turns of wire. In this case the whole of the grid circuit will be "in the air."

Each or any of these contacts may have gone wrong a little while after the set was in use, but if they are all satisfactory the trouble might still lurk in one of the flexible leads used to connect the coil holder. A broken lead here can cause no end of trouble, so the good old-fashioned 'phone test with a dry cell should be undertaken, and all these joints which can be moved or adjusted, and all the wires which go to moving parts, such as a moving-coil holder, should receive special attention when the tests are carried out.

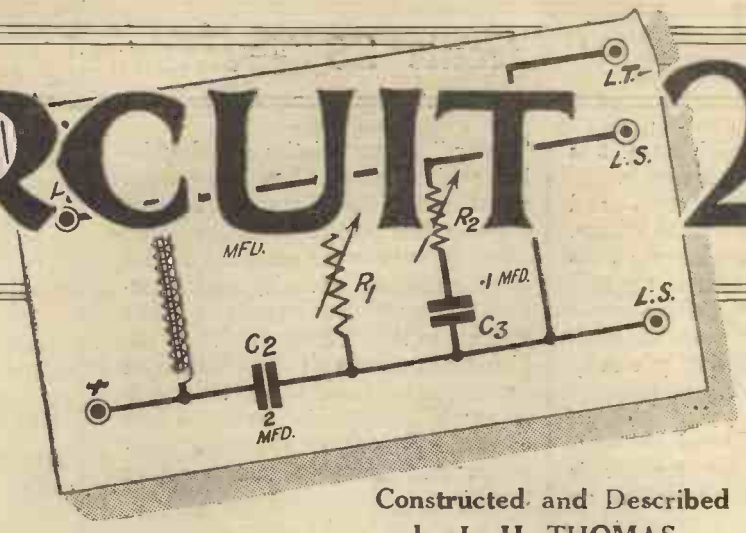
Finally, amongst the list of moving contacts which require particular attention, do not forget the L.T. and H.T. leads. (Not only the flexible leads going from the set to the L.T. battery are liable to give trouble, but it sometimes happens that the connecting bar of an accumulator will move slightly, and thus prevent any current coming to the set. This fault, of course, would be shown up by a voltmeter test, but it can prove very puzzling when there is no voltmeter available.)

## That Extra Efficiency

Similarly with the H.T. battery where it sometimes happens that one of the plugs has moved slightly in its socket, and although it appears to be fixed firmly in the battery it is not making proper contact with it.

Difficult as these faults are to find, there is one good thing about them. A thorough search for trouble will probably have smartened up some of the contacts very considerably besides the one in which the real fault existed. So that generally when once a "sulky" set can be got to go it goes off with a bang, and will probably have just that little touch of extra efficiency which makes all the difference between a very, very good set and a set which is "quite all right."

# "CIRCUIT 29"




*A combined tone and volume control which you can connect to any ordinary set.*

*The practical form of one of the "31 More Tested Circuits."*

Constructed and Described by L. H. THOMAS.

WHEN the Editor recently asked me to make up in practical form the circuit appearing in the book given with last month's issue, it took me some time to decide in exactly what form is should be done. I solved the problem eventually by deciding to make the whole thing as inexpensive, as simple and, above all, as small as possible, and the little unit seen in the photographs is the outcome of this decision.

## Two Independent Controls

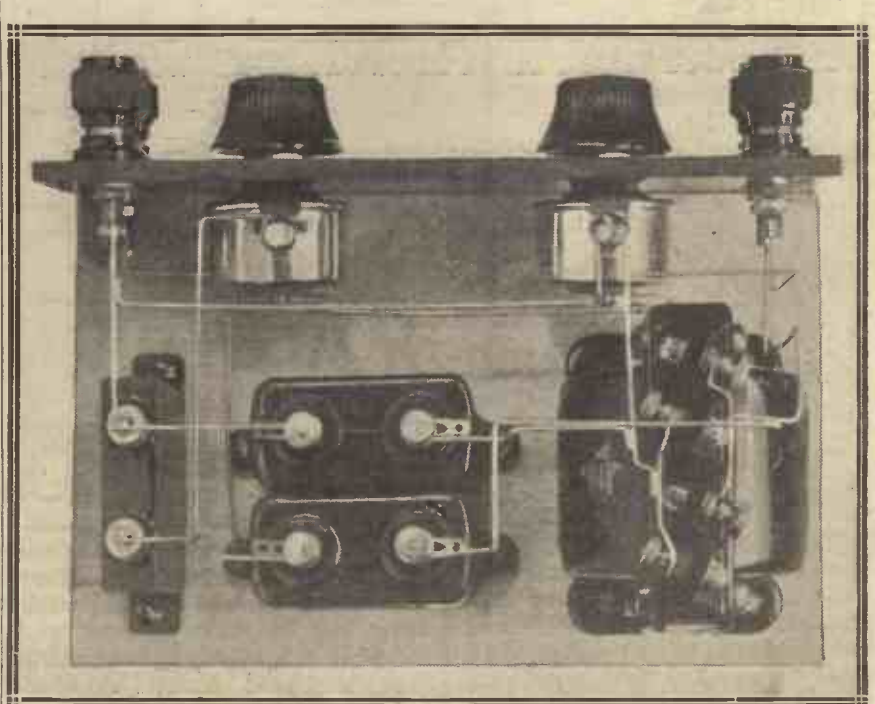
As you will know by now, the unit is a combined tone and volume control, and it certainly performs its functions as such very well, although there will doubtless be those who find fault with the principles, and assume that the two controls will both work in the same manner. In actual practice, however, there is little doubt that the two controls are entirely independent. The "tone-control" certainly does not affect the volume in the slightest, and if the volume control *does* change the tone, it is only to an extent that is barely appreciable.

## Fine Volume Control

There must be many receivers with no volume control incorporated which cause their owners much worry by behaving themselves during quiet passages and suddenly making the loud speaker chatter upon the arrival of a crescendo. I am not for one moment suggesting that it is a good plan constantly to be twiddling a volume control and thus reducing the whole of a musical programme to one level, but there are times when one particular portion of a programme seems to be exceptionally loud, whether for the reason that the B.B.C. engineers have increased the modulation or simply that the actual volume turned out by the performers is greater than usual. In such cases it is often useful to have a good volume control which works smoothly and allows one to tone the loud speaker down to one's own liking. The usual method is, of course, simply to detune the set, but this has several disadvantages. In the first place detuning to the correct degree requires a little skill. In the second place, in the present days of overcrowding of the ether it is ten to one that we shall land our set on top of another broadcast station, to the annoyance of any of our near neighbours who happen to be trying to receive that station. We need not be in a state of oscillation ourselves (or, rather, our receivers need not be !) to cause much worry in this way, as I know too well myself. I have a neighbour who "detunes" habitually, and when I have found just who he is I am going to present him with the volume control I am describing at present ! I often use a volume control myself to counteract over-modulation.

## The Actual Circuit

Referring to the circuit diagram, the "Clarostat" $R_1$ is the volume control, $R_2$ being the tone control. The L.F. choke used is an Igranic double choke, and the two windings



*"The unit is a combined tone and volume control and it certainly performs its functions as such very well."*

# "Circuit 29"—*continued*

are connected *in parallel*, since it is being used as an output circuit.

The two 2-mfd. condensers, $C_1$ and $C_2$, are of Dubilier manufacture, while the ·1-mfd. condenser $C_3$ is a T.C.C. No other details of the unit need be given, since the photographs and the small back-of-panel diagram show every detail sufficiently clearly for the reader to follow.

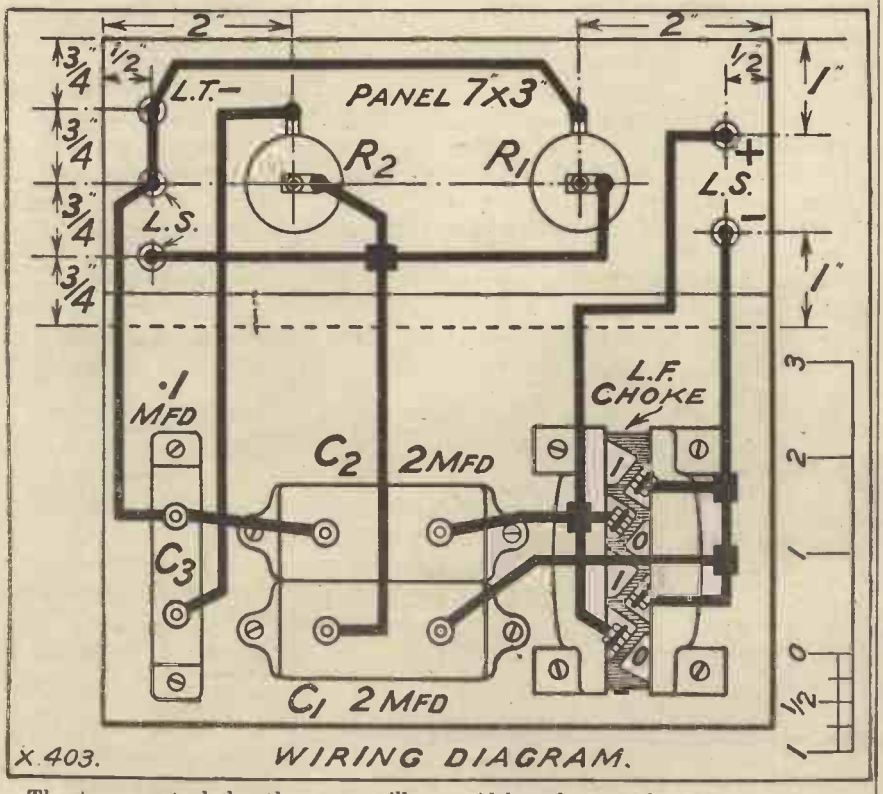
### Using the Unit

The output from the receiver is simply connected to the terminals on the left-hand side of the unit (which, by the way, may either be inscribed "L.S.+" and "L.S.—" to correspond with those on the set, or "Input+" and "Input —." Those on the output side of the unit are simply two "L.S." terminals (since polarity does not now matter) and an "L.T.—." The latter terminal need not be connected to the L.T. supply unless a long extension lead is in use, and even then it is not always necessary.

"tinny" characteristics sound quite like modern cones when this control is put into action. Naturally, all that it really does is to suppress the higher frequencies to some extent, but this has the effect of improving the proportion of the various frequencies in the output, so that the suppression of the high tones gives a similar effect to an increase in the lower tones. On speech it is usually advisable to cut the tone control right out, or the "S's" disappear and the speech sounds rather throaty.

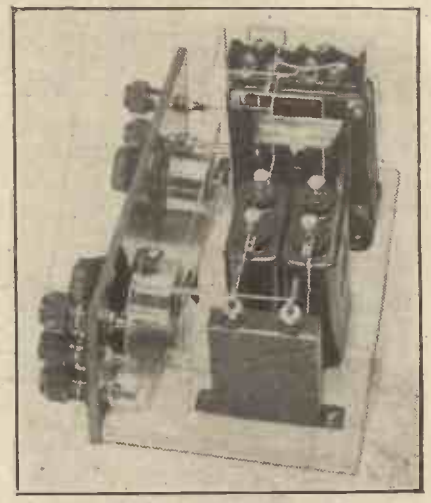
### Safeguards Your Speaker

The advantages of using a choke output circuit of this kind are, of course, too well known to need mentioning in any detail. One among them is the fact that the steady anode current of the last valve no longer has to pass through the loud-speaker windings, which therefore stand a chance of a considerable increase in length of life.




The tone control, by the way, will be of little use to you if you have a really good loud speaker, and it is provided rather for the listener who has a cheap or old-pattern loud speaker from which he does not want to part. Some of the very old, small, horn loud speakers which have very

Although we have these three different purposes served by one cheap unit, it is fortunate that the whole thing can be made so small and compact, and, as can be imagined, it can be placed almost anywhere between the set and loud speaker, or even underneath the latter.

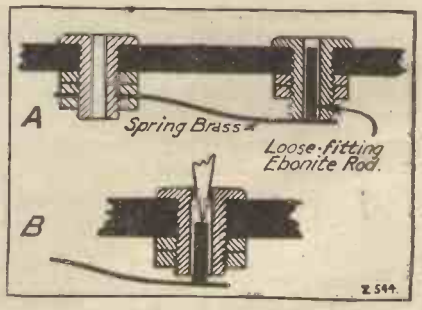


*The L.F. choke used by the author has four terminals instead of the more usual two. The choke has two windings and these can be connected either in series or parallel.*

## AUTOMATIC SHORTING DEVICE

A very neat back-of-panel arrangement for automatically shorting telephone sockets which are wired in series with loud-speaker terminals is shown in the accompanying illustration.

The shorting is carried out by means of a strip of springy brass which is fixed by a nut to one socket, and makes contact with the bottom of the other by reason of the pressure caused by its springiness. When the plug is inserted it pushes down the short length of ebonite rod and thus




breaks the circuit between the brass strip and the socket, as shown at B.

This arrangement is most useful when the loud speaker is wired to the back of the receiver and the sockets are on the panel, as tuning may be done by the aid of headphones without interfering with the loud-speaker connections.

# Calibrating a Short-Waver

*One of the greatest problems that confronts the newcomer to short-wave reception concerns the question of wave-lengths. It is not an easy matter to find out one's wave-length unless a calibrated receiver or wave-meter is employed.*

By C. P. ALLINSON, A.M.I.R.E.

ONE way of carrying out the calibration of a short-waver can only be performed if a number of interchangeable coils is at hand, covering the wave-lengths from 200 metres downwards. This method is to employ the harmonics of the local station.

## The Best Method

It is necessary, however, to know when changing over from one coil to another that you are starting at the same point as you left off, otherwise it will be very easy to skip a harmonic and throw your calibration very badly out. In order, therefore, to make sure that you start at the right point on the new coil, it is advisable to have an absorption circuit handy for this purpose. This need not be calibrated and all that is required is a condenser and a series of small coils. The arrangement is shown in theoretical form in Fig. 1.

The procedure to follow in doing this calibration is quite simple. If the S.W. receiver tuning condenser is a ·00025 or ·0003 maximum capacity, then we know that a 20-turn grid coil will tune in to the neighbourhood of 200 metres with the condenser at its maximum.

With this coil in the grid circuit, therefore, increase the reaction so that the short-wave receiver is just oscillating. Now gradually reduce the value of the tuning condenser till the first harmonic of the local station is picked up.

## Checking the Transmission

This can easily be checked up by listening on a crystal receiver connected to the aerial in which the short-wave receiver is placed in circuit. Indeed, the connection of this crystal receiver will assist in picking up the harmonics for reasons which need not be explained here.

Having picked up the first harmonic this gives us the first calibration point, since the wave-length of this harmonic is exactly half of that of the local transmitting station.

Now reduce the value of the tuning condenser till the next harmonic is picked up. Care must be taken, of course, to make sure every time that it is the local station harmonic you are picking up, and not that of another transmission, and frequent reference to the crystal receiver may be necessary in order to make sure that exactly the same item is being received.

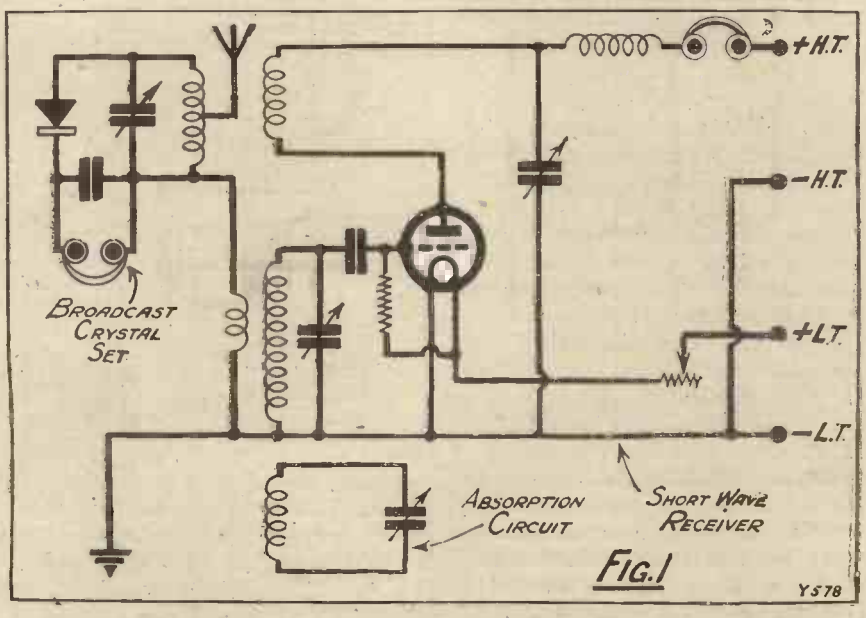



FIG. 1

The next harmonic will have a wave-length of one-third of that of the local transmission. In the same way, the next harmonic is picked up and the one below that, these having a wave-length respectively of a quarter and one-fifth of the local station wave-length. It may be found that no further harmonic on that particular coil is obtainable after, we will say, the fourth has been picked up, and it is therefore necessary to change the coils in the short-wave receiver.

## The Absorption Meter

In order to make sure that you are starting on the next coil down at the point at which you left off on the first coil, bring up the absorption circuit before changing the coil, and rotate the condenser until the familiar click is heard, where the absorption circuit comes into tune with the oscillating short-wave receiver Note the reading on the absorption condenser.

Now change over the coils on the short-wave receiver, and with the receiver in an oscillating condition, and the tuning condenser somewhere

# Calibrating a Short-Waver—*continued*

near the top of the scale, find out at what point the absorption circuit causes the click to be heard. Having noted the point, adjust the tuning condenser on the short-wave receiver till the click is obtained on the absorption circuit at the same reading as obtained with the previous coil.

Now reduce the tuning condenser on the short-wave receiver till the next harmonic is picked up, keeping count of these, and carry on this procedure as low as you can.

### Another Method

Particular care must be taken not to miss any harmonics, especially when you get down towards the 30- and 35-metre mark, since they become somewhat prolific in this neighbourhood, and if a single harmonic is missed then, of course, the whole calibration is thrown out.

The owner of a heterodyne wave-meter can employ another and much simpler method of determining what wave-length he is receiving on his short-wave receiver. This is to employ the harmonics of his heterodyne wave-meter in the following way:

Suppose that the short-wave receiver is tuned in to a wave-length in the neighbourhood of 40 metres, and that you wish to determine exactly what wave-length it is. The short-wave receiver should, of course, be in an oscillating condition. Turn on the heterodyne wave-meter and turn the dial until a whistle is heard.

### Extremely Simple

This will be, of course, a harmonic of the wave-meter. Note the wave-length reading of the wave-meter, which we will say is 295 metres. Now continue to turn the dial till a second whistle is heard, and this occurs, say, at the reading of 337 metres, then the wave-length to which the short-wave receiver is tuned will be 42 metres.

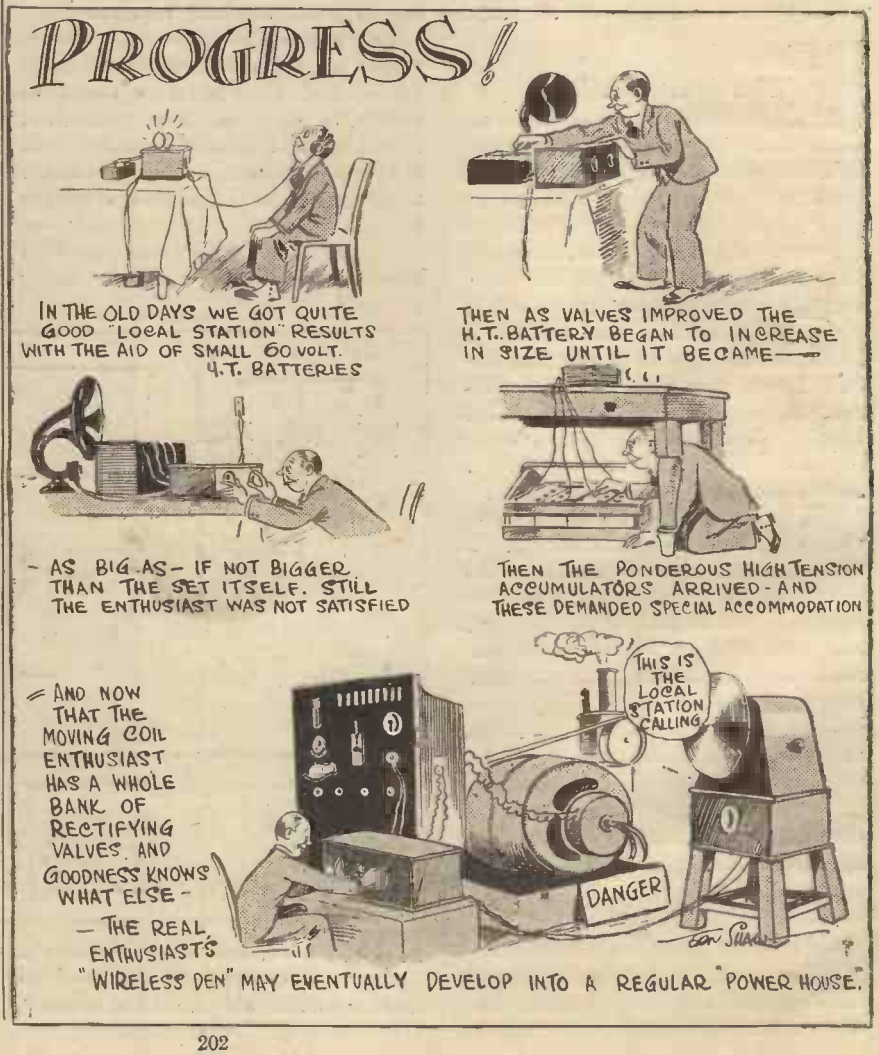
Care should be taken to see that the heterodyne wave-meter is well away from the set, so that you only get the beat between the wave-meter harmonic and the receiver fundamental, otherwise errors will be introduced.

As a guide to the short-wave enthusiast I give herewith a short list of stations transmitting on the short waves between 45 and 15 metres, and this will be found exceedingly useful in checking up the calibration of not only the short-wave receiver but also of a short-wave wave-meter, whether of the heterodyne or absorption type.

SHORT-WAVE STATIONS.

| Call Sign. | Wave-length. | Location. |
|---|---|---|
| KDKA(T) | 62·5 (?) | Pittsburgh, U.S.A. |
| WLW (T) | 52·02 | Cincinnatti, U.S.A. |
| WIZ | 42·98 | New Brunswick, U.S.A. |
| 3LO (T) | 36·0 | Australia. |
| BYB | 35·0 | Whitehall, London. |
| IDO | 33·4 | Rome, Italy. |
| 2XAF (T) | 32·77 | Schenectady, U.S.A. |
| GBK (B) | 32·5 | Bodmin, England. |
| FL | 32·0 | Eiffel Tower, France. |
| PCJJ (T) | 30·2 | Eindhoven, Holland. |
| WRNY (T) | 30·91 | New York City, U.S.A. |
| 2FC (T) | 28·5 | Sydney, Australia. |
| AGB | 26·3 | Nauen, Germany. |
| KDKA(T) | 26·0 | Pittsburg, Pa., U.S.A. |
| FW | 24·3 | St. Assise, France. |
| 5SW (T) | 24·0 | Chelmsford, England. |
| 2XAD (T) | 21·96 | Schenectady, U.S.A. |
| AGK | 20·0 | Nauen, Germany. |
| PCLL | 18·0 | Kootwijk, Holland. |
| AGC | 17·2 | Nauen, Germany. |
| NKF | 17·0 | Bellvue, D.C., U.S.A. |
| GBK (B) | 16·3 | Bodmin, England. |
| PK1 | 16·0 | Bandoeng, Java. |
| AGA | 14·95 | Nauen, Germany. |
| 2XBC | 14·09 | New York, U.S.A. |

(T) means "Broadcasting" station.
(B) means "Beam" station.



# CHATS AT THE WORK-TABLE

*Many points of practical interest to all radio constructors are dealt with under this heading.*

By R. W. HALLOWS, M.A.

## Sound Soldered Joints

THERE can be no doubt that the soldered joint is a weak spot in the wireless set, for no matter how well the work may be carried out one can never tell when or how it may come "unstuck" and lead to a fault that may be difficult to locate. A case in point occurred to me a week or two ago.

I took a set by car to try out at a friend's house. Such soldered joints as there were had been most carefully made with a clean iron of the right temperature, and every one had been thoroughly tested before it had been passed as sound.

The set did not come in for any kind of bumping about, but when it was tried out it refused to work. Investigation showed that no H.T. current was flowing through the first note-magnifying valve in the ordinary way, though if the cabinet were given a sharp rap current might flow for an instant. Clearly, a case of a loose connection, but where?

## Peculiar Fault

There were two jacks in the set, but every joint here appeared to be in perfect condition. It was not until one of the connections to the first jack was pulled quite hard that a crack was seen in the solder. Since the crack was quite invisible until the lead *was* pulled, one would have thought that there would have been some kind of electrical contact, but actually there was none.

Time and again I have had trouble with portable and other sets in the same kind of way. One finds, too, that there is a distinct tendency for soldered joints to "go" when they have been in existence for some considerable time.

Lately I have evolved what I believe is really a perfect soldered joint for use in all kinds of wireless sets. Fig. 1 explains how it is made.

If two wires are to be joined their bared ends are laid together and a binding of fine wire is put tightly round them, its ends being twisted up with flat-nosed pliers. A little flux is applied and solder is then run in. Soldered joints break down mainly because of the strain put upon them by the effects of vibration.

## A Better Method

In the joint under description the fine wire binding is there to take the strain and I have never found solder

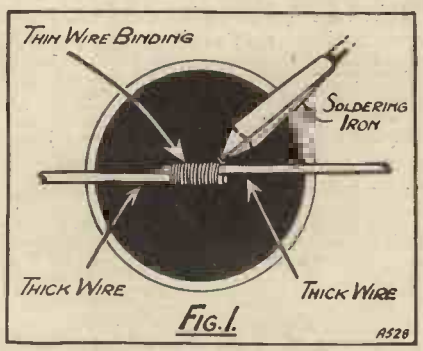



FIG. 1.

show the slightest inclination to give way. Even if it should crack the joint would still be quite a good one owing to the presence of the binding. It is quite easy to use the same idea for joints between leads, and the tags of jacks or other components.

Actually, comparatively few soldered joints are used in most up-to-date receiving sets, the great majority being of the screw-down order. I have never liked the ordinary milled-headed terminal, for a connection that is only finger-tight is not a very good one and you cannot apply pliers to a milled nut without rather damaging its appearance.

The tip seen in Fig. 2 of improving terminals of this type is a thoroughly sound one. It has been adopted in one well-known low-frequency transformer and I should be glad to see other makers follow suit. A deepish hacksaw cut is made in the top of each terminal nut, and the shank of the screw on to which the nut fits is cut off rather short.

By placing the screwdriver in the saw-cut one can turn the screw tightly home, and thus ensure a sound connection. The home constructor can treat his existing terminals in this manner. Very neat terminals would result if makers would care to standardise a terminal nut made on the lines of the recess-headed screw which is seen in Fig. 3.

## Neat and Efficient

These screws are used a good deal in coach-building work, and, incidentally, they look very neat if used for mounting panels and so on of wireless sets. Instead of a nick, the screw has in its head a hollow of square section, into which fits the point of a square turn-screw.

Terminals made on these lines would be excellent, but standardisation would be absolutely necessary if they were to be successful, for no constructor would want to keep in his tool outfit a big selection of different sized turn-screws.

The connections made inside a wireless set to components such as valve holders, transformers, condensers,

# Chats at the Work-Table—*continued*

and the like, seldom have to be detached (unless, of course, a breakdown takes place), until the set is dismantled. There is, therefore, no reason why they should be of the easily detachable type made by the ordinary terminal with its milled nut.

My own practice, as I have mentioned before, is generally to substitute hexagon for milled nuts throughout the set and to tighten down with a box spanner. Even hexagon nuts, however, may work loose in course of time, particularly in apparatus that is subjected to vibration.

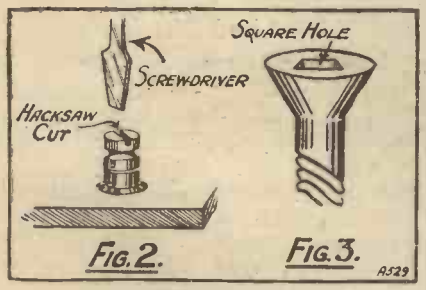
An exceedingly sound job can be made in the way shown in Fig. 4. The nuts having been turned down, the shanks of the screws are cut off about ⅛ in. above them, and a cut is made in each by means of a coping saw or a jeweller's hacksaw.

With the help of the screwdriver, or an old knife, these cuts can be opened out a little. The nut is then absolutely jammed in its place, and cannot possibly come loose.

When it is desired to remove the nut, this can be done by pinching the screwed end of the shank with a pair of flat-nosed pliers. This partly closes the cut again, and the nut comes off quite easily with a little gentle persuasion.

## Slab Inductances

Many constructors provide for family use a simple receiving set of the foolproof kind (one friend of mine after bitter experience says that you can make sets foolproof, but you can't make them "*damfool-proof!*") intended for reception of the local station and either 5 X X or 5 G B or both of these.




Owing to the short ranges at which they are designed to operate and the comparatively large amount of energy that is therefore available, there is no need as a rule for such sets to be particularly efficient in their high-frequency circuits; in fact, efficiency in this department is, if anything, a disadvantage rather than an advantage in a set specially designed, as most family sets are, for first-rate quality of reproduction.

One can therefore make use very often of the simple slab-wound coil, which has many advantages from the constructor's point of view. It is the simplest thing in the world to make, and it occupies so little space that it can be fitted in with the greatest ease.

## Mounting the Coils

Quite a good way of making slab-wound coils is to use empty sticking-plaster reels as formers. I mean, of course, the cardboard and not the metal reels. If your own medicine cupboard cannot supply what you want the chemist will probably oblige.

These reels have a cardboard or wooden centre about ¾ in. in diameter and cardboard cheeks. The most suitable kind is that made for sticking plaster half an inch in width. To make your coil, use double-cotton-covered wire and wind it on in layers. The "in" end can be secured by making a small hole close to the centre and tying a knot in the wire.

The "out" end is anchored in the usual way by means of a pair of small holes near the rim. By using stoutish wire for the medium-wave coils and thin wire for those intended for long-wave circuits all coils can be kept to the same dimensions.

## A Simple System

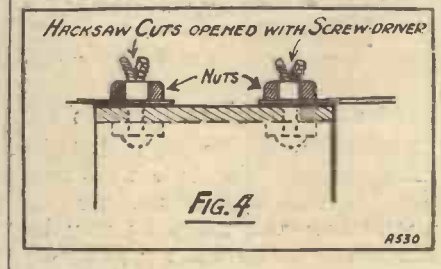
One very neat family set that I saw the other day was made for the reception of 5 G B and 5 X X. The coils were of the pattern just described and the circuit used incorporated one H.F. valve with single-circuit tuning followed by plain tuned-anode coupling.

Since very sharp tuning was not aimed at there was no need for neutralisation or any form of "holding down" device. In the grid circuit of the H.F. valve were two slab coils on sticking-plaster formers mounted side by side and each provided with its own condenser of the semi-variable type.

The anode tuning circuit was similarly arranged. By means of switches either set of coils could be brought into action. The whole thing was absolutely easy to operate and no tuning was ever required.

## Making Coils to Measure

It is quite a straightforward business to make slab coils to tune to any particular station with a semi-variable condenser in parallel. For medium-wave stations one with a maximum capacity of about ·0005 mfd. may be used, whilst ·001 mfd. is suitable as a maximum for the long-wave stations.




For the combined aerial and grid coil of a single-circuit tuner put on about 60 turns to begin with, using the sticking-plaster reel former. A test made with any valve set will soon show whether you have too many turns or too few.

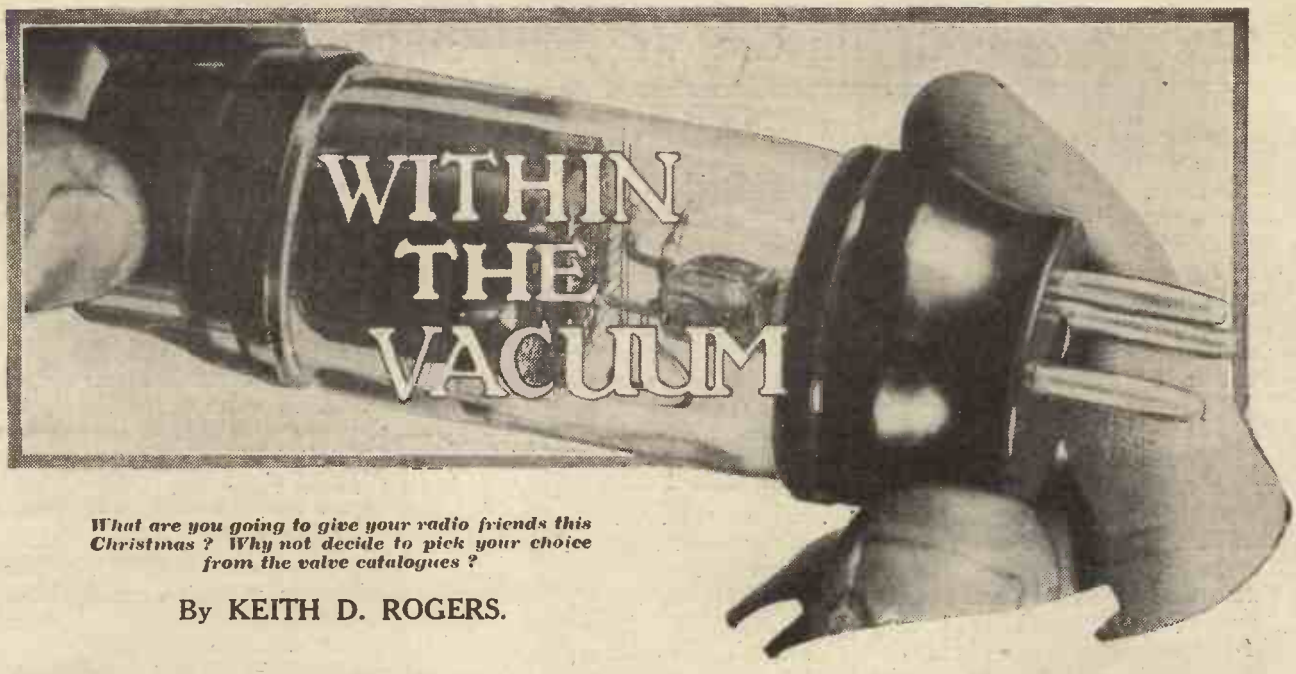
## Tuning Adjustments

Should you require practically the maximum capacity of the condenser (or be unable to tune in the station properly with the condenser at its maximum setting) then more turns are needed. If, however, the station comes in with the condenser at or near its minimum setting, some must be stripped off.

Try adding or stripping off half a dozen or so as the case may be. Don't cut the wire if you are stripping off, but make a small bare place and see how the coil behaves when connected up again. Working in this way the made-to-measure coil is easily turned out, requiring just the right amount of parallel capacity to give good signal strength and reasonable selectivity.

Any bared patches may be re-insulated by winding over them strips of sticking plaster about ⅛ in. in width. Once you have found the number of turns needed for the medium-wave station that you want to be able to tune in, it is easy enough to discover the approximate number that will be required for 5 X X.

(*Continued on page* 248.)



# WITHIN THE VACUUM

*What are you going to give your radio friends this Christmas? Why not decide to pick your choice from the valve catalogues?*

By KEITH D. ROGERS.

HAVE you decided what you are going to give your radio friends this Christmas? Those friends who are enthusiastic constructors as well as listeners, I mean!

I have been thinking the problem over quite a lot lately, and it is a problem, isn't it? It is so difficult to choose something that you know will be really acceptable. Unless you have some fairly intimate details about the set the particular person employs it seems almost impossible to pick out anything from the huge list of radio components and accessories. Not everyone wants batteries, either high- or low-tension; eliminators require a good knowledge of the conditions under which they will be employed, mains voltages, D.C. and A.C., number of valves in set, etc., etc.; while to choose a loud speaker that will be sure to suit is extremely difficult.

## Easy and Safe

Components may or may not be useful, and so this year I for one am going to fall back on my old system of last Xmas—that of giving away valves. It is easy, safe, and practically every valve-set user appreciates a valve.

The most handsome present, of course, is a complete set of valves for any particular receiver that may be under construction at the time, but single valves can be most useful and valuable gifts.

## Acceptable Gifts

Who would not be pleased with a good H.F. valve of the L.T. voltage used by the recipient—an easy matter to ascertain? Such a valve, having an impedance of about 20,000 ohms and a magnification factor of 17–20, is useful not only as an H.F. valve but also as a detector, a first stage L.F. where R.C. coupling is employed, or in front of an L.F. transformer in an L.F. amplifier.

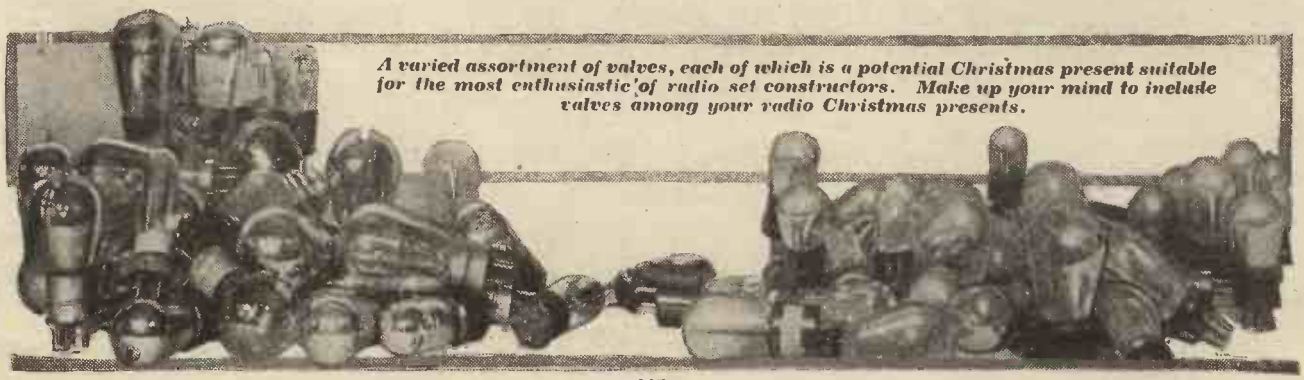
It is better, unless you know fairly exact details about your friend's set, to choose an H.F. or a general-purpose valve rather than one of the R.C. or power or super-power variety. In the case of the R.C. valve this would perhaps be useless in many sets, and is really only suitable for tuned-anode or resistance H.F., or R.C. coupled L.F. and detector stages, and even here it has to be used with circumspection.

These valves very easily overload, and so it is obvious that they are not really suitable except for more or less special circuits.

In the case of power valves, these are of more general use, but unless your friend has at least a three-valve set they are hardly suitable. You cannot place them in front of an L.F. transformer unless this be of special design, or it will tend to become saturated.

## Output Valves

The super-power valve needs more H.T. and takes more H.T. current than many people can give it, and so you do not want to give these away indiscriminately. If your friend wants a super-power valve, well and good, but if he does not need one, or cannot supply the necessary anode power, it is rather like landing him with a



*A varied assortment of valves, each of which is a potential Christmas present suitable for the most enthusiastic of radio set constructors. Make up your mind to include valves among your radio Christmas presents.*

# Within the Vacuum—*continued*

white elephant to give him a valve with an impedance of less than 5,000 ohms.

As a general rule then, we can safely say that the most suitable valve present is one which has the most general appeal—in other words, a valve having an impedance of not more than about 20,000 ohms and not less than 10,000 ohms.

### More Difficult Presents

This excludes the power and super-power valves on the lower end, and the resistance and higher magnification H.F. valves at the other. These can be given in cases where more details than "fil. volts" and perhaps "number of valves used" are known.

I have said nothing about the screened-grid or pentode valves because these require even more careful choosing than do the types I have excluded from my "general present" list.

A screened-grid valve would be very useful to a person who wanted one, but probably *useless* to the average man.

So before you decide on one of these make sure of the wishes of the man to whom you are giving it.

As regards the pentode, even more care is needed here, for *you cannot merely replace your output valve by a pentode and be sure of good results.*

Pentode valves take from 14 to 18 milliamps H.T. current, and so you need a large capacity H.T. battery. They also need a special output high-impedance-primary transformer if they are to be used to their best advantage.

They require careful biasing, and easily overload. Altogether, while being excellent valves in themselves, they are *not* the valves for the average "ham" to tackle.

### Require Careful Treatment

They will not do themselves justice unless conditions are right, and unless you know the man to whom you are giving your present will treat his pentode properly, take the old advice and *don't.*

There is nothing so annoying as a Christmas present that will not give satisfaction, so be careful this Christmas.

With references to last month's valve notes I have received the following from the G.E.C.:

SIR,—We have read with interest your report on certain of our latest types of Osram valves given in the article entitled, "Within the Vacuum," on page 113 of your December issue.

### The D.E.L.610

When referring to the new Osram D.E.L.610 valve, however, we note that you state that its impedance of 7,500 ohms is a disadvantage and that the older valve with an impedance of 13,000 ohms is preferable, due to the possibility of transformer saturation with a valve of 7,500 impedance.

When a valve is correctly biased, it would be of the order of 5 m/a under maximum conditions, that is, anode voltage 150, and, in the majority of cases, where a lower voltage of 100/120 is used, this would not exceed 3·5 m/a.

Under such conditions we should not think that serious trouble would be experienced in the majority of transformers on the market, as regards saturation, with this current passing.

There is a very considerable number of transformers of the cheaper line in use at the present time with moderately high ratio, and which would benefit exceedingly by the use of a valve of such low impedance, and, in conjunction with an amplification factor of 15, as given by the Osram D.E.L.610, should give better quality reproduction and bigger overall amplification per stage.

### Higher Impedance Valve

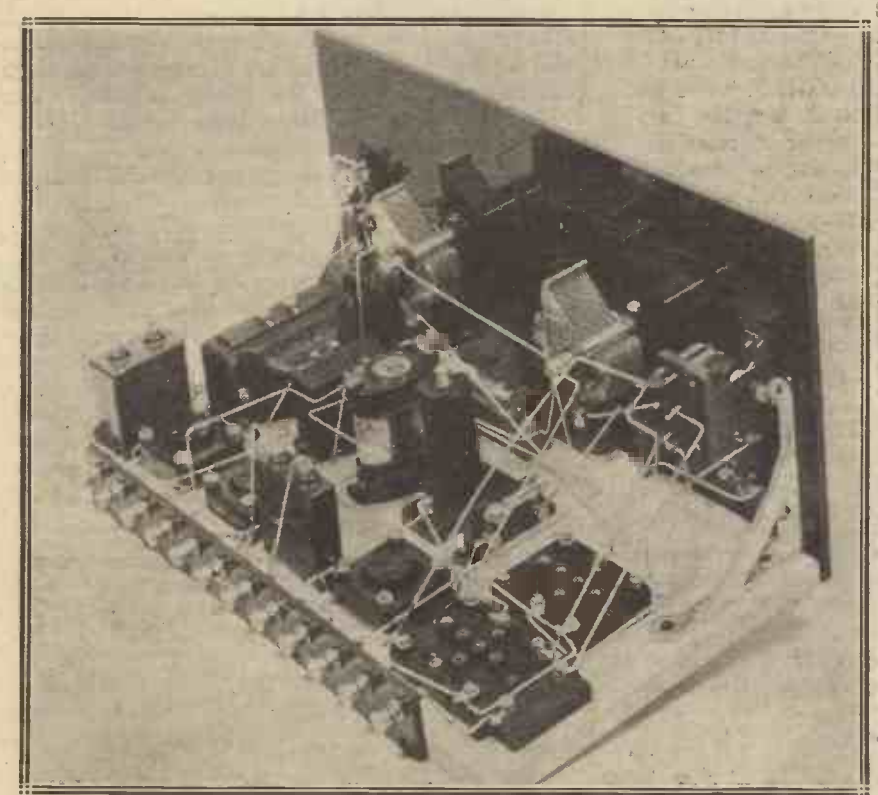
For those transformers which saturate the core with a very small current, the Osram H.L.610 type has been specially designed, its impedance value being 30,000 ohms and the amplification factor 30.

At its maximum anode voltage of 150, the grid swing of the H.L.610 valve is about 3.

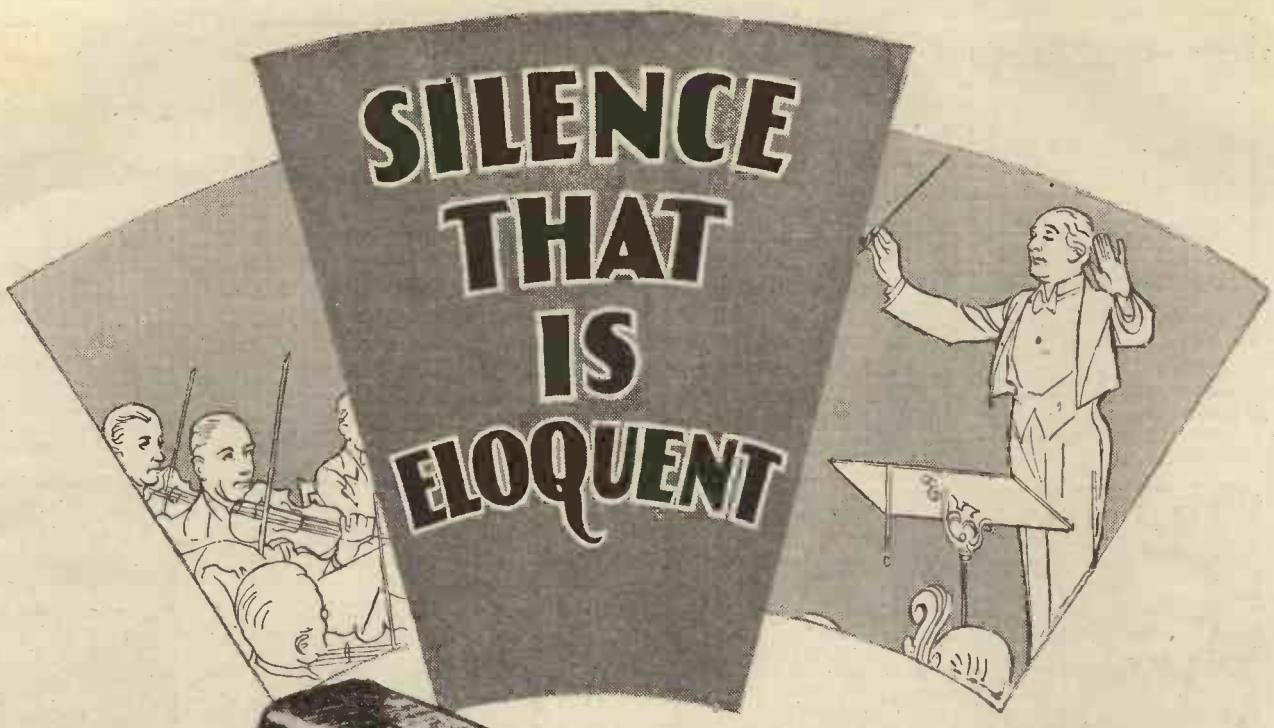
Valves requiring a negative grid bias of 1½ are very suitable for the first L.F. or amplifying stage, followed by a modern transformer of high inductance primary.

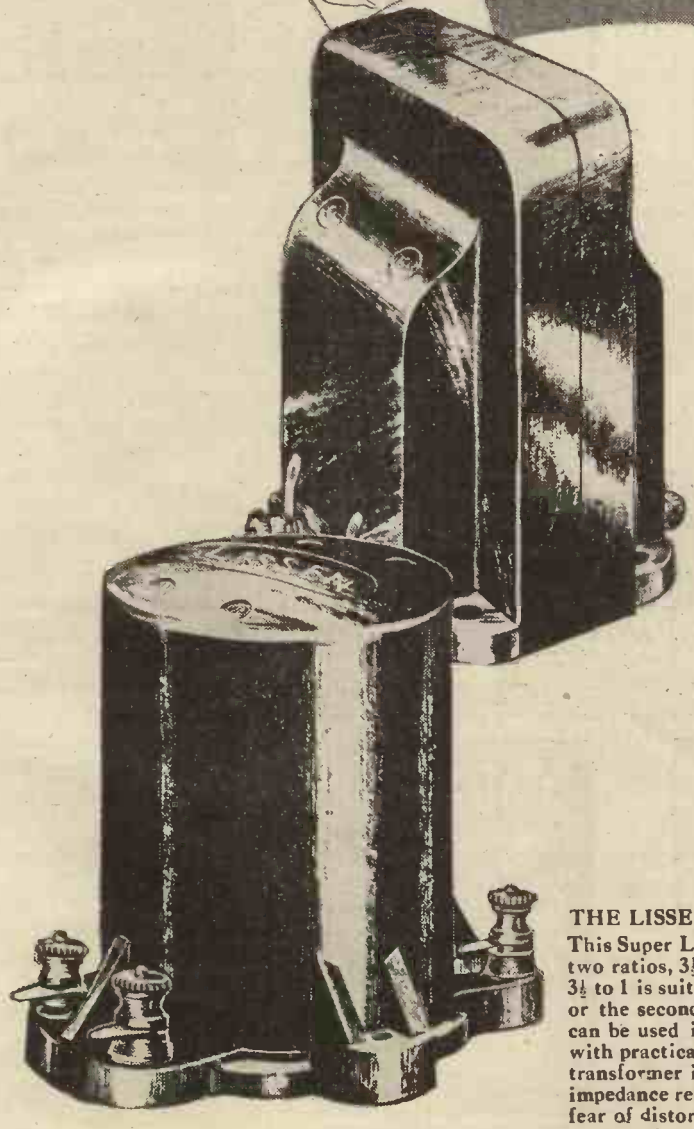
Yours faithfully,
J. H. MARRIOTT.

[It is of interest to know that two of the leading transformer manufacturers advise the limit of 3 milliamps for the current passing through the primaries of their L.F. transformer.—ED.].



*A complete set of valves for "Big Ben" (shown here) makes an ideal Chistmas present, and costs only a moderate sum. Such a gift, or even a third of it, would be gladly acceptable to many of the thousands of "Wireless Constructor" readers who are building the set.*



**There's a hush of expectancy—the sharp tap of the conductor's baton—and then through the silence comes the melody of familiar instruments.**

Judge a Lissen Transformer by the intensity of this preliminary hush; you will not hear a sound to break the stillness. By this alone you may know that the Lissen Transformer brings a new standard of purity to transformer amplification. Test the Lissen Transformer by any other standard—listen for the low bass notes of some sonorous chord, or be critical of the purity of some passage in the upper register. In every case you will find the Lissen Transformer is supreme and ***this is scientifically proved*** by the laboratory curves taken with a Lissen Transformer using ordinary standard valves; these curves show that a Lissen Transformer gives ***exceptionally*** even amplification over the whole band of audible frequencies.

# LISSEN

## TRANSFORMERS

**THE LISSEN SUPER TRANSFORMER**

This Super LISSEN Transformer is made in two ratios, 3½ to 1 and also 2·1/3 to 1. The 3½ to 1 is suitable for use in either the first or the second stage of an L.F. amplifier, or can be used in cascade for both stages, and with practically any valve. The 2·1/3 to 1 transformer is suitable for use after a high impedance rectifier valve without fear of distortion or loss of high notes and overtones. The price is the same for both ratios.

**19/-**

**For GENERAL USE the 8/6 TRANSFORMER IS STILL SUPREME AND WILL NEVER BREAK DOWN**

The famous 8/6 Lissen Transformer is suitable for all ordinary purposes, and its huge sale proves it still supreme value. It continues to earn high praise as "the transformer that never breaks down." Turns ratio 3 to 1. Resistance ratio 4 to 1.

**8/6**

LISSEN LIMITED, 26-30, Friars Lane, Richmond, Surrey (Managing Director: THOS. N. COLE.)

# RADIOGRAMOPHONICS

*A monthly article for the gramophone enthusiast.*

*A new pick-up tone-arm—A new sound-proof reproducer.*

By A. JOHNSON-RANDALL.

WE have recently received one of the new Watmel gramophone pick-up tone-arms for test. The arm is constructed of aluminium, and presents a neat and workmanlike appearance. It is built up in three portions. There is the vertical base by which the arm is held rigidly to the turntable mounting. To this base the tone-arm is pivoted so as to be free to transcribe a circular arc over the surface of the record.

The pivots are so arranged that friction is at its minimum, and the arm swings round at the slightest touch. At the same time there is no vertical movement at this portion of the tone-arm, and hence no extra weight to be carried by the needle. At the end of this arm is a shorter arm which is pivoted so as to permit free vertical movement, and to this the pick-up is attached, the "added weight" being exceedingly small. The makers supply detailed instructions for fitting the arm so as to obtain the correct track angle, and we have no doubt that the device will find a ready sale among those who are desirous of constructing their own gramophone attachments.

## Pick-Up Chatter

Quite recently I remarked on the desirability of passing the flexible leads to the pick-up through a small hole in the side of the gramophone cabinet lid. This, as I pointed out, makes a neat job, and also to some extent does away with the unpleasant chatter which is rendered more audible by the slightly open lid. Some people place the cabinet in another room, running long leads from the pick-up to the amplifier; but this scheme, whilst being inconvenient, adds to the chances of L.F. howling occurring. I was reminded of this troublesome chattering when, the other day, I had an opportunity of inspecting a new instrument specially designed for pick-up work.

The device outwardly resembles a gramophone, and in size is similar to the ordinary table grand model.

It will not, however, work as a gramophone, and is intended to be an aid to perfect electrical reproduction, the designer having studied the weaknesses of the various adaptations of the gramophone when used for pick-up work, and set himself out to eliminate them.

The instrument is contained in a stout, figured, oak cabinet, and its lid, which can be closed even when a 12-in. record is in use, has a small bevelled lip, so that it is quite sound-proof.

*The "Beamu" drive is fitted with a sound-proof lid, and is specially designed for "chatter-free" pick-up work.*

This sound-proof lid does away with those chattering noises which one hears even with the best pick-ups.

At the back of the cabinet are three terminals. Two are for the pick-up connections, and the third is an earthing terminal which enables both the motor and "tone-arm" to be earthed for stabilising purposes—an important point with a high-efficiency amplifier.

No flexible wires have to be taken into the cabinet at all, since the necessary connections are already made internally via the pick-up arm.

The pick-up arm itself has an adjustable counter-balancing movement, and is tracked for central needle alignment.

## A Practical Point

The clockwork motor is a double-spring Garrard, and will run three 10-in. records without rewinding.

Beneath the turntable a raised ridge is provided to prevent needles, etc., getting underneath and possibly through into the clockwork of the motor, and the pick-up arm has a detachable cup at its end which can be changed for one suitable for any kind of pick-up. The whole device is extremely well-made, and seems to be ideal for serious pick-up work.

## Unit Construction

The instrument is known as the "Beamu" drive, and the makers are Messrs. Beagley & Musto, of 47, Cranbourn Street, London. I understand that while the firm are marketing the "Beamu" as a separate and complete article, they are also retailing a radio-gramophone arrangement consisting of units which comprise a three or four-valve receiver, a cone loud speaker, a record cabinet, and a container for batteries or a mains unit. Any single section can be purchased complete or in a set of parts for home assembly. The "Beamu" drive is also to be supplied with an electric, instead of a clockwork, motor for the benefit of those who prefer to use the mains throughout.

I wonder how many pick-up enthusiasts use a milliammeter for

## RADIOGRAMOPHONICS
*—continued*

detecting distortion. Probably very few. Yet one of those thirty-shilling 0-25 or 0-50 meters is a most valuable aid to perfect quality, and well worth the moderate outlay. It is so simple to connect one in circuit. The meter will have one of its terminals marked +, or positive. Break the H.T. + lead to the last valve and join the + side to the + terminal on the milliammeter.

### Checking Quality

The other terminal goes to the H.T. + terminal on the set. In other words, you connect the meter between the H.T. battery and the set. You can, if you wish, join up the meter internally in the receiver, but then you will not have it available for other measurements you may wish to make.

To make sure that no distortion is occurring due to valve overloading, the volume control should be adjusted so that the needle of the milliammeter is as steady as possible.

If it kicks violently backwards or forwards, it is a sign that distortion is taking place, and the remedy is to try various adjustments of grid bias and, at the same time, increase the H.T., if possible.

### Permissible Variation

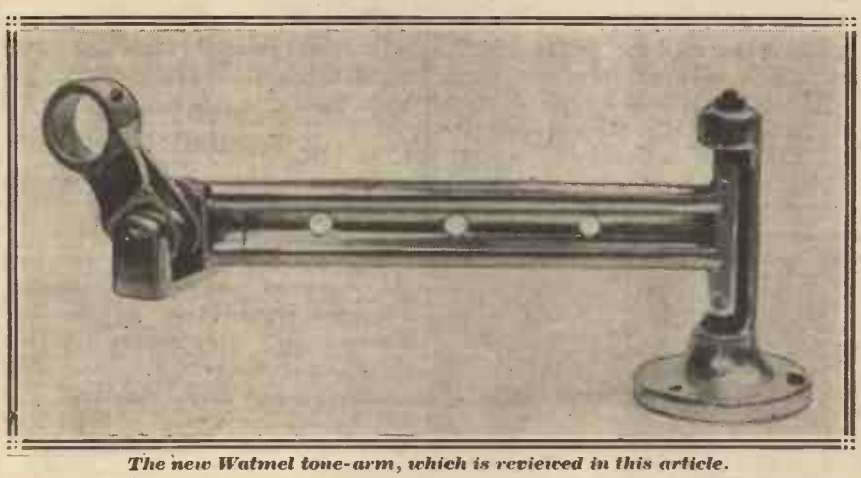
I usually permit a kick of about 10 per cent, because I do not believe the average ear will detect any distorton until the kicks increase above this value. In fact, with occasional big kicks one cannot often hear any distortion, but if the needle tends to kick backwards and remains there for a few seconds, then it is time to attend to the amplifier adjustments.

## COMMENTS FROM CONSTRUCTORS

### Swiss Success

SIR,—As one of your devoted followers in set-building and a regular reader of the WIRELESS CONSTRUCTOR, I have not been able to resist the lure of the "Radiano" Four, as described by you in the October and November issues of your famous periodical.

My London dealer being rather a long time over the delivery of the components, obviously owing to a big rush, I only finished my set last night. Aided by your test report, a preliminary stroll over the scales of the two dials brought in 21 stations on the short and 7 on the Daventry wave-band, all on the loud speaker, and most of them demanding a reduction of volume by means of the control.



*The new Watmel tone-arm, which is reviewed in this article.*

I have in my wireless den the remnants of some of your best known receivers, such as the "Transatlantic" V, "American" Six, "Signal Box," "Long-Wave Special," "Radiano Short-Wave," "Radiano" Three, with H.F. Unit and Silencer, "Concert" IV, the latter two made up in accordance with the contents of the two convenient envelopes, No. 1 and No. 2, of the WIRELESS CONSTRUCTOR.

All I can say is that the "Radiano" Four fully comes up to the "Harris Standard." Easy to build and equally easy to handle it gives results which satisfy the most exacting amongst our clan. The outstanding feature of this set is the convenient switching system.

I am using Philips 4-volt valves—A.442, A.415, A.425, and B.405—as the 2-volt class of this firm does not include screened-grid valves as yet. I find that by inserting the R.C. valve in the third socket I get slightly better tonal quality. The tuning of this receiver is very sharp, and the selectivity consequently first-class and a considerable improvement on the "Radiano" Three.

I tender you my congratulations for having put before your readers a set of universal merits embodying all the latest improvements of the art, and I do so most heartily since even my wife has pardoned me for spending more money on wireless!

Believe me, dear sir,

Yours faithfully,

M. A. ZUEST.

Zurich 8, 1, Dufourstr.

### The "New Family" Four

SIR,—I feel I must write and give you a report of my receiver, your "New Family" Four. The set is outstanding, on account of its performance in this part of England, as we build sets that have been tested in London, and when tested here fail to do justice. The only modification in my set is a Mullard R.C. coupling, and I have added an high-frequency amplifier, designed by "Popular Wireless," which gives me heaps of punch and a few distant stations. My log to date is: 5XX, Radio Paris, Konigswusterhausen, Kalundborg, Motala, Hilversum, and two other stations (unidentified) on the high wave-band on the broadcast local (uncomfortable on three valves), Cork, Leipzig, Bremen, Stuttgart, Hamburg, Toulouse, 5GB, Witzleben, Aberdeen, Manchester, and three not identified. I am using "Cossors" right through. Thanking you for a good circuit.

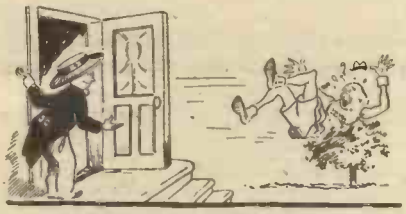
Yours,

JOHN BROWN.

Liverpool.


I MUST confess that as a rule I have no affection for letters bearing the Mudbury Wallow postmark. When they have half-penny stamps there is nearly always a nasty looking red label gummed to their contents which reads: "Kindly settle this account now much overdue." And if the stamps are three-halfpenny ones the notepaper is that of Messrs. Grabbit & Pinch, who write me a charming little note which runs:

"Dear Sir,—Messrs. Plooper have instructed us to apply to you for payment of your account amounting to £12 19s. 1½d. Unless payment is received within seven days . . ."



*Goshburton-Crump went down rather quickly.*

Well, anyhow, you know the kind of thing. So that when there was a flop in my letter-box and a rat-tat with the knocker on a recent afternoon, I eyed the missive that had been delivered with a certain amount of apprehension, since like so many of its predecessors it bore both the penny-halfpenny stamp and the local postmark.

## The Professor's Party

I was holding the thing unopened, meditating whether I should write "Dead" across it and then go and drop it into Messrs. Grabbit & Pinch's letter-box, when it occurred to me that the envelope was squarer than those which usually contain unpleasant communications. Prompted by curiosity, I decided to open it.

Within was no little bill, no beastly communication beginning "Dear Sir" (why "dear," I have always wondered). Instead there was a beautiful gilt-edged card, printed in copperplate, which read:

*Mr. Wireless Wayfarer.*

*Professor And Mrs. Goop*
*At Home*
*Wednesday, Dec. 26th, at 9 p.m.*
*Christmas Revels.*
*R.S.V.P.* *Fancy Dress.*

Now if there's anything I am jolly good at it's revelling. Provide me with a cardboard nose and give me a bag of confetti and I go on simply anyhow. There is, in fact, nothing that I enjoy so much as a jolly old revel, particularly at the glad season when the Christmas spirit is abroad—provided always that the spirit is at least ten years old.

Therefore I hastily wrote Mrs. Goop a charming little note telling her how delighted I was to accept her kind invitation and promising to evolve something striking in the way of a costume.

## A Cute Costume

It is all very well to say that kind of thing, but you have no idea until you come to do it how hard it is to think out a simple but original fancy dress. I thought first of all of going as Winston Churchill. I could manage the little hat and the cigar all right, or even a bricklayer's hod and a couple of bricks. But the swelled head was a difficulty.

Douglas Pickbanks? Cartwheels and somersaults are a *little* strenuous after dinner. I thought of going as Mr. Hercy Parris, but those big horn-rimmed glasses do get in the way so towards the end of the evening if revels really become revels and people start throwing blanc-manges and things about.

In the end I decided to go as the WIRELESS CONSTRUCTOR. Mr. T. Twontfitt, the eminent tailor of Mudbury Wallow, contrived for me a delightful little costume consisting of a royal blue coat, a pair of orange trousereens and a white cotton waistcoat, all covered with circuit diagrams and signs for 'phones and batteries and condensers and coils and things.

I also wore a belt stuffed not with cutlasses and pistols, but with soldering irons, screwdrivers, monkey-wrenches, tommy-bars, case openers and the like. I felt that these might come in useful supposing that the revels became a trifle too revelsome, for, believe me, there is nothing like a monkey-wrench for dotting on the boko any fellow who tries to shove an ice down the back of your neck. It is in thoughtfulness over little points like these that the really great mind shows itself.

## When is a Door . . . .

I could see as soon as I got to the door of The Microfarads on the great evening that we were in for a wonderful time. When I placed my hand on the bell-pull I got a shock that made me leap into the air with a scream.

I discovered next moment that the professor had had the brilliant inspiration of having his front door rehung for the occasion so that it opened outwards. I sprang aside just in time as it swung majestically open, but Goshburton-Crump, who had just come up, received it on his left ear and went rather quickly down the five steps from The Microfarads into a holly bush.

*I got the monkey-wrench mixed up with my knees.*

"Good-evening," I said to the maid who opened the door. "I rather think that I heard someone in your holly bush just now. Possibly he's trying to pinch its beautiful foliage, though it is a little late, is it not, to begin decorations."

## Wayfarer Arrives!

On being shown into the drawing-room, I strode quickly forward to greet Mrs. Goop, got the monkey-

# In Lighter Vein—*continued*

wrench mixed up with my knees, and landed face downwards on the hearthrug.

"Splendid!" cried the professor. "I see at once what he is. He's come as the Sleeping Beauty."

The professor had originally intended to impersonate Captain Chuckersley, though owing, as he explained, to a slight technical defect there had been a breakdown in his arrangement. He had therefore decided to dress as a Man About Town, his costume being, of course, pyjamas and a bottle. Mrs. Goop told me that she was Bebe Daniels, so I took her word for it.

## The Rest Arrive

Thick and fast the rest of the guests began to arrive. After his encounter with the holly bush, everyone thought that Goshburton-Crump, who was really the Spirit of the Short Waves, must be Television, because he was so bared.

Miss Worple came as Gracie Fields; Tootle said he was a regional station, and refused to utter a sound; Primpleson was a Wireless Pirate equipped with frame aerial; Captain Buckett was "Wireless Afloat," complete with miniature spark transmitter; Sir K. N. Pepper, with a certain lack of originality, came as Little Lord Fauntleroy; and Lady

*The professor pulverised the watch with a sledge-hammer.*

Pepper looked a little startling as Miss 1929. In fact, after one glance at her, I rather hoped that we might miss 1929

## Trick No. 1

"And now that we are all assembled," said the professor, "let us start this jolly evening that we are going to spend together. On the occasion of one's golden wedding——"

"Christmas, you idiot!" hissed Mrs. Goop, who doubtless felt that Bebe Daniels and golden weddings hardly fitted in.

"I should say Christmas," went on the professor. "It is only right that there should be fitting jollifications. Now, first of all, I propose to show you some little tricks with the wireless set. Here is what appears to be a perfectly ordinary loud speaker. Pass it round, ladies and gentlemen, and make quite sure that the horn is empty. When you have done so, I will mystify you by producing a rabbit from it."

## We Try Again

We passed the horn round, looked through it, tapped it, and did all the other things that an audience is expected to do. It was returned to the professor, who covered it up with a cloth and proceeded to make mystic passes with one hand, whilst feeling in the pocket of his pyjama jacket with the other.

The gestures continued. The audience was all agog with expectation. The professor's face grew longer and longer.

"* * ! ! $ $ % % ? ? ?——" he exclaimed at length. "I left it in the pocket of my dressing-gown. I think that we had better go on with the next trick. Will somebody kindly lend me a watch? Perhaps Mr. Wayfarer will come and act as my assistant?"

## Not a Complete Success

The only person who had a watch was Sir K. N. Pepper, and, after considerable persuasion from her Ladyship, he handed up a splendid gold affair.

The professor, beaming at his audience, announced that he would pulverise the watch with a sledge-hammer and afterwards produce it intact from Primpleson's ear. He and I withdrew behind a curtain for a moment. He gave me Sir K.N.'s watch and one of the super-Woolworth variety, explaining just how I should make the substitution at the critical moment.

I think I must have misunderstood the instructions or got mixed up somehow, for we simply could not persuade Sir K. N. Pepper that the watch returned to him was the one with which he had parted. Still, everybody enjoyed the bit with the sledge-hammer.

We had a lively time with the trick in which you disconnect one lead of the loud speaker and form a human chain between it and the lonely output terminal on the receiving set. I suppose there must have been a short in the filter circuit, because when I, whom the professor had asked to preside over the H.T. battery, slipped the wander-plug into the 500-volt socket, people's eyes turned inwards, and they all did a funny little dance, exclaiming:

"I can't let go! I can't let go!"

And there were dozens of other tricks which everyone thoroughly enjoyed. Finally the professor said that, to turn from the ridiculous to the sublime, he would give us a

*I naturally hit him with a turkey.*

demonstration of rapid fault-finding. He would go out of the room. Anyone might mess about with his short-wave set, and he would guarantee to locate the fault in a matter of seconds.

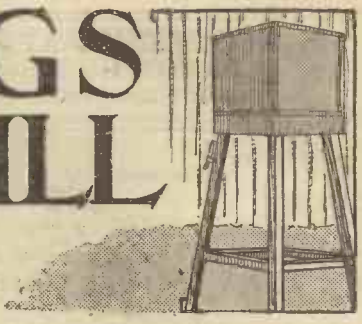
The choice of a fault-maker fell upon me. That is to say, I got first to the receiving set, and kept the others back with the tommy-bar. All that I did, if you will believe me, was to remove the diaphragms from the telephones; but the professor was still messing about with milliammeters and things a whole week later.

## Things Warm Up

The evening, though, seemed to drag a little, somehow or other, until we went down to supper. Then Primpleson started arguing with me about pentodes, so I naturally hit him over the head with a turkey. His shot at me with a trifle was a bad one, so far as I was concerned, though the missile found its billet upon the countenance of Sir K. N. Pepper.

He retaliated by flinging a jelly, which hit Tootle, and next minute we were revelling away like anything. In fact, it was only Mrs. Goop's bright idea of turning the fire-hose on to us that brought the party to a close. If the professor gives a revel party next year, I shall wear oilskins and a sou'wester, and say that I have come as "An English Summer Day."

# HAPPENINGS AT SAVOY HILL



By OUR SPECIAL COMMISSIONER

## Wireless Exchanges

IN Post Office circles there is a good deal of excitement about the forthcoming development of "re-diffusion." The comparative success of the pioneering efforts at Clacton, Southsea, and Hythe has led to the elaboration of nation-wide schemes involving capital running to hundreds of thousands.

It is believed that the B.B.C. tried to get the Post Office to take on the business as part of the telephone service. But the P.M.G. wasn't "having any." So the buck was returned to Savoy Hill, where it has been gingerly examined for some months. Meanwhile, private enterprise has been having a shot here and there about the country. A former B.B.C. engineer has been prominent in one of these concerns. But it is obvious that if the method of re-diffusion is to be of any real value it must be experimented with over a considerable period in different sets of circumstances.

The Regional scheme, contemplated by the B.B.C., by no means covers the whole country with "A" or "B" service area conditions. It is conceivable that in some of the least favoured parts of the country the institution of efficient wireless exchanges would be the only means of providing accessible reception for the majority. Apart from such cases, however, it is doubtful whether B.B.C. participation in, or encouragement of, wireless exchanges would be justified, particularly as it might cause serious damage to the wireless industry.

## Savoy Hill to Langham Place

The B.B.C. has singularly little to say about the move of its headquarters and main studios from Savoy Hill to Langham Place. It is understood, however, that the transfer will be effected in the Spring of 1931. The fluid state of broadcasting technique makes it extremely difficult for the B.B.C. to decide on plans for the new building. The studios, for instance, are constantly changing.

It is probable, therefore, that the B.B.C. will introduce temporary walls and intersections in a considerable part of the building. It is noteworthy that picture transmission is to be taken into account seriously. Hence, apparently, Captain Eckersley is being converted by the current series of experiments in the transmission of still pictures by the Fultograph method.

## Television War

The area and intensity of hostilities in the television war steadily increase. The Baird Company is determined to secure a place in the broadcasting firmament. The B.B.C. is equally determined not only to keep Baird television out of the broadcasting wave-band, but also to prevent the Baird Company from getting any alteration in, or extension of, its present licence to broadcast experimentally on 200 metres with a power of one-quarter kilowatt.

It is believed that the B.B.C. has decided not to have anything to do with any kind of television. Hence there is no possibility of rapprochement or alliance. The war is assuming bitter dimensions.

## A Brilliant Woman Broadcaster

Miss Hilda Matheson, the Talks Director of the B.B.C., is generally acclaimed as the most promising recruit to the staff at Savoy Hill during the past three years. Coming from the personal staff of Lady Astor, Miss Matheson took over the talks when they were at a deplorably low ebb. Deservedly unpopular with both highbrow and lowbrow, talks seemed to be irretrievably doomed eighteen months ago.

Through sheer personality Miss

## FIRST PHOTO FROM 5 X X

*Transmitting the first Fultograph picture from Savoy Hill, whence it was "landlined" to 5 X X and there sent by radio.*

## HAPPENINGS AT SAVOY HILL

*—continued from page 221*

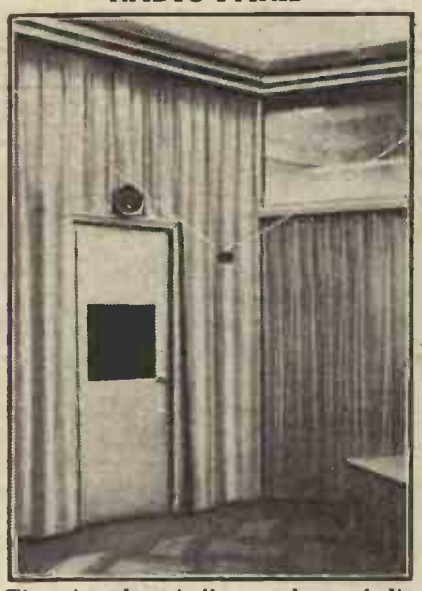
Matheson has transformed the whole situation, until now she ranks among those who most nearly approach the status of indispensables of broadcasting. It is known that the Governors hold Miss Matheson in the highest regard, and there are not wanting signs that she is already marked out for high preferment.

Incidentally, her ambitious young cousin, Cleghorn Thomson, the B.B.C. chief in Scotland, continuing to advance from success to success, is now contemplating the adventure of holy matrimony.

### B.B.C. Concert Attendance

The B.B.C. rightly claims a better orchestra, better artists and better conductors for its current series of

### RADIO-PARIS



*The microphone in the new large studio of the Radio-Paris station is quite small and is slung as shown. The door is that of the announcer's cabin, in which he has a special speech "mike"*

symphony concerts than for any of its predecessors. There has been the great new attraction of Sir Thomas Beecham's adherence to the microphone. But, strangely enough, the attendances at the Queen's Hall have been lamentably thin.

Even for the great inaugural concert conducted by Sir Thomas Beecham, not more than half the house was sold. Sir Henry Wood's concert was worse attended, and there was not much improvement for the Hallé Concert conducted by Sir Hamilton Harty. The B.B.C. seems to be as strenuous as ever in advertising its concerts. There are microphone announcements almost *ad nauseum*, and space is bought liberally in the Press. What is the reason for the falling off?

I believe that the concerts are too frequent. If they were monthly instead of fortnightly there would be no complaint of public apathy. The impressarios, watching the decline, are remarking that they always prophesied the B.B.C. would ultimately discover that the microphone would ruin any concerts. The real testing time is apparently only now beginning.

### Broadcasting and the General Election.

Rumbles of the coming election struggles are already echoed at Savoy Hill. Each of the "Big Guns" is to have two goes at the microphone. I would hazard a guess that the order will be as follows: Mr. Baldwin, Mr. Macdonald, Mr. Lloyd George, Mr. Macdonald, Mr. Lloyd George, Mr. Baldwin. The advantage of the opening and the conclusion would rest with the representative of the largest party in the House of Commons.

The B.B.C. is trying to arrange some debates and discussions between rival leaders; these to be in addition to the set statements of policy by the party heads. For example, an effort is being made to induce Mr. Churchill and Mr. Snowden to debate national finance before the microphone. I sincerely hope that this plan materialises.

There is much more entertainment in a political dog-fight than in any hard-boiled statement of policy, so carefully worded as to be meaningless.

### The Axe at Savoy Hill

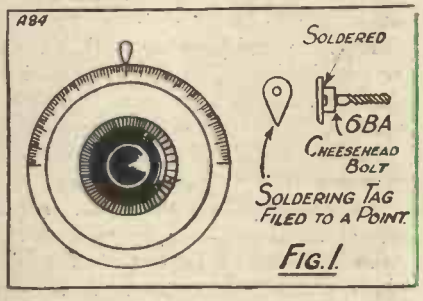
A friend of mine who has just been invited to "retire" from the service of the B.B.C. tells me that he is the victim of a severe inquisition into staff efficiency, which has resulted in a sudden and peremptory reduction in all departments. This particular victim's theory is that the Post Office are behind the recent investigation. He regards it as the first move towards the translation of the B.B.C. into a full-blown Civil Service Department.



## FOR "DX" ENTHUSIASTS

A MARK scratched on the panel serves quite well as a guide to dial readings on an experimental hook-up, but it does not improve the appearance of a receiver intended for regular use by the family. You can make neat little indicators with materials from your scrap-box.

For the indicator you will need a soldering tag and a cheese-headed 6 B.A. bolt. Choose a tag with only one hole in it, and file its narrow end down to a point, as in Fig. 1. Now you have to solder the tag to the head




of the bolt. The easiest way to do this is to put a metal plate on the top of the gas ring (do not use tinned metal, or you may solder the indicator to the plate), and turn the gas on till the plate is not quite red-hot. Then turn the gas low, put the tag on the plate, and tin it with a stick of solder and a trace of flux.

Put a little flux on the bolt head, and place the bolt in its right position with a pair of tweezers. Now turn out the gas, and leave the indicator to cool before you move it.

The bolt secures the indicator to the panel, and you can bend the end of the tag up or down so as to bring it just level with the edge of the dial.

## IMPORTANT "IFS"

If you want to alter the grid bias of your set, remove the H.T. plus plugs first.

* * *

If your mains are D.C., don't forget the condenser between the earth and your set if you use an eliminator.

* * *

If you are in trouble with your set, write to our Query Dept. about it.


## A New Volume Control

MESSRS. GAMBRELL, who have a high reputation for the quality of their products, have submitted to us the new Gambrell Voluvernier, a very neat high-resistance potentiometer with a very smooth and silent action, for use as a volume control. The measured value of the specimen submitted proved to be a fraction over 1 megohm, and the minimum resistance position practically zero. This is noticeably superior to many volume controls submitted to us, which have quite an appreciable resistance at their minimum position.

A handsome bakelite knob is fitted, and provision is made for one-hole mounting on either an insulating or a metal panel when it is desired to keep the metal body of the volume control out of electrical contact with the panel itself. The device can certainly be recommended.

## New R.I.-Varley Products

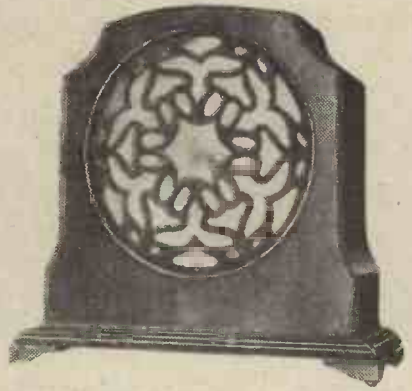
The R.I.-Varley universal power transformer is illustrated herewith, and is a very workmanlike and


*The Gambrell "Voluvernia," referred to above.*

**TESTED APPARATUS.**

**NOTE: All the radio apparatus reviewed in this section has been tested in the Editor's private laboratory, under his own personal supervision.**

efficient piece of apparatus, fully justifying its title of Universal. Contained in a strong iron case measuring 4 in. by 3½ in. by 5 in. deep,



*The new Amplion Loud Speaker, Model A.C.29, is priced at £5, as against £7 for last year's model, the A.C.9.*

it is fitted with four ebonite blocks with small holes into which the necessary wires can be inserted and locked.

Projecting metal terminals are conspicuous by their absence. One terminal block has four tappings, so that 200-, 220-, or 240-volt A.C. mains can be used; a second block has three terminals to give 5 volts overall, with the centre-tap; a third is arranged for 250-0-250 volts, and the fourth for ·8 volts and for 4 volts respectively. It will thus be seen that the transformer can be used for a mains unit using a 5-volt rectifying valve such as the U.5, with a centre-tap, and with 250 tappings for each plate; for operating sets using the ·8-volt A.C. valves; the K.L. type of valve; a combination of the K.L. and the ·8 types; and many other arrangements.

It is one task to make a transformer which will give the voltages named either at no load or at one particular load, but it is by no means so easy to design an instrument to have what is termed "good regulation," that is to say, will maintain its voltage within narrow limits over a wide range of load. This transformer will give up to 2 amps. at 5 volts, up to 6 amps. at 4 volts, and up to 5 amps. at ·8 volt, and so good is the regulation that even on open circuit the voltages are only slightly above the rated figure.

In view of the excellent workmanship and the high quality of the instrument, the price charged is reasonable and the multiplicity of uses to which the instrument can be put makes it most valuable for every experimenter's and every home constructor's den.

*The R.I.-Varley Universal Power Transformer.*

# Christmas Gifts for Yourself and Others—*continued*

A second new product of this company recently received is their push-pull output transformer, which will give both a 1-to-1 and a 25-to-1 ratio, thus making the instrument suitable for either a low-resistance moving-coil speaker or the ordinary high-resistance instrument. Substantially made in a stout metal case, finished with crystallised lacquer and insulated terminals, its appearance and performance are well up to the high standards set by this firm.

As one output terminal is common to either the 1-to-1 or the 25-to-1 ratio it will be seen that a simple change-over switch can be incorporated in any set using this transformer, so that either high- or low-resistance loud speakers can be used at will. A word should also be given to the very excellent instructional books issued with the components named. A very large amount of practical information is condensed into a very small space, and the clear circuit diagrams are a great help to every experimenter.

## The Soldometa Pocket Soldering Outfit

The Soldometa soldering outfit submitted to us for test and report consists of a neat enamelled box


***This output transformer will give either a 25 to 1 or a 1 to 1 ratio. (R.I.-Varley.)***

measuring 4 in. by 3 in. by ¼ in. deep (thus being very little bigger than a packet of twenty cigarettes), in which are contained a miniature soldering iron with detachable handle, a tiny box of a compound called Soldo, a similar size box of soldering flux, a small stick of solder, a tiny tray with three feet to raise it above the table, and a small box of the well-known "Meta Solid Fuel."

A tablet of the solid fuel is placed in the tray, and the soldering iron held in the small clip attached to the box in such a way that the copper bit

***A neat soldering outfit.***

is held just above the flame during the heating process. As soon as the copper bit becomes sufficiently hot (a minute or two) it is dipped into the Soldo compound and is at once tinned, the Soldo being a preparation of flux and solder in combination.

For many jobs enough liquid solder will adhere to the iron without further addition, but a touch with the stick of solder will give the necessary quantity for a blob. For wireless work we would recommend that the Soldo be used only for tinning the iron, joints being made in the usual way with a touch of the flux and solder.

By following the instructions given in the box, thoroughly sound soldered joints were made on a wireless set under construction, but for putting together a multi-valve set and for general construction work the small size of the bit with its rapid cooling and the necessity for frequent re-heating is rather a disadvantage.

## Centralab Products

We have received from Central Radio Laboratories, through their agents, Messrs. Rothermel Corporation, Ltd., a number of interesting and very useful devices for the experimenter and home constructor. The Centralab Modu-plug, illustrated herewith, is a device for what may be termed an "easy-chair" volume control for a loud speaker.

While it is best on theoretical grounds to use a volume control which reduces the voltage applied to the grids of the valves in the set, there are many occasions when a loud speaker is giving too loud a reproduction for comfort without valves being overloaded, and it is desired temporarily to reduce its strength during conversation or for better appreciation of some speech or musical passage. In such cases the method of shunting a variable resistance across the loud-speaker terminals is useful, the very slight alteration in tone so brought about being tolerated in such conditions.

The Centralab Modu-plug is a very useful and neat method of applying the principle. It consists, as will be seen, of a small casing with control knob, and long flexible leads which are attached to the loud-speaker terminals on the set (in addition to the loud-speaker leads themselves). Sitting back in a chair one can easily vary the volume from a whisper to the loudest the loud speaker was giving before this device was incorporated.

A very valuable use of this device is to reduce the strength of an unwanted portion of the programme to a whisper without actually cutting it out, so that one can tell in a second whether or not a boring speech or an undesired musical item has finished. Without some device of this kind,

***The Centralab Modu-plug Volume Control.***

## CHRISTMAS GIFTS FOR YOURSELF AND OTHERS

—*continued from page 226*

one must either listen to the unwanted item at full strength for fear of missing a subsequent item it is desired to hear, or else switch off the set and switch it on again periodically in order to find whether the desired programme has begun, unless, of course, detuning is used.

The Centralab Modu-plug removes all this trouble, and should be welcomed in a large number of homes. Other products of this company submitted for test and approved are their quarter-megohm modulator for panel mounting, and certain power resistances of different values capable of carrying much heavier currents than usual.

### The Harlie Wave Selector

This piece of apparatus, which is really a wave-trap, consists of a single-layer coil tapped at various points, together with a small variable condenser of ·0005 mfd. capacity, the whole being put up in a neat and convenient form. Our test consisted in connecting this device in the aerial circuit of a receiver which was deliberately made up to be flat in tuning and which gave the local station over a wide band of the tuning scale. When adjusted according to the maker's instructions we succeeded in cutting out the local over all except a very narrow band without reducing the sensitivity of the receiver to other wave-lengths.


***A test with this instrument is described on this page.***

While this is quite an excellent wave-trap and functions perfectly satisfactorily as such, we do not agree with the maker's advertisement that it "increases volume from foreign stations," for which claim there is no technical justification. The Harlie Wave Selector is certainly a good wave-trap, and as such can be recommended.

### Mains Unit for D.C. or A.C.

Messrs. E. K. Cole, Ltd., of Leigh-on-Sea, one of the very earliest firms to market mains units, have submitted to us two of their latest products for review. The first is the Ekco H.T. unit for D.C. mains, arranged for 200 and 250 volts D.C. input, and an output of twenty milliamperes.

Two output voltages are available, one at 120 volts fixed, and the other adjustable from 0 to 120 volts by means of a knob attached to the front of the instrument. The finish and general appearance of the unit are excellent, a metal case with a brown crystallised finish being adopted.

Tested on D.C. mains which were

(*Continued on page 230.*)

## CHRISTMAS GIFTS FOR YOURSELF AND OTHERS

—*continued from page* 228.

known to be rather "noisy," the unit gave perfectly silent operation of a set and proved quite satisfactory in all the tests to which it was submitted. The unit can certainly be recommended to set users where D.C. mains are available, and who do not require more than 20 milliamps output at the voltages named. The D.C. model reviewed is known as type 1VA20, but a number of others are made to suit different requirements.

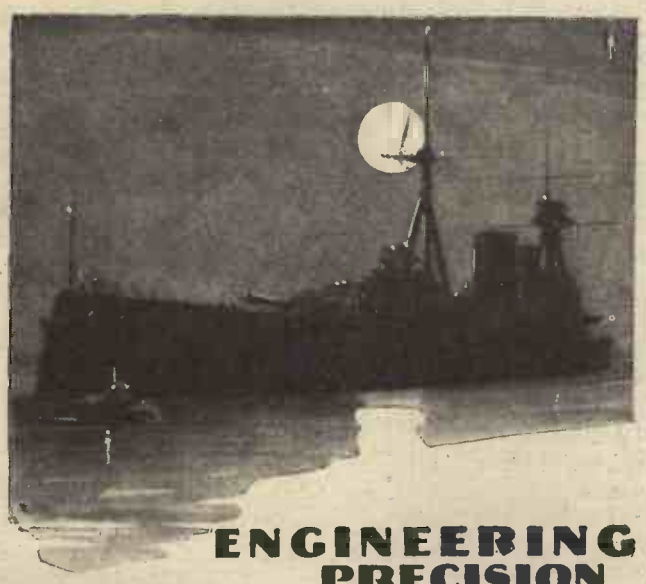
From the same company we have also received their H.T. unit model 1VA20, for A.C. mains, this having, as in the case of the D.C. model, one variable and one fixed tapping with the same voltages, namely, 0 to 120 variable and 120 fixed. The instrument is larger than the D.C. model as a rectifying unit is incorporated.

By removing a small metal plate access is obtained to a compartment into which the single wave rectifying bulb is inserted, and in this compartment will be found a plug and one or two sockets, so that the instrument can be adjusted for the particular mains voltage on which it is to be used. On test it was found that full 120 volts could not be obtained with a 20-milliampere load, but in fairness it should be said that this is not claimed in the instructions issued with the instrument, the makers stating that 120 volts is obtainable at approximately 16 milliamps, which corresponds to the results of our test. Those readers who wish to buy a unit for use with a super-power valve are advised to invest in one of the larger models of which the makers of this unit have considerable variety.

*The H.T. unit for A.C. mains referred to above. (E. K. Cole, Ltd.)*

### The Philips' L.F. Transformer

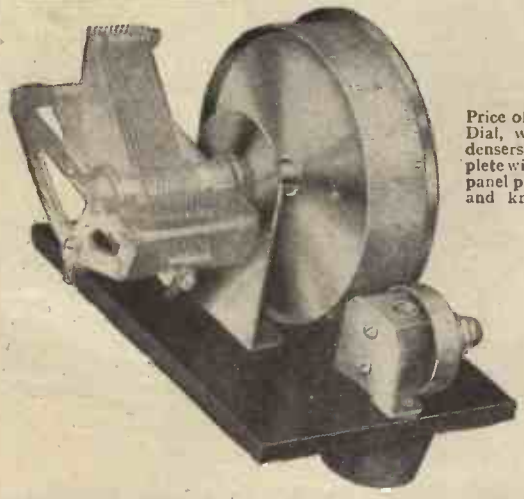
The makers of the above component have notified us that the statement made in "What's New" in the October issue (page 419), regarding the use of "Permalloy" for the core of this transformer, is incorrect. "Permalloy" is not used, but the core is formed of a special high-permeability iron which confers similar benefits.



# ENGINEERING PRECISION

Accuracy is the beginning and the end of engineering. In constructing wireless instruments, no less than in constructing giant battle cruisers, not a slip must be made—either in design or execution. Absolute precision is a feature of J.B. instruments, their workmanship is exact in every detail and consequently they do exactly what they are designed to do, no more, no less.

The Drum Dial illustrated here is startlingly novel in design. It enables the Control Knob to be placed immediately below the scale, thus the scale may be brought flush with the panel and may be read with ease. A powerful and positive friction drive prevents backlash and slip. Vernier ratio, 16-1.

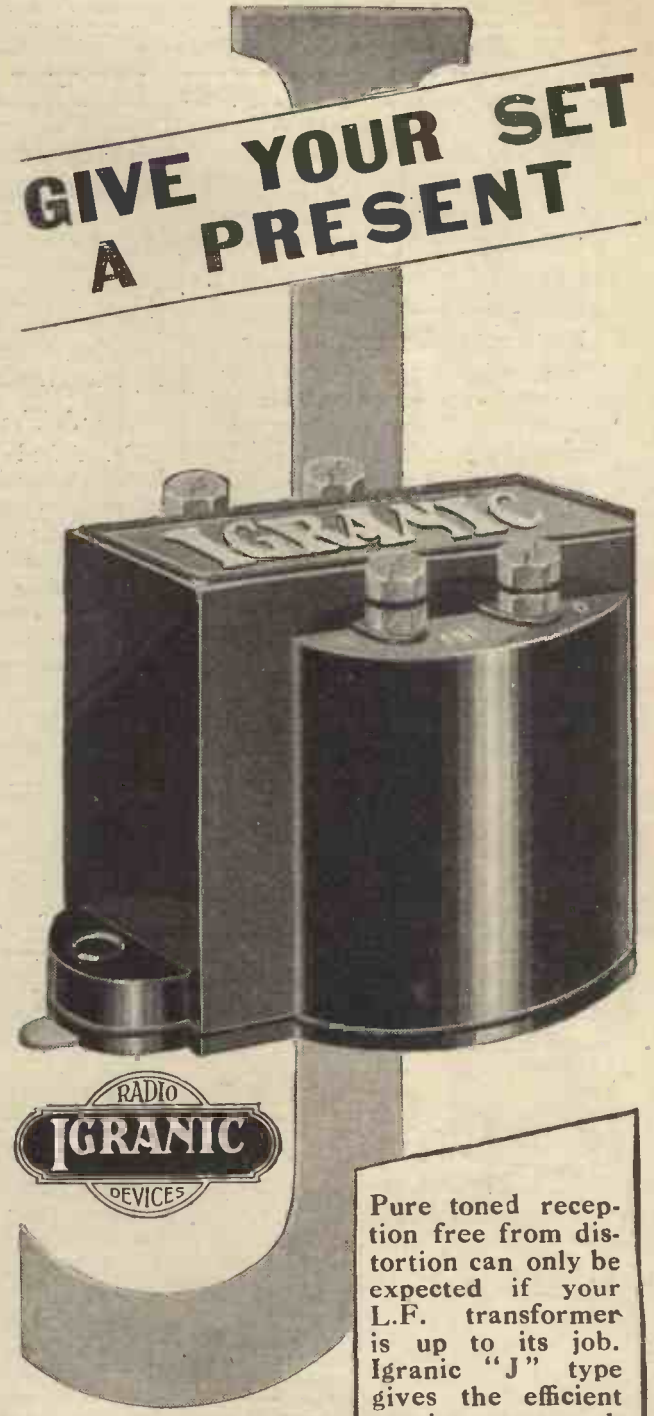


Price of J.B. Drum Dial, without condensers, but complete with attractive panel plate and knob. **10/6**

# PRECISION INSTRUMENTS

*Advt. of Jackson Brothers, 72, St. Thomas' St., London, S.E.*

# GIVE YOUR SET A PRESENT




Pure toned reception free from distortion can only be expected if your L.F. transformer is up to its job. Igranic "J" type gives the efficient service you need. Fit one and *hear* the difference it makes.

Ratio 3:1 / 6:1 — PRICE **17/6**

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# OUR NEWS BULLETIN

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

### Television Tests—
### Postmaster-General's View

IN a written reply to Lieut.-Commander Kenworthy, Sir W. Mitchell-Thomson (Postmaster-General) says: "I know of no system which is at present capable of transmitting moving pictures of actual events for satisfactory reception by wireless listeners. I have not refused permission for the use of the British Broadcasting Corporation's stations for television tests. The Governors of the Corporation decided, in the exercise of the discretion vested in them, after a demonstration by the Baird Company, who hold an experimental licence, that the system did not at present fulfil the conditions which would justify a public trial through one of their stations.

"I have recently received an application from the Baird Company for further facilities. This application is at present under consideration, and I am not yet in a position to say anything further."

### A Frank Opinion

Dr. Alfred Gradenwitz was in London a few days ago investigating television systems on behalf of a well-known German concern. Dr. Gradenwitz said in an interview that he had had an opportunity of examining very closely the apparatus invented by Mihaly and Karolus for the Telefunken Company, and, in his opinion, both systems merely transmit lantern slides. These transmissions were only shadowgraphs.

### Aid for Art!

A suggestion which has some originality has been made for the disposal of the surplus licence money now held by the Post Office. Mr. J. C. Squire recently suggested that those artistic concerns requiring financial aid, such as opera, orchestral music, the national theatre, etc., might possibly be helped out of a fund, the nucleus of which would be formed by the surplus licence money. If the B.B.C. adopted such a procedure the Board of Governors would become more or less a Ministry of Fine Arts.

### That Surplus Money

The B.B.C. cannot, however, do anything in this matter, because it is part of their Charter that they do not ask for more money until it expires in 1936. Furthermore, it is extremely unlikely that the Post Office will hand over the surplus licence money, although it could not be better expended than on the improvement of British broadcasting programmes.

### Radio Rivalry?

There was quite a hullabaloo the other day when it was announced that the B.B.C. is likely to be faced with the prospect of real and effective competition. It seems there is a possibility of a competitive broadcasting system being started in February, either from Holland or from the Radio-Paris or Eiffel Tower

(*Continued on page* 234.)

## OUR NEWS BULLETIN

—*continued from page 232*

stations. The idea is, I suppose, that the organisers of this competitive B.B.C. would get their money back by ether advertising. Or, at least, they think they would. As a matter of fact, ether advertising is a tricky business, and as 95 per cent of listeners purchase sets which only cover B.B.C. wave-lengths, and as it is obvious this rival concern will have to use an outside wave-length, the audience would probably not be so big as the advertiser might like.

### An Opportunity to Judge

There is also a suggestion that Mr. Baird might be associated with this concern, and that television broadcasts will be transmitted. In a sense, this is all to the good, for the public, if they take the trouble and spend the money, will at least have the opportunity of realising how exaggerated have been the reports published from time to time concerning the amusement and interest of television.

Furthermore, it would be a practical experiment for ascertaining whether the Baird Television system does cause interference owing to a wide frequency wave-band.

### Enterprise and Efficiency

Anyway, the "Daily Express" seems to have summed up the situation pretty well when it refers to the B.B.C. as "a system which has proved itself under men of high ability. It is a well-organised Corporation, with a range of enterprise, efficiency and interest that is rapidly widening. To allow a private concern in a foreign land to set up an opposing service would be wholly bad from every point of view."



### Tragedy of the "Vestris"

The tragedy of the "Vestris" again illustrates the incalculable value of wireless. Had it not been for wireless, it is probable that the death-roll of the "Vestris" would have been even greater than it was. At least two hundred lives were saved from the ship, thus bringing the total number of lives saved through the agency of wireless to over 8,000 in sea disasters in times of peace.

The apparatus fitted to the "Vestris" was a Marconi 1½-kilowatt installation with emergency apparatus. The set consisted of a continuous long-wave transmitter for special service, and a valve receiver, plus a spark "standby" set. The main apparatus enabled the ship to carry out communication over distances up to 1,500 miles, and up to 500 miles with the main spark transmitter.

Reports from New York indicate that the operator was able to carry on communication for three hours on his main set, and then to continue communication with his emergency set until the ship sank.

### A Proud Tradition

And once again the heroism of wireless operators has been demonstrated

(*Continued on page 236.*)

## OUR NEWS BULLETIN

—*continued from page* 234

by the bravery of the chief operator of the "Vestris," Michael Joseph O'Loughlin, and by the devotion shown by James Taylor Forbes MacDonald and Charles Verchere, the two junior operators. O'Loughlin and MacDonald were experienced men, with eleven and thirteen years' service respectively, while Verchere, although with only three months' service, proved himself a worthy recruit to the traditions of the wireless profession at sea.

### Set Standing Sideways

O'Loughlin was thirty years of age and joined the staff of the Marconi International Marine Communication Company during the war, on September 11th, 1917. His bravery on the "Vestris" has been a world-wide topic during the last few weeks, and every reader of the WIRELESS CONSTRUCTOR knows now how he stood by his set when the ship had canted over to an abnormal degree, and how he was almost standing on one "wall" of the cabin sending out the S.O.S. until the very last moment.

### Then and Now

It is interesting to note that wireless was introduced into the British Merchant Service in 1901, when the Marconi Company first fitted up a set on the Beaver Line Steamship "Lake Champlain." From 1901 until the present day no fewer than 6,000 British merchant ships have been fitted with Marconi apparatus, and at the present moment over 15,000 ships throughout the world are equipped with wireless sets of the Marconi type.



### Xmas Radio Fare

Every reader knows that the WIRELESS CONSTRUCTOR, "Popular Wireless," and "Modern Wireless" Xmas Numbers are numbers which offer the best value for money in radio journalism. This Xmas number of the WIRELESS CONSTRUCTOR is a good example of how well the radio man is catered for these days. If you want to have a really good feast of radio fare for Christmas, add to your Christmas Number of the WIRELESS CONSTRUCTOR the Christmas Number of "Modern Wireless," which will contain, among many first-class technical articles, special contributions by Sir Oliver Lodge, Dr. J. A. Fleming, Rosita Forbes, (the famous woman explorer, who writes on "Wireless in the Desert,") and an excellent article by Mr. Beverley Nichols, who writes on "Brighter Broadcasting."

### "Modern Wireless" Attractions

The "Modern Wireless" Christmas Number is now on sale at all booksellers, price 1/6. Among the many sets described you

(*Continued on page* 238.)

## OUR NEWS BULLETIN

*—continued from page 236*

will find the "S.G.P." Three, one which will greatly interest you. There is also the "Shortradyne," a first-class short-wave receiver, and the "Three-Band" Two, a two-valver you will simply have to make when you read about it.

### Rome's Radio

It is reported in the "Times" that a new high-power broadcasting station of 50 kilowatts is to be built in Rome, and is likely to be ready by October, 1929. It is also proposed to erect by the same time a short-wave station for transmitting Italian programmes to America and the Italian colonies.

### The "Pirate" Position

It was stated in the House of Commons the other day by Viscount Wolmer, the Assistant Postmaster-General, that his department does its best to ensure that any person who owns a wireless set of any kind shall pay a licence fee. The number of licences now in force is over two and a half million. Viscount Wolmer stated that he did not think there was any widespread evasion of paying the licence fee, nor had he any reason to suppose that the owners of portable sets are more prone to evade their obligations than other members of the community.

### The Crease in the Trousers

Writing in one of the newspapers the other day, Mr. A. Corbett Smith, who is well known to readers of this journal, pointed out that Dickens was the eternal child playing with children—as the great-hearted public are; and once upon a time the B.B.C. used to skylark with the best of them. But to-day Mr. Corbett Smith finds the B.B.C. a trifle corpulent. It wags an admonitory finger with a "Now, children!" and if ever it can be induced to play bears on the hearth-rug, it is thinking all the while of the crease in its trousers.

That's not bad, you know; and there's a lot of truth in the crease in the trousers suggestion!

### Back To Methuselah

Recently Berlin took courage and broadcast part of Mr. Bernard Shaw's "Back to Methuselah." On other evenings, excerpts from the author's "Candida" and "St. Joan" will be broadcast. If any of our readers hear these broadcasts, I should like to know what they think of them.

## THE NEW "BUSINESS MAN'S" FOUR

—continued from page 185

by drilling four holes at the corner of the rectangular marking and using a fretsaw, the method I always adopt myself.

The front panel should now be held temporarily in position with a couple of screws through the bracket holes, and the metal screen, and the other components arranged as shown in the wiring diagram. It is as well to place a coil in the six-pin base and to turn the condenser vanes backwards and forwards to see first of all that the a coil does not foul the reaction condenser, and that the moving vanes of the variable condenser are quite clear of everything else, including the valve when placed in the valve holder.

Be careful to place the other components so that the illustrated wiring can be made conveniently, and before screwing the screen in place finally mark the position of the lead which will go from the top terminal, or plate, of the screened-grid valve, through the screen. Then drill this hole, giving adequate clearance for the rubber-covered wire.

### Component Positions Important

It is a little difficult to get at the terminal on the underside of the variable condenser, and you will find it most convenient to attach a soldering lug at right angles to the wire which goes to this terminal and then to slip the soldering lug over the terminal shank before running the terminal over the thread.

When wiring-up, follow as closely as possible the wiring diagram shown, for the positions of the various parts have been carefully worked out in order to keep the wiring simple. In the case of the screened-grid valve, where the amplification is very high, stray capacity and other effects loom much larger than in the case of ordinary valves, and unsuitable wiring may give you, for example, too high a minimum capacity in your reaction circuit. The photographs and wiring diagrams should, however, enable you to make a good job of it with very little difficulty.

You will notice that there are three terminals, $R_1$, $R_2$, and $R_3$, on the top of the anti-mobo device, $R_2$ only being used in this case. The reader may, however, care to try $R_1$ or $R_3$, the connections to these terminals varying

(Continued on page 240.)

## THE NEW "BUSINESS MAN'S" FOUR

*—continued from page 239*

the amount of resistance in circuit, as shown in the theoretical diagram.

The standard wave-trap has three sockets and two Clix terminals. The wire which goes from the second terminal to the six-pin base is so secured in this Clix that it is possible to plug the other Clix from the aerial terminal into the top of the first one when it is required to cut the wave-trap out of circuit.

The valves used in this receiver are: in the first socket a screened-grid valve of the four-pin type, in the detector circuit a resistance-capacity-coupling valve, in the first note-magnifying circuit one of the valves known as the H.F. type, and in the output circuit a good power or super-power valve according to the high-tension supply available. Suitable valves in all the well-known makes are available for each socket.

### "Stedipower" Suitable

The low-tension terminals will have, of course, either 2, 4, or 6 volts, according to the type of valves used, or alternatively a "Stedipower" unit. (The larger "Stedipower," not "Stedipower Junior," as the latter will not give quite enough current for the new "Business Man's" Four.) H.T. positive 1 is connected only to the screening grid, and the voltage applied to this should be that recommended by the maker of the particular screened-grid valve you are using. H.T. positive 2 should be from 120 to 150 volts, anything much less than 120 will not work satisfactorily with a screened-grid valve. Grid bias negative 1 will require from 1½ to 3 volts, and G.B.$_2$ the particular grid bias specified by the maker of the output valve for the H.T. voltage used.

For preliminary tests, plug the flexible lead going from the aerial terminal into the bottom socket of the wave-trap. Set the reaction condenser on the front of the panel at its minimum position (with the knob screwed out as far as it will go), switch on, and set the tuning condenser at zero.

Now slowly turn the knob of the reaction condenser until you hear the set oscillating by a faint plop or rustling noise in the loud speaker. Listen very carefully for this as the set goes very smoothly into oscillation, and not with any pronounced click. Immediately screw the reaction knob back again just sufficient to stop oscillating, and then try for oscillation on other parts of the scale. If the set should oscillate anywhere else, a slight turn of the screw will stop it. Then all you have to do is to turn the tuning dial and you will soon pick up your nearest station, and at night many others in addition.

### Cutting Out the Local

If you find that the local station covers quite a wide band of wavelength on your tuning dial, as will be the case if you are fairly close to it, tune to the maximum strength in the local station, and then plug the flexible lead from the aerial terminal into the upper left-hand socket looking from the back of the set. Next, with a screwdriver or some suitable shaped instrument, turn the knob of the small adjustable condenser on the wave-trap slowly in one direction or the other until you reach a point where the local station is at a minimum. You will easily go past this point if you are not careful to make one or two adjustments until you are sure you are at the minimum sound position.



### Sharp Tuning

Having found this position, you can revert to the tuning condenser, and you will find that the local station is now tuned very sharply, and you will be able to tune in a number of others near it without any interference from the powerful local station. On any good night you will now be able to pick up a large number of stations on the loud speaker provided you are using an average aerial, while on the smallest indoor aerial you should hear at least three or four on the lower band.

Tuning on a small indoor aerial will be so sharp, however, that you will probably not need to use the wave-trap at all, but here experience will guide you.

## THE "DIRECTOR"

—*continued from page* 197

because although the wiring is not complicated it is quite abundant, and leads to condensers or potentiometers can be easily overlooked. Do not omit to earth the cases of the 28/14-henry L.F. chokes, as this is a means of reducing the hum.

We can assume the set is now ready for operation, and after the initial adjustments have been carried out, as explained in the first part of this article, we can turn our attention to the choice of suitable coils. The writer carried out his first experiments with "D.X." coils Nos. 35, 75 and 50 in the primary, secondary and reaction coil sockets respectively, but, of course, other suitable makes will occur to the constructor, if he does not already possess a complete range. The primary coils can be any size between 25 and 50 for the B.B.C. wave-band, depending on the selectivity required and length of aerial. Remember the smaller the primary aerial coil, the sharper the tuning and the fainter the signals, so that the choice will naturally fall on the coil which compromises between these two, unless one only desires the local station, in which case the 50 coil will be chosen.

### The Series Condenser

For the higher wave-band, coils 150, 250 and 200 can be tried for primary, secondary and reaction.

In reference to sensitivity, a word of explanation might be made regarding the ·001-mfd. fixed condenser shown in series with the aerial lead inside the set. When positive main is earthed, the aerial becomes "alive" and can deliver a nasty shock. This condenser therefore overcomes this trouble, but should the negative main be earthed, then it can be omitted, as slightly greater signal strength is obtainable without it, and without the attendant danger.

Finally, in regard to the Truvolt, it will be found that when the set is first connected to the mains, and adjusted correctly, the resistance element will begin to smoke, as the resistance wire is wound on an asbestos-copper core, which, being chemically treated, gives off fumes for the first few hours of its use. Readers should therefore prepare for this event and ventilate their wireless rooms accordingly at the time of making initial tests.

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## THE "DIRECTOR"

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### Notes on Accessories Required

Two valves: 2, 4 or 6 volts (a combination of any two voltages can be chosen), one being of the H.F. type, 20,000 to 30,000 ohms impedance, and the other being a small power valve of 6,000 to 12,000 ohms impedance; both valves must each only consume ·1 ampere filament current. Plug-in coils: for B.B.C. wave-band, 35, 50, 75 coils are suitable, and for 5 X X, etc., 150, 200, 250 (coils shown in set are "D.X."). Loud speaker: any sensitive horn or cone type. Although the receiver gives excellent quality, yet it is not sufficiently powerful to operate a moving-coil loud speaker satisfactorily, so that prospective users are advised to confine their choice to the types mentioned above.

## TRADE JOTTINGS

*A brief review of recent issues of trade catalogues and literature.*

An attractive folder from the Benjamin Electric, Ltd., deals with some of their new lines, including the new Benjamin switch of the make-and-break type that goes on and off with a snap and retails at the low price of 1s. 3d., or 1s. without terminals. Nearly three-quarters of a million of this switch have already been sold. Other cheap lines are the new Benjamin vibro holder, an anti-microphonic valve holder which retails at 1s. 6d., and the new Benjamin earthing device.

### A "Posh" Affair

The new Met-Vick wireless catalogue is a really "posh" affair, arranged in sections—A, B, C, and D.

Section A deals with Cosmos valves. It deals not only with the ordinary types of battery-operated valves, but also with the A.C. types (indirectly-heated cathodes) and rectifying valves for A.C. eliminators. The characteristics are given, and, in addition, circuits, operational details, etc., make this an extremely valuable work of reference. Section B gives full details of three-, four-, and five-valve wireless receivers for operating from A.C. and D.C. mains or batteries, while Section C deals not with complete sets for mains

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## TRADE JOTTINGS

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operation, but with eliminators which supply L.T., H.T., and grid bias for the operation of receivers from A.C. or D.C. supply. Finally, there is Section D, which deals with accessories and components, resistance units, aerial equipment, accumulators, H.T. batteries, A.N.P. coils, etc. All the sections are profusely illustrated with practical diagrams and stacks of practical information, the whole catalogue being helpfully and sensibly arranged, in a way that speaks volumes for the technical efficiency behind Cosmos products.

### Details of the Amplion Trickle Charger

Details of the Amplion trickle charger that have been received in leaflet form show that this unit is suitable for charging 2, 4, or 6-volt accumulators, and the charging rate is adjusted automatically, thus eliminating any danger of overcharging. Where A.C. mains are fitted only small accumulators are required in conjunction with the Amplion trickle charger, no matter how many valves are incorporated in the receiver. The operation is simplicity itself, the charger is left permanently connected to the accumulator, and the set only requires switching on and off. The price is 52s. 6d., and as there is nothing to wear out and there is no fear of earthing the mains, the charger is a noiseless, reliable solution of the problem of the low-tension supply.

### New Output Valve

Interesting details of a new loud-speaker valve have just been received in leaflet form from Aneloy Products. This valve is called the L.F.680, and these figures indicate that it is a 6-volter, with a filament current of ·8 amperes. Designed to deliver an output to moving-coil loud speakers or to large types of cone speaker, it is a valve which requires a maximum plate voltage of only 200 volts.

The makers claim that on an H.T. voltage of from 100 to 200 volts it has a power output three times as great as the usual loud-speaker type of valve, operating on double that H.T. voltage. Its A.C. resistance is given as the low figure of only 1,000 ohms, and the "mutual conductance" (which is a figure of merit that provides a very convenient

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## TRADE JOTTINGS

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standard) works out at the extraordinarily high figure of three. The electrodes have been so arranged internally that the valve can be regarded as a three-electrode in all respects. The price is 27s. 6d., and the L.F.680 may with great advantage be used for push-pull amplification.

### The Ediswan Valve Catalogue

The new Edison-Swan valve catalogue is a handsome 50-page affair, worthy of acting as a model of what a valve catalogue should be. Well printed on good paper, with large illustrations of every model of valve made by this famous firm, it really does give the purchaser an accurate idea of what he is buying.

Every valve listed is not only shown practically life-size, but there is a full technical specification with each, and some general descriptive remarks as to the suitability of the various types for different stages, etc. In this section the values of grid leak, etc., are discussed in a practical and helpful manner.

Over and above it all there are the curves—real big map-like curves set out with incomparable clearness and free from all those eye-straining irritations which are associated with so many small leaflets and squeezed-in specifications.

Altogether the Ediswan valve catalogue is a book to get hold of at all costs, and to keep from all would-be borrowers!

## MORE HELP FOR THE INVENTOR

**Reforming the Patent System.**

From a Special Correspondent.

THE effect of the patent law with its various "thou shalt nots" has become far more familiar to the general public since the introduction of broadcasting than it ever was before. In the first place, questions of patent-right are naturally of interest to the millions of listeners who pay royalties for the use of protected circuits, as well as to hundreds of thousands of home constructors.

In the second place, the keen

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## MORE HELP FOR THE INVENTOR

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wireless experimenter has opportunities of making useful contributions to the progress of his favourite hobby, sometimes reaping a reward in the shape of patent royalties for doing so. Many important developments in wireless technique have been made by amateurs working with practically no other equipment than is to be found in the wireless den of most of our readers.

Any organised attempt to reform the present system of protecting invention so as to bring patent procedure as a whole more closely into line with modern requirements must therefore be regarded with sympathetic interest.

Early last year a committee was appointed by the British Science Guild with this object in view. Its members were admirably chosen from well-known scientists and lawyers, together with the representatives of leading industries, under the chairmanship of Dr. W. H. Eccles, F.R.S.

### The Main Features

Following eighteen full meetings and four sub-committee meetings, the committee has now issued its report * in which the more important recommendations are set out below:

NOVELTY.—No patent should be invalidated by any prior publication more than fifty years old. This will hardly affect wireless inventions as a class, though the principle is important. The committee hold the view that the consideration which a patentee gives for his patent rights is the disclosure of an invention not otherwise known in industry. Fifty years is roughly the working life of a skilled workman, so that the rediscovery of an invention not used within living memory may fairly be said to be meritorious and worthy of reward if it can be worked successfully under modern conditions.

CHEAPER PATENTS.—The introduction of a special "short term" patent is recommended in order to give a cheaper form of protection to minor inventions, such as detailed improvements on existing types of circuits or component parts, designed, say, to simplify operation or

* Report on the Reform of the British Patent System, published by the British Science Guild, price 2s.

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## MORE HELP FOR THE INVENTOR

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to cheapen manufacture. The new "short term" patent should be issued quickly, and at a low fee, and is intended to give protection for a total term of not more than seven years.

The existing or normal patent would still be available for inventions of greater importance, such as are often termed master patents. It sometimes happens that the demand for the "small improvement" is large while it lasts, though it quickly falls off. Meanwhile most of the market has been supplied by "pirates," before the actual inventor can secure full protection in the ordinary course.

### Very Successful

A short-term patent granted within a few weeks of making application at the Patent Office would prevent this form of abuse. The same facility already exists in Germany and has proved very successful in practice.

A NEW PATENT COURT.—It is also proposed to give the Comptroller of the Patent Office power to try actions arising out of the infringement of patent rights, and to decide questions relating to the validity of patents. This does not, of course, affect the right of any party to go to the High Court, if he prefers. But patent actions in the High Court cost a lot of money, and the intention is simply to provide a less expensive tribunal to whom the inventor (or manufacturer) of modest means can apply in cases of alleged infringement.

Such issues would only be heard by mutual consent of both parties concerned, and there would be a definite limit to the amount of damages that could be awarded. The special knowledge and experience of the Patent Office staff is such as would ensure a thorough understanding of the technical facts involved, and it would appear reasonable to utilise their services in this way.

CONCERNING NOVELTY. — As everyone knows, an invention must be novel. When a patent application is filed one of the most serious obstacles the inventor has to face is the search made in the Patent Office to see whether his invention

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## MORE HELP FOR THE INVENTOR

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is really new, or whether it has already been protected by someone else.

At present this "search for novelty" is confined to prior British patents. If no anticipation is found among former patents the patent may be granted. Unfortunately, however, it will have no force, should the inventor afterwards attempt to claim royalties, if it is proved in Court that the invention was previously described in some text-book or other technical publication. In order to remove this risk as far as possible, the committee recommend that the official search should be extended to cover all such available literature, in addition to previous patent specifications.

HELPING THE POOR INVENTOR.—Before an inventor can learn how he stands as regards novelty, he must file a complete patent specification and pay stamp fees amounting to £4. If the invention is found to be not novel, or to have been anticipated by some other patentee, then this money is practically wasted.

The Committee therefore suggest that facilities should be given to enable a poor inventor to make his own search before filing a formal application. He would then be in a better position to decide whether or not to go on with the matter.

Such a search would be rendered a comparatively easy matter—at least by comparison with the facilities now available—if duplicate files corresponding with those used by the official examiners were provided for public use in the Patent Office library.

As an alternative, in cases where the inventor cannot conveniently visit the Patent Office library, an official search should be made for a moderate fee.

TECHNICAL INFORMATION.—It may easily happen that whilst a manufacturer or inventor is puzzling his brains over some particular problem, the required solution is lying hidden away in the Patent Office files, forgotten by everybody except the official staff.

In such cases, when the request is made, any such information

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## MORE HELP FOR THE INVENTOR

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should be made available to the public, quite apart from any application for a patent. The collected files of the Patent Office constitute a valuable and unique record of scientific labour and ingenuity applied to the practical needs of industry. The task of quickly collecting all the available information bearing upon any particular problem is one that is peculiarly within the competence of the Patent Office staff.

AN EMPIRE PATENT.—The proposal to introduce a single patent having effect throughout the whole Empire has already been made in various quarters. The report points out that whilst the total cost of securing and maintaining a British patent for the full term of sixteen years amounts to £130, the cost of securing the same protection in the various Colonies and Protectorates is no less than £1,245.

In view of this exorbitant expense, the Committee recommend the use of a restricted Empire patent to have effect throughout Great Britain and the Colonies and Protectorates; they also express the hope that India and the Dominions may later see their way to become parties to a "single-patent" scheme.

## CHATS AT THE WORK-TABLE

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### The Perfect Screwdriver

For a long time I have been trying to find a screwdriver with a really satisfactory attachment for holding screws.

Every constructor knows only too well the horrible little jobs that come one's way at times when securing components to panel or baseboard in awkward places. There is no room for the hand, so that the screw cannot be held between the fingers until it has been "started." One fiddles and fiddles in an effort to get the thing into position. At last it is fairly over the hole into which one is hoping to drive it.

Carefully one applies the screwdriver. There is a lurch to one side and the work must begin again!



Hitherto the best method that I have found in dealing with these awkward customers is to make rather large holes for their reception with a long-handled bradawl and to use copper-covered steel screws. With a magnetised screwdriver this scheme is fairly successful—so long as the driver retains its magnetism.

That unfortunately is, as a rule, not very long. Screwdrivers are not made of very hard steel; this combined with the knocking about that naturally comes their way on the work bench make them prone to become demagnetised rather rapidly. They can, of course, be remagnetised quite easily by rubbing the blade upon one of the poles of a permanent magnet.

The other day I came across what seems to me the ideal screwdriver for wireless work. This tool has every possible good point and not a single bad one.

The blade is a full $\frac{3}{16}$ in. in width, and is so ground that it is a really good fit for the notches of small B.A. and wood screws. The handle is cylindrical, as the handle of a screwdriver should be, and the tool is 11 in. in length over all—I have often pointed out the advantages of a long screwdriver.

In addition, it is made of good steel with just the right temper. Even as a plain screwdriver, therefore, this is just the thing that the wireless constructor wants. But it is more than a plain screwdriver.

### A Handy Screwdriver

On the shaft is a sliding sleeve provided with two spring jaws which can be pushed out beyond the end of the blade. A spiral spring placed round the shaft exercises a fairly powerful thrust on the sleeve. If an awkward screw has to be dealt with the sleeve is pushed downwards, the screw is placed so that the blade is in its nick and the jaws are then allowed to spring back against the underside of its head.

In this way the screw is firmly gripped and can be inserted without the least difficulty into the most awkward place. As soon as it has been fairly started, the sleeve is given a half turn. This releases the jaws and the screwdriver is then used to turn the screw home.

Having given this tool an extended trial in wireless constructional work, I can confidently recommend it to readers as the best screwdriver that I have yet come across. It is by no means expensive, considering its usefulness, the price being half-a-crown.

## INDEX TO ADVERTISERS



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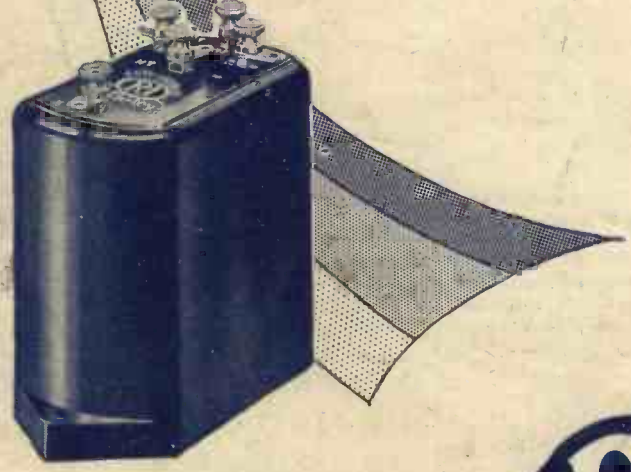

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