

# The Wireless Constructor

6<sup>D</sup>  
MONTHLY

EDITED BY  
**PERCY W. HARRIS, M. I. R. E.**  
Vol. VIII. JULY, 1929. No. 33.

## The "TEN POUND FIVE"

BY

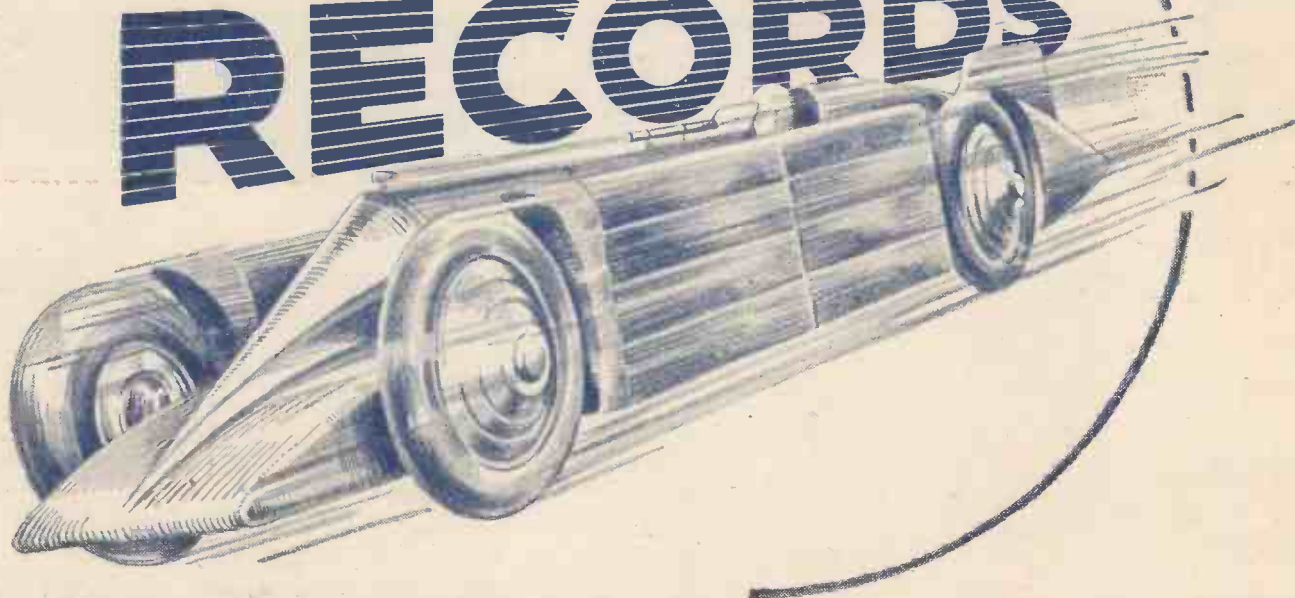
PERCY W.  
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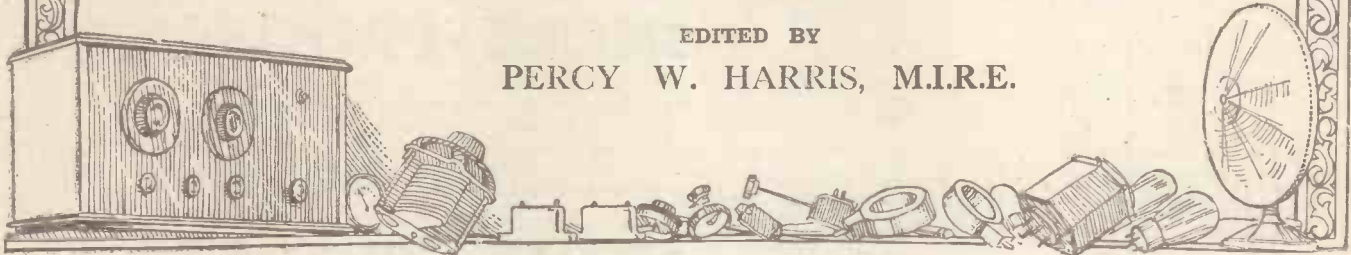
Arts

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

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



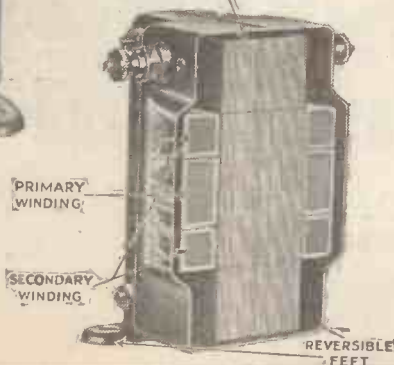
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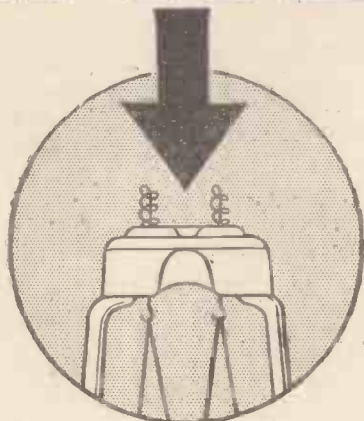
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# ELECTRODES

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Noises are generally due to loose elements in a valve. In the Cossor Screened Grid Valve the elements are interlocked. Every joint is scientifically welded to ensure long life and complete rigidity. Even under the heaviest shock individual movement is impossible.

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Even the hardest blow cannot disturb the perfect alignment of the Electrodes which are rigidly braced at top and bottom. As a result, every Cossor Screened Grid Valve retains its characteristics throughout its abnormally long life. For any Screened Grid Receiver choose Cossor. Accept no substitute—for there is no adequate substitute for the Cossor system of Interlocked construction.



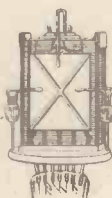
**1.** Here you see the double length of Cossor filament famed for its colossal emission. Note the sconeite bridge holding it rigidly in position.



**2.** Around the two stout grid supports is wound the first grid, electrically welded at twenty-five points.

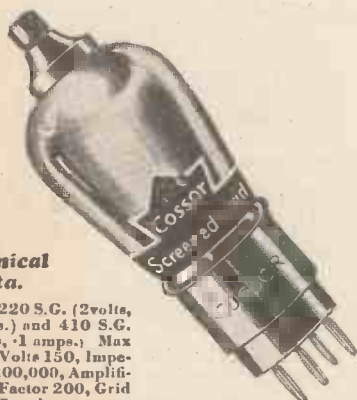


**3.** Note the enormous strength and rigidity of the screen. See how it is built on four stout supports and capped by a metal bridge-piece anchored to sconeite insulator.



**4.** Finally, observe the construction of the anode. Actually two rectangular nickel plates are used and for greater rigidity each is diagonally ribbed.

**Only Cossor Screened Grid Valves have interlocked Electrodes**



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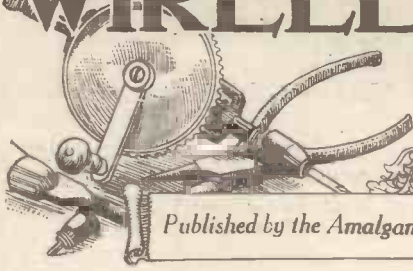
Price (each) **22/6**

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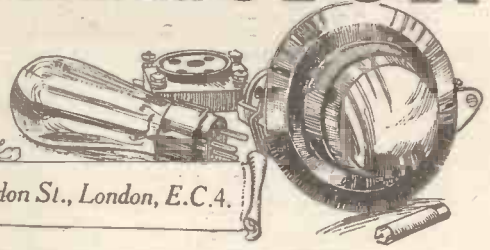
# COSSOR Screened Grid

**THE ONLY SCREENED GRID VALVE WITH INTERLOCKED CONSTRUCTION**

# THE WIRELESS CONSTRUCTOR



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



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## THE EDITOR'S CHAT

In this article Percy W. Harris, M.I.R.E., the Editor of "Wireless Constructor," discusses the question of set assembly.

PEOPLE who are not wireless enthusiasts sometimes express surprise at what they call the "tremendous hold" that wireless takes upon its adherents, for it seems strange to them that any hobby can arouse such active enthusiasm. When they see the happy home constructor busily at work with his soldering iron and screwdriver they sometimes exclaim: "What! Another set!" and then point out that only a month or two ago he made a set which seemed to them to be perfect.

### A Unique Hobby

But when they take up the hobby themselves, we soon find them just as keen as anyone else on building one set after another, for wireless is a hobby which is unique, in that the reassembly of existing parts, with very little additional expenditure, often enables one to make an entirely new and different receiver. The man who builds several sets a year rarely buys a complete new set of parts for each. He will probably keep one set as a kind of "standard" for programme reception, and then, from his general assortment of parts, he will build up others as new circuits arrive and as new and improved components interest him. Frequently, too, he will discover something which he cannot explain, and will start a line of original experimenting, for he has always the chance that he may discover something vital—something entirely new to enrich our knowledge.

### Special Skill Unnecessary

Furthermore, it does not follow that he must be a highly skilled or

highly trained experimenter in order to become a famous inventor. Armstrong—the American whose name is so closely linked with the superheterodyne, and who is credited in America with the invention of reaction (simultaneously invented by Franklin in England)—had hardly left college before he sprang into fame. In fact, he could not persuade his father to finance him in taking out the patent for his invention, so he wrote out a description of it and took it to an official, who, in this country, we should call a "notary public," and made a sworn statement

### A LUCKY ESCAPE



Mr. John Scott Taggart shortly after his recent aeroplane accident. Mr. Scott Taggart, who has enthusiastically taken to the air and pilots an aeroplane of his own, was flying to his sister's wedding when he had the crash. The machine very narrowly missed a house and was badly damaged, although luckily Mr. Scott Taggart escaped with but a few bruises.

before him. In subsequent litigation this statement was held to establish his priority to the invention.

### A New Note in Sets

This month our leading feature is "The Ten Pound Five," a set specially designed for use with small indoor aerials, and for the convenience of those who cannot erect an outdoor aerial. Complete with single-dial tuning, wave-changing by means of a switch, a volume control, and the latest improvements to ensure the best possible quality of reproduction, this receiver strikes quite a new note.

It is what may be termed a "specialised" set, the object of which is to give certain definite results in certain conditions, and while it does not pretend to get the fullest possible magnification out of the number of valves used (this cannot be done without detracting from the simplicity of the design), it is astonishingly efficient compared with the best five-valve sets available a year or two ago.

### Popular Receivers

As we anticipated, the "Air Commander" is proving exceedingly popular at home and abroad, while the "Champion" Three has fully justified its name. Next month we hope to give first particulars of an amplifier with unique qualities. Watch for this! When we promise a good thing you know you will get it!

By the way, if you especially like any particular design, or type of design, why not write and let us know?

## L.S.D. and B.B.C.

*Some interesting facts and figures about the cost of broadcasting in this country.*

From a Special Correspondent

**D**URING 1928 the B.B.C.'s income amounted to £1,002,505. At first sight this looks a gigantic sum of money, and many a listener might carelessly assume that, with this cash, broadcasting programmes every night should be absolutely tip-top. Well, perhaps they should be. But let us look at the question of how this income is derived and how it is expended.

Out of this gross income, the B.B.C., in 1928, spent £879,324, which left a balance of £123,181, which was carried to the revenue appropriation account.

### Excellent Figures

Compared with 1928, the income shows a satisfactory increase. In 1927 the total income was £800,959, and the total expenditure was £773,289, which left the B.B.C. a balance of £27,669. In 1928, 2,628,392 licences were taken out, showing an increase of 233,218 over the previous year, while 14,068 free licences were issued to the blind.

Other interesting statistics are that in 68,000 hours' transmission the B.B.C.'s percentage of breakdowns was only .035. Compared with 1927, this shows just a slight increase, but the explanation is due to the damage to the B.B.C.'s aerials during the big gales in November.

The report goes on to show that talks have shown considerable "technical improvement," and have "increased in popularity." This is the B.B.C.'s opinion. Whether it will be acceptable to the majority of listeners we take leave to doubt!

### Successful Charity Appeals

However, the B.B.C.'s "Week's Good Cause" series have certainly proved satisfactory, for over £60,000 has been contributed to charity by listeners. Probably the most successful was the Prince of Wales' appeal last Christmas Day, for this brought in the biggest sum of the year, while Lord Knutsford's appeal for the London Hospital brought in £19,000.

With regard to education in schools and adult education, the report states that 5,000 schools—an increase of 1,000 in the year—took advantage

of the educational facilities provided, and over 700,000 school pamphlets were circulated.

With regard to the B.B.C.'s publications, a third edition of "The Radio Times" was added, entitled "The Scottish-Ulster Edition," and the average circulation showed an increase by 130,000 during the year; while the circulation of "World Radio" increased 30,000.

It appears that satisfactory arrangements have now been concluded for the erection of the new 2 LO in Portland Place, where, in due course, double accommodation will be available for rehearsals and performances. Listeners already know, of course, that the new Manchester studios are in operation, and that the old receiving experimental station at Keston has now been dismantled, and a new one is being built at Tatsfield, a few miles away.

## DURING 1928 THE B.B.C.—

*RECEIVED* £1,002,505 from its varied activities and in revenue collected by the Post Office from licence-holders.

*SPENT* £879,324.

*COLLECTED* over £60,000 for charities in connection with *The Week's Good Cause*, and

*LOST* the services of several famous members of its staff.

From the organising and financial point of view, no doubt the B.B.C. has every reason to be pleased with itself, for the balance of capital account allowed just under £170,000 to be available for the development of the new regional scheme. Investments increased by nearly £70,000, and the depreciation and reserve increased by £31,150. Income from licences indicated an increase of £71,000, and an increased revenue from publications of over £20,000.

The total expenditure on programmes, cost of staff, etc., showed a

decrease of about 2 per cent; but, nevertheless, the actual amount spent under this heading was increased by over £50,000 during the year. £538,990 was spent on programmes, working out at a daily expenditure of £1,477.

### Valuable Officials Leave

In view of the above figures, a good many critics in the Press have been inquiring why the B.B.C. has been unable to retain the services of its most capable and experienced officials. As our readers know (with considerable regret), Captain West, Mr. Cecil Lewis, Mr. Rex Palmer, Mr. R. E. Jeffrey, and other members of the staff have now left the B.B.C. to take up more satisfactory posts elsewhere.

This undoubtedly does cause a good deal of unsatisfactory criticism, and no explanation seems to be obtainable from the B.B.C. Despite its huge revenue and the monopoly it has been given by the Government, it absolutely refuses to let the public know the full details concerning its expenditure.

We know roughly what is spent on programmes, and this, that, and the other; but the details such as salaries, for instance, are withheld. Furthermore, the expenditure of the Corporation is free from any sort of control, and one would assume that such a Corporation as the B.B.C. should be open to criticism or control either by the Treasury or the Public Accounts Committee.

### Poor Fees Offered

After all, it is the listener who provides the money; and the listener, like any shareholder, is entitled to a little more confidence than the B.B.C. gives at the moment.

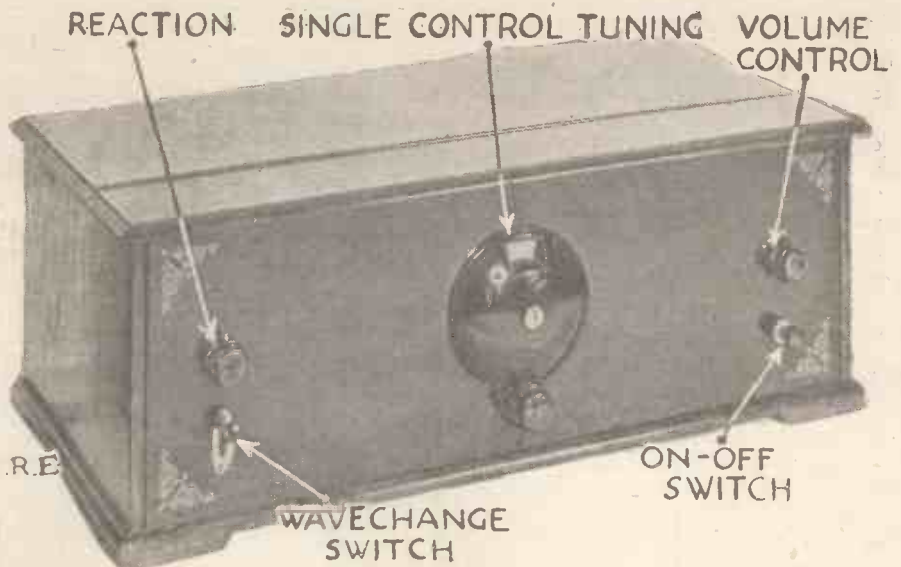
Anyway, the facts are that vast sums of money are flowing into Savoy Hill and flowing out again, and yet the best talent seems to be leaving the B.B.C.

Everybody knows the old stories about the poor fees offered to well-known artists, and even to-day we are aware of certain well-known theatrical and concert stars who, when approached by the B.B.C., were offered fees which were, to put it frankly, of the most meagre proportions. It may be that the old wartime policy holds too strongly at Savoy Hill—the policy of not paying too large salaries, but too many.

Probably this is what is wrong at the B.B.C. to-day, and it is probably the explanation why so many of its talented staff members are seeking employment elsewhere.

# THE "TEN POUND FIVE"

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



It is sometimes forgotten that a considerable proportion of the residents in highly populated areas such as London, Manchester, and Glasgow, are unable to erect an outdoor aerial. In such circumstances they are only able to enjoy wireless reception if the particular receiver chosen is capable of working either on a frame or on an indoor aerial.

## No Outdoor Aerial Needed

Doubtless, the big sales of the so-called portable and transportable receivers can be largely accounted for by the fact that they are completely self-contained and thus lend themselves admirably to the requirements of the flat-dweller. Such receivers are, of course, designed to work with a frame aerial concealed in the cabinet or lid and, as this available frame aerial is so small, five valves are used in the majority of such receivers.

*A quality set for the indoor aerial. Remarkable power and purity are achieved inexpensively and by an exceptionally easy-to-make design.*

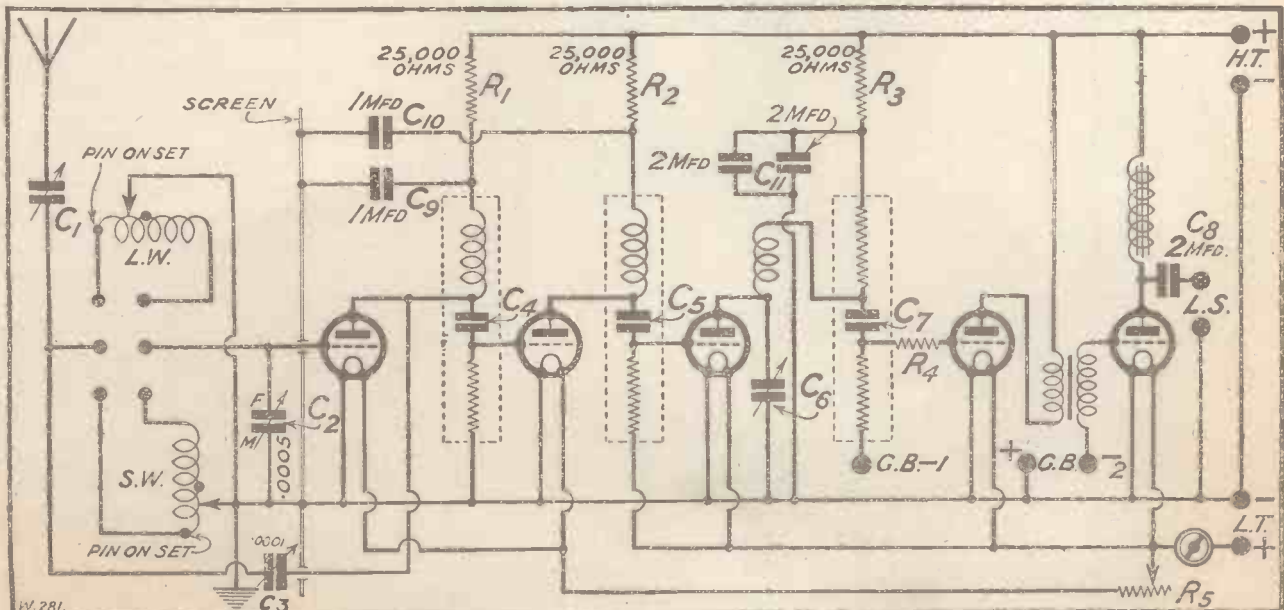
Now, as recently explained in the "Editor's Chat," highly coloured and exaggerated claims are all too frequently made for such receivers, whereas, technically, they are incapable of anything outstanding in performance. Almost invariably they consist of two untuned radio-frequency stages, a detector, and two stages of note magnification, and in a very large number of cases the frame is no more than twelve inches square.

If, as may be assumed, it is not so much their portability as the fact that they give good reception without an

outdoor aerial that makes them appeal to so many people, why not attempt to design a receiver with the same number of valves, the same general simplicity of operation, but a number of special features not possible of incorporation in a compact portable set, and thus endeavour to get the best possible results, not on a 12-in. frame, but on the much more efficient indoor aerial, consisting of a wire round the picture rail?

## The Total Cost

These are some of the thoughts which entered my mind a few months ago, and they soon crystallised into the "Ten Pound Five," which takes its name from the fact that, although it possesses such valuable features as single control tuning, wave-changing by means of a switch, a volume



The circuit of the "Ten Pound Five" embodies many features of exceptional interest

## The "Ten Pound Five"—continued

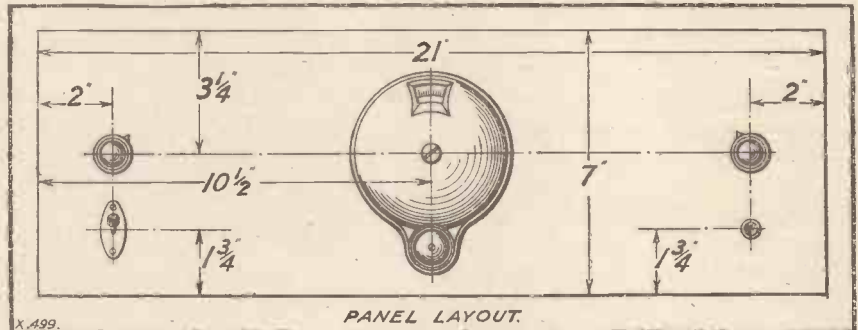
control, high quality reproduction, anti-motor-boating devices, an output filter, and single H.T. positive terminal for all circuits, it can yet be built, exactly as shown, in a handsome cabinet with a decorated ebonite panel, vernier dial, and including coils (but not including valves or batteries), for well under ten pounds. Add to this five valves and accumulator, high-tension battery and one of the excellent low-priced loud speakers now available, and you will find the cost will still come under that of any portable which gives comparable results.

### Continental on Loud Speaker

The sensitivity and the selectivity of the set are, of course, not so great as would be the case if the high-frequency stages were tuned, but the sensitivity is nevertheless much greater than most readers would imagine, particularly on the long waves.

So far as these latter are concerned, it is possible, for example, in the WIRELESS CONSTRUCTOR laboratory at Wimbledon, to receive Hilversum on the loud speaker, using as an aerial a single wire stretched across the

hausen, Eiffel Tower, Motala, Kalundborg and Hilversum are all receivable at excellent loud-speaker strength, and without any of the usual sacrifice of quality due to the excessive use of reaction.



room and measuring between insulators only 14 ft. With our standard indoor aerial (consisting of a wire across the rafters in the loft immediately above the laboratory), Huizen, Radio-Paris, 5 X X, Konigswuster-

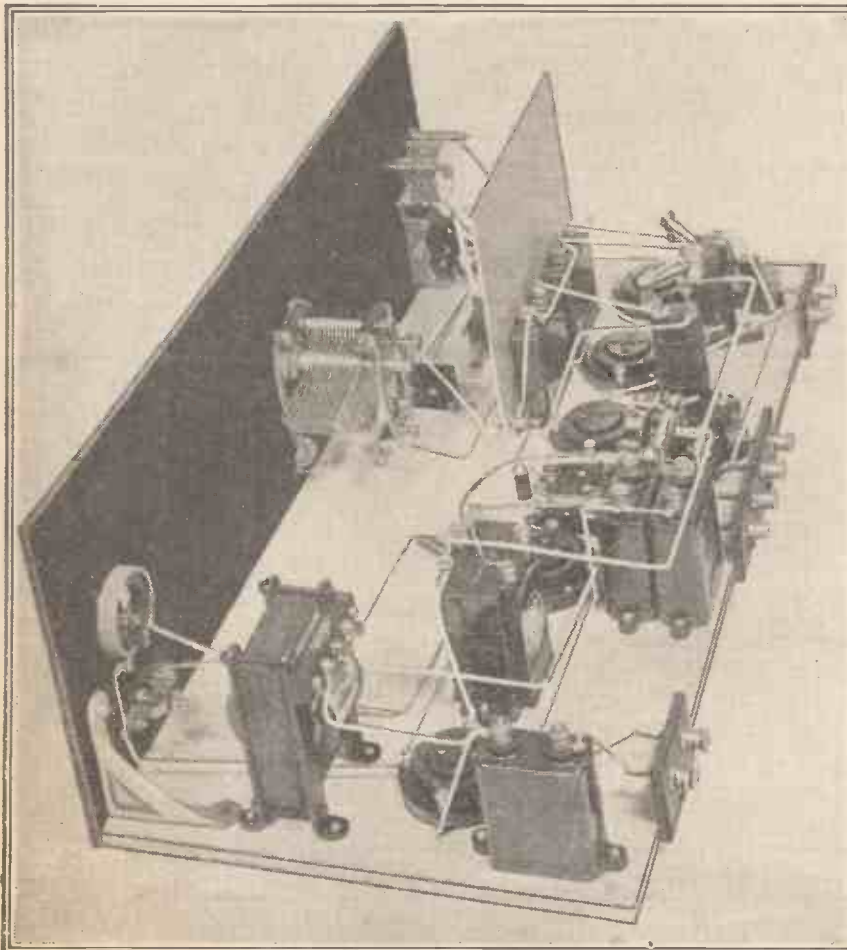
On the short waves, delightful quality and far more strength than can be utilised in a living-room is obtainable from London and 5 GB in daylight, while after dark you will be able to pick up quite a number of "continentals" by simply turning the dial, and without altering the reaction setting from that which is best at the bottom of the scale. It is, however, on the long wave-band that this receiver so particularly distinguishes itself. Its sensitivity there is amazing, even on the smallest indoor aerial.

### An Ideal "Family" Set

Seeing that the touch of a switch changes from one wave-band to the other, it will be realised that on the smallest aerial, and with practically any conditions, quite a number of alternative programmes are readily available. And it may be said that the quality is fully worthy of the best loud speaker.

The more expert user, with a judicious use of reaction, will be able to log a considerable number of stations on the indoor aerial and on the lower wave-band, but it is one of the great advantages of this receiver that, owing to the particular scheme I have used, reaction is practically constant over both wave-bands. No tricky neutralisation has to be resorted to in order to get best results, and for quite a number of programmes the only control necessary is the single tuning dial. Thus, as a family receiver for unskilled use, it is practically ideal.

On an outdoor aerial in the immediate vicinity of a broadcasting



Note the novel and simple screening employed.



## The "Ten Pound Five"—continued

station the selectivity is scarcely good enough, as the set stands, but if your nearest station is forty of fifty miles away, and thus not close enough to give a "wash-out" effect, then the selectivity will be found quite good enough for the largest outdoor aerial.

For those who desire to use this receiver on an outdoor aerial, in conditions where normally the local station is spread too wide over the tuning band, a simple wave-trap will meet the case, and particulars are given in this article of one which is so inexpensive to build that the cost of it can be included in the ten-pound note referred to.

### Circuit Considerations

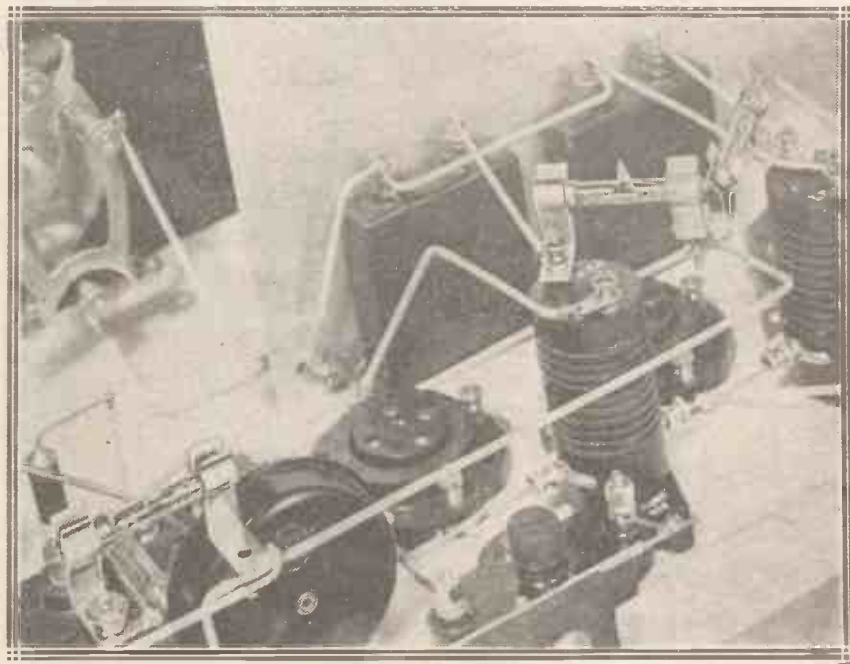
And now let us look at the circuit, which contains a number of features of interest. Thus we have the WIRELESS CONSTRUCTOR standard scheme of a 4-mfd. (in place of the old 2-mfd.) condenser, together with a resistance, as a de-coupling or anti-motor-boating device in the detector circuit, and an output filter consisting of a choke and condenser combination, which time has shown to be the most generally satisfactory scheme.

The combination of the 4-mfd. and 25,000-ohm resistance, together with the output choke and condenser, not only secures admirable quality with freedom from low-frequency reaction, but also enables us, together with a scheme of a similar nature in the high-frequency stages, to get what we have aimed to make as far as possible a standard scheme in this

journal, a single high-tension tapping for the whole set.

The benefit of this scheme has been previously explained in this journal, and lies in the fact that the user of an eliminator has no need to worry about or guess at his voltages for various

If, again, the constructor uses high-tension accumulators, he will find it a great advantage to be able to use the whole battery and discharge it uniformly instead of having tappings which discharge some sections of the battery before others. The user of dry



The unique method of mounting the de-coupling resistances makes for simple wiring, efficiency and low cost.

circuits, it merely being necessary to connect the whole receiver to the maximum tapping (if this does not exceed 150 volts under load) or to any tapping giving from 120 to 150 volts.

cells also is in an advantageous position, for his batteries will give good quality much longer than would be the case without such a scheme, and he will be delivered from certain distortion troubles usually occurring

### COMPONENTS REQUIRED

- 1 Panel, 21 in. × 7 in. ×  $\frac{1}{8}$  in. (Resiston Goldecorners). (Ebonart, Beool, Ripault, etc.)
- 1 Cabinet for same, with 10-in. baseboard (Cameo). (Arterraft, Raymond, Ready Radio, Caxton, etc.)
- 1 Pair small brackets (Magnum).
- 1 '0005 variable condenser (Lissen) (Lotus, Ormond, Polar, Cyldon, Formo, Igranic, J.B., Utility, etc.)
- 1 Vernier dial for same (Lissen) (Igranic, Utility, J.B., etc.)
- 1 '0001 reaction condenser (Key-stone). (Lissen, Cyldon, Polar, etc.)
- 1 D.P.D.T. switch (Utility).
- 1 On-and-off switch (Lotus). (Decko, Duco, Benjamin, Magnum, Igranic, etc.)
- 1 Panel-mounting 30-ohm resistance (Precision). (Igranic, Lissen.)
- 1 Screen, 7 in. × 6 in. (Magnum) (Ready Radio, Paroussi, Peto Scott, etc.)

- 2 Coil holders (Any good make).
- 2 Adjustable condensers, '00027 or '0003 max. (Igranic Preset). (Formodensor).
- 5 Valve holders (Lotus). (Benjamin, Wearite, W. & B., etc.)
- 2 H.F. units, 1 and 2 (Peto Scott).
- 2 1-mfd. condensers (Dubilier and T.C.C.). (Hydra, Ferranti.)
- 3 2-mfd. condensers (Dubilier and T.C.C.). (Hydra, Ferranti.)
- 1 R.C. coupling unit (Lissen) (Dubilier, Detex, Trix, etc.)
- 1 R.F. choke (Igranic). (Lissen, R.I. Wearite, Leweos, etc.)
- 3 Vacuum resistances, with clips (Loewe, 25,000 ohms, or Ediswan, 20,000 ohms).
- 1  $\frac{1}{2}$ -meg. leak (Pye).
- 1 L.F. transformer (Hypermu). (Ferranti, Brown, Igranic, Lissen Super etc.)
- 1 Output choke (Magnum) (R.I. Wearite, Pye, etc.)

- 8 Terminals.
- 2 Ebonite strips, 2 in. × 1½ in.
- 1 Ebonite strip, 4 in. × 1½ in.
- 3 Wander-plugs (5 if 2 grid batteries are joined in series for S/P valve).
- 1 X coil, No. 75 (Any good make).
- 1 X coil, No. 250 (Any good make).

### FOR WAVE-TRAP IF REQUIRED.

- 1 Paxolin or Pirtoid tube, 3 in. diameter, 3½ in. long.
- 1 Piece of wood, 5 in. × 3½ in.
- 1 Adjustable condenser, '0005' max. (Formodensor).

### VALVES.

- 2 H.L. type.
- 1 R.C. type
- 1 H.F. type.
- 1 Power or super-power type.

NOTE.—Use 120 to 150 volts H.T. for best results, and grid bias as recommended by valve makers.

# The "Ten Pound Five"—continued

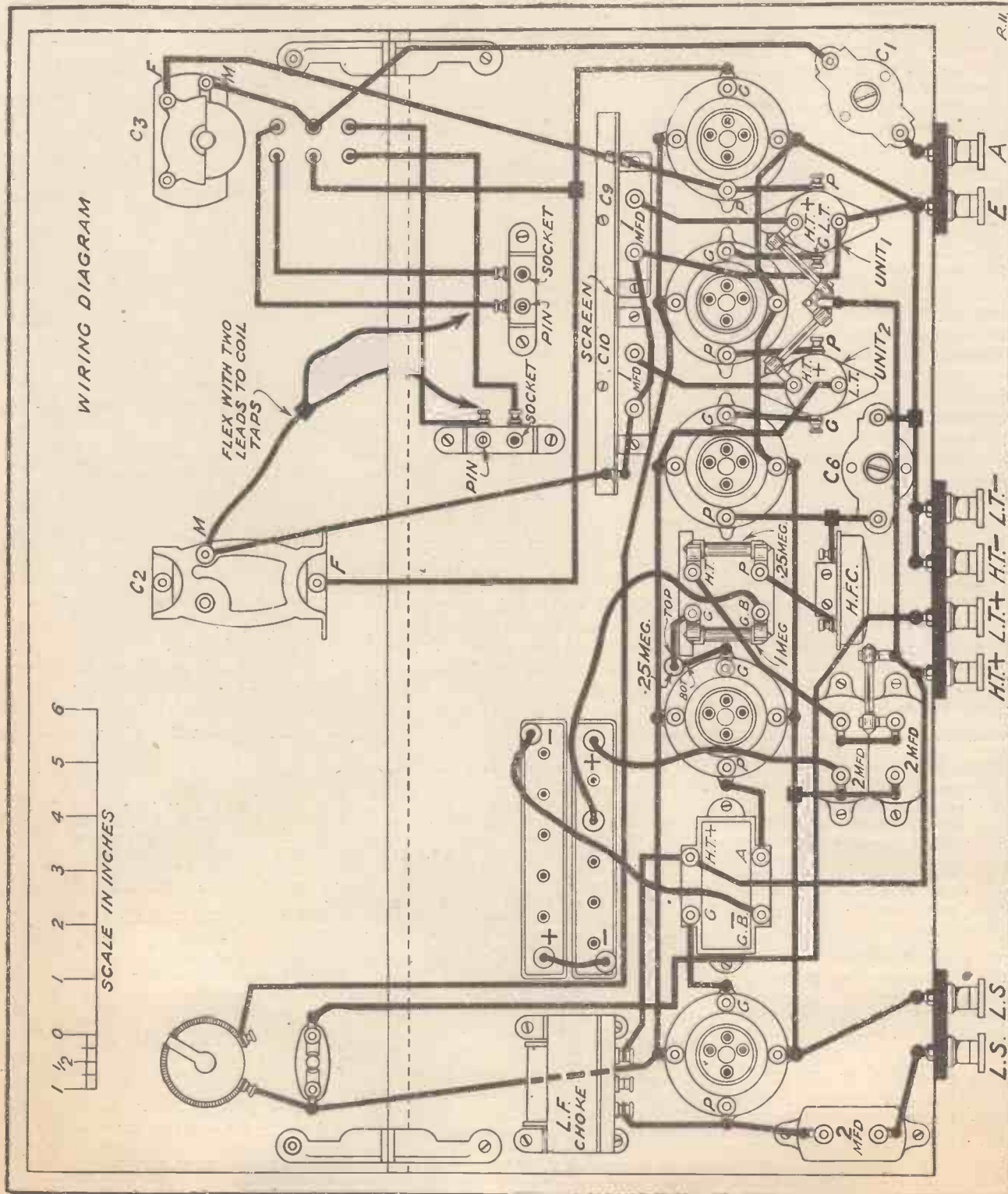
in sets when running on dry batteries which have lost the freshness of youth).

Considering the circuit in detail, we start with the aerial terminal from which a lead is taken to an adjustable

condenser, and from this to one of the centre blades of a double-pole double-throw switch.

The actual scheme here is the same as that adopted in the very successful "Request" Three, two X coils being

used, the larger portion of each coil being tuned by the tuning condenser, and the lower portion serving both as aerial coupling and as reaction; a rather peculiar scheme which works very well in practice.



## The "Ten Pound Five"—*continued*

Reaction is obtained from the anode of the first high-frequency valve, through a .0001-mfd. variable condenser, and the method of coupling the first two valves is by means of high-frequency chokes, the choke for each coupling, together with a condenser and grid leak, being formed into one unit. (This pair of units is sold by Messrs. Peto Scott, Ltd.)

Incidentally, the special pair of units must be used here, as the natural wave-length of each choke is different, and the values are so arranged that unwanted self oscillation will not occur owing to the two chokes employed having the same natural period.

### Simplified Tuning

The simplicity of this form of coupling—for no tuning condenser is needed—lends itself to a very simple layout, and it will be noticed that by placing the coils close to the switch, and by shielding them from the high-frequency coupling chokes, we get

not only an efficient arrangement but a very practical and simple layout.

The detector valve uses grid leak and condenser rectification, the condenser and leak of the second H.F. unit providing the necessary parts for this. Here it should be noted that the first grid leak is taken to negative low tension, and the second to positive low tension, the second being, of course, in the detector circuit.

The detector is coupled to the first note-magnifying valve by means of a resistance-capacity coupling unit, and between the plate of the detector valve and negative L.T. another adjustable condenser is placed to take care of the high-frequency component flowing in the plate circuit of the detector valve.

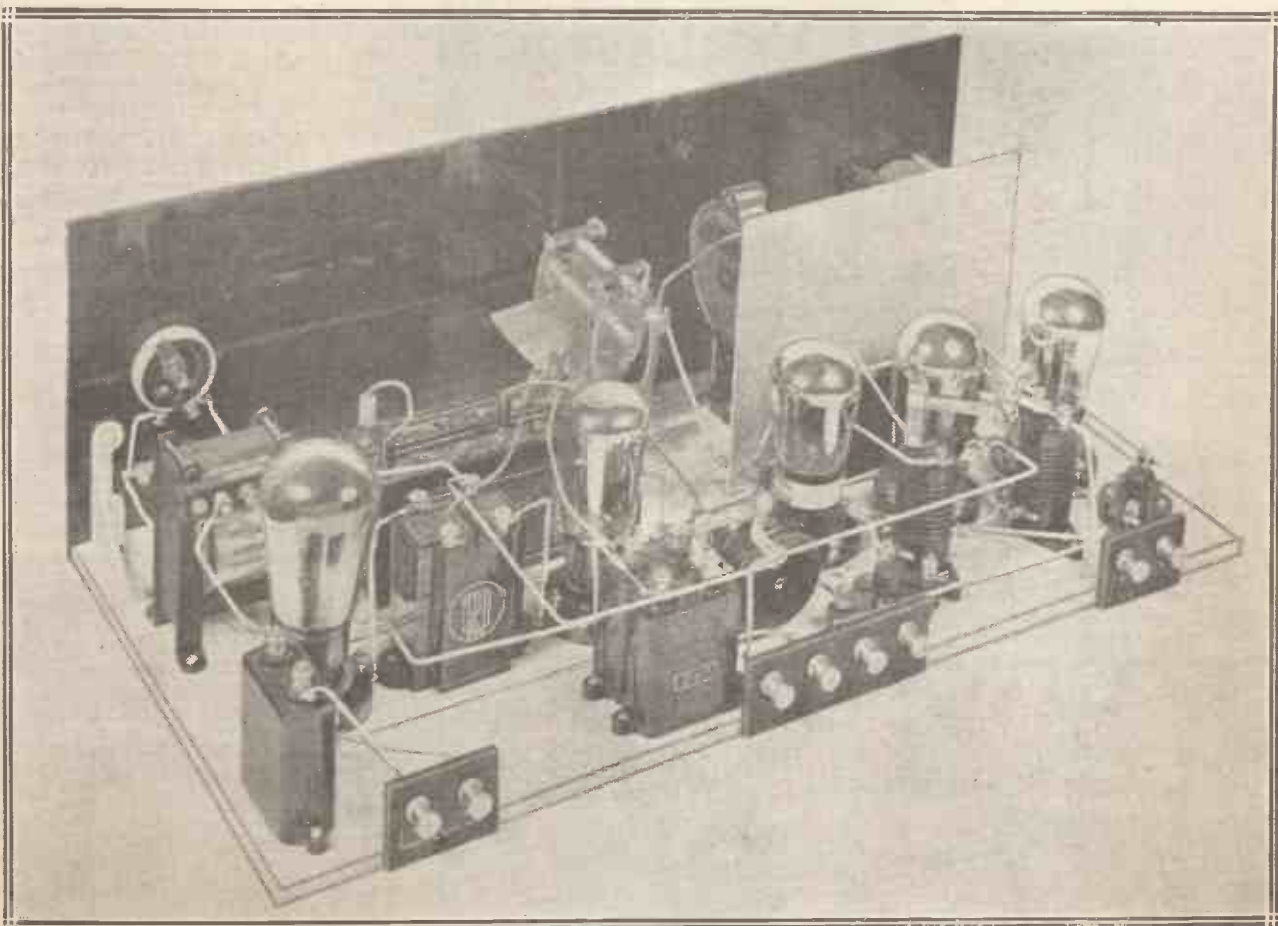
The first L.F. valve is coupled to the output valve by means of the new "Hypermu" transformer, a very remarkable and highly efficient device which was reviewed in our last issue. Incidentally, it should be noted that this transformer can be

used in two different ways, one with a special form of feed, and giving practically a flat curve from the lowest to the highest frequencies, and the other in the usual transformer method, which gives a curve not so good-looking on paper, but with higher magnification.

### Compact and Efficient

The latter form of connection is used so as to utilise the full magnification this transformer is capable of giving; and, in practice, the reproduction loses nothing that is detectable to the ear on anything other than a moving-coil loud speaker.

In the output of the detector valve, we have a low-frequency choke of good quality. Reverting now to the high-frequency stages, it will be noticed that the 25,000-ohm resistance, shunted on the coupling side to filament by a 1-mfd. condenser, is used in each high-frequency stage, the vacuum type of resistance being adopted here. It will be noticed, too,



*Simplicity both of circuit and layout are prominent features in this design.*

## The "Ten Pound Five"—continued

that a rather novel method of attachment is used, the clips of the resistance being screwed underneath the H.T. terminals of the unit at one end, and joining at the other by means of a screw which keeps both clips firm. The point of junction of the two resistances goes to positive high-tension. A 25,000-ohm resistance, shunted by 4-mfd. to filament, is used as the anode feed of the detector valve plate circuit.

Although no attempt has been made to compress the receiver at any

part, it will be noticed that the general layout is exceedingly compact, while leaving at the same time ample room for the inclusion in the cabinet of the grid-bias battery. Aerial and earth terminals, low- and high-tension terminals, and loud-speaker terminals are symmetrically placed, and there is even room inside, if desired, for a 2-volt accumulator of reasonable size, such as the pattern which has become popular for portable receivers. Normally, however, this is better kept outside the cabinet.

Some readers may wonder why a radio-frequency choke is included in the detector circuit, although there is no reaction used in this circuit. The reason is that the radio-frequency choke offers a high impedance to high-frequency currents, which are by-passed to the filament through the adjustable condenser, the value of which should be as high as possible without sacrifice of quality or signal strength. The actual variable condenser used is an Igranic, about .00025 mfd., and normally can be used screwed right down. In this way, high-frequency currents are kept out of the low-frequency side, where they often cause distortion in sets which have no such provision.

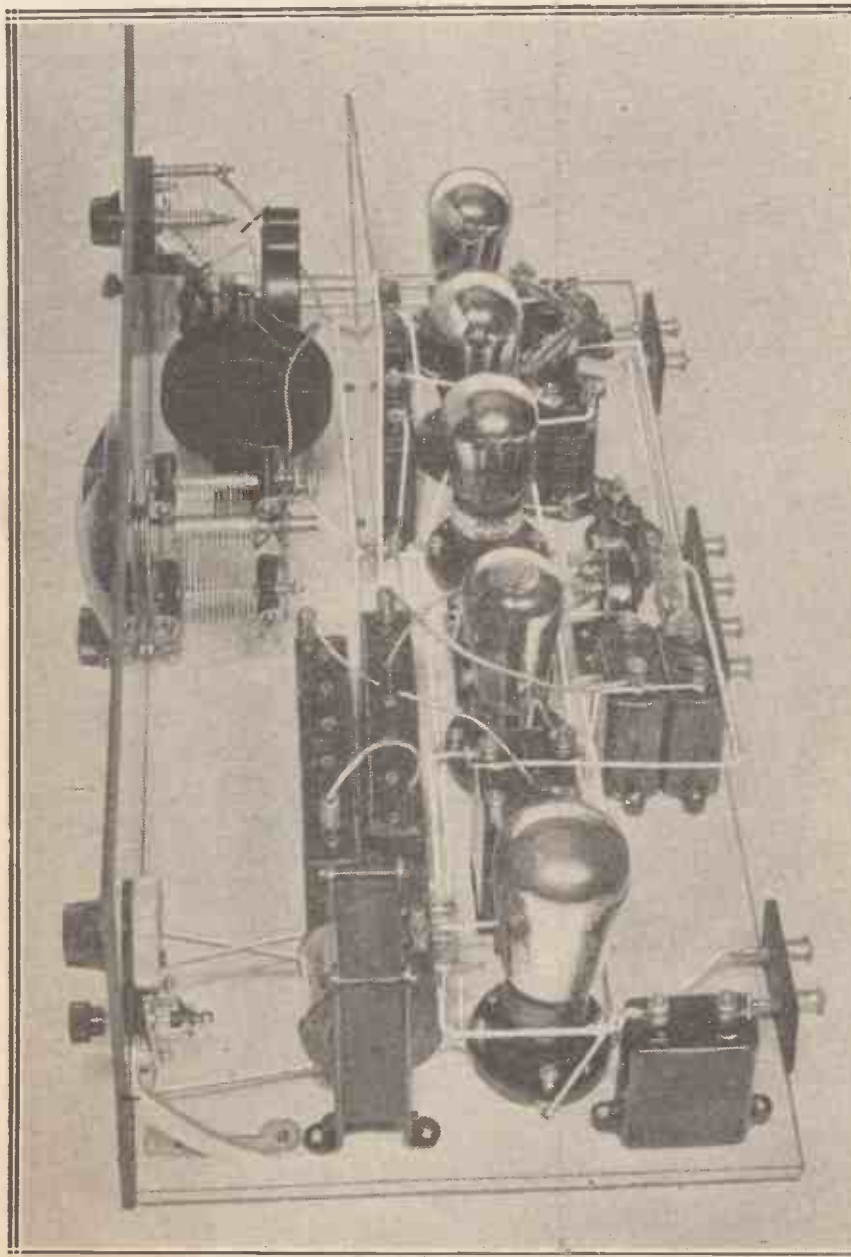
### Numerous Refinements

Examining the panel, it will be seen that, although a perfectly symmetrical layout has been possible, nevertheless the parts seem to fall in their natural positions, so far as the controls are concerned. Take, for example, the tuning condenser, the coils, the reaction condenser, and the switch. Again, the volume control, which is really a filament resistance controlling the two high-frequency valves, falls naturally to the right, above the on-and-off switch, to which, incidentally, it is connected.

The whole receiver, in fact, can be considered as the utilisation of the type of circuit which has become so popular in five-valve portables, with the addition of numerous refinements which are not included in any portable set on the market. Although the general cost of this set, as previously mentioned, is under ten pounds (following the usual practice of not including in the "set" cost the cost of the valves and batteries), this low figure has not been obtained at the sacrifice of quality in any part of the receiver.

### The Parts to Use

The names of the parts used in the laboratory model are given in brackets following each name in the list of components, but in order that the reader may have the widest possible choice, a number of good alternatives are also given. The only case in which no alternative is suggested is the high-frequency coupling, for here the reader must be careful to obtain the actual units specified, as the



Even with the valves, grid batteries and coils in position the set fails to look as complicated as most sets using fewer valves.

## The "Ten Pound Five"—continued

design has been worked out for these, and there is no exact equivalent in other makes.

The more experienced reader, who is experimentally inclined, may care to try resistance coupling here, the values suggested being  $\frac{1}{2}$ -megohm anode resistances, .0003-mfd. coupling condensers, and 2-megohm grid leaks. The results, however, will not be so good, and the change is not recommended except to those conversant with such matters.

### A Reaction Puzzle

There are several very interesting points regarding the particular form of high-frequency coupling used. Obviously, the coupling must have *some* natural period, and if both couplings had the same natural frequency the set would be hopelessly unstable.

The manufacturers of the particular couplings used have, therefore, made the natural period of each somewhat different, so that they are "out of tune" with one another, although offering a high impedance to broadcast wave-lengths. With regard to the first coupling, it will follow that when the first grid circuit is tuned to the natural frequency of the coupling, continuous oscillation will take place. This happens, as a matter of fact, at a wave-length somewhere above 2,000 metres, so that at the extreme end of the upper wave-band (and above the wave-length of any station you will want to receive) the set will oscillate when the reaction condenser is at zero setting.

You will find, however, a peculiar effect, for, when you alter the reaction setting so that the plates are slightly interleaved, this oscillation will cease. In case this may puzzle you, it should be explained that, with the very small capacity and the reaction winding, the self-capacity of the valve is neutralised and therefore the feedback effect causing self-oscillation is annulled.

### The Valves

When we increase the capacity still further, the set will oscillate, due to the before-mentioned reaction effect. This is mentioned in case the reader, when experimenting with the set, should imagine that there is something wrong at the very top of the scale. Remember the top of the scale on the upper band is above

the wave-length range for which the set is designed.

It will thus be seen that the set is somewhat similar to the "New Business Man's" Four, where choke high-frequency coupling is used with reaction on the first valve, but instead of one choke-coupled high-frequency stage two are used, with ordinary high-frequency valves.

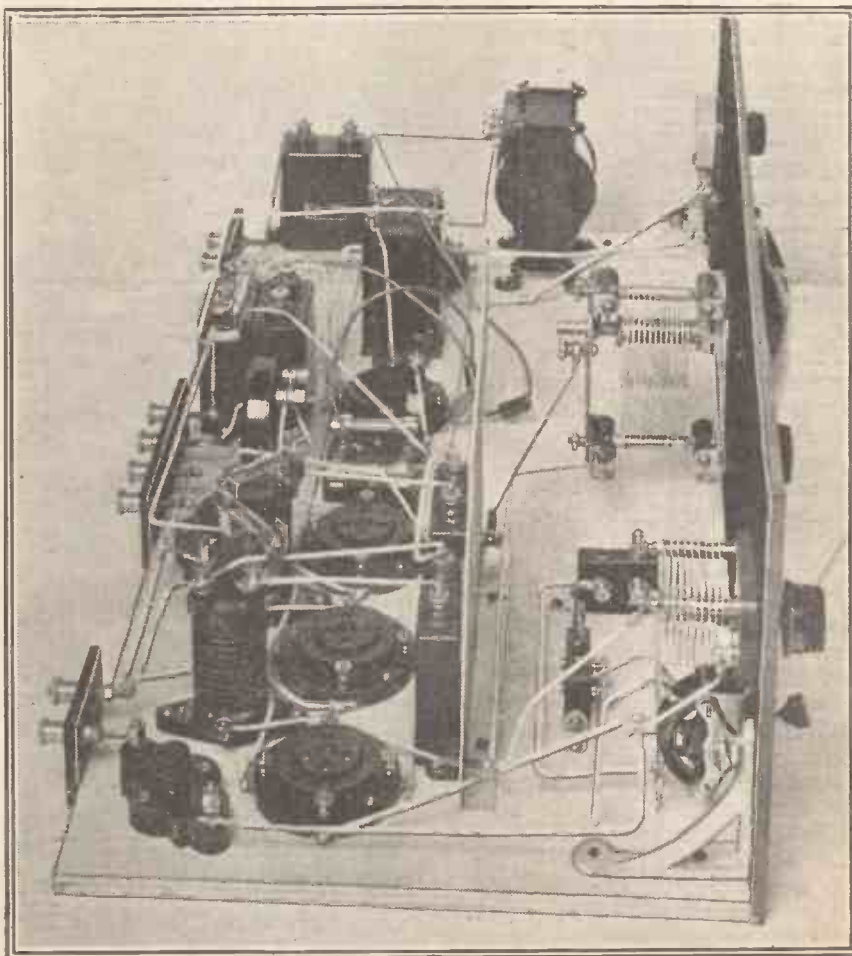
With regard to the valves, numerous experiments have shown that best results with this coupling are obtained in valves having an impedance of 30,000 and an ampli-

and the H.L.210 in the 2-volt class for the high-frequency stages, in either the Marconi or Osram makes.

The detector valve should be an R.C. valve of any of the good makes, whilst the particular transformer arrangement works well with a high-frequency valve of any good make. The output valve should be carefully chosen to suit the particular form of high-tension supply available.

### Batteries or Unit?

If you are running the set from a mains unit, then use a super-power



A view of the set which will help you during the wiring of the variable condensers.

fication figure of about 30. The H.L. type of valve in the 6-volt class are found to be best of all, and next to these the high-frequency type in the various makes.

These differ, however, between makes, and one or two makes will not oscillate satisfactorily in the first stage. I would therefore recommend the H.L.610 in the 6-volt class,

valve of any of the leading makes, with adequate grid bias, but if you are limited to dry batteries then the drain will probably be too great except for the largest and most expensive sizes of battery, and therefore I would recommend a power valve with its less extravagant consumption.

(Continued on page 183.)

# QUEER QUERIES

Some typical radio faults  
reviewed and questions  
answered.

By P. R. BIRD.



A VERY vexed Lincoln reader has been "on at me" about voltage drop! He says that up to a little time ago he thought that if he plugged the H.T. + plug for his last valve into the 120-volt socket on his H.T.B., he naturally expected he was working on 120 volts. Then he found that H.T. batteries drop their voltage after a time, and so to get 120 volts he had to go higher up the battery. That seemed reasonable on the battery's part—"none-of-us-are-getting-younger" kind of thing—but what is bothering him now is a friend's statement that his output choke also has a "voltage drop," and so to get 120 volts on the plate, where he wants it, the H.T. + plug must be moved up still farther.

## Plug Positions

After a long and bitter letter about this he winds up: "But the set is the envy of all who hear it. Station after station roll in clear and sweet, and very loud. I never tire of it and would not be without wireless for anything now. But how can I tell if I have got a voltage drop? And how many volts ought I to allow on the H.T. battery plug?"

As to whether he has a voltage drop across an output choke, loud speaker, or anything similar, there is no doubt. All such apparatus means a voltage drop, and in no case does the full voltage on the output valve's + plug reach the plate without loss.

Fortunately it is not a big loss generally, and it is easy to calculate exactly how many volts are "dropped" by a choke (or any similar apparatus), provided you know two things: (a) the D.C. resistance of the choke; and (b) the current flowing in the circuit.

Suppose, for instance, that the

resistance of the choke is 300 ohms, and a current of 10 milliamps is flowing. To find voltage drop you have simply to multiply the ohms by the amps. In this case we have 300 ohms and 10 milliamps (i.e. 0.01 amp.). Three hundred multiplied by .01 gives us 3, which means that three volts are required to push the 10 milliamps through the 300 ohms.

## THE TECHNICAL QUERIES DEPARTMENT

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A postcard will do. On receipt of this all the necessary literature will be sent to you, free and post free, immediately. This application will place you under no obligation whatever. Every reader of the WIRELESS CONSTRUCTOR should have these details, which will enable you to ask your questions so that we can deal with them expeditiously and with the minimum of delay.

London Readers Please Note: Application should not be made in person at Tallis House, or Fleetway House.

So, in such a case, 120 at the battery would mean only 117 on the plate of the valve—nothing to worry about as regards lost voltage, because the choke has a low resistance.

## S.G.'s and Pentodes

So much has been written about the new screened-grid valves and their advantages of stability and high amplification that it is small wonder that constructors are anxious to build sets embodying these new valves. But what is rather wonder-

ful is the weird idea which has got abroad that if you build a screened-grid valve set you can use any ordinary valve in place of the S.G. valve. This is "all wrong"!

The screened-grid valve does not act like the ordinary valve, the connections are not the same as for the ordinary valve, and consequently an ordinary valve *cannot* be used successfully in place of an S.G. valve. There are, of course, ways in which a set can be converted, often without much trouble, so that an S.G. valve can be used in place of an ordinary H.F. amplifying valve. And, on the other hand, it is possible, though not easy, to alter an S.G. set so that ordinary valves can be used in it.

But only when the set has been altered can this be done, and it is a great mistake to stick an ordinary valve into an S.G. valve-holder and to hope for good results.

## The Extra Terminal

Both the screened-grid valve and its low-frequency counterpart, the Pentode, are fitted with an extra terminal, in addition to the four legs similar to those on the ordinary valve. In the case of the Pentode valve, this extra terminal on the valve has to be taken to the high-tension positive in order to bring the valve into its most sensitive condition and to enable it to work properly. Despite its extra terminal, the main conditions of a Pentode valve remain unaltered, that is to say, the grid remains the grid, the two filament pins remain the filaments, and the plate or output leg of the valve holder still takes the plate or output connection from the inside of the Pentode valve.

## Cutting off the Output

In the case of the screened-grid valve, however, matters are quite different. This valve, too, has an extra terminal on the top of the bulb, but this extra terminal in the case of the screened-grid valve is not a sort of auxiliary terminal helping the valve to work properly, but is actually the main output terminal through which all the current flowing through the valve has to emerge in order to reach the remainder of the circuit. If this point is borne in mind, it will be realised how hopeless it is to place an ordinary valve into the S.G. valve socket and to hope for good results when the semi-flexible connection which is the main connection between that valve and the rest of the circuit is left "in the air."

# Playing THE "ACE" BY G.V. COLLE



*Some how-to-handle hints on the fine all-from-the-mains set called the "Ace" which was described last month.*

A POINT in the construction, which was not mentioned in last month's article on building the "Ace," concerns the aerial coil unit. In the wiring diagram a brief reference was made to two  $\frac{1}{2}$ -in. supports on which the coil unit rested, although no reason was given for their use. Actually, they are intended to keep the low-wave windings on the coil unit away from the metal baseplate, the effect of the latter being to increase the aerial damping and so "broaden" the tuning. The writer found that the insulated portions of two "Clix" plugs, with the metal portions removed, served the purpose excellently, the coil being held with 1-in. screws passed through lugs situated at the bottom of the unit, through the hollow centres of the "Clix" plug-heads, through holes in the metal baseplate, and screwed into the wooden baseboard.

### The G.B. Batteries

Before inserting the A.C. valves and joining up to the mains, several adjustments have to be made to the H.T.appings to the potential divider and to the various grid batteries. First of all, verify the connections to the  $1\frac{1}{2}$ -volt "T" cell in the first H.F. compartment; the positive on the battery, i.e. the central electrode terminal, should connect to one side of the .01-mfd. fixed condenser and thence to a screw through the metal baseplate. A connection from the negative terminal goes to the remaining side of the .01-mfd. condenser and so on to various other points, eventually going to the control grid of the screened-grid valve via the secondary winding of the "Titan" coil unit. (Should there be any trouble from instability this "T" cell can

be removed, and a bare wire can be joined in its place across the terminals of  $C_4$ .) Grid bias, applied to the grid of the detector valve ( $V_2$ ), is derived from a  $4\frac{1}{2}$ -volt battery with tappings. The bias applied to the grid is positive and varies between  $1\frac{1}{2}$  and 3 volts.

For general purposes,  $1\frac{1}{2}$  volts will prove sufficient, and can be obtained by connecting the plug, joined by flex to the top end of 2-meg. grid-leak holder, into the positive socket on the battery, the negative connection being taken from the adjacent socket with the flex lead going to a screw

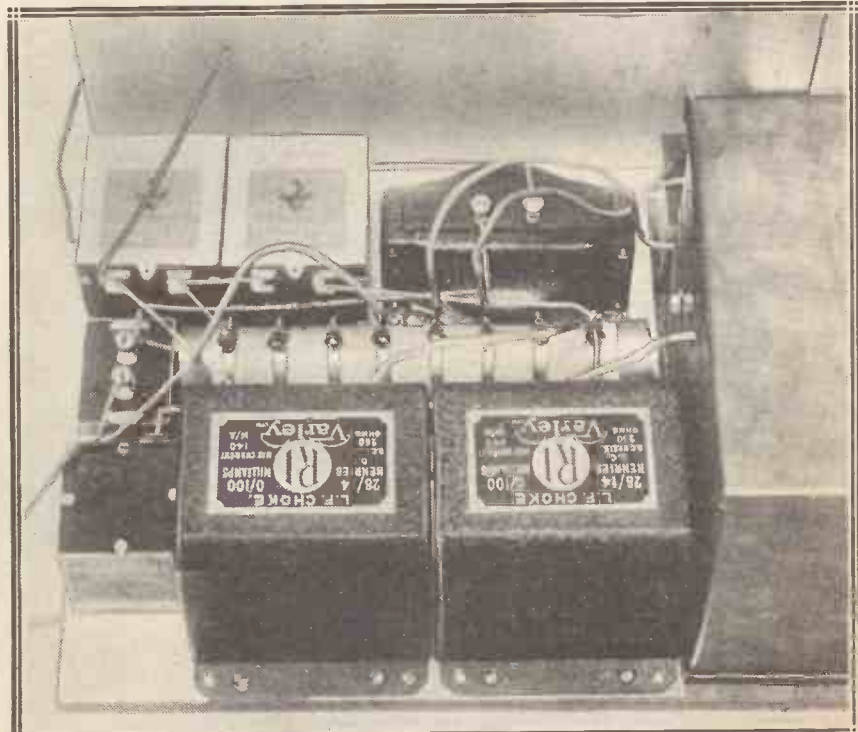
through the "B" vertical screen. Take great care that the connections to this battery are correct.

A further battery of 15 to  $16\frac{1}{2}$  volts will be required for the negative grid bias on the L.F. valve.

Turning now to the H.T. + leads, it will be seen that there are four of these, it being necessary to arrange them so that the correct voltage is applied to each one.

### H.T. Voltages

Fortunately, the problem is not a difficult one, especially if a reasonably accurate voltmeter is at hand, reading 0 to 150 or 0 to 200 volts, although the arranging of the various H.T. + leads can be undertaken from these notes alone, provided the particular A.C.



*This photo shows the smoothing chokes, potential divider and condensers which figure in the H.T. smoothing section of the "Ace."*

## Playing the "Ace"—continued

H.T. transformer and potential divider, as used in the original receiver, are incorporated.

In the first place, the H.T. +4 lead may very well be joined to the maximum positive point (the end) on the potential divider, which, if as specified, will be the 7th clip on the tube, not counting the negative. This automatically applies the maximum H.T. to the L.F. valve, and, being in the region of 200 volts or slightly more, an appropriate negative grid bias must be provided to prevent the anode current of the Red Spot L.F. power valve from becoming excessive.

### The Potential Divider

The H.T. +3 lead is then taken in hand, and, as it is joined to the H.F. choke in the anode circuit of the A.C. screened-grid valve, the lead must be connected to the potential divider at any point between 120 and 150 volts. As a guide, the writer suggests the 5th or 6th clip on the tube, counting from the negative end, but not including that connection. Naturally, it must be understood the points mentioned only remain good for the type of potential divider shown in the photographs and where a voltmeter

is not employed. Where other makes of resistances are used, such as Igranic, R.I.-Varley, Climax, etc., it is advisable to check the voltage before commencing operations. H.T. +1 lead supplies the H.T. potential to the screening grid of the A.C. H.F. valve, and, according to the maker's instructions, should not be in excess of 60 volts.

However, the writer must admit that though he agrees this figure represents the best working voltage from the point of volume, yet it does not represent the most stable point, and therefore should be open to variation. The voltage on H.T. +1 found most suitable was 75 to 80 volts approximately, the lead going to either the 4th or 5th clips, the former apparently allowing the greatest stability.

### Smooth Reaction

Readers should keep an open mind on the subject, and having tried the clip positions advocated are advised later to try slightly lower voltage tappings with a view to increasing the amplification of the screened-grid valve, if at all possible. The detector valve anode is supplied with current by the H.T. +2 plug, the position

of which is not critical, though governed to some extent by reaction. Quite a small voltage in the region of 45 to 60 volts will be found ample, and the writer's only suggestion here is that readers should choose the voltage which gives a smooth reaction control. According to the wiring diagram, the 3rd plug can be tried first, but here again it is possible that the 4th will prove better in certain cases. Before inserting the valves, make it a point of spreading the valve pins with a knife blade so as to ensure good contacts.

### Final Connections

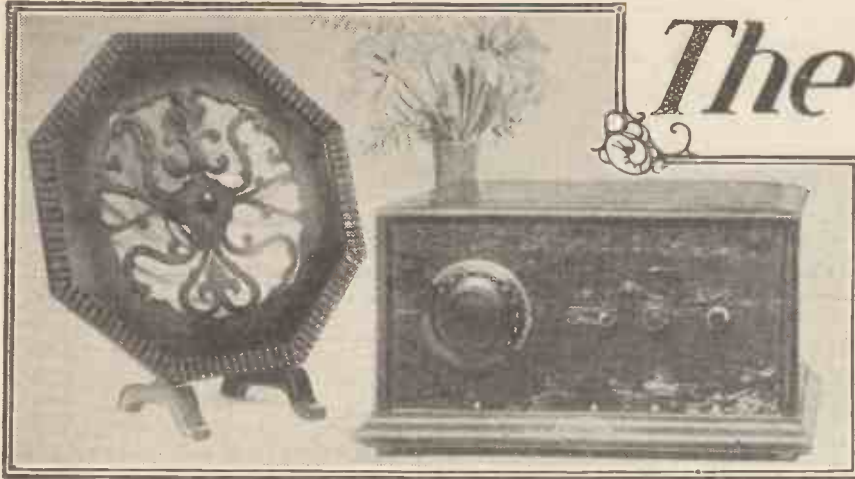
All that remains to be done now is to insert the  $V_5$  full-wave rectifying valve in its holder inside the iron screening box, the lid of which can be replaced. Connect the aerial, earth and loud-speaker leads, set the reaction condenser to minimum, the volume control at maximum, and then insert the mains plug and switch on. If all is well, the set will sound alive after a period of a few seconds, this short delay being due to the indirect heating of filaments. In the case of the L.F. valve, the operator

(Continued on page 184.)



Measuring the voltage across the various H.T. tappings with a high-resistance voltmeter.





# The "ONE COIL TWO" by A.S. CLARK

As you will no doubt have gathered from the name of this set, it is of the wave-change type, which is so popular. A separate loading coil, however, is not employed, one coil being arranged to cover both ranges. This coil is the outcome of a large amount of experimenting, in which it was remade in different forms many times. The results obtained with the finished receiver, however,

### COMPONENTS REQUIRED.

- Panel 14 in. × 7 in.
- Cabinet for above with baseboard 9 in. deep.
- 0005 variable condenser (Ripault).
- 0001 reaction condenser (Peto-Scott).
- 2-pole double-throw switch (Utility).
- L.T. switch (Benjamin).
- 2 Anti-shock valve holders.
- L.F. transformer (Ferranti A.F.3).
- H.F. choke (Lissen).
- 0003 fixed condenser and grid-leak clips (Dubilier).
- 2-megohm grid leak (Dubilier).
- 6-in. lengths of insulating tubing, 3 in. diameter and 2½ in. diameter.
- 9 Terminals and strips of ebonite for same. Wire, screws, etc.

An extremely simple but remarkably effective wave-change two-valver which will appeal to a large number of constructors.

Reinartz set, apart, of course, from the wave-change switch. There is the tuning condenser on the left, followed by the wave-change switch, and then the reaction condenser. The fourth knob to the right of the panel is the L.T. switch with which all modern receivers are provided. The wave-change switch is placed between the two variable condensers so as to bring it conveniently near to the coil, and thus help efficiency.

All the terminals are carried at the back of the set on strips of ebonite screwed to the baseboard. Instead of two separate pieces being employed, the strip can be run the whole length

an inch each end. The slot is 2 in. high.

The grid-bias battery goes inside the set on the baseboard instead of being connected up to terminals. All that has to be done when it is desired to change from the normal broadcast band to the long waves is to push the knob of the wave-change switch over to the left. The connections to this switch are extremely simple, only three of them having to go to the coil. To facilitate the making of these connections, and also the other connections to the coil, the ends of the windings are left fairly long and are taken direct to the various points. The minimum amount of actual wiring is therefore required in the receiver, and that this is not very much can be seen from the pictures of the back of the panel.

### The Special Coil

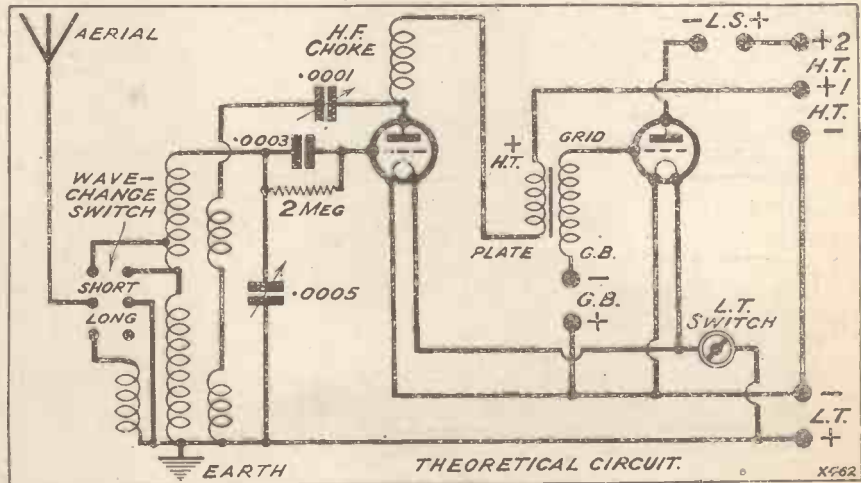
The scheme employed in the special coil can be followed in the

are so good that the research work is amply repaid. The coil is exceptionally efficient both from the point of view of selectivity and strength of reception.

### A Real Advantage

Not the least of the advantages of the coil is that it overcomes a fault that is very puzzling when it occurs. That is, that the local station and sometimes 5 G B come in on the long-wave coil over such a large band that reception of 5 X X is spoilt and it is impossible to receive other long-wave stations at all. An interesting point in connection with the above will be referred to later in this article.

To turn to the general design of the receiver, the controls on the panel are similar to those of any ordinary



of the back of the panel except for an inch each end. The latter is mentioned as it is becoming a standard scheme for cabinet makers to supply their cabinets with a slot for terminal strips right along the back except for

theoretical diagram of the circuit. It will be seen that the tuned winding is wound in two sections, one of which is shorted when the wave-change switch is moved to the short-wave position. The two sections of this

## The "One-Coil Two"—continued

winding when in series are sufficient for tuning over the higher broadcast wave-band. When one section is shorted out, the remaining part has just the right number of turns for the lower wave-band. This short-circuiting operation is done by one half of the wave-change switch.

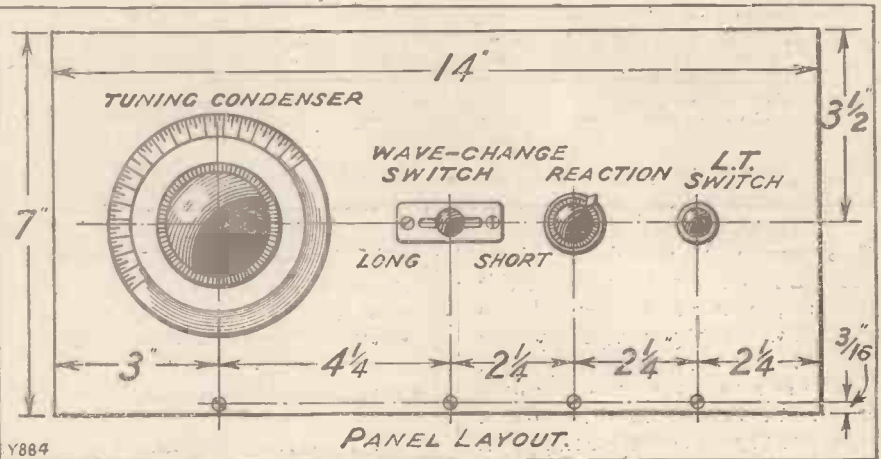
The other half of the wave-change switch changes the aerial over from one coupling coil to another. It will be seen that for short waves, selectivity is obtained by means of a tap on the tuned grid circuit. To use the same tap for the long waves would be almost the same as having a direct-coupled aerial arrangement. This, of course, would give nowhere near sufficient selectivity. A tap was therefore tried on the long-wave section of the grid coil. This was made at 75, 50, and even 25 turns. In all cases, although the tuning of 5 X X was fairly sharp, 2 L O. could be heard fairly strongly as a background no matter to what wave-length the set was tuned.

### The Remedy

A separate coil for aerial coupling on the long waves was therefore tried, and although it was simply wound in hank form and had 20 turns, there was no unpleasant trace of any unwanted stations. Also, not only was the degree of selectivity very high, but the volume of the long-wave stations was better than with the

bands and yet gives a smooth control. It is wound in two sections, one of which is coupled to the lower-wave section of the grid circuit, and the other to the long-wave portion. When

the usual manner. No output filter is incorporated in the set, but when it is used with a loud speaker this can easily be added externally if desired.



working on the long waves, since both sections of the grid coil are in use, the effect is to add the two parts of the reaction winding together. On the lower waves, however, the lower portion of the reaction winding is too far away from the tuned circuit to have any effect, and consequently the effective size of the reaction coil is equal to the number of turns in the top section of the reaction winding.

### Reaction Control

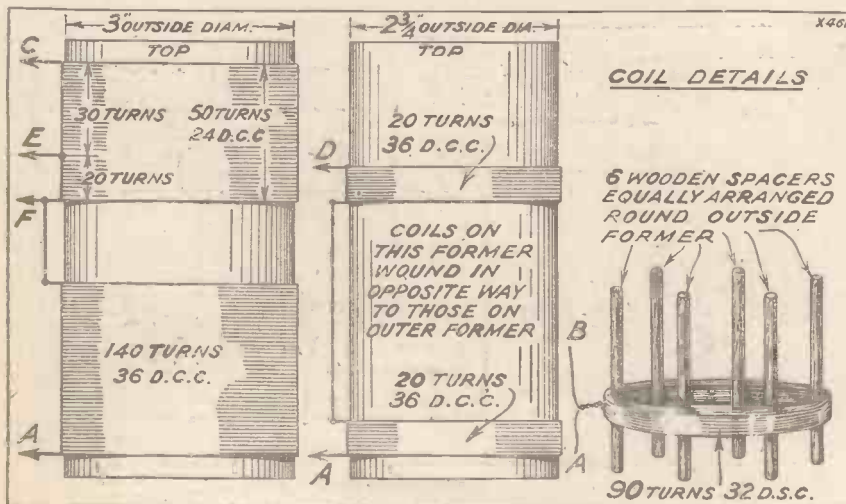
Reaction is controlled by means of the Reinartz method, a .0001 variable

A list of the parts necessary to build this set will be found in another part of the article. It is not necessary to keep exactly to the makes mentioned, as these are merely given to indicate suitable types and the class of parts to buy. Before commencing work on the panel it is as well to get the coil completed, so that once the set is started it can be finished without a break.

Two formers are employed for the coil, the smaller of which has an outside diameter of  $\frac{1}{2}$  in. less than that of the larger. When the winding is on the inner former it will be found to slide just conveniently into the larger without there being any play between the two. A special diagram is given of the coil, and with its help no difficulty should be experienced in constructing it.

### Coil Details

The first part of the diagram shows the windings on the outer former, the second those on the inner, and the third shows the hank winding which goes round the outer former and is separated from it by means of six pieces of wooden stick. The relative positions of the various windings as shown in this diagram must be followed. It will be noticed that the reaction windings are at the low potential end of the coils to which they are coupled, and the hank winding is also towards the low potential or earth end of the larger part of the grid winding.



smaller number of turns used in the aerial with the auto-coupled arrangement.

No switching is needed for the reaction winding, since this is so arranged that it covers both wave-

condenser being employed. Apart from the tuning arrangements and wave-change switching, the circuit is of a straightforward nature. The L.F. valve is coupled to the detector by means of an L.F. transformer in

## The "One-Coil Two"—continued

The ends of the windings are secured by means of two small holes in the formers about  $\frac{1}{4}$  in. apart. The ends should be arranged so that

pleted attention can be turned to actually making the set.

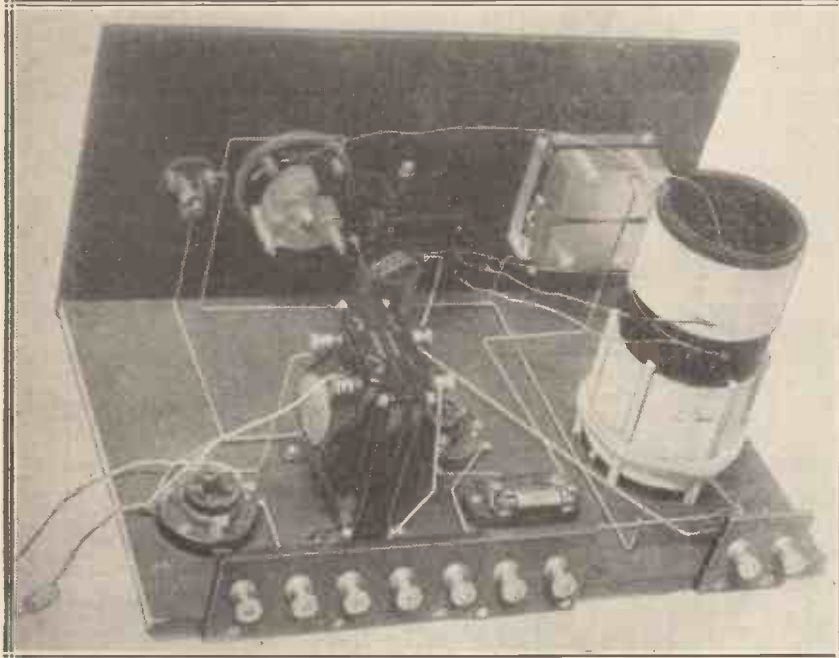
Drill the panel in accordance with the dimensions given on the drilling

terminal strips can be obtained from the wiring diagram. When the panel is drilled mount the components which go on it, then screw it, together with the terminal strips, to the baseboard. The remainder of the components are now fixed in place, the layout as shown in the wiring diagram being followed as closely as possible.

### Connecting Up

The coil is quite simply mounted. A small piece of wood is cut so that it will just fit across the inside of the former when the ends have been rounded a little. This is kept in place by two small screws put through from the outside of the former. The coil is then fixed to the baseboard by means of a fairly large screw put through the centre of the wooden bridge piece.

The wiring does not call for much comment. There is one point, however, to which special attention must be called, and that is the earthing plate of the reaction condenser. If a reaction condenser of different type is employed, it is quite possible that it will not have an earthing plate. Should this be the case, the wire running from the earthing plate terminal to the L.T. switch must be omitted entirely. By the way, the capacity of the reaction condenser is not critical and other makes with a slightly different capacity, such as .00015 or .0002, could be utilised.



*Only one coil and a minimum number of components make the construction and wiring of the set an easy matter.*

they are on the inside of the formers. Both sections of the tuned coil must be wound in the same direction, that is to say, the two parts should be wound the same as if they were one coil. Particular care must be taken to see that the two parts of the reaction winding are wound in the opposite direction to the tuned winding. If the reaction turns are not in the opposite direction, it will be impossible to get any oscillation or reaction effects.

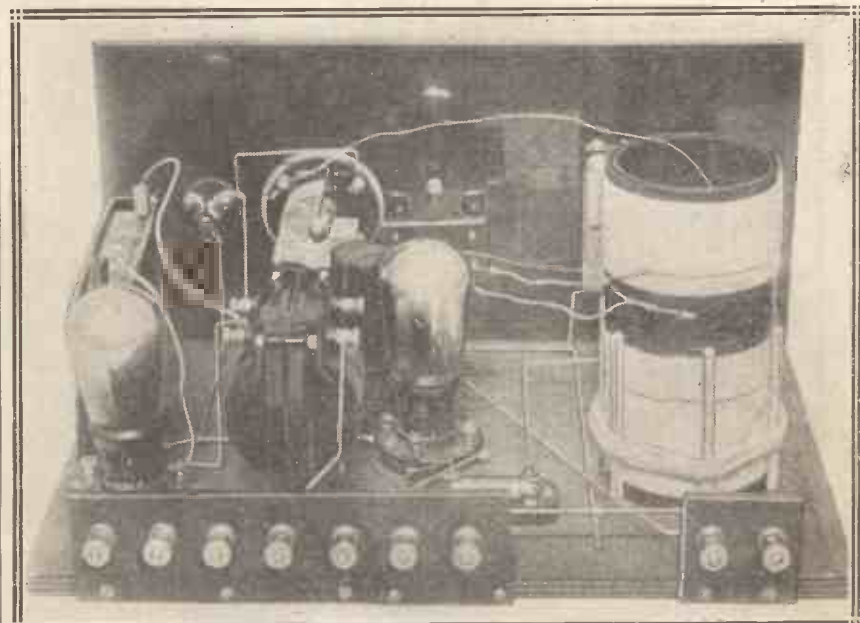
### Assembling the Coil

The two sections of the tuned and reaction windings are joined as shown, and taps are made on the bottom and 20th turn up of the 24 D.C.C. winding.

When putting the smaller former inside the larger, make sure that the two ends marked "Top" are together. The hank coil is wound on six small pieces of wood equally spaced round the lower end of the outer former. It does not seem to matter which way this coil is wound, nor does it matter which end of it is connected to earth. The ends of the windings should be left about 12 in. long for connecting up purposes, and when the coil is com-

pleted attention can be turned to actually making the set. Drill the panel in accordance with the dimensions given on the drilling

terminal strips can be obtained from the wiring diagram. When the panel is drilled mount the components which go on it, then screw it, together with the terminal strips, to the baseboard. The remainder of the components are now fixed in place, the layout as shown in the wiring diagram being followed as closely as possible.



*The hank winding at the lower end of the coil provides aerial coupling on the long waves. An auto-tap is used for the lower band.*

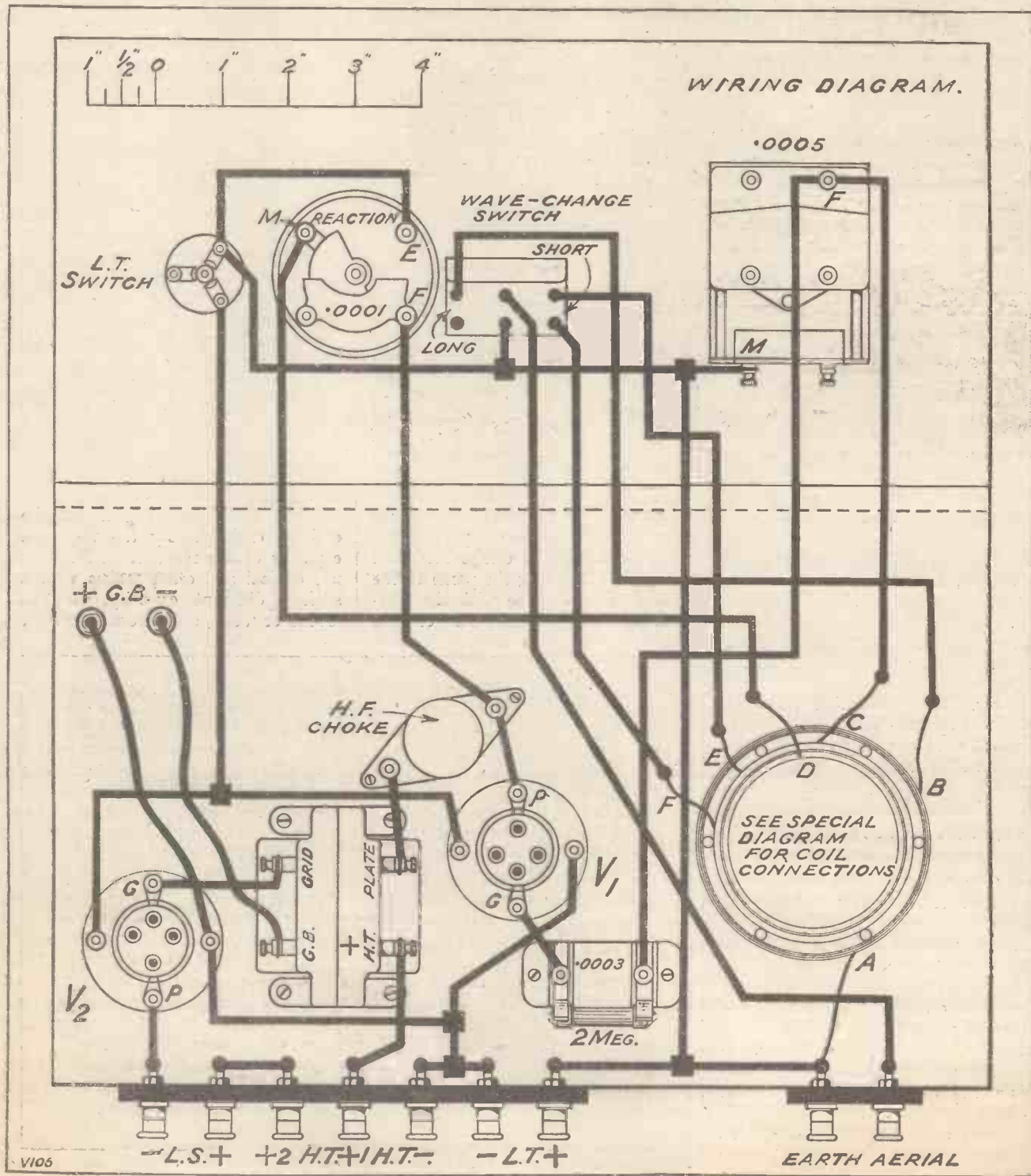
## The "One-Coil Two"—continued

When connecting up the coil reference must be made to the special coil diagram to ascertain which wires have to be connected to the various points. The letters, which correspond in both diagrams, will be very helpful. The three wires marked "A" are all

joined together and then connected to the earth terminal or the wire which runs from same. The first valve should be of the H.F. type, and the second one either an L.F. or small power. The L.F. valve is only suitable in cases where telephones only

are going to be employed; 2-4- or 6-volt valves can be used quite satisfactorily with the set.

The operation of the set is exactly similar to any other ordinary Reinartz circuit, and consequently there is no need to enter fully into the matter



## The "One-Coil Two"—continued

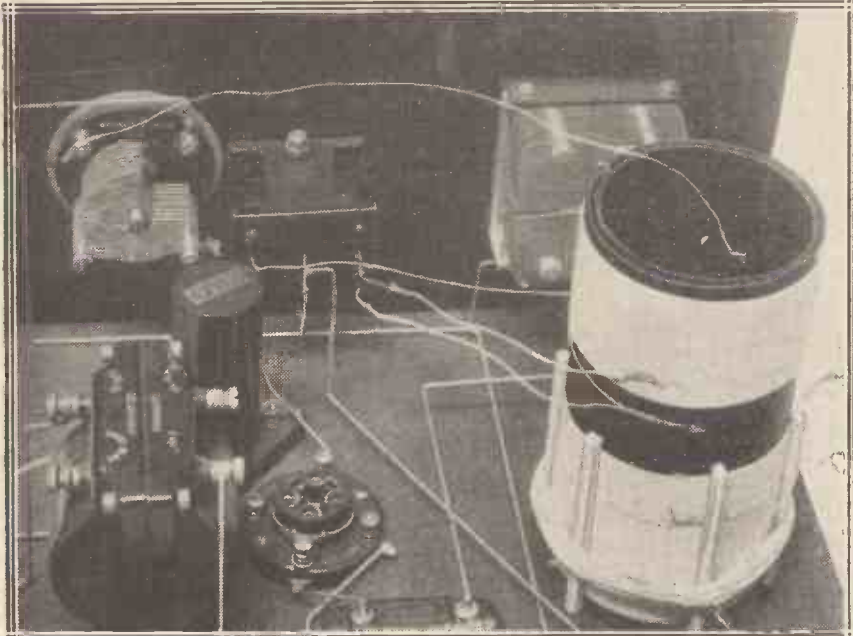
here. There is one point about selectivity on the lower wave-band. Although the tap at 20 turns will provide ample selectivity for nearly

there is no reason why the tap should not be higher on the coil. For instance it may be made at the 25th or 30th turn from the bottom of the coil.

At one mile from 2 L O a tap at 15 turns was found to give 5 G B with only a weak background of 2 L O, which was not strong enough to spoil the reception of 5 G B.

It will be gathered from the above that it is worth while experimenting with the position of the tap so as to get it at the most favourable position for the particular locality and aerial. It is also interesting to try different numbers of turns on the hank coil for the long waves. As a general rule, the larger the number of turns on the aerial winding the better will be the strength of reception.

If an output filter is employed the connections are as follow: Join the loud-speaker minus terminal to one side of a 20-henry L.F. choke and also to one side of a 2-mfd. fixed condenser. The other side of the choke goes to the plus loud-speaker terminal, and the other side of the fixed condenser to one side of the loud speaker, the other side of which is joined to the L.T. minus terminal. If the set is used with a D.C. eliminator, connect another 2-mfd. fixed condenser between the L.S. and L.T. minus.



The ends of the windings are taken direct to the various components, three of them going to the wave-change switch.

all cases where an average aerial is employed, it is possible that when the set is to be used only two or three miles from the local station that interference will be experienced from it. If this happens, the effect of taking the tap at 15 turns or even 10 from the bottom of the 24 D.C.C. winding should be tried.

### Sensitive and Selective

The set was found to be as sensitive and as selective as the very best of two-valvers of the detector and one L.F. type. No efficiency therefore is lost due to the simple short-wave switching, and anyone who wants a really good two-valver with something "different" in wave-changing schemes should seriously examine the design of the receiver just described. If they build it, I can assure them that they will not be disappointed in anyway.

With the tap for short waves made at the 20th turn from the bottom of the short-wave grid coil, the tuning of 2 L O at about 8 miles was very sharp, and the signal strength from other stations was extremely good. The local station produced hardly any jamming. Actually at this distance if the aerial is on the small size



Apart from the wave-change switch, the controls are similar to those used on any ordinary straight two-valve set.

# EXPERIMENTING WITH THE THIRTY-ONE NEW CIRCUITS

BY THE EDITOR

IN last month's circuit article we dealt with various methods of charging accumulators used for high-tension supply. In this article we have to deal with the final circuits in the booklet "Thirty-one More Tested Circuits." Take first of all No. 26, which shows a simple and sharply tuned buzzer wave-meter. This particular form of wave-meter is so easily made that it is a wonder that more experimenters have not used it in the past. Probably the lack of adequate data has been the deterring factor.

In the practical make-up it is best to have a small baseboard with a coil socket screwed to it, a good buzzer (do not try to cut the price of this article, for unless the buzzer is satisfactory you will never get proper working of the wave-meter), and means of holding dry cells for supplying the power, while the condenser can be supported on a small panel. To run a buzzer one should use fairly large cells—not the small flash-lamp variety, but such batteries as the Ever Ready No. 126, which is a three-cell box battery with screw terminals. Such a battery will give good and efficient service over a long period and can be replaced at the cost of 1s. 9d.

## How the Wave-Meter Works

In case you cannot see the internal connections of your buzzer, it is well to point out that the method of connection to the X-coil is simply to place the battery and buzzer in series with the portion of the coil between the lower end and one of the tappings (which you will use is best found by trial). The frequency at which the circuit will oscillate is dependent purely on the inductance and capacity of the coil and condenser, and has nothing to do with the frequency of the buzzer, which merely determines the particularly musical note or buzz you hear.

The principle of working is as follows: When the buzzer contacts are together, current flows from the battery across the contact through the buzzer coil, through the portion of

the X-coil and back to battery. Directly the coils become magnetised the armature is attracted and the circuit broken, and the current thereupon ceases to flow until the armature springs back again.

## Calibrating the Instrument

The sudden cessation of current gives a kind of shock to the oscillatory circuit, setting up oscillations in it, whereupon the circuit radiates freely into surrounding space, the wave-length of the radiation depending, of course, on the tuning. A No. 60 X-coil and a .0005-mfd. variable condenser will cover the whole of the lower band from 200 to 600 metres, while a 250 X-coil covers everything you need between 1,000 and 2,000 metres.

This is the final article on the practical applications of the circuits shown in the book given away with the December, 1928, issue of the "Wireless Constructor."

To calibrate this wave-meter, tune-in on your receiver a station the wave-length of which you know accurately, and then, leaving the set so tuned, start the buzzer and turn the tuning condenser on the wave-meter until you hear the strongest note in your receiver.

The best position for the wave-meter in relation to your set will depend on a number of factors, and particularly on the sensitivity of the set, but you will soon find where to place it so as to get a good note which is not too strong. The tuning will be quite sharp, and when you have tuned to the strongest buzz, note the reading and proceed to another station. When you have picked up several stations of known wave-length on your receiver, and have tuned-in the buzzer wave-meter to these, you will be able to plot a calibration chart. After this, if you want to pick up a

station of a particular wave-length, all you have to do is to set the dial of the wave-meter to the particular wave-length setting shown on your chart, and then tune-in the receiver until you pick up the wave-meter buzz the loudest. Your receiver will then be tuned to the wave-length desired.

When calibrating this set, remember that the calibration will not be quite the same on a different tapping. It is best to find the most satisfactory tapping of the two before you start to calibrate the meter. Use plug-in coils of a good make, as poor coils will make the tuning flat and unsatisfactory.

## A More Complicated Type

Circuit No. 28 shows a more complicated continuous-wave heterodyne wave-meter and oscillator. This is a much more useful wave-meter for the advanced experimenter, and proves equally satisfactory with either small or large powers, but, for general wave-meter use, a 2-volt low-frequency valve, with a 30-volt H.T. battery is quite suitable, and the meter M can be dispensed with.

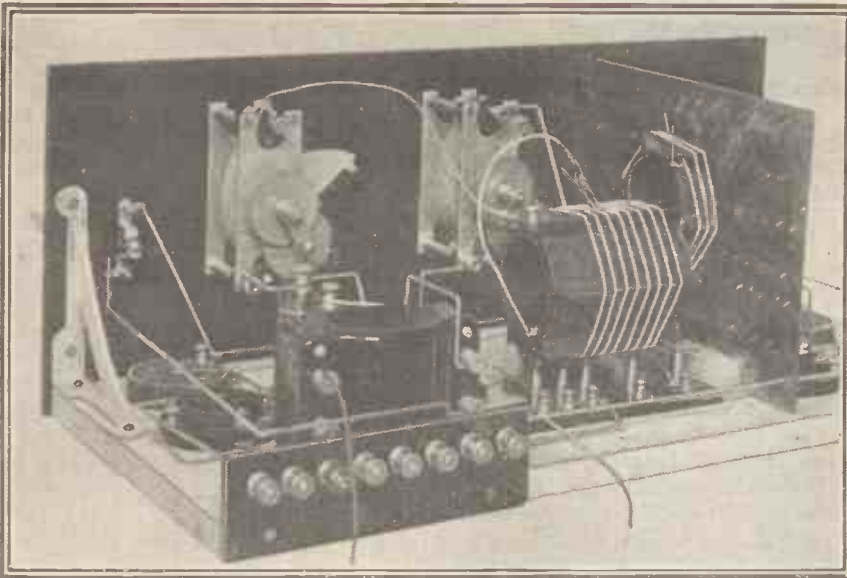
For experimental work in the determination of high-frequency resistance, etc., where powerful continuous oscillations are required of a definite frequency, the valve can be L.S.5, with 250 volts on the plate from a mains unit.

## A Peculiar Circuit

The circuit is rather peculiar and requires a double condenser, each half being of .0005 capacity. Condensers of this type are obtainable in good quality from a number of the manufacturers and in our own laboratory oscillator we use a Cyldon double .0005 mfd. for this purpose. The resistance  $R_3$  should be of 30 ohms, for ordinary small receiving valves, but for high power laboratory oscillators, a 5- or 6-ohm rheostat capable of carrying one ampere should be used here.

The meter M is extremely useful, and gives a reading of the grid current

(Continued on page 181.)



# PCJ

ON THE

## "P.C." THREE

Adapting a successful "Wireless Constructor" set for short-wave work.

By GEORGE T. KELSEY

THE Editor tells me that several readers have recently sent in what I may term a "post-script" to their original cards on which it will be remembered they were asked to outline their ideal receiver.

In the opinions of many at that time, the ideal set was voted to be one consisting of a straightforward neutralised H.F. stage, a detector and one "note mag.," with provision for the reception of stations on the broadcast and long-wave bands.

But now, due possibly to the increasing amount of interest that is being taken in short-wave reception, a number of readers have written to ask if it would be possible to use the receiver on the very short waves.

There are one or two important questions to be considered when deciding whether a broadcast receiver can be used with any degree of success on waves below 50 metres, and the mere fact that a set may give excellent results on normal broadcasting is unfortunately no indication of its probable performance on short waves.

### Australia on Two Valves

First of all, the H.F. valve can be ruled right out of the question, since an ordinary H.F. stage, as generally arranged, is useless on waves below about 75, or even possibly 100, metres.

That leaves us then with a det. and L.F. stage with which to experiment, and, of course, to make a modification of this type popular it is essential that it should be carried out with a minimum amount of alteration to the existing receiver.

Given reasonably good conditions, it is possible to hear American and, in

many cases, Australian stations with ease with a simple det. and L.F. arrangement, and, to come to the point, I have found it possible during my experiments with just the two last valves of the original "P.C." Three receiver to hear stations from all over the world on and around the 32-metre band.

### No Wiring Alterations

I expect you are wondering exactly what alterations are necessary to your receiver in order that you can do likewise.

You will, therefore, probably be interested to learn that absolutely no wiring alterations are necessary to your set, and that the only extra component required, the short-wave

coil, can be made for a total cost of a few shillings.

For those readers who are technically inclined, the theoretical arrangement of the set as it is used on short waves is shown in Fig 1. The H.F. circuit, as mentioned previously, is not used on short waves, but there is no necessity for a switch with which to cut it out, since this operation is automatically carried out when the special short wave coil is inserted.

### Using the Original Variable

All that it is necessary to do then when it is desired to use the set on short waves is to turn the first resistor to the "off" position and, of course, to insert the special coil, an operation taking at the most a few minutes.

Perhaps it would be as well to explain at this juncture that although it is usual not to use tuning condensers with a larger maximum capacity than .00025 or .0003 in short-wave receivers, it was not found necessary to include a condenser in series with the tuning condenser in the present case, chiefly because the

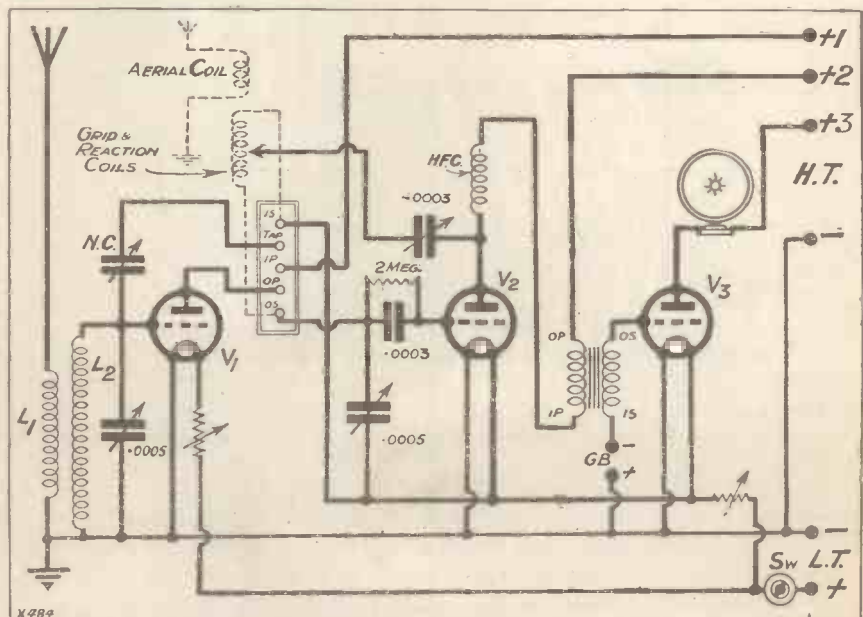


Fig. 1: The theoretical arrangement of the set when it is modified for short-wave reception as described.

## PCJ on the "P.C." Three—continued

slow-motion dial enables a sufficiently slight tuning variation of capacity to be obtained. Also, although it might have been thought that the H.F. choke would require to be replaced by one specially designed for short waves, it was found possible with the choke in the original set to obtain satisfactory reaction control on wave-lengths as low as 17 metres.

### Making the Coil

This cannot be said of all commercial chokes, and although quite a number are effective on all wave-lengths down to about 20 metres, it should not for one moment be imagined that a choke is a "dud" if it will not perform on short waves.

Having decided therefore that the set does not need to be altered in any way (assuming, of course, that your particular choke enables you to obtain a reaction effect on low waves), the only thing to consider is the making of the special coil, and for this purpose you will require some ripped ebonite former, some wire and a few valve-pins, etc.

The ebonite former used for the

purpose has an outside diameter of 3 inches (this measurement is to the outside of the ribs), and a total length of 4 inches will be required.

The 4-in. length should be cut into two pieces, the smaller of which is  $\frac{3}{4}$  in. long. This small piece is to accommodate the aerial coupling winding, and by fixing it to the main former with only one screw the degree of coupling for the aerial can be varied over fairly wide limits merely by swivelling the small coil away from its support.

Fixing the small coil to the main former calls for a little careful workmanship, and although it is not really a difficult job the constructor would be well advised to proceed slowly.

### The Former Base

The hole through the small former should be just large enough to allow a small clearance for the screw, but the hole in the main former should be tapped with a screw thread.

To avoid having to tap this hole, an ordinary wood-screw can be used for the purpose, and by drilling a

hole slightly smaller than the screw this latter can be screwed home without much difficulty.

Before starting the windings it is necessary to fix the larger former to

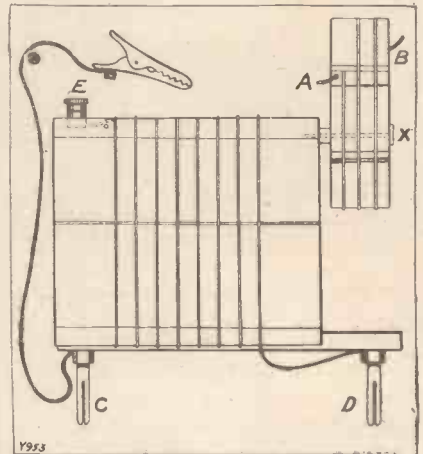


Fig. 2. Here you clearly see the arrangement of the short-wave coil windings.

a base in order that it may be plugged into the special five-pin holder. Incidentally, only the two end pins of the five-pin base are used.

Two pins should first be fixed to a strip of ebonite at a distance corresponding to that of the two sockets into which they are to be plugged (O.S. and I.S.), and having arranged the piece of ebonite in this way the main former should be secured to it.

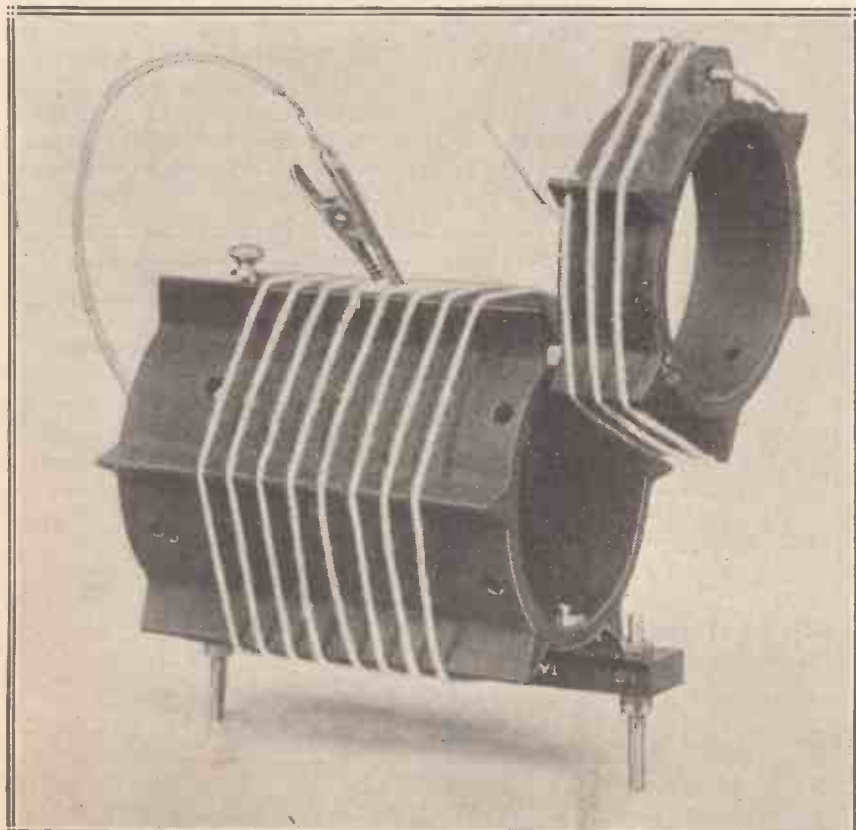
The winding is carried out with No. 20 gauge wire (cotton covered will do, but enamelled wire is to be preferred), and the aerial coil consists of three turns. The ends of this winding should be scraped and left free, since it is to these two points that the aerial leads will ultimately be fixed by means of crocodile clips.

### The Coil Connections

For the grid and reaction coils, which are really all one coil as far as the winding is concerned, a total of eight turns should be placed on the former. The end of this winding nearest the coupling-coil end is joined to the pin at the same end, but the other end should not be joined to the other pin, but to a terminal mounted on the top of the coil.

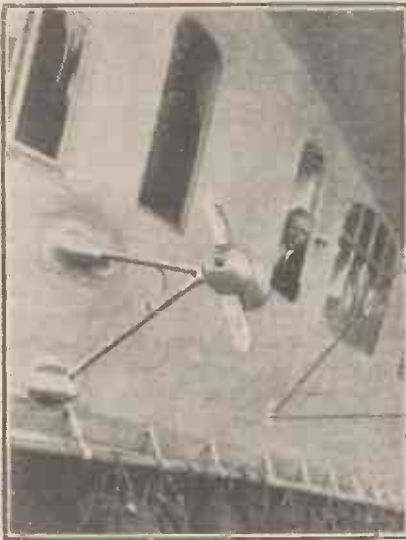
To the other pin (the vacant one) a short length of flex wire terminating in a crocodile clip should next be attached, and this clip can as a start be joined to the fourth turn of the

(Continued on page 178.)



You should compare this photo of the short-wave coil unit with the sketch which appears on this page.





**T**HE final appeal, by the Marconi Company, against the recent decision of the Comptroller General of Patents in favour of the Brownie Wireless Company, was heard in the Chancery Division of the High Court before Mr. Justice Luxmoore.

It will be remembered that the effect of the Comptroller's ruling was to reduce the existing scale of 12s. 6d. per valve holder to a minimum charge of 5s. on the first and 2s. 6d. on each additional valve holder.

In his opening address, Sir Duncan Kerly, K.C., counsel for the Marconi Company, pointed out that the appeal involved points of the utmost importance to patent law and practice as it existed to-day. It was the first case of its kind to come before the Courts.

### Home Constructors

The Brownie Company had put on the market a two-valve amplifier which, when used with a crystal detector, did not infringe the Marconi Patents, but which, if used in combination with a valve detector, might be an infringement of those patents.

The Marconi Company had licensed some 2,200 manufacturers. There were also many private people who made their own sets. They were called home constructors, and it was complained that the Marconi Royalties were too high, with the result that the home constructor built up his own set, using the Marconi patents, but did not, because he was not able, pay any royalties.

The Brownie Company originally applied for a licence to the Marconi Company, and were told that they could have one on the usual terms. They refused because, they said, the royalties were too high. Not a single other licensee had come forward

# RADIO IN THE HIGH COURTS

*An interesting account of the Marconi v. Brownie Appeal.*

By a Special Correspondent.

to say that the licence was so unreasonable that they could not carry on their trade at a profit.

The decision of the Comptroller of Patents was based on two propositions and two assumptions. The first proposition was that it was against public policy to refuse a licence on reasonable terms to any applicant who desired to make use of the patents. A more far-reaching proposition it would be difficult to conceive.

### The Two Assumptions

The second proposition was that it was contrary to public policy to exact a royalty on unpatented articles even though they were articles sold in competition with the patented articles. If these propositions were wrong, the Comptroller's decision must also be wrong.

The two assumptions were, first, that if a licence was granted at a low rate of royalty, this would ensure the sale of an enormous number of sets at a cheap rate, and so reach a class of listener who could not now afford such sets owing to the royalty charges.



*A view of the Dublin broadcasting station which is installed at the McKee Barracks.*

The second assumption was that the new cheaper sets would be largely bought by people who did not now buy sets on which royalties had been paid, but, instead, made up their own sets at home from component parts. If they could be persuaded to buy manufactured sets they would no longer infringe the Marconi patent rights.

No evidence had been brought forward in support of either of these assumptions.

The Comptroller knew that there was a very large and profitable wireless trade extending to thousands of manufacturers. All the 2,200 licensees could abandon their licences if they found the business to be unprofitable. Very few notices to abandon had, in fact, been received.

### The Marconi Co.'s Policy

It was the Marconi Company's policy to insist on goods used in this country being British made. It would be quite within their rights to grant licences to foreign manufacturers. Suppose a member of the wireless trade had been called at the previous enquiry and had been asked: "How much is the protection you are getting against foreign competition worth to you? Is it worth 12s. 6d. a valve?" One could have no doubt what the answer would have been.

Suppose the Marconi Company reversed their policy. Where, then, would be the chance of English manufacturers who were going to make cheap sets?

Mr. Barber, of the Brownie Company, admitted, during the previous proceedings, that the selling profits on existing sets represented fifty per cent. of the retail price. This was much more than the royalties. On a two-valve set marketed at £5 4s. 6d. without valves, the royalty charge was only £1 5s. But the distributor's profit was £2 12s. There was no attempt made by the Comptroller to correlate these two figures.

## Radio in the High Courts—continued

The Comptroller held the Marconi Company to be super-monopolists and said that "such an arbitrary exercise of monopoly rights seems contrary to public policy." That conclusion could not be upheld. One might as well conclude that there should be no royalty at all, that the patents should be put an end to, and the foreigner let in with his cheaper sets.

### The Comptroller's Finding

The Comptroller's finding, in substance, was that it was contrary to public policy to refuse the applicants (Brownie) a licence, and that such an arbitrary exercise of monopoly rights constituted an abuse. In his (counsel's) opinion, there was no reason in law why a patentee should not select whom he pleased, although the Marconi Company had not done that. They had never yet refused a licence to any solid applicant.

Mr. Moritz, K.C., counsel for the Brownie Company, said that the importance of the case, as affecting patent law, had been grotesquely exaggerated. It was an important case simply because it affected a large body of traders, and an industry which had grown up to be of national importance. The trade was struggling at the moment with difficult circumstances.

There were no novel principles involved in this case. Compulsory licences had been part of the law for fifty years, and scores of them had been granted. A patentee could no longer do what he liked with his own. Patent legislation tended to interfere more as years went by with his liberty of action, because of the increasing complexity of commerce and the modern tendency to combine large businesses in a few hands.

The danger that patents might become harmful to the public manifestly increased in such circumstances. The tendency of Parliament was to fetter more and more the power of the patentee.

### Special Licence Terms

The Brownie Company were in a position to supply receiving sets at such a price as would enable them to reach a vast new section of the public, who had never before been catered for. According to the avowed policy of the Government, they desired all sections of the community to enjoy the advantages of the broadcast service.

Certain manufacturers, who could produce on a large scale by mass production, started with the dice loaded in their favour because they were granted special licence terms. At the same time, other licensees were told that everyone was being treated on an equal footing.

Mr. Moritz, referring to the home constructor, said that he was a person who should be considered when it came to settling the scale of royalties to be paid.

*His Lordship:* Why should the home constructor who avoids the payment of royalties be a factor at all?

*Mr. Moritz:* Mr. Barber, of the Brownie Wireless Company, says, "From my knowledge of the trade, if you lower the royalty, home constructors, who are not dishonest people, will be willing to buy royalty-paying goods." Mr. Shoenberg, of the Marconi Company, says: "I don't think so." The Comptroller is entitled to judge between them and to find as a fact what will be done.

### Two-Valver for 50/-

*His Lordship:* I don't know how anyone can find that. He may say it is my guess it will be so, but it is an odd kind of guess.

*Mr. Moritz:* What more can the Comptroller do than take the skilled conjectures of two prominent men in the trade and make up his mind between them. He is entitled to form his judgment upon it. Unless you say he has gone definitely wrong in principle you will not disturb his verdict.

*His Lordship:* To decide between two conjectures is not a finding of fact.

*Mr. Moritz:* The Comptroller has done his very best in very difficult circumstances. If there is a manufacturer who is prepared, if granted a licence on reduced terms, to satisfy a large body of listeners with a two-valve set at 50s., it is obviously in the public interest that he should be put in a position to do so. His Lordship could not interfere with the Comptroller's decision unless there was a flagrant absence to support it.

Sir Duncan Kerly, replying for the Marconi Company, said that counsel for respondents had not met his arguments or indeed really set himself out to meet them. It was argued that Parliament had entrusted the Comptroller of Patents to act

without evidence because he had special knowledge. This assertion was neither true in fact, nor was it supported by the Statutes.

It was said that there was a large body of people who could not afford to pay more than 50s. for a valve receiver. But the Brownie Company advertised a crystal set with note magnifier for 52s. 6d., on which no royalty was payable. Where was the evidence that that did not satisfy the demand?

### The Attorney-General

There were many people who would like to have the fancies they nourished satisfied at other people's expense, but the State did not step in to gratify their desires. Some people wanted to go to the pictures for nothing. Instead of providing facilities for them to do so, he was credibly informed that on the contrary the State taxed them for going.

There was nothing in the Patent Act which said that different terms might not be given to different licensees. Many considerations might arise which would justify such a distinction.

Sir Thomas Inskip, K.C., the Attorney-General, said that he appeared simply in order to help the Court so far as he could from the point of view of the public, and to give whatever assistance he could on the interpretation of a somewhat difficult section of the Patents.

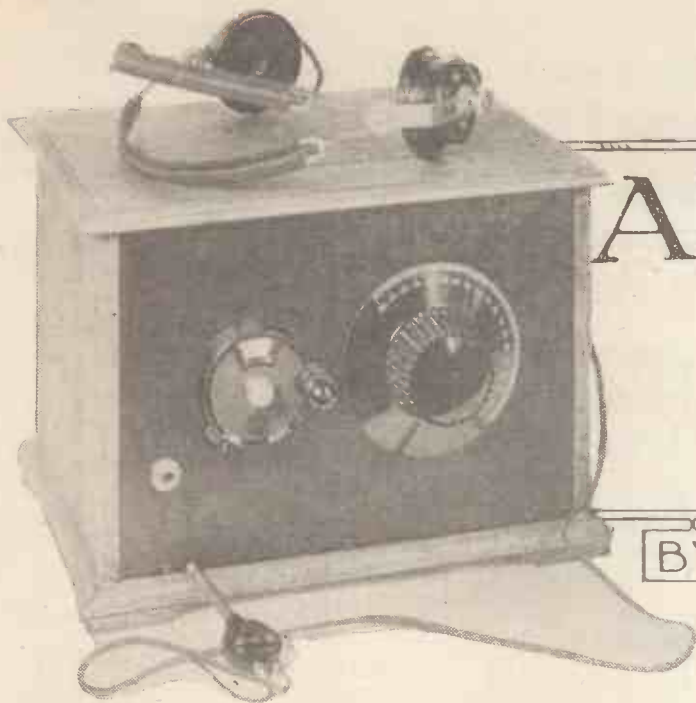
### The Proceedings Terminate

The view which he took was that Parliament intended that the patentee should himself directly or indirectly put on the market the patented article for the benefit of the public. Where, as in this case, the patentee did not produce the article himself the public interest required that a licence should be granted to someone.

It was clearly laid down by Parliament that a patent was not granted to enable an ingenious inventor to make an enormous profit at the expense of the public.

He was intended to use his patent for the public advantage, on reasonable terms, so that as many as possible could enjoy the benefit of it.

At the close of the proceedings, Mr. Justice Luxmoore announced that he would reserve judgment. Which is still awaited as we go to press.



# A BEGINNER'S SINGLE VALVER

BY HARRY P. WOOTTON

*An extremely simple but remarkably effective one-valve set for long- or short-wave reception.*

THE writer was recently asked to prepare a design for a single-valve receiver, bearing in mind the requirements of the reader

### COMPONENTS REQUIRED.

- 1 Cabinet to take 10 in. x 7 in. panel with 7-in. baseboard (Cameo). (Arcraft, Raymond, Gilbert, Pickett, etc.)
  - 1 Ebonite panel 10 in. x 7 in. x 1/4 in. or 3/8 in. (Ebonart Moire). (Radio, Becol, etc.)
  - 1 Aperiodic tuner (R.I.-Varley).
  - 1 Variable condenser, .0005 mfd., with dial (Ormond). (Lissen, Lotus, Raymond, Jackson, Cydon, Igranic, etc.)
  - 1 Adjustable condenser (Igranic Pre-Set, 210-820 m.mfds.). (Formodensor with maximum capacity of .001 mfd.)
  - 1 Grid condenser, .0003 mfd., with clips and 2-megohm grid leak (Lissen). (Dubilier, T.C.C., Mullard, etc.)
  - 1 Filament single-control jack (Lotus). Alternatives are: Three Spring Automatic Jack P.65 (Igranic). (Bowyer-Lowe and Ashley jacks are also suitable.)
- NOTE.— The connections on the wiring diagram are for the Lotus jack. If a different make is used, the reader should make sure that the connections will suit the particular jack.
- 1 Plug for same. (The plug and jack should be of the same make.)
  - 1 Fixed condenser .0005 mfd. (Dubilier). (Lissen, Igranic, Atlas, Mullard, etc.)
  - 1 Terminal strip 7 in. x 1 1/2 in. with six terminals: Aerial, earth, L.T.—, L.T.+, H.T.—, H.T.+ respectively (Belling Lee).
  - 1 Valve holder (Wearite). (Benjamin, Lotus, Bowyer-Lowe, Magnum, Formo, etc.)

the now popular wave-change feature. Not only the construction but the operation of the set was to be of the simplest, the aim being to design a set which could be built up at very moderate cost in a couple of evenings.

The set illustrated in this article certainly complies with the requirements mentioned and has exceptionally good performance on both wave-lengths. Soldered connections are illustrated, but as all components have terminals, soldering can be avoided if desired.

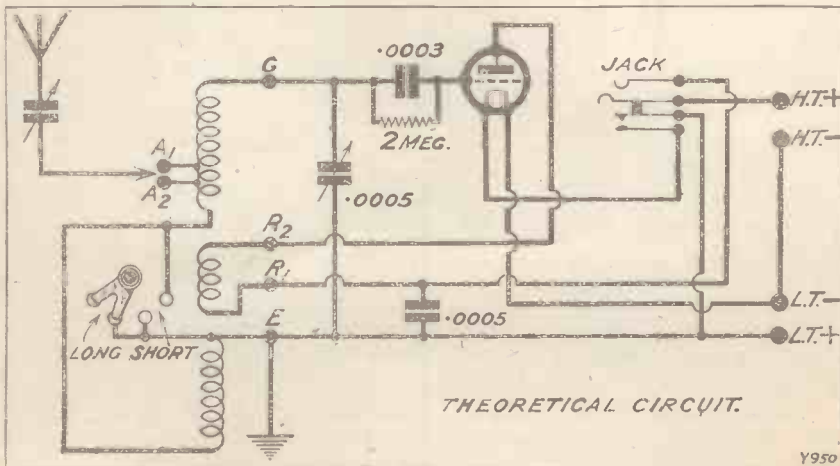
The constructional work has been simplified by the choice of a special coil unit mounted on the panel by the popular one-hole-fixing method, and containing both long- and short-wave windings, together with a variable reaction winding controlled by a vernier dial from the front. The unit also contains the necessary wave-change switch, and all that has to

be done is to fit the device to the panel and connect the terminals provided to the rest of the apparatus.

There are thus no coils to wind, no complicated switching to be wired up, while the additional apparatus to make the set is quite simple. Indeed, the total cost of the parts will be found surprisingly low in view of the particularly good performance given.

### Automatic Jack-Switch

For convenience of operation as well as simplicity of make-up a filament control jack is fitted to the set, and the 'phones are joined up to a plug. When the plug is pushed into the jack, not only are the telephones connected in circuit, but the valve is also switched on and, correspondingly, directly the plug is withdrawn the set is switched off. There is thus no on-and-off switch, and if the user acquires the habit of withdrawing the



who is about to start home construction and who desires a simple and efficient single-valve set incorporating

## A Beginner's Single Valver—continued

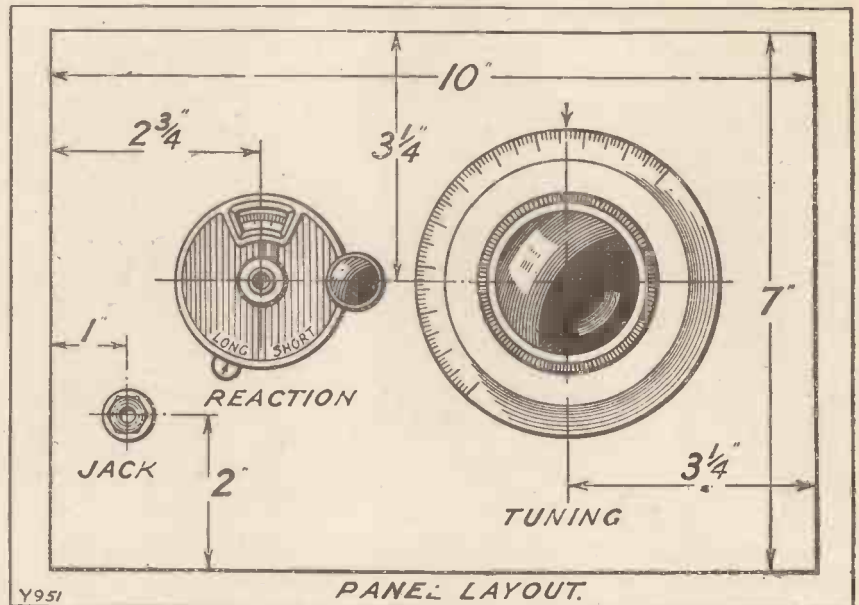
plug after a bout of listening there is no risk of the accumulator being run down due to the set being left switched on all night.

Begin work by marking out the panel according to the diagram. Rather a large hole will be required for mounting the tuner unit, and as the reader will probably not have a drill larger than  $\frac{3}{8}$  in. it is just as well to drill a  $\frac{3}{8}$ -in. hole and enlarge it with the end of a file until it is big enough to take the threaded bush on the unit.

### The Vernier Control

The variable condenser will require a  $\frac{3}{8}$ -in. hole, as will the jack. Three small holes should be drilled along the bottom edge of the panel, so that it may be screwed vertically against the front edge of the baseboard. After the other parts have been set out, bend all wires to shape and solder them into position, using as a guide the photographs and wiring diagram.

Full instructions for mounting the vernier dial belonging to the tuner are given in the carton by the makers.



As, however, accuracy in drilling the small hole to take the securing pin of the vernier dial is essential, the following "tip" will be found helpful.

Take the vernier dial and lay it face downwards on the table, and then

cut a piece of paper somewhat larger than the whole dial and pierce it with a hole just big enough to slip over the projecting pin. Push the paper down over this pin so that it is flush with the underside of the dial and then carefully mark out the exact position of the hole in the centre of the dial, which takes the reaction shaft.

### Any Filament Voltage

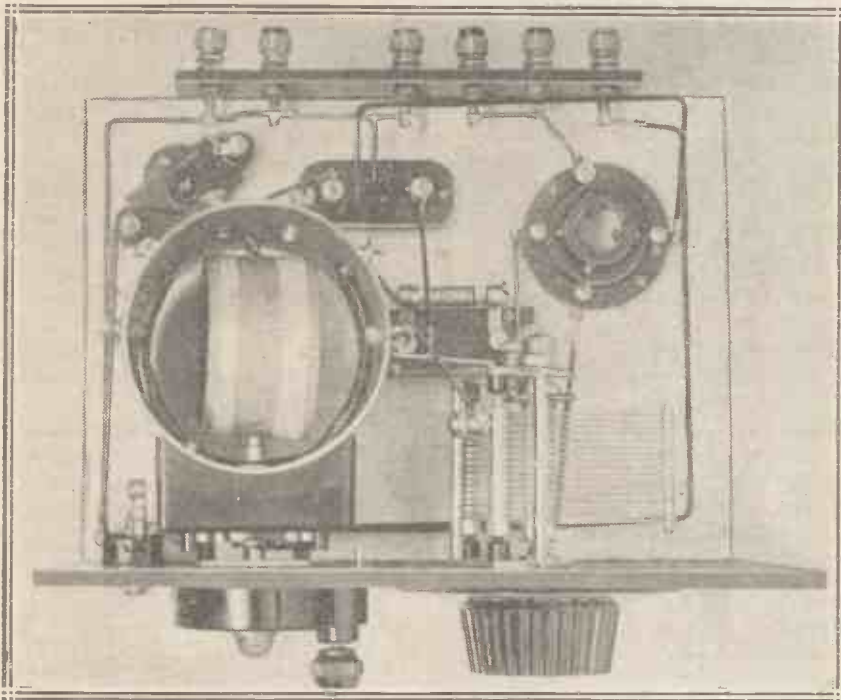
Next cut out the hole in the paper so that you have a template, which can now be slid over the reaction shaft and the exact position of the hole for the pin on the vernier dial marked on the panel. Unless the position of this hole is correctly made the dial will not make a proper fit, and if the hole is too large it will tend to shake. If, by chance, the hole should be made too large, it is not a bad plan to seal it up with a little cobbler's wax after the dial has been put into position. This can be done from the back, and when the wax is set it will hold the pin securely without any shake.

When you have built the receiver you will naturally want to try it out at once. The set will work well with two-, four- or six-volt valves, but in view of the economy of the two-volt valves one of these is recommended for the beginner. A two-volt accumulator and a 60-volt high-tension battery, together with a pair of telephones, are the only other accessories required, and an ordinary



A vario-coupler type of reaction control is employed, while a wave-change switch is also incorporated in the tuning unit.

## A Beginner's Single Valver—continued



A general view of the set showing how easy it is to wire up.

general-purpose or detector valve will suit as well as any.

After connecting up the accumulator and the battery to the terminals marked, join the telephones to the plug and plug into the socket. Aerial and earth are joined up, as shown, and the knob of the reaction dial is turned so that the coil of wire on the small cylinder inside the larger cylinder is at right angles to the latter.

The knob on the wave-change switch is pushed over to either short or long, according to the listener's requirements. By means of a screwdriver the adjusting screw on the Pre-Set condenser is turned clockwise as far as it will go, thus obtaining the maximum capacity value here.

### Tuning the Set

Tuning is carried out on the right-hand dial, and the strength is controlled by turning the knob of the reaction dial in the direction which increases the strength of signal. This knob must not be turned too far, however, otherwise the set will oscillate and cause disturbance to your neighbours. If you hear a chirping noise when the tuning dial is turned backwards and forwards, the note of the chirp being varied by turning the dial, then you are certainly oscillating and the knob of the reaction control should be turned at once until this effect ceases.

same on both bands, so when changing from one wave-band to the other be sure you alter the reaction setting accordingly. There is no need to alter the setting of the Igranic Pre-Set condenser unless the set is not tuning sharply enough, whereupon a few turns in an anti-clockwise direction will sharpen tuning.

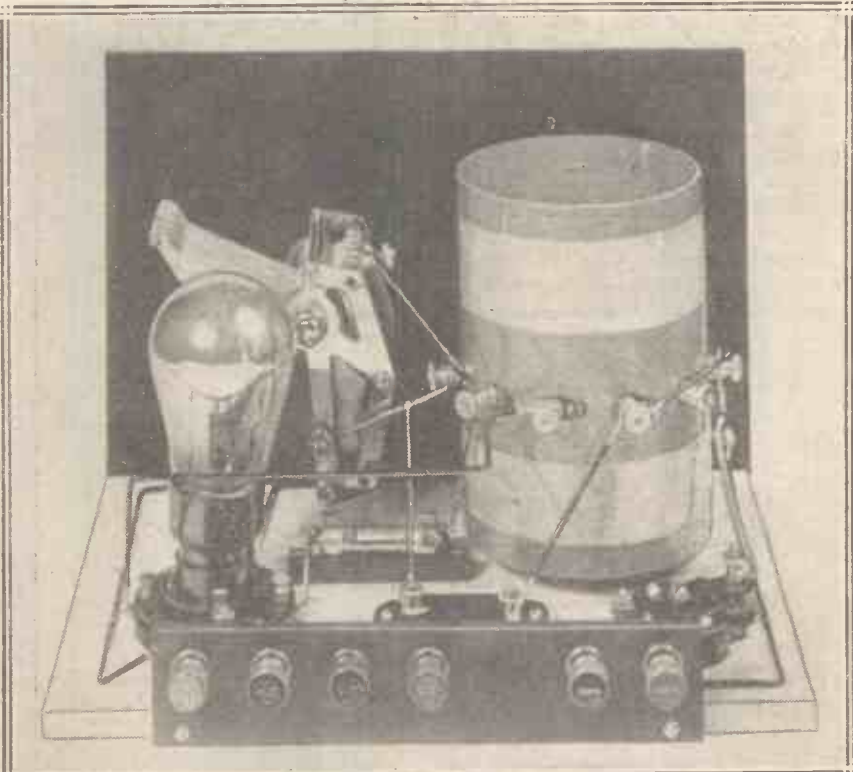
### Stations You Can Hear

Although the wave-length range, as marked on the box, suggests that the tuner will not go below 1,200 metres when made up as shown in our diagram, with the Pre-Set condenser in the aerial lead Hilversum and Kalundborg can be brought in quite easily. The set will also tune well below the Newcastle wave-length and will go up on the short band to 600 metres and on the longer band to 2,000 metres. It will thus include all the stations you will want to hear.

On tests, using an ordinary outdoor aerial, London, 5 G B, Langenberg, and a dozen or more other European stations were clearly heard in the headphones, the strength from several of the Germans being adequate to enjoy the programme. On the long wave-band, Hilversum, Kalundborg,

Never use more reaction than is required to give the strength you need, for too much reaction will inevitably spoil the quality of reproduction.

The reaction setting will not be the



Nothing can be simpler than the handling of this one-valver, which can be built in a very short time.

## A Beginner's Single Valver—continued

Eiffel Tower, 5 X X, Radio-Paris, and Huizen were all heard at comfortable telephone strength, there being no difficulty in separating Radio-Paris from 5 X X when a little reaction was used.

\*\*\*\*\*  
 \* **ROUND THE TRADE** \*  
 \* **Some Transformers!—** \*  
 \* **An Ingenious Scheme.** \*  
 \*\*\*\*\*

As everybody knows nowadays, a very ambitious scheme for the electrification of the British Isles and the standardisation of mains,

etc., is now in being, and within the next few years we shall all be having more juice and better voltages. Ferranti's, Ltd., of Hollinwood, Lancs., tell me that an important order for the largest transformers in the South-East England electricity scheme has been placed by the Central Electricity Board with them.

As a matter of fact, these transformers are the largest yet ordered for use in this country. Where Ferranti's score in a job like this is that the manufacturing facilities at their factories are such as to enable the firm to build these transformers entirely from the raw material, with the great advantage of complete

control, both of the quality and of the progress of the work.

The technical figures and details of these transformers are truly staggering to the electrician, while, of course, they are beyond the comprehension of the man who only knows Ferranti's from experience of their small wireless transformers. Probably everyone who reads this paragraph has been excited at some time or other over the excellence of the performance of the Ferranti transformer; but these latest super, staggering, record-breaking transformers have actually succeeded in exciting Ferranti's, Ltd., themselves. So you can be sure they are "some transformers!"

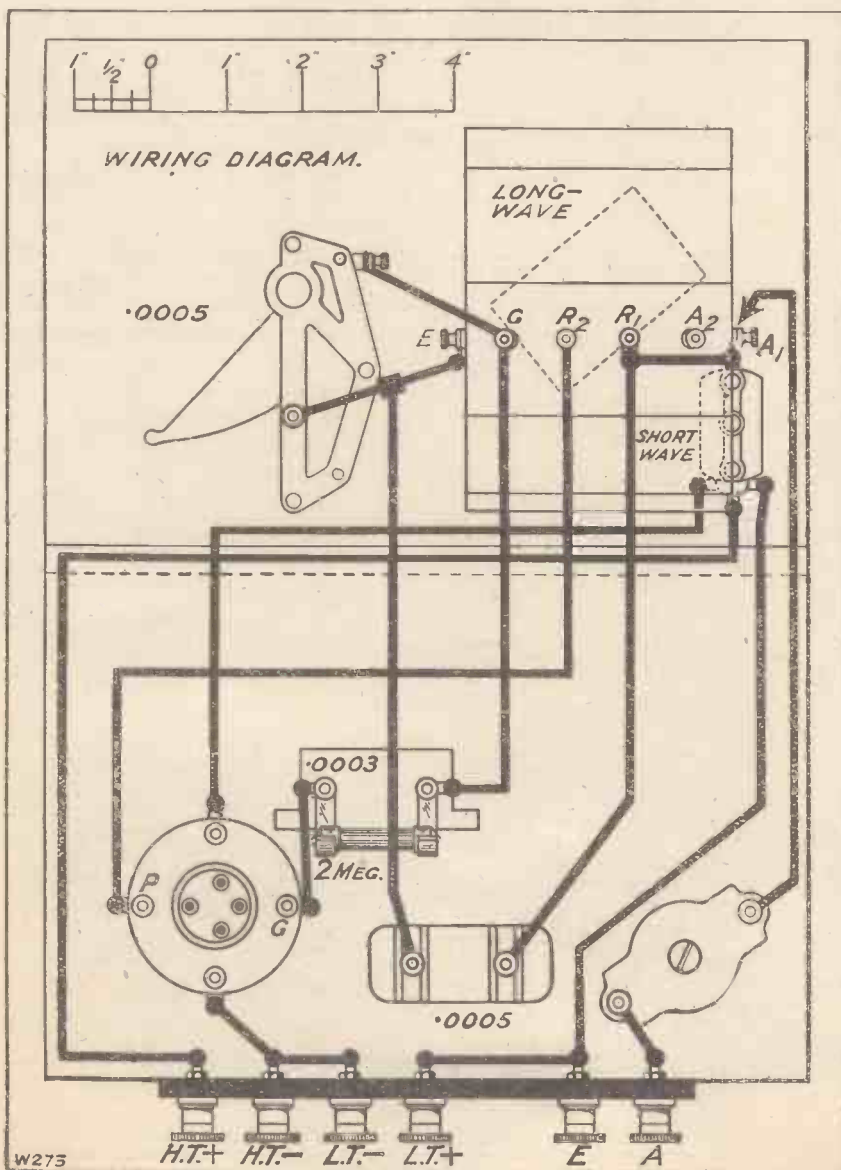
### An Ingenious Scheme

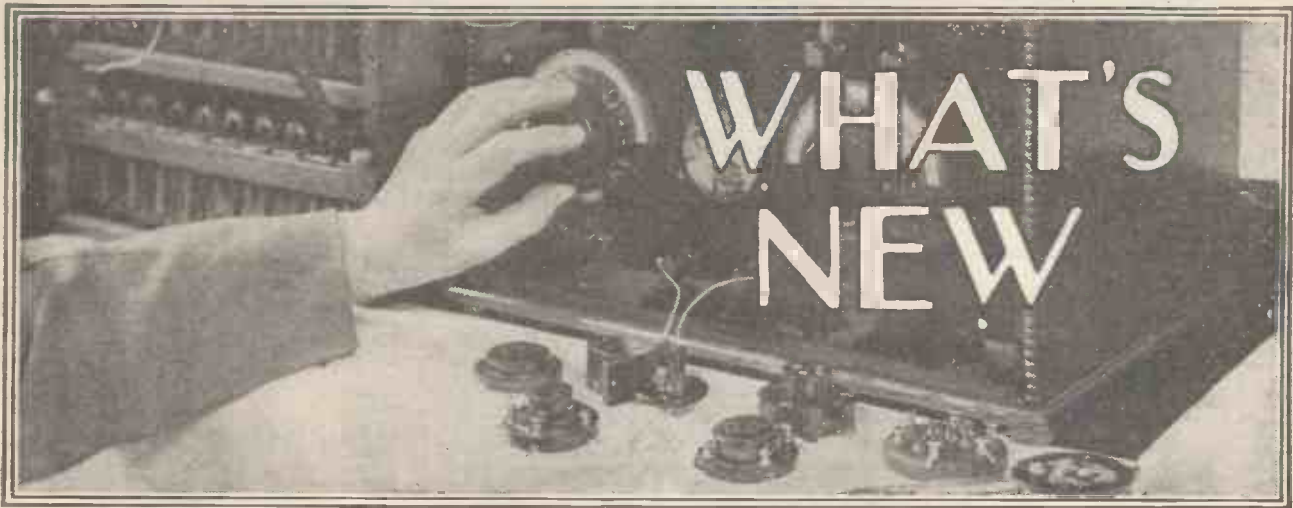
Messrs. Ripaults, Ltd., have just devised a very ingenious scheme for making sure that their H.T. batteries really do please the purchaser and give complete satisfaction. The idea is that on every H.T. battery which now leaves the Ripaults' works there shall be stuck a large label which in case of necessity can be detached by the purchaser. This label has been designed not only to assure the purchaser that the battery carries a full guarantee, but also to save him the trouble of taking the matter up with his usual dealer in the event of the battery having failed, in his opinion, to give satisfactory service.

If he thinks he has cause to complain, all that he has to do is to remove this label from the battery, fill in the details called for, and return the label to Ripaults, Ltd., so that they will be able to give the matter prompt attention. In this way they feel sure that absolutely complete satisfaction to the customer can be given.

### A Valuable Idea

The idea is a new one, and it seems not only tremendously attractive from the customer's point of view, inasmuch as he is certain of being able to deal direct with the makers in the event of anything going wrong, but it also shows in a remarkable way the extraordinary confidence this firm has in its products. Incidentally, the label gives a reminder that anyone sending a 2d. stamp for the 24-page booklet, "Light on the H.T. Battery," can obtain this direct by post from Ripaults, Ltd., 1, King's Road, St. Pancras, London, N.1.

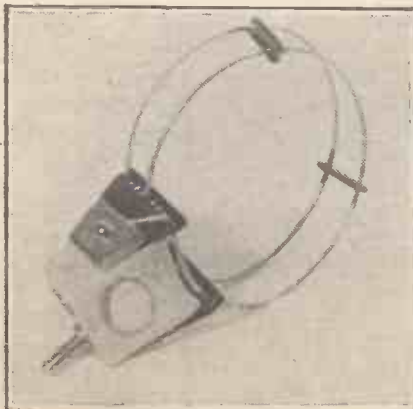




### The Marconiphone Cone

THE Marconiphone octagon cone, selling for thirty-nine and sixpence, is a particularly handsome instrument finished in a deep brown colour, which harmonises excellently with mahogany, walnut, or dark oak. The fret, of a floral design carries in its centre a moulded projection containing the driving unit and the necessary adjusting knob. The cone itself is placed behind the fret, finished in black, and supported round the edge on a ring of felt. A simple black metal framework enables the cone to be supported at a suitable angle, and clearly marked positive and negatives are provided, the purchaser attaching his own leads.

Test results show that the reproduction is good, for an inexpensive cone of this class, the tone being pleasing if somewhat deficient in the lower register. At the upper end of the scale, however, where many cheap cones make a very poor showing, the tone was very good and quite free from the irritating paper rattle which one too often finds. The resistance is given as 2,000 ohms, and the



An Atlas short-wave coil.

### A MONTHLY REVIEW OF TESTED APPARATUS

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

speaker carries a good load without rattling or sign of distress.

The performance of this speaker, for the price, is certainly good, and can be recommended to those who are not prepared to pay the higher figure necessary to obtain the very best in modern reproduction.

### Atlas Short-Wave Coils

From Messrs. H. Clarke & Co. (Manchester), Ltd., we have received a number of the Atlas short-wave coils, which are well made and efficient in use. The general appearance will be gathered from the photograph, and it will be noticed that these coils will fit into ordinary plug-in sockets.

A heavy wire is used, well spaced, while the porcelain insulation for the plug and sockets gives a distinctive appearance, as well as providing all that is needed in the way of insulation. Four sizes are made and the cost of the set of four is only 10s. Indeed, these coils and a few accessories, which most experimenters have lying idle, make it possible to rig up an excellent short-wave set at a very low cost.

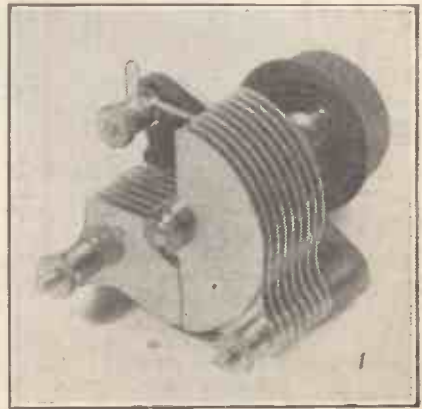
Two complete sets only are required to cover all wave-lengths from 15 to 100 metres, three coils being used for each band—aerial, grid and reaction coil. The leaflet which will be found in each coil box gives a circuit arrangement (which we can confirm to be good) and coil numbers for different bands. These coils can

be recommended to all short-wave enthusiasts.

### New Reaction Condenser

The Lissen reaction condenser, illustrated herewith, is one of the recent additions to the line of components manufactured by this firm. With a nominal capacity of .0001 mfd. this proved, on measurement, to be .00011 maximum, while the minimum was .000008 mfd. The insulation is of a moulded material, and a positive stop is provided at maximum—quite a good point. One-hole-fixing is, of course, adopted, and there is a good moulded knob with an arrow as an indicator. Both terminals and soldering lugs are provided.

For general reaction purposes this condenser is quite satisfactory, but, as the box is marked "can be used as a balancing or neutralising condenser," it should be pointed out that the rate of change of capacity with movement of the knob is rather high in this general type, while the minimum is on the high side for neutralising purposes. In our opinion, a neutralising condenser should have a much lower maximum than .0001 mfd.,



The new Lissen condenser.

## What's New—continued

otherwise it is very difficult to get a really low minimum and to obtain the neutralising point to a nicety.

### Truvolt Divider

The Truvolt divider is a very ingenious piece of apparatus, consisting of a complete resistance unit so constructed that by simply connecting it to the output terminals of the filter of a mains unit the desired plate voltages and grid bias for the receiver can be obtained. Its general appearance will be gathered from the accompanying photograph, which shows the neat moulded casing inside of which are a number of Truvolt wire-wound resistances, of a type which has already been described in this journal. (Incidentally this type was used in the "Stedipower" H.T. Unit.)

There are, actually, five wire-wound resistances in series, each having a slider; thus we have the equivalent of one resistance with five variable tappings. Obviously, a large number of different arrangements is possible with this scheme, a typical one being a maximum voltage from the filter, a variable from maximum down to

that the Electrad Truvolt Divider gives a wide range for experiment.

It does not, of course, contain the shunting condensers necessary for the various voltage tappings, and these must be assembled externally. The whole unit presents a very handsome appearance, and it can either be mounted flat, on an experimental board, or vertically, by means of the bracket provided, at some convenient point, such as the end of a casing. While the price may seem to be high at first glance, it must be remembered that the unit contains five variable wire-wound resistances of heavy current-carrying capacity, and, in our opinion, seeing what is provided, the price is quite reasonable.

The unit can certainly be recommended, particularly to the more advanced experimenter, to whom it gives the great advantage of a number of very accurately adjustable voltage controls for mains work.

### A Long-Felt Want

Very often when building a wireless set it is desired to conceal screw heads when, for example, brackets are

which melts easily, has good electrical characteristics, is elastic and, in fact, will serve all the purposes for which modelling wax is generally used for filling holes in wireless sets, but will do it more efficiently. The makers give a number of uses for this substance,



Useful accessories for the home-constructor (Belling-Lee, Ltd.).

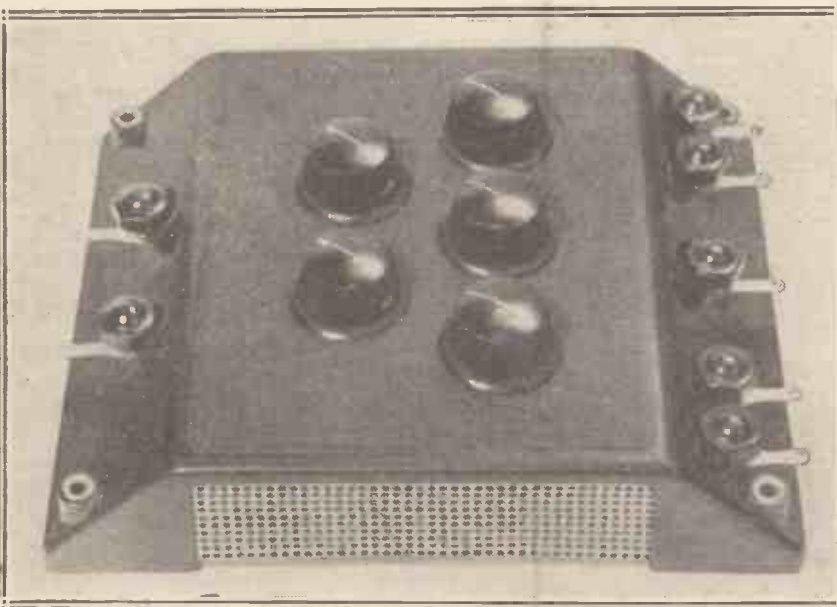
but that which will commend itself mostly to WIRELESS CONSTRUCTOR readers is the aforementioned filling of holes in panels. The wax easily slices off, leaving a surface which closely resembles the ebonite, and as the material is sold in useful melting tins with handles, at 6d. per tin, it will be seen the price is reasonable. We have used the wax a good deal in our laboratory and can recommend it. The makers are Hay's Marine Waterproof Glue Co., Ltd., of Portsmouth.

### New Belling-Lee Accessories

Messrs. Belling & Lee, Ltd., whose well-known insulating and indicating terminals are so deservedly popular, have now produced a line of plugs and sockets which have certain distinct merits. Both parts are completely insulated and both are clearly marked.

The insulated socket is mounted on the set, while the wire is connected to the plug, the method of securing enabling both the wire and the fraying of the insulation to be gripped tightly, and so make a neat and sound joint. When it is desired to connect the two, the plug is simply pushed on to the socket and connection is only made when one is well over the other. If, by accident, the plug should drop into the set, the insulation point prevents it short-circuiting and doing any harm. A very good point is that high-voltage plugs will not fit low-voltage sockets, so it is quite impossible to make the wrong battery connections to the receiver.

The price of the flex portion is 6d., the panel portion 3d., and practical tests show they admirably serve the purpose for which they were designed.



This is the Truvolt Divider, referred to above.

perhaps 150 volts for the first L.F. stage, another variable giving, say, 80 volts for a screening grid, and a further variable for detector and ordinary high-frequency valves. This leaves us, still, two variables to give the grid bias for the first and second L.F. respectively. Thus it will be seen

mounted on an ebonite panel. In WIRELESS CONSTRUCTOR designs the hole is often countersunk so that the screw head falls below the surface, the depression so formed being filled up with "play wax" or other modelling material. We are, therefore, glad to welcome "Hay's Radio Wax,"



# WITHIN THE VACUUM



*Do you suffer from distortion on loud notes? If so, make sure, in the manner indicated here, that your valves are not being overloaded.*

By KEITH D. ROGERS.

**T**HIS month I want to answer one or two queries which have been put to me by readers during the last month or so; queries which I think may be of interest to quite a number of constructors. One concerns the ever-present problem of tracing overloading.

## Commencing the Search

Probably the easiest way to trace the overloading of a valve in any L.F. position of the set is to place a milliammeter in series with the H.T. lead to that particular valve.

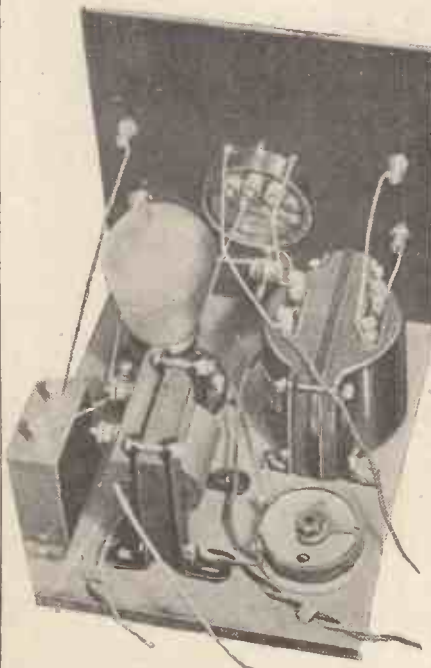
In the first place, if a set is suspected of overloading—it will be pretty obvious by a sort of roughness on the edges of many of the loud notes, especially some of the high ones—and a milliammeter be placed in the negative H.T. lead, this will be seen to kick violently over to the right or to the left.

It is essential that a sensitive milliammeter be used, and not one with a tremendously long pointer which has so much inertia that a rapid kick cannot be noted on it. A milliammeter reading up to about 25 milliamps with quite a light pointer should be used, provided, of course, that the set does not take more than 25 milliamps. If it does, then I am afraid that we shall have to use a meter reading to a higher milliamperage.

## Each Stage Separately

The next job, providing the milliammeter does kick (if it does not the

trouble is not overloading), is to try it in the plate circuits of the various L.F. valves and to see where the kick originates. As this has kicked in the negative H.T. lead you may be sure that it will kick in the positive H.T. lead of the last valve, and so what I usually do is to take the milliammeter straight away to the plate circuit of the first L.F. valve and see what happens there.



*The use of a volume control, as shown on the panel of this amplifier unit, will prevent distortion from overloading. The output choke filter (left) is also an aid to pure reproduction.*

If there is absolutely no kick here at all, then one may be pretty sure that no overloading has taken place so far, and can proceed farther down the scale towards the last valve.

## Detector or L.F.?

If a kick is noticed here, however, we have to decide whether it is taking place in the detector or the low-frequency valve, and which is being overloaded. Perhaps the best way to do this is to change the L.F. valve for a larger valve, which you feel sure will not be overloaded, and, still keeping the tuning of the set the same, adjust the grid bias for this larger valve to somewhere about its right value.

If the kicking was not very bad on the L.F. valve just tested, then we may rest assured that this larger valve will not be overloaded; but if the detector is overloaded the magnified distortion will still be present in the valve just placed in the L.F. position, and we shall see at once that the detector is being overloaded.

## The Next Step

Should we find that the detector is being overloaded we can either use a larger valve for the detector or readjust the bias and H.T. (especially if this is operating on the anode-bend principle) or detune the set somewhat.

Having cured the detector overloading, we turn our attention to the L.F. and replace the original valve, biasing it as before. If this now kicks, then we may be pretty sure that this

## Within the Vacuum—continued

valve also is being overloaded, and if alterations in grid bias and H.T. do not affect an improvement here, then we must insert a larger valve, taking care, of course, that if this stage is transformer-coupled to the next we do not saturate the core of the transformer by using a valve which takes too heavy a plate current.

### Watching the Kick

We then proceed to the next stage, and do the same here, and, finally, arrive at the last stage and do exactly the same there, noting, of course, that we do not alter the tuning of the set all the way through, except when absolutely necessary.

Now, when testing with a milliammeter, for overloading, one should note which way the milliammeter kicks. Sometimes, if the kick is very

particular valve is caused by the incoming signals making the grid too much positive, and that grid current is occurring. So, sometimes, by altering the grid bias to a larger *negative* voltage this particular kick can be eliminated, and the overloading stopped.

If, however, the kick of the milliammeter is to the right, it shows we have too *much* grid bias and partial rectification is occurring, and we either have to increase the H.T. or decrease the grid bias, to get rid of this kick.

We are assuming, of course, that the overloading is not so great as would cause an overload which ever way the grid bias was altered, making the milliammeter kick in both directions.

Overloading of the L.F. valves, and not uncommonly the detector valve,

It can be used for many other purposes, besides that of tracking overloading, and is a most valuable instrument, and one which should be in the possession of all wireless constructors.

### S.G. or Neut. ?

Another reader asks whether he should use a screened-grid valve or an ordinary neutralised H.F. stage for his four-valve receiver. As he lives somewhat near the local station, within a distance of five miles, I would strongly recommend him to use an ordinary neutralised H.F. stage, neutralising the set very carefully indeed.

Even then he may require a wavetrap of the usual absorption type. If he employs a screened-grid valve, I am very much afraid that the tuning will be so flat that he will have extreme difficulty in cutting out his local station, unless he so designs the tuning circuits as to cut down to a very great extent the magnification by having moderately weak coupling between the plate circuit and the grid of the screened-grid valve, the detector.

Although the screened-grid valve is excellent for the man who wants distance, it is only really at its maximum usefulness when employed outside the ten-mile limit from a station, unless, of course, one has two stages, when one may use it much closer than ten miles.

Personally, I am rather in favour of having one neutralised stage followed by a screened-grid valve as the H.F. side of a receiver, and I think that this is one of the best arrangements possible with present-day valves.

### Grid-Bias Adjustment

Finally, I would like once more to emphasise the importance of switching off a set before altering the grid bias of any of the valves. While the grid-bias plug is out the valve has absolutely a free grid and the resistance of the valve drops considerably, with the result that the emission increases, and this may, in less time than it takes for you to take the plug out and put into another hole, rise to a value far in excess of the intended maximum emission of the valve, and thereby do the valve a tremendous lot of damage. All grid-bias plugs should be adjusted with the H.T. or L.T. off.



Some of the apparatus used in the "Wireless Constructor" laboratory. The milliammeters in the left foreground are useful for taking valve curves and testing for overloading, while the meter on the right is a complete set tester that is often found extremely valuable.

uncertain, it will be difficult to see which way it goes, but if the kick is vigorous you will see quite easily that it goes either to the right or to the left.

If it goes to the left it is a definite sign that the overloading in that

is the cause of a tremendously large proportion of poor results, and I would advise all constructors to invest in a milliammeter, for this instrument will rapidly repay its initial cost in enabling the constructor to get absolutely the best out of his receiver.

# IN LIGHTER VEIN

*By  
Wireless  
Waitarer*



"I WANT you," said Mr. Hercy Parris, "to go and spend a day at the B.B.C. headquarters."

"Spill the beans," I returned (I had spent the previous night in listening to America on the short waves, and Mr. Parris' horn rims continued the transatlantic atmosphere). "What is the big idea?"

"Heaps of people have written snippets on this and that of Savoy Hill, but no one has yet told readers what they are thirsting to know—just how the great machine and the brains behind it function from early morn until the small hours of the next day."



... I landed upon a tin-tack ...

"I don't like the early-morn business," I began. Mr. Hercy Parris cowed me with a steely glare. "I have arranged for you," he told me, "to be there at nine o'clock and to visit one department after another right through the day. You will see the entire working, and you will then be able to write me a splendid article, entitled, 'Savoy Hill With The Lid Off.'"

I suggested that the programme sounded rather like another place that was sometimes referred to as having its lid off, but Mr. Parris would not listen.

"Do you think that they will all talk?" I asked.

## I Awake Early

Mr. Parris hoped that they would. But, anyhow—why?

"Well," I said, "honestly I have had so much talking from Savoy Hill in the last five years—"

"That will do," snapped Mr. Parris. "Be there at nine o'clock to-morrow morning."

On retiring to rest, I set my alarm clock for six-thirty—a horrible thing to do. Luckily, I forgot to wind up the

part that makes all the noise, so that I did not start my strenuous day in a fagged and floppy condition through lack of sleep. I awoke early enough, though, for it was barely ten-thirty when I opened my eyes to gaze upon the smiling morn. Leaping out of bed, I landed upon a tin-tack, and hastily got back again. Early rising brings all sorts of horrors in its train.

After a short nap, to settle my nerves down after the shock inflicted by the puncture, I got up once more, first carefully reconnoitring the rug by my bedside. Then, having sung gaily in my bath, I proceeded to dress with my usual good taste, but with more than usual care, since the occasion was so momentous.

## I Dress Chastely

A morning coat and topper were just the things, I felt, in which to visit the Chairman, the Managing Director, and the Educational Department. A bright, but chaste, waistcoat would appeal at once to those engaged upon the artistic side. An Old Parkhurstian tie and Oxford bags got the right public school and 'varsity spirit for calling upon culchard announcers. Brown boots and but a single spat would, I felt, make me at once welcome in the Variety Department.

After a light, but satisfying, breakfast I entered my car (I always say that there is no make to beat the L.G.O.C. for economy and reliability) and was wafted in almost no time at all to the Strand. I turned down towards Savoy Hill and climbed the steps of Number Two. On the way up, I hooked my stick over my arm, in order to pull out my card case.

A puff of wind at this moment loosened my hat. I flung up my hand to save it. The stick got somehow between my legs, with the result that I did a kind of Charleston up the remaining steps and landed upon the broad bosom of a stalwart commissioner.

"Better go 'ome and sleep it off," he suggested.

Drawing myself up to my full height, and looking the fellow full in

the eye, I handed him a card, saying haughtily: "To Sir Scone Teith."

"Just gone out to lunch," grunted the commissioner; "back at three o'clock."

"Never mind," I said airily, "Take it to Lord Glaringfrown!" "Gone to lunch; back at three o'clock."

## I Lunch Expensively

"Then take it to Lord Faintbored."

"Out at lunch; back at three o'clock."

I suggested all the alternative programmes that I could think of, but it appeared that the whole of Savoy Hill had gone to the charging station, and, as I was feeling distinctly peckish myself, I decided that I might go and do likewise. Since Mr. Parris had assured me that I might charge up my expenses, I did myself rather well in the way of lunch, though it was only four-thirty when I drained my coffee cup and returned to the assault upon the B.B.C. headquarters.

A fresh commissioner was on duty when I got there, the previous one having, I presume, gone out to lunch. Before I could get out a word, he jerked his thumb over his shoulder, and said:

"Comic artists first on the right, second on the left."

This so took the wind out of my sails that I began to stammer:

"Wwww—"

"Microphone fright," said the



... Better go 'ome and sleep it off ...

commissionaire, with a kindly glance. "The Official Soother'll be here in a moment. He will make you feel quite at your ease."

"I don't want the Official Soother," I cried, suddenly finding my voice. "I want the Official Receiver, or any

## In Lighter Vein—continued

other confounded official who will take this card to Sir Scone Teith."

"Gone to tea; back at five-thirty."

Lord Glaringfrown and Lord Faintbored, it appeared, were similarly occupied. The Programme Director was busy rehearsing. All the announcers were announcing, or about to act as uncles in the Children's Hour. In fact, I had struck a bad time, and he advised me to come back a little later.

With the cheerful thought that expenses included tea, I betook me to the cosiest teashop that I could find in the neighbourhood, and settled down to well-earned refreshment. It was obviously useless to hurry back, I thought, so I went afterwards for a stroll along the Embankment before returning to the attack.

My old friend, commissionaire number one, was again on duty when I staggered up the steps the third time. Sir Scone Teith, Lord Glaringfrown, and Lord Faintbored, it appeared, had gone to dinner, and might, or might not, be back about nine. The announcers were busy with the first news bulletin. Most of the other departments were closed, and it would be better for me to call again a little later on.

### I Dine Expensively

My walk by the margin of Father Thames had sharpened up my appetite, so that I was feeling pleasantly hungry when I entered the Saveloy Hotel to dine. You can take it from me, next time that *your* expenses are being paid, that the Saveloy is quite



... After about nineteen courses ...

a good place to go to. My little snack ran to about nineteen courses, and by the time that I had finished my Flor de Cabbaggio it was close upon ten o'clock. Now or never, I thought, setting out once more for that grim flight of steps. The commissionaire eyed me a little sadly.

"Curious how you miss 'em," he said, before I could utter a word. "All the big pots have gone out to

supper, and all the announcers have finished for the day and gone home, except those who are engaged in the studio. If you like to come back again at twelve o'clock you will just catch those we have on their way out."

"Well, well," I said, "it has been a tiring day, so I'll just go and have a little supper, and toddle round again at midnight."

### I Make My Report

The Saveloy had done me so well in the matter of dinner that I thought I couldn't do better than return. Believe me, or believe me not, their supper is simply tophole.

When it was over, I went up to the ballroom for a time, for I thought I ought to see the place in which dance music was broadcast for some years, and there is nothing like getting atmosphere if you have to write a descriptive article. A sudden booming of clocks made me realise that the witching hour of midnight had arrived. At the double, I made my way to Number Two Savoy Hill. All the lights were out, the door was closed, and though I both rang and knocked, nobody answered.

Next day, I called upon Mr. Hercy Parris to report.

"Well," he smiled, "I expect that you had a wonderful time."

"I had," I said, "and here is my little account for expenses."

He frowned slightly over this, but parted readily enough when I assured him that I was thoroughly primed with original information.

"Now sit down," he said, when I had safely pocketed the cash, "and tell me all about it."

"Really, I couldn't," I sighed; "my mind is still so seething that I must go home and write it all down quietly. It has been an absolutely unique experience. In fact, I may say, that there has been no day in my whole life during which I have absorbed so much."

\*\*\*\*\*  
 \* "BIG BEN" AGAIN! \*  
 \*\*\*\*\*

Sir,—No doubt it will interest you to know that I have built your "Big Ben" receiver. The outstanding feature of this set is the splendid tone. I am working it off 120-volt H.T. accumulator, with a Mullard super-power valve in the last stage.

Several people have heard the set

work, and express their praise of the tone and volume. As regards distant reception, I have had, at full speaker strength, varying from very loud (almost as loud as Manchester, six miles from here) to good audibility, without "forcing" the set: Munich\* (very loud), Langenberg\*, Dublin, an Italian station—Rome or Turin\*, Stockholm\*, Paris (Petit Parisien), and three or four very good and clear any night, but not identified, and



... My little account for expenses ...

perhaps as many more at varying strengths; but all marked with the \* are loud and clear on most nights.

On the upper band I can hear Motala\*, Hilversum\*, Radio Paris, Kalundborg\*, Berlin and, of course, 5 X X\*, and two others occasionally but not identified. Those marked \* are very good, particularly Motala and Kalundborg, and often Hilversum. 5 X X is particularly fine.

### Midday Foreigners

I can listen to Hilversum and Kalundborg at midday any time. 5 GB comes through quite well, but on some nights with fading; but I suppose this is quite satisfactory, as few people in this district receive 5 GB with any strength. Two or three English stations can also be heard any night.

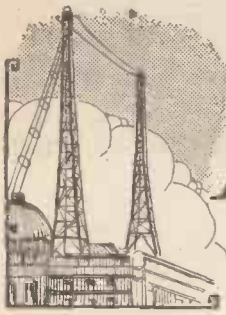
Considering that my aerial might be better (an outdoor one), but good short earth (tube), under the aerial, I think the above results are very good for a three-valve set, and I am rarely short of a musical programme. The only alteration, if you can call it one, is that I fitted a volume control recently, as one or two distant stations need it, not forgetting Manchester and London.

Despite the decent list of stations referred to above, the chief virtue of the set which appeals to me is its reproducing quality. Thanking you for such a splendid circuit and wishing you the best success in the future.

Yours sincerely,

G. O. JONES.

Oldham,  
Lancs



# HAPPENINGS AT SAVOY HILL



By OUR SPECIAL COMMISSIONER

## B.B.C. Staff Losses

**D**EFECTION of staff from the B.B.C. has now grown into a steady stream. I understand there are a lot more officials in negotiation with outside firms. Meanwhile, Savoy Hill maintains a curious imperturbability. When I discussed the matter the other day with a high official, I was told that broadcasting is now so firmly established and the machine running so smoothly that, with the possible exception of Sir John Reith, it would not make the slightest difference if the whole of the staff were changed to-morrow.

For every defection there are hundreds of applicants. But I think this is perhaps going too far. Unless the B.B.C. is careful of some of its staff the place will tend to become simply a training ground for jobs elsewhere, and this would be reflected in programmes. On the other hand, there is no doubt that in a few years' time there will not be half as many people employed by the B.B.C. as now.

## Is the Studio Performance Doomed?

The development of Outside Broadcast work both on the technical and presentation sides has been so striking and rapid that straight studio work is now on the decline. I believe that this process will continue. More concerts, variety shows, and features generally will be taken from outside. As long as quality is good, there are many advantages.

For one thing it enables the B.B.C. to save money on staff and organisations. Some of this money might be turned to good account in helping local musical effort. As long as microphone value was secured there would be no objection to carefully controlled expenditure of that kind. Similarly, repertory companies here and there might be induced to take on radio drama now and then. A prudent exploration of possibilities of this kind might make possible a much more extensive demobilisation

than is already contemplated. I cannot say how far this O.B. tendency will go, but its extension is certain.

## The B.B.C. Report

The Second Annual Report of the B.B.C., covering the year 1928, was made available in printed form by H.M. Stationery Office an hour or two after the formal Prorogation of Parliament. The First Annual Report was presented by the P.M.G. still later in last year, and at a time when it was almost certain to attract no notice.

One wonders if this procedure is accidental or calculated. Anyway, its result is that this Parliament has had no opportunity of discussing the Governors' stewardship since they were appointed at the end of 1926. Why should it require five or six months to get out a Report of this kind? The B.B.C. will offer no explanation, but I understand that the cause of delay is at the Post Office.

It is believed that the P.M.G. feels

nervous about the B.B.C., and is not at all anxious to be cross-examined about the details of its work. In view of the insistence of the B.B.C. on the necessity for maintaining big profits from its publications, no one has yet asked why there is no sign of Savoy Hill seeking a revision of the terms of distribution of licence revenue.

When the present allotment was made, the P.M.G. told Parliament that if the B.B.C. found it could not get along with the money given it for the first two years, then it would be entitled in 1929 to ask for a revision in its favour.

So far not a murmur from Savoy Hill. The staff there apparently have been told to avoid discussing finance at all costs. But I would like to see this little inconsistency cleared up. If the joint committee of the newspapers and the B.B.C. were to tackle this problem, they might make some real progress. Why not a bargain that if the newspapers brought such pressure to bear that the P.M.G. yielded all the licence

## A POPULAR PRAGUE BROADCAST



The National Theatre, Prague, from which broadcasts are often transmitted to the various Czecho-Slovakian stations.

## Happenings at Savoy Hill—continued

revenue than the B.B.C. would hand over its publications to independent interests.

### Brookman's Park Plans

Brookman's Park will be on the air experimentally before the end of July. I gather the B.B.C. proposes to switch over from Oxford Street to Brookman's Park not later than September 1st. During August the idea is to give listeners numerous opportunities to change their tuning and adapt their sets.

Then, if all goes well with the new 2 L O, the second wave will be introduced experimentally during October. There is substantial hope of double wave-length working regularly by the end of the year. Hence, at long last, the first instalment of the Regional Scheme will come into opera-

definite that Dr. Boulton, of Birmingham, believes he is taking over Mr. Pitt's work. So I suppose Savoy Hill is searching the inevitable compromise formula designed to make everyone happy, but apt to make everyone cross. If it should turn out that Mr. Pitt does retire I look forward to a period of intense hostility between Covent Garden Opera interests and broadcasting.

### Retiring Age at Savoy Hill

Press discussion on Mr. Pitt elicited from Savoy Hill confirmation of the rumour that the B.B.C. regarded sixty as the normal retiring age. But I am told that, as this has not been made clear in staff agreements, it is doubtful whether it could be applied where the wish was not mutual, and where it could be demon-

policy to carry over any staff from the present B.B.C. to the new organisation that will replace it in 1937.

### Broadcasting House

There is still no progress report of Broadcasting House in Portland Place. But there is some activity. Lieut.-Col. G. Val Myer, the able architect, and the Civil Engineer of the B.B.C. (Mr. Tudsbury) have been on the site a lot lately, and constructional operations have now replaced the demolition operations.

### Sir John Reith's American Tour

Sir John Reith's American tour, so long projected, is apparently nearing fulfilment at last. Mr. Aylesworth, Sir John's opposite number in the States, was most insistent about this when he was in England in April. Sir John himself has hosts of friends in America, where he was once in charge of thousands of munition inspectors and other officials concerned with Britain's war effort on the other side of the Atlantic.

I am told on fairly good authority that Sir John will spend six months in America either this year or next. If so, the Governors of the Corporation had better be on the alert to keep him tied up in some way.

## A NEW EUROPEAN ETHER-SHAKER



A view of the Beograd (Yugoslavia) station, which broadcasts with a power of 2.5 kw.

tion. Over four years have elapsed since the B.B.C. announced its "regional" plans.

### Mr. Percy Pitt

Friends of Mr. Pitt tell me that he is highly amused at the antics of those who, by saying it often enough, hope to bring about his departure from Savoy Hill. It appears definite that Mr. Pitt is going on just the same as ever, so far as he is concerned. On the other hand, it is equally

strated in arbitration that efficiency was maintained.

It might be thought to be at least doubtful whether there would be a retiring age laid down. People who do their job with the enthusiasm and application expected by the B.B.C. will be burnt out long before they get anywhere near this age. And there is another point. The whole staff should change at least every ten years to keep up brightness and vigour. It would, I think, be bad

\*\*\*\*\*  
\* **H.T. Voltage & Quality** \*  
\*\*\*\*\*

**H**AS it ever occurred to you that good quality from a loud speaker cannot be obtained without a real supply of high-tension? Where you get a case of two similar sets, one of which gives good quality and the other makes a "horrible row," the cause, assuming correct valves to be in use, is generally a question of H.T.

No matter what sort of power valve you use, unless you have sufficient H.T. voltage you will not get really pure results. The ideal at which to aim is to apply the maximum permissible H.T. to the plate of the valve. Note that I do not say to the H.T. + terminal of the last valve. This is because a certain voltage drop is bound to take place across the loud speaker or the output filter. An extra voltage of 10 to 20 volts will be needed to make up for this.

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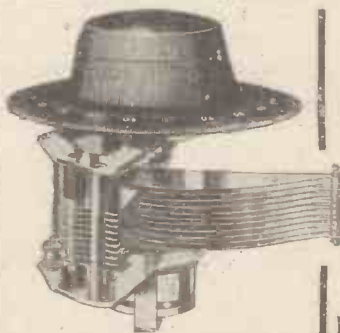
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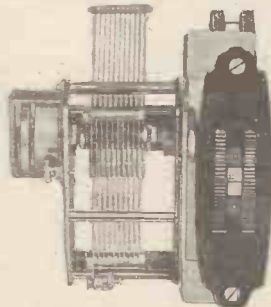
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# CHATS AT THE WORK-TABLE

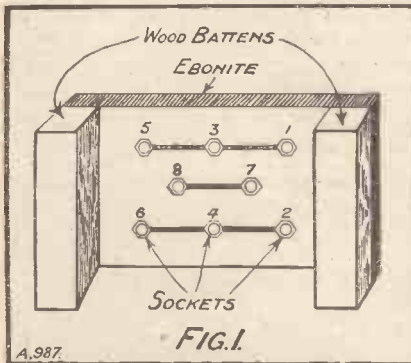
Many points of practical interest to amateurs and set constructors are dealt with under this heading.

By R. W. HALLOWS, M.A.

## A Loud-Speaker Distributor

QUITE a number of people nowadays use two loud speakers; a horn model and one of the cone type. The former give their full brilliancy to the higher notes, whilst the latter deals, as the other cannot, with the bass. Others again have wired their houses so that two or more loud speakers may be used at once in different rooms.

Now, until one actually tries out various combinations, one cannot tell whether the series or the parallel arrangement is going to give the better reproduction with a particular circuit and a particular output valve. Generally speaking, if the windings of the loud-speakers are of approximately the same resistance they may do well in parallel, whilst if they are of different resistance values the series arrangement may be better. Where the resistance of both is similar, but on the low side, series connection may be better than parallel.



In order to facilitate experimenting with loud-speaker combinations, the reader will find it a great advantage to spend a few minutes in making up the little distributing panel illustrated in Fig. 1. This consists of a piece of 1/4-in. ebonite, of suitable dimensions, in which are mounted eight standard sockets, connected as shown in the drawing. At each end of the ebonite is a small wooden batten, to allow the shanks of the sockets and the connecting wires to clear the surface of the

table or baseboard upon which the panel stands.

Fig. 2 shows how very simple the change-over from series to parallel is made. The leads from the receiving set, and those from each loud speaker, are provided with plugs to fit the sockets. The receiving-set leads are plugged in the sockets numbered 1 and 2. For the parallel connection, one loud speaker is connected to sockets numbered 3 and 4 and the other to numbers 5 and 6.

To throw the two into series, one plug is removed from socket No. 4 to socket No. 7 and another from No. 5 to No. 8. In this way, any combination can be tried out and one loud speaker or both used at will. I have found this little panel of the greatest use in experimental work and I am sure that any reader who makes it up will have a reason to bless it.

## Another Vice Tip

Recently, I gave a hint about the use of a small auxiliary vice clamped in the jaws of the big bench vice for holding small pieces of work. Here is another hint which may be found useful. If you happen to have an old hand drill, which has been discarded either because it has seen its best days or because its chuck will not take 3/8-in. drills, the tool, or rather a part of it, may be given a fresh lease of useful life.

In most patterns, the shank of the chuck is held in place by a pin running through the boss of the lower small bevel gear wheel. File off the riveted-over end of this pin and punch it out. The chuck and its shank can then be withdrawn. If you have to deal with any small round piece of work, which requires to be firmly held, place the shank of the chuck in the jaws of the bench vice and use the chuck itself to grip the work.

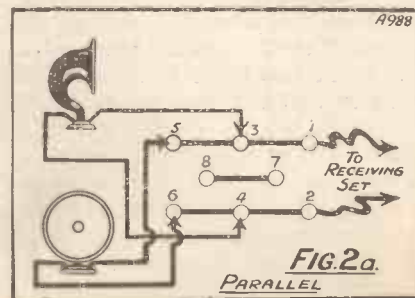


## Nothing Wasted!

The old drill, deprived of its chuck, need not be thrown away for it can be converted quite easily into a very useful coil winder. Fig. 3 shows how this is done. A spindle threaded for the greater part of its length is made, the diameter of the unthreaded portion being the same as that by which the chuck is mounted. This spindle is fitted into the drill and secured by pinning it to the lower bevel wheel.

On the threaded portion are mounted two wooden cheeks shaped as shown in the drawing. Of these A is fixed, being secured in position by a nut. B is movable, being free to slide to and fro on the threaded portion. When a coil is to be wound, the former is fixed between the cheeks by pressing them together and tightening up the nut on the outside of B. The body of the drill is then fixed in the vice and the step-up gear ratio much reduces the time taken in winding a solenoid or hank coil.

The left hand turns the crank of the drill whilst the right feeds on the wire. The majority of hand drills are geared 4 to 1. If, therefore, a hundred turns are to be put on, the left-hand must



## Chats at the Work-Table—continued

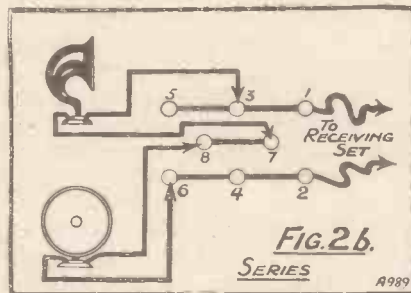
make twenty-five revolutions. Discover the ratio of the gearing of your own particular drill and you will have no difficulty in counting the turns put on.

### Soldering to Tags

It is customary, nowadays, to fit most components provided with terminals with small soldering tags. Many constructors screw down leads to the terminals, but those who like to have their wireless equipment "just so" are particular about soldering as many joints as possible. With the tag, there must be a screw-down joint anyhow, but its flat surface ensures a good contact and tagged leads are always good-looking.

There is one point about soldering to tags that is frequently overlooked. They should really be removed temporarily from the component before being fixed to the ends of the leads. If soldering is done with the tags in position the terminals to which they are fixed are sometimes unduly heated, which may cause them to come loose in the ebonite mounting. It does not take more than a second or two to remove and refix a tag and it is much more satisfactory to do so, especially if one is dealing with a delicate component.

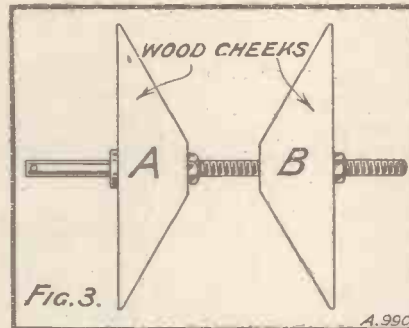
For some queer reason that I have never been able to understand many makers use tags which have been carefully arranged so that solder will not adhere to them. Nickel plating,



of course, looks very beautiful, but it is productive of much bad language on the part of the wireless constructor. It is a sound rule never to attempt to solder to anything nickelled, for even if the solder appears to flow pretty well a dry point is more than likely to occur.

Unless the tags provided are obviously tinned, it is always best as a preliminary to try scraping one of them with an old knife. The odds are

that scraping will disclose the presence of plating with brass beneath it. If this is so, continue the process of scraping, until the plating is removed, and tin each tag carefully before making joints. The use of the



nickelled tag, like that of the nut which no standard box spanner will fit, is probably a little jest on the part of the component maker, who feels that the path of the home constructor is being made too easy.

### Baring Flex Ends

Many constructors make more than one mistake over the simple job of baring the ends of flex leads. An error that one commonly sees is the removal of the outer braid covering as well as of the inner insulating layers for about an inch when the end is being dealt with. When this is done a clumsy job nearly always results, owing to the way in which the ends of the braiding fray out.

Here is a much better method. Snip off the end of the flex cleanly with a sharp pair of nippers or a pair of scissors. Grasp the rubber part with the forefinger and thumb of the right hand and with the left hand work the braid covering back for an inch or so. Now remove the inner insulating layers, make your loops in the strands. Solder on your tag or fix your plug, and then work the braid covering back into place. A thin strip of sticking plaster or insulating tape wound round the ends of the braid will now make all very neat and snug.

There is a right way and a wrong way, for removing the rubber insulation. The best way, I find, is to cut through it all round, about an inch from the end, with a sharp knife or a pair of scissors. Go gently, taking care not to cut any of the strands inside as well. When the rubber has been cut through, it can be pulled off

with the forefinger and thumb of the right hand.

The worst method of all is to go for the rubber bald-headed with the blade of a knife, scraping it away. If this is attempted, some of the strands are almost certain to be cut or broken, and one is invariably left with a rather ragged end to the rubber. Before you make a loop in flex, always twist the strands very tightly together. This having been done, wrap your wire once round a piece of rod or one point of a pair of bottle-nosed pliers, turn the end over the standing part, and twist until the loop is tight.

### A Safety Dust Brush

For removing dust from the panel of the receiving set, from the top of the high-tension battery, and from the various components within the cabinet, there is absolutely nothing to beat a soft, flat camel-hair brush—a sky brush I think it is called by painters. The one that I use myself is about 1½ inches in width. With it, one can get into all sorts of odd corners that cannot be reached with a duster, and an occasional few minutes' work suffices to keep everything free from that dangerous coating of dust.

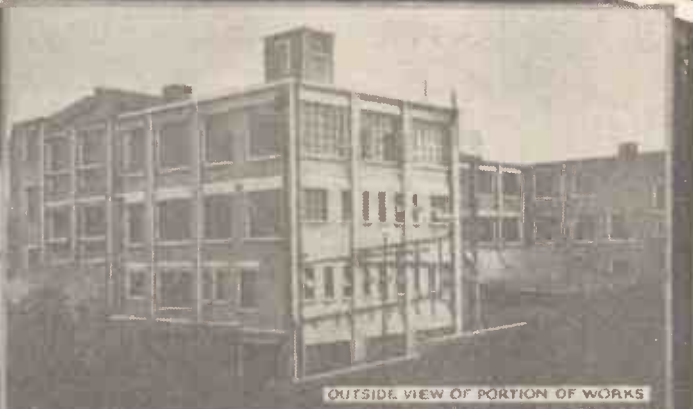
There is, however, one point about these brushes that one does not always realise until it is somewhat too forcibly brought home. The hairs are fixed in a metal sheath, and metal is rather a good conductor of electricity. Sticking plaster should be wound on puttee-wise, so as entirely to cover the metal (Fig. 4). The brush is then as safe as the proverbial houses,



and can be used anywhere in the receiving set without the slightest risk of any untoward happening.

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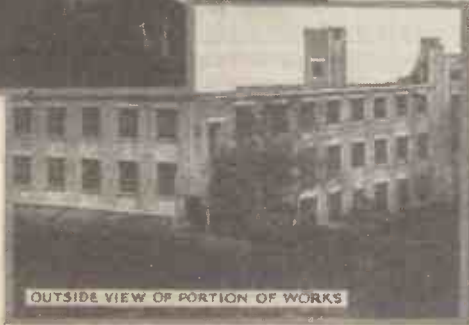
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# RADIOGRAMPHONICS

*This month a simple explanation of the working of a gramophone pick-up is given together with a report on a new pick-up and carrier that has just been received.*

By A. JOHNSON-RANDALL

WHAT the pick-up actually has to do, is to change the wavy grooves which form the channels of a record into varying electrical potentials.

First of all, let us consider a simple case of magnetism with which all will be familiar. If an ordinary horseshoe magnet is brought near to a pin it will attract the latter towards it. Two facts in connection with the "magnetic field" that produces this movement stand out. First, that it is concentrated very closely to the magnet—that is to say, the magnet will not attract the pin until it is quite near; and secondly, that it is only evident at the ends of the magnet.

## Making a Magnet

If we now take a bar of ordinary iron and wind a large number of turns of insulated wire around it, and connect the ends of the windings to a battery, the iron bar will become a magnet. A pin brought near to either end of it will be attracted, and if we bend the bar into a horseshoe shape we shall have a similar magnet to that previously considered. In this case, however, the electric current will be causing the pin to move.

An electric current in the coil produces a movement in a pin or piece of iron brought into the magnetic field. Vice versa, a movement of the piece of iron will produce a current in the coil. If this is to take place, however, the iron bar must be magnetised by current from the battery. The extra current will be superimposed on the battery current. There is no reason, however, why we should not replace our iron bar by an ordinary permanent magnet.

## The Armature

We now have a little instrument consisting of a permanent magnet, with its poles near one another, and with two little coils of wire on it. A piece of iron moves about near the poles of the magnet, thus producing voltages across the coil which vary

according to the amount and speed of the movement of the iron. This, in effect, constitutes a working model of an electrical pick-up.

In an actual pick-up, the piece of moving iron is represented by what is known as the armature. The armature is arranged very close to the magnet's poles, since as the field is strongest at this point, the movement will produce the maximum possible voltages.

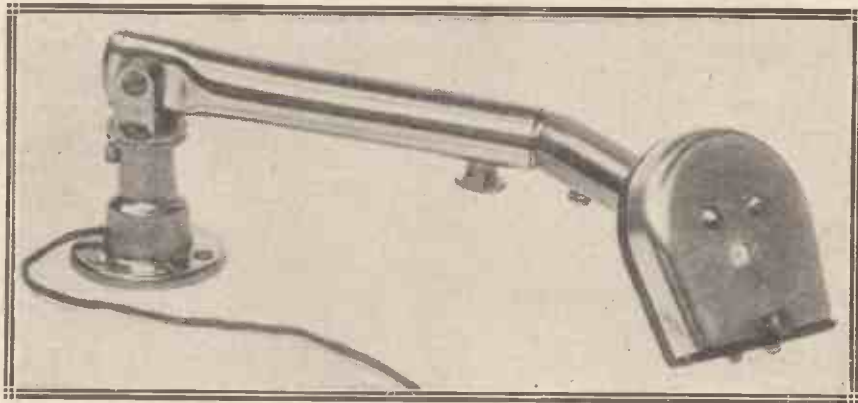
At one end the armature is firmly fixed, whilst at the other, a chuck is arranged to take gramophone needles. The movement of the armature is carefully damped, so that it responds correctly to the gramophone record and has practically no natural period of vibration itself. Very often the

to the electro-magnet already described.

## A Pick-Up Tested

We have received for test a new type B.T.-H. pick-up and carrier. The makers claim that the tracking error has been reduced to no more than 3 degrees, permitting the armature of the pick-up always to work on a line at right angles to the groove.

A close inspection of the device reveals the excellent workmanship and the care that has been taken in the design. The carrier rotates freely on ball bearings, and the weight of the arm itself, together with the pick-up, are partially counter-



*The B.T.-H. pick-up and carrier which is reviewed.*

armature passes between the two poles of the magnet, instead of being arranged across them both, as in the case of the horseshoe magnet previously mentioned.

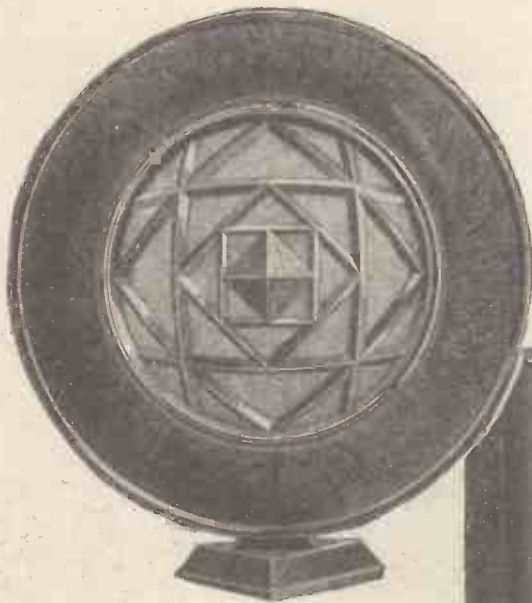
The foregoing description applies to the majority of pick-ups, but there are some which are known as polarised pick-ups. In these an electro-magnet is employed in place of the permanent one, in a similar manner

balanced by a spring, the overall weight upon the record being small.

The carrier is supplied with a template and complete instructions for fitting. The device gives one the impression that it is a thoroughly well-designed job, and this was borne out by our preliminary tests. We shall have more to say about this carrier and pick-up in our next issue.

# *Speakers that the Critics buy*

BLUE SPOT  
101 - £3. 13. 6.



Of course it is possible to criticise Blue Spot. One can criticise a Stradivarius or a Rembrandt—but the analogy is obvious.

For in Blue Spot, loudspeaker performance is perfected. Tone is phenomenal—appearance is in such good taste and the two models illustrated here are indeed worthy of the Blue Spot tradition.

Hear them to-day at your nearest wireless dealers—you may prefer the 101, or perhaps the 99K will harmonise in your home—but in both the purity of tone will be a revelation.



BLUE SPOT  
99K - £5. 5. 0.

F. A. HUGHES & CO., LIMITED, 204-6 Great Portland Street, London, W.1

Distributors for Northern England, Scotland and North Wales: H. C. RAWSON (SHEFFIELD & LONDON) LTD.,  
100 LONDON ROAD, SHEFFIELD; 185 PRINCESS STREET, MANCHESTER.



# THE ART OF TUNING-IN

GET two men, one skilled in the art of tuning and the other a member of the ham-handed fraternity, spend half an hour apiece at the controls of the same receiving set, and there will be a vast difference in the way in which searching is carried out, in the number of stations received and in the general quality of the reproduction.

The expert will tour the broadcast band from end to end without a squeal, bringing in station after station and working each up to the maximum signal strength obtainable without distortion; the less skilled searcher will probably howl the place down during his turn at the controls; he will miss a large number of transmissions altogether, and as often as not he will overload the set when a powerful signal is coming through, or be unable to work up a weak one to reasonable loud-speaker strength.

## Delicacy of Touch?

Now, just what is it that makes A more skilful than B, Jones a better searcher than Brown, Smith more successful in the number of stations bagged than Robinson? In the early days of wireless we should have said at once that it was largely a matter of delicacy of touch; A or Jones or Smith were the fortunate possessors of hands capable of making the exceedingly small adjustments required when plain condenser dials were in use, whilst B or Brown or Robinson were less lucky in their natural gifts.

We cannot say this to-day, for the geared condenser and the slow-motion dial, whether edgewise or flat, have almost entirely discounted the advantages brought by the possession

*The expert will smoothly tour the broadcast band from end to end, while the less skilled searcher will probably howl the place down in his endeavours. Why? The question is answered in this interesting article.*

## By An Old Hand.

of nimble fingers. The ability to make very fine adjustments has now been brought mechanically within the powers of every wireless man.

The truth is that the skilled operator gets almost instantly the "feel" of any set that he handles. Unlike the non-expert, he is able whilst searching over a band of waves to keep his

tuned circuits in resonance and to maintain the apparatus in a sensitive condition without allowing it to oscillate.

## Power of Observation

In many cases—perhaps the majority—he could not himself tell you the secret of his success, but it lies actually in observation. He uses his eyes and his ears as well as his fingers. Watch how he tackles the job of making a search over the broadcast band with a set that is entirely strange to him. He sets the reaction control at zero, or very nearly so, to begin with, and finds



*This young radio fan is an expert at tuning-in, for with his two-valver he established communication with the Byrd Antarctic Expedition base ship, "City of New York," far away among the southern ice.*

# Weston sets the world's standard



Model 506, Pin Jack Voltmeter complete with high range standard testing cables.

Price £2.10.0.

To obtain the very best results from your receiver, you must be quite sure that the High Tension, Low Tension and Grid Bias voltages are regulated correctly.

For exact measurements of these variable voltages be sure you use a Weston Pin Jack Voltmeter.

It is sold by all Radio Dealers as the finest instrument for accuracy and reliability.

Write for the Weston Free Booklet, "Radio Control," which explains the necessity for accurate electrical control of your Radio receiver and gives much helpful advice. Address your applications to:-

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15, Great Saffron Hill, London, E.C.1.

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For Panels up to 21 ins. X 7 ins.  
Baseboards up to 11 ins.

£4.4.0

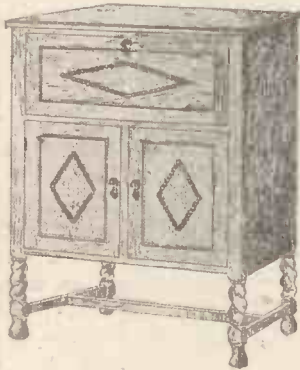
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The "Radiano" Three

and

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ENVELOPE SERIES, Price 1/6  
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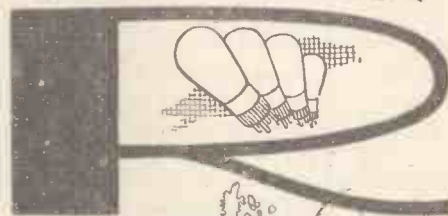
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### 5/6 TWO VOLTS

General Purpose, .05 amp.	5/6
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Super-Power, .18 amp.	7/6
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Pentodion, .3 amp.	21/-

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General Purpose, .05 amp.	5/6
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Super-Power, .1 amp.	7/6
Super H.F. & R.C.C., .1 amp.	7/6
Pentodion, .15 amp.	21/-

From your dealer or direct:

IMPEX ELECTRICAL LTD.,  
Dept. L, 538, High Road, Leytonstone, E.11.

## The Art of Tuning-In—continued

the local station before he does anything else. There are, we will say, two main tuning dials.

His eyes glance first at one and then at the other, and he notices that No. 1 shows a reading two divisions higher than No. 2. The non-expert will probably not observe this, or if he did he would as likely as not learn nothing from the fact. To the skilled searcher it means that the two circuits do not work quite in step, and that he must be on the watch to discover just what are the relations between their readings both above and below the wave-length of the local station.

### Keeping Circuits "In Step"

Most likely he will go next for 5 G B, if that station happens to be well heard in the locality. Again he notices the difference, if any, between the readings of the two dials. This time, let us say, No. 1 is three divisions above No. 2.

He now knows, though the process is so automatic with him that he is

If he were to work downwards from the settings needed for the local station the two readings would come closer and closer together.

It is quite possible that they may coincide at, say, 250 metres, and then exchange positions; No. 1 reading slowly less and less than No. 2 as the wave-length is decreased below this point. This may not happen, but he is prepared for such a contingency.

Next he may try for Brussels or Vienna, since the set is already adjusted to 5 G B's wave-length. To do this he will move fairly rapidly upwards, taking care to keep the tuned circuits in step. There is no need for any particularly fine tuning since both these stations are easy to pick up; he will, though, tighten the reaction coupling a little so as to obtain rather greater sensitiveness as well as the selectivity necessary to cut out 5 G B. He hears, say, Brussels; slight movements of the controls tune the station in sharply, and the reaction dial is then slowly advanced until his ear tells him that

dial No. 2 is twenty-five divisions between the settings for the local station, which we will take to be London, and 5 G B, then a moment's thought shows that twenty-five divisions equals 134 metres, or, roughly, that each division corresponds to 5 metres. Or, if S.L.F. condensers are in use, a glance at a table of wave-lengths and frequencies shows him that 5 G B's frequency is 622 kilocycles and 2 L O's 838.

### Experts "Search Upwards"

The difference is 216, which means that each division corresponds to between 8 and 9 kilocycles, or, roughly, that under the Brussels Plan slightly more than one division of the dial of condenser number two will give him the step between one station and the next.

All this takes some time to describe, though actually these preliminaries would not occupy more than a minute or so, and at the end of them the operator would know a very great deal about the set that he was called upon to tackle. He is now ready to begin his real search and you will find that in nine cases out of ten he will not work downwards from Vienna, to which station we have just left him listening, but will go right to the bottom of the band and work upwards.

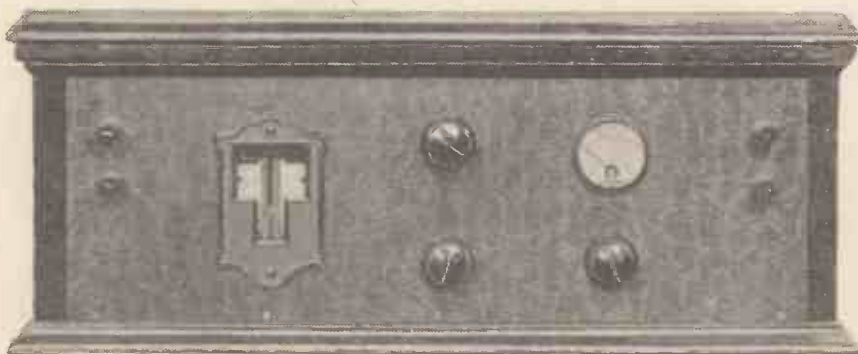
Unless the reaction control is constant, as it is in very few receiving sets, it is both easier and safer to search upwards. It is easier because once a station has been found and the maximum permissible amount of reaction applied the reaction condenser is not touched until the next station is picked up, when any small increase needed in its reading is readily made.

### A Safer System

It is safer since there is much less liability to cause interference through unintentionally allowing the set to oscillate for a moment; working from a given degree of reaction coupling the set will, in the ordinary way, tend to be slightly farther from the point of oscillation if the wave-length to which it is tuned is increased, but it may break into oscillation if the wave-length is reduced with the reaction coupling left in the same position.

The expert, then, will proceed to turn the reaction dial to zero, or nearly so, and he will probably start

(Continued on page 178.)



The layout of the panel has great bearing on the facility with which a set can be handled. The above shows the panel of the "D.C." Four—a remarkably easy set to tune.

scarcely conscious of having made any calculation, that for the whole band between the wave-length of the local station and that of 5 G B he will need, if he is to keep his circuits in resonance, to have dial No. 1 reading higher than No. 2, and that the difference between them will increase gradually from two to three degrees until the upper wave-length is reached.

And he has learnt in a few seconds a good deal more than this, for he knows in the first place that to find Brussels, Vienna, Munich, or Budapest, all of which work on wave-lengths above that of 5 G B, he will require a difference in the readings growing gradually greater than three degrees. Nor is this all.

he must go no farther or incipient oscillation will set in.

A glance at the reading of the reaction dial shows him just how much may be applied in the upper part of the wave-band. He knows that the odds are that a considerably looser coupling will be needed when he is down upon the shorter wave-lengths.

Now for another way in which observation simplifies tuning. Before he began to handle the controls the expert is sure to have looked inside the cabinet and to have noticed whether the tuning condensers were of the straight-line wave-length or the straight-line frequency pattern.

Suppose that they are S.L.W. and that the difference in the readings of



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An exclusive Harrods Radio device, this Speaker brings out the best from your Set because of its balanced armature drive and specially designed cone. Handsomely enclosed in either polished Oak or Mahogany case.

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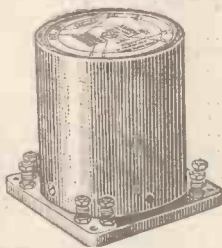
THE **100% Broadcast Receiver**  
BUILD and OPERATE in ONE EVENING

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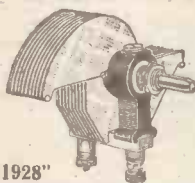
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BRITISH Components Throughout  
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TRANSFORMER-OUTPUT FILTER CHOKE 25/-



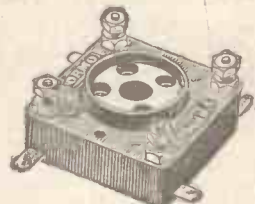
"1928" LOG CONDENSER 5/-  
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COILS SG 1 & 2. 10/6 each



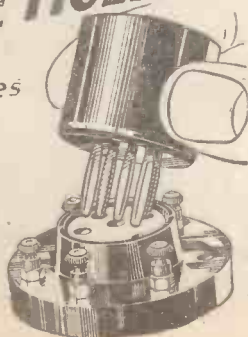
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The New W.B. VALVE HOLDER  
5-PIN For A.C. Valves



The most scientifically designed 5-Pin Valve Holder on the market. Fitted with patent expanding leg sockets suitable either for resilient or solid valve legs. Already this new W.B. Valve Holder is in use in the laboratories of the leading Valve Manufacturers in this country.

Ask your Dealer to show you one to-day.

Price 1/6

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THIS IS THE CABINET

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NEW ROADSIDE FOUR

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Also suitable for 3-, 4-, or 5-valve circuits

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\*\*\*\*\*  
**OUR NEWS BULLETIN**  
*Some of the More Interesting Happenings  
 in the Radio World this Month.*  
 \*\*\*\*\*

**Rex Resigns**

THE recent resignation of Mr. Rex Palmer from the B.B.C. must have been a great shock to thousands of listeners in this country. Mr. Palmer has now joined H.M.V. Gramophone Company, and before leaving 2 L O he bade his farewell to listeners by singing "Abide with Me," and a whispered "Good-night" into the microphone.

**One of the Old Brigade**

Uncle Rex, it will be remembered, was one of the original five members of the B.B.C., and he was, in fact, the first staff man to be appointed by Sir John Reith (then Mr. J. C. W. Reith), in November, 1922. He was the first Announcer and first Director of the London station, 2 L O, and also the first Director of 5 X X, Daventry.

**Nightingales and Dinners**

During his six and a half years with the B.B.C., Mr. Palmer has had a varied experience. He first thought of the idea of broadcasting the nightingale and, with the assistance of Captain West (who also has recently left the B.B.C.), arranged those fascinating broadcasts.

Incidentally, he was also the first man to arrange an outside broadcast from a public dinner, and he was the first man to engage Sir Harry Lauder to appear before the microphone.

**Bad for B.B.C.**

With Captain West, Mr. Palmer, Mr. Cecil Lewis and others now engaged in activities other than broadcasting, listeners are beginning to ask why these men are leaving the B.B.C. and why does the B.B.C. let its star members go so easily. It is certainly a

question which should be inquired into. The B.B.C. cannot afford to lose such pioneers of broadcasting. Is it because, like all Civil Service Departments, they think that nobody is indispensable? We suppose that, in practice, nobody is indispensable; but it is bad for broadcasting that its experienced pioneers should be allowed to devote their energies elsewhere. The B.B.C. can ill afford to lose such men.

**Figures and Finance**

With the publication of the B.B.C.'s Report for 1928 many listeners are still anxious to know what sort of fees are paid to B.B.C. artists and orchestras. In fact, there is a general demand for a more detailed statement as to how the money is expended on programmes.

It has been said that the B.B.C. cannot compete in salary payments with commercial firms, and that is why some of its star members have recently left them. But, nevertheless, with such an income as the B.B.C. has—the actual income for 1928 was £1,002,505, of which £871,763 was derived from licences and £120,635 the net revenue from publications—the explanation seems a little unsatis-

(Continued on page 174.)

**MAGNUM  
 "TRANSPORTABLE" FIVE**



A high-grade instrument of amazing efficiency. Entirely self-contained. Cabinet of polished Mahogany.

Price **18 Guineas.**

We specialise in all apparatus described in "Wireless Constructor" and other Radio Publications.

Dutch representatives:  
**Messrs. A.B.C. RADIO CO.,**  
 Singel 400,  
 AMSTERDAM.

**BUILD THE  
 "TEN POUND" FIVE  
 AS DESCRIBED IN THIS ISSUE.**

	£	s.	d.
1 Oak Cabinet	1	10	0
1 Resiston Panel with Ornamental Corners, 21 in. x 7 in.	0	10	9
1 Magnum Aluminium Screen, as specified	0	2	3
1 Magnum L.F. Choke, as specified	0	15	0
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1 Lissen Variable Condenser, .0005	0	6	6
1 Lissen Slow-Motion Dial	0	3	6
1 Reaction Condenser	0	4	6
1 Utility C.O. Switch	0	5	0
2 Lotus Single Coil Mounts	0	1	4
5 Vibro Valve Holders	0	7	6
1 Precision 30-ohm Rheostat	0	2	6
1 On and Off Switch	0	1	6
1 R.I. Hypermu L.F. Transformer	1	1	0
2 Igranic Pre-Set Condensers	0	5	0
1 Pair Peto-Scott H.F. Units	1	1	0
2 Terminal Strips with 2 terminals	0	2	0
1 Terminal Strip with 4 terminals	0	2	3
1 Lissen R.C.C. Unit	0	4	0
1 Igranic R.F. Choke	0	5	0
1 Pye Leak, 1/2 meg.	0	1	0
2 T.C.C. 1-mfd. Condensers	0	5	8
3 Dubilier 2-mfd. Condensers	0	10	6
1 Grid Battery with 3 plugs	0	2	0
1 Lewcos X Coil, No. 75	0	4	9
1 Lewcos X Coil, No. 250	0	7	6
3 Loeve Resistances, 25,000 ohms and clips	0	5	0
Glazite Connecting Wire	0	1	6
	£9	10	0

Any of the above parts supplied separately as required.  
 Set of Valves for above £2 14 6  
 The "Ten Pound" Five, ready wired and tested, including Cabinet, Valves and Royalty £15 0 0

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 & CO. LTD.,  
 MAGNUM HOUSE**

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 296, BOROUGH HIGH STREET, LONDON, S.E.1.

**MAGNUM  
 "SUITCASE" FIVE**



The ideal Portable for outdoor use. This cabinet is covered with Blue Leatherette.

Price **18 Guineas.**

Magnum Products may be viewed and demonstrated at  
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 273/4, High Holborn,  
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Lists and full particulars on application.

SAY 'T.C.C.'



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WHEN you think of Condensers, think of T.C.C. — and you won't go wrong. For, because T.C.C. have made nothing but Condensers for over 22 years, the letters T.C.C. on a Condenser are recognised throughout the World as the undisputed hall-mark of accuracy and dependability.

Remember, there is a T.C.C. Condenser for every purpose. Here is an enlarged illustration of the Flat Mica Type. All Wireless Dealers stock it—in capacities from .0001 mfd., 1/10 to .01 mfd., 3/6.

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**CONDENSERS!**

Adv. Telegraph Condenser Co., Ltd.,  
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Now On Sale! — The June number of  
**MODERN WIRELESS**

This new issue of Britain's Leading Radio Magazine is a  
**SPECIAL PORTABLE SET NUMBER**

- Amongst the profusely illustrated articles are The "Traveller's" Two and The "M.W." Portable Five — both practical sets for outdoor radio recreation.
- In addition there is a long article on "Buying a Portable," and a special contribution on "Open Air Radio" by PERCY W. HARRIS, M.I.R.E.

THE CONTENTS INCLUDE

Editorial  
Quality v. Quantity  
Radio on Railroads  
Setting up Sound Waves  
Pentodes and Portables  
The Latest Wave-length Solution  
My Broadcasting Diary

Short-Wave Schedules  
Portable Pastimes  
What Readers Think  
The S.G. Valve as a Rectifier  
Testing Telephones  
The "Kuttemout" Three  
The Mystery of the Ether

The "Auto Tune" One  
Questions Answered  
Illustrated Radio  
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FOR EVERY  
PURPOSE

SECURE YOUR COPY NOW  
**MODERN  
WIRELESS**

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ON SALE  
Price One Shilling

**OUR NEWS BULLETIN**

—continued from page 172

factory. It is no good spending a lot of money on programmes unless the right people are engaged to get them over.

**Satisfactory Symphony**

The negotiations between the B.B.C. and Sir Thomas Beecham, regarding the formation and joint control of a large permanent Symphony Orchestra in this country, are reported to be going on very satisfactorily. It is also reported, however, that this new scheme will mean the reduction in the numbers of the B.B.C.'s provincial orchestras. The new arrangement will be that listeners will get a first-class symphonic orchestra giving first-class works by the simultaneous broadcast system.

**"Tristan" Tunes-In**

As reported some time ago, the loneliest island in the world, that of Tristan da Cunha, will now probably be able to listen-in to 5 S W, for, early last January, the inhabitants of the island were presented with a short-wave set. The receiver was taken

out by the Reverend A. G. Partridge, when he sailed to assume Chaplaincy of the Parish of the island. On the way out, the Rev. Partridge was given detailed instructions on the operation of the set. There was some trouble at first, but this was found to be due to a fault. The set eventually operated excellently and, between Monte Video and Tristan, reception of 5 S W at 6,000 miles was constant every night, often at good loud-speaker strength.

- (2) The removal of about one-fifth of the turns of the coils now in use;
- (3) The fitting of a small series condenser, about .0001 mfd. capacity, between the aerial lead-in and the aerial terminal of the set.

The power of Plymouth station will not be changed, but listeners may notice a slight reduction in the strength of signals because of the greater attenuation attendant upon the higher frequencies.

**The Cigarette Question**

The Federal Radio Commission of America has had a demand made upon it that the licences of 38 stations of the National Broadcasting Company be revoked, because of broadcasts from these stations to institute a vast child market for cigarettes. This demand has been made by representatives of over 1,500 associations connected with the American Food Industry. They urge that such broadcasting is against the public interests.

And yet some people still maintain that we should be better off in this country if we allowed advertisement interests to run our broadcasting programmes!

(Continued on page 176.)

If you want to  
**KEEP IN TOUCH**

With week-by-week radio developments, you must

READ

**POPULAR WIRELESS**

"BRITAIN'S BEST."

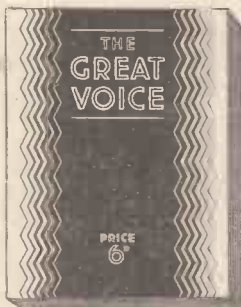
All "P.W." Sets are guaranteed.

Price 3d. :: :: Every Thursday.

**Tuning for Plymouth**

Now that Plymouth station has changed over to the national common wave-length of 288.5 metres, no doubt some of our listeners will have had to adapt their apparatus to the new conditions. The B.B.C. suggests:

- (1) The use of a smaller coil;



**MAGNAVOX**  
*The Originators of the Moving Coil Speaker*

The new and enlarged third edition of our Great Voice Booklet is now ready. It tells you all about electro dynamic speakers, pick-ups, amplifiers, and, in fact, everything you wish to know to enable you to obtain perfect radio or electrical phonograph reproduction. The "Great Voice" is packed full of useful diagrams and illustrations and should be in the hands of all enthusiastic amateurs, music lovers and managers of Theatres and Cinemas. Write for your copy to-day. Price 6d. post free.

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**COMPONENTS**  
**"CHAMPION 3"**

STANDARD 6 PIN BASE .. .. .	s. d.
PANEL, "PAXOLIN," 18" x 7" x 3/16" (Drilled) ..	8 0
STRIP, "PAXOLIN," 16" x 2" x 3/16" (Drilled) ..	2 6
H.F. CHOKE .. .. .	6 6
SCREEN, COPPER, 10" x 6" (Polished) .. ..	4 6
L.T. SWITCH (2-way, G22) .. .. .	1 0
L.T. SWITCH (3-way, G23) .. .. .	1 6
VALVE SOCKETS (Sprung, L.A.S.5) .. .. each	2 6
GRID-BIAS BATTERY CLIPS .. .. pair	6

**"TITAN" COIL UNIT**

ALSO FOR M.W. "S.-G." UNIT .. .. . **15 0**

(As approved by "Popular Wireless.")

**DELIVERY FROM STOCK.**

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# SOMETHING NEW

Getting away from standard design in radio receiver cabinets.

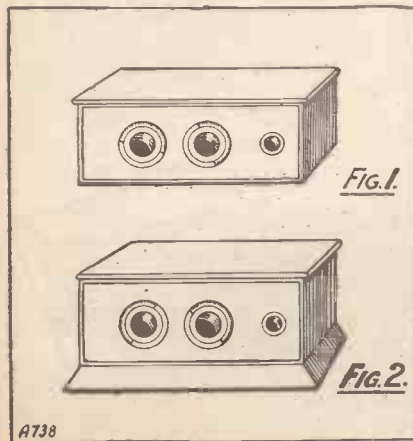
By J. B.

A GOOD wireless set should possess two qualities: firstly, efficiency—that is, it should give results; secondly, it should have a good appearance and harmonise with the rest of the furniture. You will notice that I said “rest of the furniture,” because a good radio instrument is essentially a piece of furniture, and should not be a box of tricks stuck out of sight in a corner and covered up with a cloth.

## Real Piece of Furniture

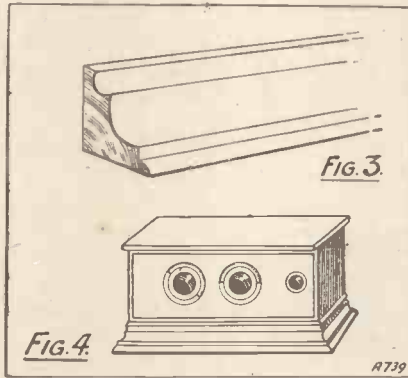
It was the realisation of this fact that prompted me, after having made my set as electrically efficient as possible, to spend three weeks designing and making a cabinet that I could with pardonable pride point to as a “real piece of furniture.”

Originally my set had been housed in the orthodox American type cabinet (Fig. 1) with hinged lid and vertical panel. Careful examination convinced me that a black ebonite panel looked odd. So this was scrapped, and a mahogany-polished plywood front fitted. A considerable improvement, and as all the components on the panel were at earth potential, there was no loss of efficiency.



There still seemed to be something wrong with the set, something missing, something—oh, I didn't know what it was. Three days elapsed and then a furniture shop window told me what it was. The set wanted something to stand on! A flat wooden

base was cut, with chamfered edges, and the effect of that tried. Good, but not good enough (Fig. 2). I bevelled the edges of the base instead of chamfering them. Better and better!



Then suddenly I realised that the base was not deep enough. I sat down and did some furious thinking, the result of which was that within an hour I had been out and purchased an 8-ft. length of standard 3-in. joiner's door-moulding (Fig. 3); my idea being to cut it into four pieces, mitre the corners and fix it into a square like a picture-frame, with the one difference that the moulding was fixed the wrong way round.

I wasted the whole of that 8-ft. length before I realised that every man must stick to his trade. Mitreing looks easy, but—well, try it!

## Completely Successful

The sympathies of a professional picture-framer were enlisted, in order to make a job of the second length.

Done, however, the job was at last, and polished, too, and when the set was fitted on to it, that final touch which some men call “style” was apparent. I was never more pleased with any bit of work in my life (Fig. 4).

As regards cost. Picture moulding runs about 2d. to 3d. a foot, according to design. Some of the more elaborate varieties cost a trifle more, but reckoning an average price of 4d. a foot, an ordinary set taking about 8 ft. comes under 3s.

If you can do the mitreing yourself (all wireless enthusiasts are not

duffers), well and good; if not, add another shilling for “professional services,” and then, finally—polishing.

Door-post moulding is usually of white wood and rather soft, so that an amateur is apt to make a “patched-up” job of it. Availing one's self of professional services a second time puts up the price a bit, but it should still come under three half-crowns, and I say definitely that for the air of “tone” that it gives to a good set, it's worth twice that amount.

## Place for Grid Bias

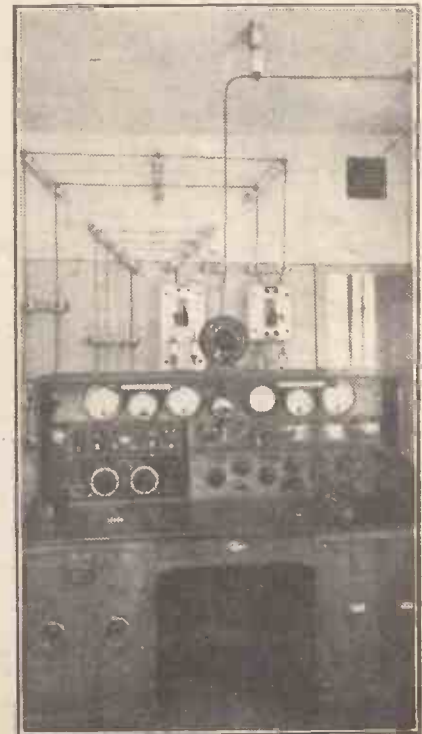
One little tip—put four dowel pins on the top of the stand or dais, with holes to fit in the base of the cabinet. This will prevent the set moving.

And another—the space between the base of the cabinet and the table inside the dais makes an admirable place to house the grid-bias batteries.

GOT twopence on you? I'm not trying to borrow anything, but thought you might like to know that Cossors are delighting their clients by presenting them with a nice map of European broadcasting stations if 2d. is sent for return postage.

They will be pleased, they tell me, to supply their friends with a copy free of all charge provided said friends forward the necessary twopence. You all know the address—Highbury, London, N. A.N.

## SOME SET!



The aeroplane service section of the Lausanne Radio station.

OUR NEWS BULLETIN

—continued from page 174

Radio's Good Manners

Lord Linlithgow, in a recent letter to the "Times," commented upon what he calls "some new element in the attitude of audiences to political speeches." According to the noble lord, this shows itself in "close attention combined with a noticeable absence of vocal reaction, friendly or hostile."

Lord Linlithgow has an interesting theory to explain the apathy of election audiences. He attributes this to the effect of wireless-broadcasting. This may be so, for wireless does impose silence upon the listener.

Wobble to Go

The B.B.C. is certainly keen on educating its broadcast artists, and it has now insisted that singers should take out the "wobble" in vocal music. Mr. Percy Pitt, the Musical Director of the Corporation, has made up his mind to stamp out this habit, which certain singers have, of using the tremolo or the shake on certain notes.

The B.B.C. say: "We can do nothing else but warn singers against the tremolo, and pull them up in their tests if they offend. If, however, we find singers who are incurable—and there may be such cases—we have no alternative but to ban them."

RADIO TRADE NOTES

New Offices for Mullards

ALTHOUGH the Mullard Company have settled down in their new premises for some weeks, not all their friends know the whereabouts of their new abode. The London address is now Mullard House, Charing Cross Road, London, W.C.2, and all communications should be addressed there except matters for the Service Department, which is remaining at the old quarters in Denmark Street. The new Mullard 'phone number is Gerrard 0767, and the telegraphic address is the same as formerly.

Owing to expansion of business the Birmingham offices also of the Mullard Wireless Company have been moved. The offices at Snow Hill were too small, and newer and larger premises have been secured at 36-37, Dale End, Birmingham. The telephone

number and telegraphic address are unaltered.

For the Technician

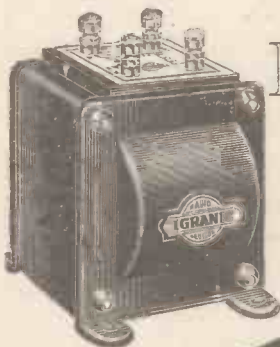
Radio technicians on the look-out for something good should make a note of the "Engineer's Guide to Success." Obviously, a great amount of thought and care has been given to the production of this book, which has 112 pages. Prepared by the Technological Institute of Great Britain, Temple Bar House, London, E.C.4, it is packed with practical information on engineering subjects, and anyone who is aiming at professional qualifications should certainly obtain a free copy.

Change of Address

Our readers' attention is directed to the price list and details of Messrs. F. C. Heayberd & Co.'s products on page 183. This firm have recently removed to enlarged premises and showrooms at 10, Finsbury Street, London, E.C.2.

Hydra Condensers

We are informed by Louis Holzman, of 37, Newman Street, London, W.1, that the above address should have appeared in their advertisement last month instead of the Kingsway address which was given on page 122.



30/.

PURITY & PRECISION



21/6

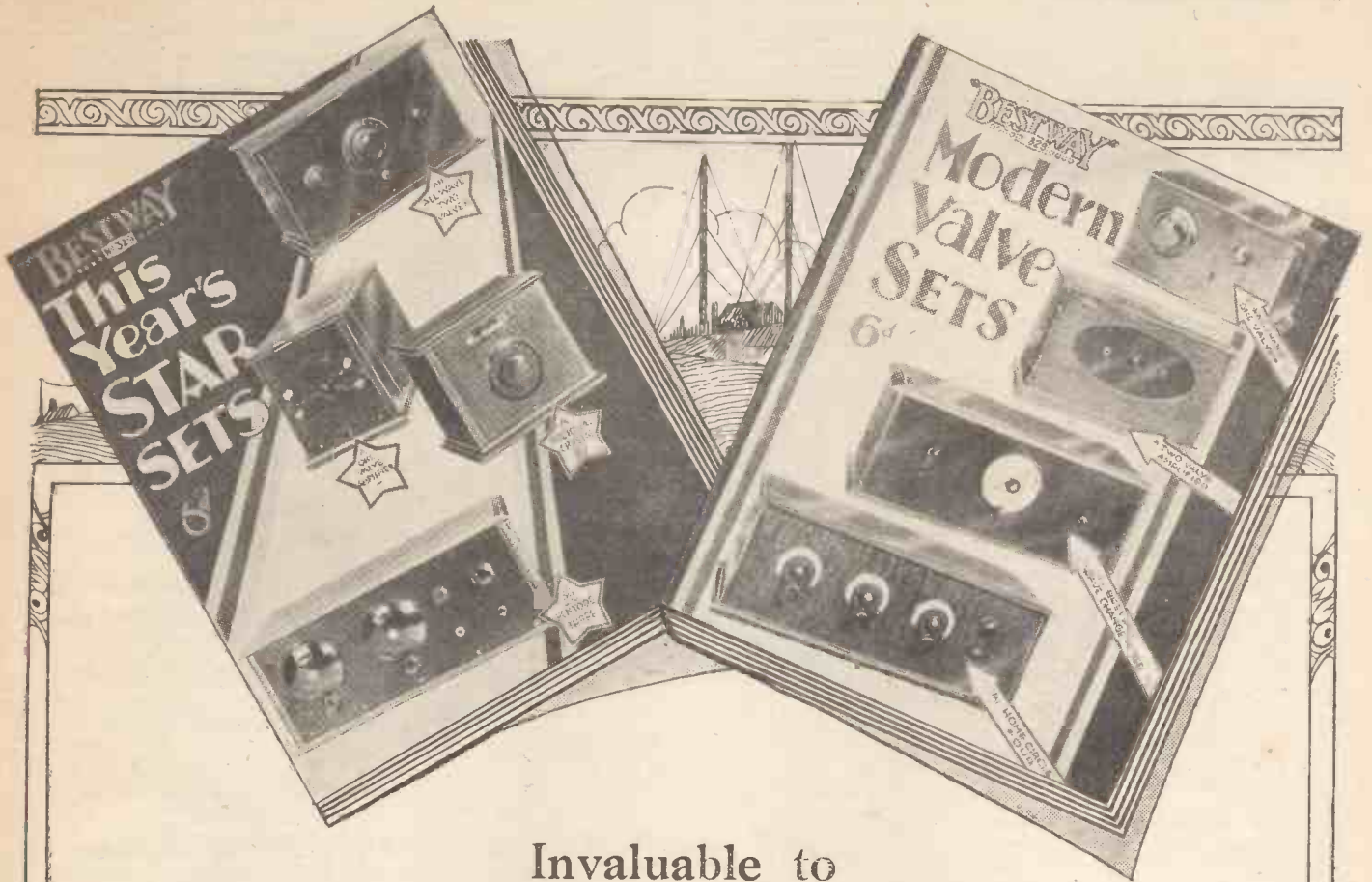
IGRANITE DUAL IMPEDANCE COUPLING

This component represents a distinct advance in low frequency coupling, giving much higher amplification for any particular H.T. voltage than R.C. coupling, and showing improved performance characteristics. Two iron cored inductances and a coupling condenser are incorporated, forming a complete unit. Amplification within 10 per cent of the maximum can be maintained over a frequency range of 40 to 6,000 cycles, so that an amplifier incorporating these units is practically distortionless.

IGRANITE TAPPED "C.C." OUTPUT UNIT

The importance of using a filter circuit consisting of a choke and condenser after the last valve is generally recognised. This patented Igranite component will protect loud speaker windings and prevent L.F. howl or motor-boating. Tappings are provided enabling step-up or step-down effect to be obtained to suit the particular loud speaker used. Apply to your dealer, or write direct to Dept. J.865.





Invaluable to  
**THE HOME CONSTRUCTOR**

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**"BEST WAY" WIRELESS BOOKS**

**"Best Way" No. 328.—Modern Valve Sets.** Contains full constructional details of four receivers. A "WAVE-CHANGE ONE-VALVER" to cover long and short waves by the operation of a switch, a "TWO-VALVE AMPLIFIER," the "'BEST WAY' WAVE-CHANGE THREE," and "THE HOME CIRCLE FOUR," a set specially designed for family use.

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EVERY SET MINUTELY DESCRIBED

*On Sale Everywhere.*

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NAME .....

ADDRESS .....

## PCJ ON THE "P.C." THREE

—continued from page 146

coil, at which point, of course, the insulation must be removed.

The coil is now complete, and it only remains to insert it and see what you can do on the short waves.

First turn the filament resistor controlling the first valve to the off position, remove the valve and the coils in the H.F. portion, and insert the special short-wave coil unit. As I mentioned previously, the aerial and earth leads are attached to the loose ends of the small coupling coil, and it does not matter very much to which ends these are fixed.

### Smooth Reaction Control

The flex lead from the reaction condenser fixed varies requires to be joined to the terminal on the end of the short-wave coil, after which all is ready for the reception of signals.

It should first be determined whether the set will oscillate, and if any difficulty is experienced in this direction the degree of aerial coupling should be reduced, an operation carried out merely by increasing the distance between the coupling coil and the main coil.

Varying the position of the clip on the coil is also a useful way of getting smooth reaction control.

With the reaction control perfectly smooth, slowly, very slowly turn the tuning condenser (the middle one, that on the left of the panel not being in circuit), keeping the reaction condenser in such a position that the set is just oscillating.

It should not be difficult in this way to locate carrier waves, and having found a fairly "beefy howl," slowly decrease the reaction until speech or music can be heard.

### Short-Wave Skill

Do not fall into the trap of listening for stations when they are not transmitting, and then wondering why the set fails to "deliver the goods," and if at first you find it a little difficult to "hang on" to short-wave transmissions by reason of the fact that you may not previously have handled a short-waver, do not despair.

Short-wave listening is very different from broadcast reception, and the only way in which to receive signals from America and Australia with any degree of success is by careful practice.

May your P.C. "Three" see 3LO!

## THE ART OF TUNING-IN

—continued from page 170

with the other two at about ten degrees apiece. Keeping No. 2 steady he turns No. 1 slowly downwards a little way, and then upwards, back to the ten-division mark and some way beyond it.

He wants to discover the relative positions of the two dials down at the bottom of the band. If he hears broadcasting, or even (note this point carefully) a spark signal, or so much as a heterodyne whistle, he tunes it in at once, for whatever it may be it is valuable since it will show him the readings that enable resonance to be obtained. Having done this he tightens up the reaction coupling slowly so as to find the reading which

### Going To Build A Set?

Why not get one of the WIRELESS CONSTRUCTOR Envelopes?

No. 1. The "Radiano" Three

No. 2. The "Concert" Four

Price 1/6 each at any Booksellers, or 1/9 by post from The Amalgamated Press, Ltd. (Wireless Constructor Envelopes), Bear Alley, Farringdon Street, London, E.C.4.

makes the set sensitive enough for searching purposes, though below the point of oscillation.

### Circuits In Step

The rest is easy. There is no haphazard fitting over the wave-band, no missing of stations, no getting lost. All that he has to do is to keep his tuned circuits in step, a matter which will now present little difficulty, and gradually to increase the reaction coupling as he works upwards. Since the circuits are in resonance, the first faint signs of a station's presence are heard immediately they occur and small adjustments enable it to be brought up to its greatest strength.

Now there are probably few people who are called upon—at any rate, as a regular thing—to give a demonstration of their skill or otherwise by showing what can be done with an entirely strange receiving set. There is, therefore, no need for the average

(Continued on page 179.)



**THE ART OF TUNING-IN**

—continued from page 178

man to make any attempt to develop the expert's power of getting rapidly to know any set that he is asked to handle.

But he can get, more or less gradually, to know his own apparatus, and it is well worth while to do so whether it is home-constructed or bought ready-made.

In place of the expert's rapid inferences and rapid calculations from the dial readings required for a few stations, the wireless man-in-the-street should certainly provide himself with a calibration chart. There is no need to describe here the way in which this is done, for instructions for the making of such charts have already appeared in the WIRELESS CONSTRUCTOR.

**The Reaction Dial**

So long as the circuit calibrated is one which is not sensibly affected by the degree of reaction coupling used, a remarkably accurate chart is easily made which acts as a welcome guide both to the location of transmissions that have not been heard previously and the identification of stations which have been tuned-in, but whose call-signs one cannot wait for. In some sets the capacity control of reaction is actuated by a simple knob without any graduated dial at all.

I do not recommend this practice, for a graduated dial of some kind makes searching easier and lessens the liability to cause interference. It is easier in most cases to fit instead of such a knob a miniature slow-motion dial, of which there are several available. This takes up very little room on the panel, and its presence enables one both to make fine adjustments—most useful when one is listening to American broadcasting stations—and to know the exact degree of reaction coupling that is required to produce reasonable sensitiveness without oscillation upon any wave-length.

**After Calibration**

Once the set has been calibrated its owner may feel that he is beginning to know a good deal about it; but he is still very much in the dark about what goes on within the cabinet unless he makes use of other means of rendering himself familiar with the working of the apparatus. Let me give a case in point.

(Continued on page 180.)

# Ready Radio



**IMMEDIATE DESPATCH**  
OF ALL THE CORRECT PARTS  
NEW "ROADSIDE" FOUR

Ensure results equivalent to the original by using only **CORRECT PARTS** as used by **Mr. PERCY W. HARRIS.**

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TEST REPORT SUPPLIED.

PRICE

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**PRICE LIST**

	£	s.	d.
1 New "Roadside" Four Cabinet ..	2	5	0
1 Utility two-pole change-over switch ..		5	0
100 ft. frame-aerial wire (Lewcos) ..		3	6
1 lb. No. 24 D.C.C. wire ..		2	0
3 yds. single-covered flex ..			6
5 Wander plugs ..		10	
2 Spade terminals ..			3
4 Lotus valve holders ..		5	0
1 Utility Mite .0005-mfd. variable condenser, with vernier knob ..	10	6	
1 on-and-off switch ..		1	3
1 Igranic panel-mounting neutralising condenser ..		5	6
1 Magnum H.F. choke ..		7	6
1 T.C.C. .0003-mfd. fixed condenser ..		1	10
2 Dubilier grid leak holders ..		2	0
1 Dubilier 1-mfd. fixed condenser ..		2	6
1 Lissen .0003-mfd. fixed condenser ..		1	0
1 Lissen .002 fixed condenser ..		1	6
1 Dubilier .001 fixed condenser ..		3	0

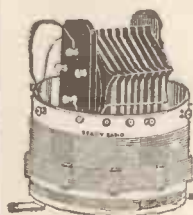
**CORRECT PARTS.**

1 Ferranti 40,000-ohm anode resistance, with holder ..	4	0	
1 Ferranti 3,000-ohm anode resistance, with holder ..	5	0	
1 Ferranti 20,000-ohm anode resistance, with holder ..	4	0	
1 Cossor L.F. transformer ..	1	10	
1 Pye 1-megohm grid leak ..	2	6	
1 Dubilier 1-megohm grid leak ..	2	6	
1 Dubilier 2-megohm grid leak ..	3	10	
1 T.C.C. 2-mfd. condenser ..	7	0	
1 Dubilier R.C.C. unit ..	1	6	
2 Magnum panel brackets ..			
Loud speaker equipment with mounting unit and cone ..	17	6	
1 Complete set of valves, as specified ..	2	16	
1 Ripault 99-volt H.T. battery ..	16	8	
1 2-volt unspillable accumulator (charged) ..	14	6	
1 Lissen 9-volt grid bias battery ..	1	6	
<b>TOTAL complete with valves, batteries, etc. ..</b>	<b>£12</b>	<b>17</b>	<b>0</b>

Any of the above parts can be supplied separately. No extra charge for mounting loudspeaker unit.

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**'TITAN' COIL UNIT**

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Write for free literature.

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# LOTUS COMPONENTS

Garnett, Whiteley & Co. Ltd., Liverpool.

Causton

## THE ART OF TUNING-IN

—continued from page 179

A friend showed me the other day a very neat portable set that he had designed and made himself. He was ecstatic over its compactness and its light weight. Noticing that its lightness was due in no small degree to the use of a standard capacity high-tension battery, I asked what the total H.T. current consumption was. He confessed that he did not know, but was quite sure that it couldn't be anything very great.

### H.T. Consumption

"Let's see what the milliammeter has to say about it," I suggested. We did. The pointer of the instrument, which had a 0 to 25 scale, swung right over and came hard up against the stop at the far end. An instrument reading from 0 to 50 showed that the current passing was 28 milliamperes.

Now it happens that I have put every dry-cell high-tension battery of repute that is now on the market through an intermittent test, consisting of a four hours' run on week-days, through a fixed resistance arranged to make the initial load, not 28, but 18 milliamperes, and I know that under these conditions the life of the very best standard battery is well under a hundred hours before the voltage has fallen to 60 per cent.

### The Question of Cost

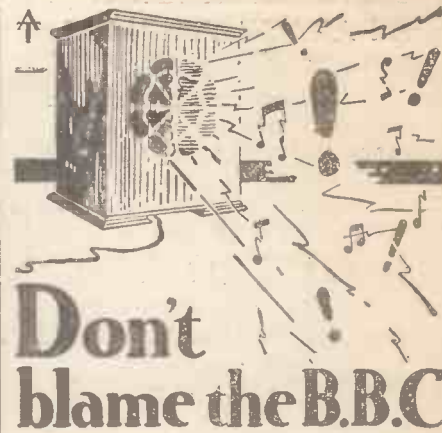
At 28 milliamperes it is probably not more than about 40 hours, which means that the H.T. battery will have to be renewed about every ten days. With 100-volt batteries at about fifteen shillings apiece this is something like £27 a year for H.T. supply. If the friend in question had known his valves, as he could have done if he used a milliammeter, he could not have made so absurd an error in design.

Similarly, if he uses a milliammeter to know the drain upon his own high-tension batteries, the average man can save pounds a year in running costs by choosing batteries to "fit" his set.

### Locating a Fault

Moreover, the milliammeter does a great deal more than this. In the first place, once the normal current load is known it will show at once when anything is wrong with the apparatus.

And having shown that there is something wrong, it will help to locate the fault in the most rapid and certain manner.



# Don't blame the B.B.C

—look to your connections

**FAULTY** joints are often the cause of crackling and strange noises that mar your programme. Avoid this unpleasantness by using Eelex Treble Duty Terminals in conjunction with Eelex Spades, Pins, and Eye connections. There is no need for messy bother of soldering if you employ Eelex components in your set.



### TREBLE DUTY TERMINALS

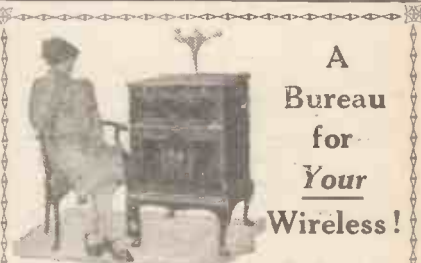
Forty indicating tops and 6 colours.

(TzLC) 4½d. each.

With plain top only (TzLN) 3d. each.

Write for Booklet Y.70.

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  - The Champion Three. Complete kit of components. Send only 19/11, balance in 11 monthly instalments of 19/7.
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Price 3½d.

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PLEASE be sure to mention "Wireless Constructor" when communicating with Advertisers. THANKS!

## EXPERIMENTING WITH THE THIRTY-ONE NEW CIRCUITS

—continued from page 144

flowing. If, for example, we are running the oscillator which is already calibrated, and we desire to know the frequency to which a circuit consisting of a given inductance and a given condenser will tune, it is only necessary to place the circuit near the oscillator, and we shall find that, when the knob of the oscillator is turned, a point will be reached when there will be a sharp kick of the needle in the grid current meter.

### An H.T. Battery Charger

This point is very sharply and definitely marked, and is an indication that the oscillator and tuned circuit referred to are in resonance. An instrument of this kind is thus very useful to a wireless society, for once it has been calibrated it is a very easy matter to calibrate other metres from it by the simple method just described.

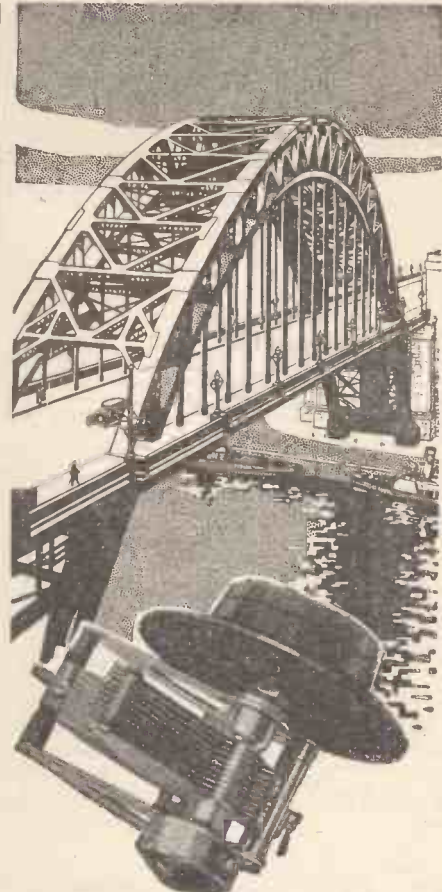
A pair of No. 60 coils will cover a wave-length range of 170 to 570 metres, giving a straight-line wave-length calibration with the particular make of variable condenser mentioned from 230 metres upwards. Two No. 200 coils will cover from about 670 metres to 1,900 metres. A good non-slip vernier dial should certainly be used here.

Circuit No. 27 shows the arrangement of a high-tension accumulator for charger for D.C. mains, and requires very little explanation. Great care, of course, must be taken when using any such apparatus connected directly to the mains, and no attempt should be made to build a unit of this kind without including a fuse in each lead. Remember that the voltage of the accumulator must be appreciably less than the voltage of the mains, and thus if you have only 100-volt mains, it is useless trying to charge a 120-volt accumulator from them direct. In such cases it is best to split the battery up into two halves of 60 volts each, and place these two halves in parallel for charging.

### An L.S. Control Unit

Circuit No. 29 shows a very useful loud-speaker control unit, as well as an output filter. The choke should be of good quality (that is, of fairly low D.C. resistance and high inductance) and should be purchased from a reputable firm. The condensers C<sub>1</sub> and C<sub>2</sub> should not be less than 2 mfd. each.

(Continued on page 182.)



## ENGINEERING PRECISION

Bestridding the Tyne like a Colossus, this inspiring new bridge leaps the great waterway in one span, a perfect example to Newcastle—and indeed the world—of the skill and precision to be found in twentieth-century engineering.

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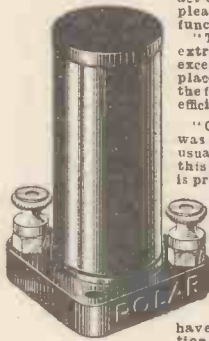
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"On test the performance was well above that of the usual commercial article of this type. The reason for this is probably the fine gauge wire and the care taken in the construction of the choke to reduce the self-capacity and the capacity between the leads to the very minimum.

"Anyone who wants a thoroughly efficient choke for all ultra-short-wave work need have no worries in this direction if they fit the "Polar" Short-Wave Choke (10 to 200 metres)."

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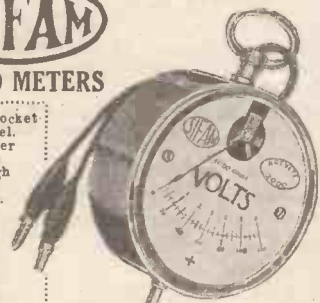
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PLEASE be sure to mention "Wireless Constructor" when communicating with Advertisers. THANKS!

## EXPERIMENTING WITH THE THIRTY-ONE NEW CIRCUITS

—continued from page 181

The variable resistance,  $R_1$ , which can be a Clarostat volume control, will vary the strength without appreciably altering the tone, but the resistance,  $R_2$ , which can also be a Clarostat volume control placed in series with the .1-mfd. condenser (do not use any other value here but this) will have quite a different effect.

### Useful Experimental Unit

Thus when it is turned to the full-on position (or screwed right down if it is of the screw-down type), the high notes will be cut off, and when it is placed in the minimum position it will have no effect whatever on volume or tone. Between limits, the high notes can be repressed to the degree desired.

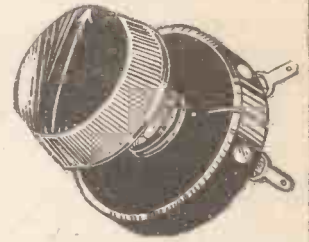
Circuit No. 30 is very useful to the experimentally inclined man, for not only can he, by placing it in series with his high-tension lead, shunt each of them with a large condenser, but by the use of the choke  $Z_1$  he can in many cases cure motor-boating.

To use this multiple condenser unit for an output filter, join a lead from the plate of the last valve to any one of the high-tension positive terminals on the lower side and also to H.T. positive 5.

The other side of H.T. positive 5 should now go to high-tension supply, while the terminal marked L.T.—should be taken to one side of the loud speaker, the other side of the speaker being actually joined to L.T.—on the set (not on the unit). The rest of the terminals should not be used for ordinary battery shunting purposes when this is done, as the necessary L.T.—negative terminal will be already occupied. This being so, it is not a bad plan to join H.T. 1, 2, 3, 4 together, as this will place the condensers in parallel and you will then have the benefit of an 8-mfd. condenser in the choke output.

The last circuit, or rather pair of circuits, 31a and 31b, show how to add a jack control and output filter to existing sets. The jack control may not appeal to all readers, but the output filter is of great value, particularly in old sets, and will probably enable you to get much better quality than you have been getting, owing to the fact that such a device largely eliminates the troubles which occur with battery coupling.

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**LOUIS HOLZMAN,**  
 37, Newman Street, London, W.1.  
 Telephone: Museum 2641.

## THE "TEN POUND FIVE"

—continued from page 135

The use of high-tension accumulators will, of course, permit the use of a super-power valve here, and if the high-tension supply available allows it, the super-power valve will certainly give the best results.

When we come to the constructional work, it is more than ever essential in this set to follow the layout carefully, as two stages of high-frequency are used. You will notice when assembling your parts that the two high-frequency coupling units are marked 1 and 2 respectively, indicating which is to be used in the first and which in the second stage.

### X-Coil Connections

Do not alter this order. There are on all X coils two tappings, and, in general, I find that the flexible lead should be connected to the higher tapping on the short-wave coil and the lower tapping on the long wave. Remember that the X coil is used somewhat differently in this receiver from the ordinary arrangement, and, as only a portion of each coil is tuned, ordinary 60 X coils are too small, and a 75 should be obtained.

This will cover the lower wave-band adequately. A 60 X coil will not go much beyond 5 G B, even if it reaches that station.

On a long wave-band a No. 250 X coil should be used, and as this is the size generally adopted for long-wave reception with X coils, many readers will have such a coil by them.

### Good Volume Control

Notice, when wiring up, a lead goes from L.T. + to the switch, while from the other side of this switch two leads are taken, one to the first two valves and the other to the remaining three. Thus the full L.T. voltage is always applied to the last three valves, while the filament resistance enables the voltage to be reduced from full, down to a small figure on the first two valves. Dimming these valves gives excellent volume control without distortion occurring.

When the set has been assembled and wired up, it can be operated at once, as there are no tiresome adjustments to make. Place the short-wave coil in the socket which makes it parallel with the panel and the long-wave coil in the other socket. Note, by the way, that it is essential

(Continued on page 184.)

# RAYMOND'S FOR WIRELESS

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See our exchange offer (applies to this set only).  
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|---|--------------------------------------|
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| Benjamin Switch ... 1/3   | 2 Spades ... 6d.                     |
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 For every 30/- you spend you can buy for 3d. extra one of the following Lots on this coupon only.  
 '0005 variable 4" slow-motion dial, 16-volt Grid Bias; Binocular H.F. Choke, '0001 Reaction with Knob, Special Indoor Aerial complete, Set of 12 Plugs and Sockets (red and black), 2 Fuse-holders and Bulbs, 4- or 5-way L.T. Battery Cord, 100 ft. best Copper 7/22, 100 ft. Insulated Aerial.

**THE "TEN POUND FIVE"**

—continued from page 133

that the pin and socket connections on the coil holders shall be the same as in the drawings, and the pins and sockets are clearly marked so that you cannot make any mistake. Unless this point is remembered your coil connections will be wrong.

**The Switch Arrangement**

When the X coils are in their holders, connect the higher tapping of the short-wave coil and the lower tapping on the long-wave coil to the flexible lead shown.

When the coils are in this position, the switching will be such that, when the switch is up, you are on the upper band and, when it is down, you are on the lower band, an arrangement which is easy to remember. Go on to the lower band first, turn the tuning condenser to the zero position and then turn the reaction condenser until the set just oscillates.

Now turn this back slightly, so that the receiver is off oscillation, and move your tuning dial slowly from the bottom of the scale to the top, and you will find that you will soon pick up your nearest station even with the smallest indoor aerial.

Now switch over to the upper band again, starting at the bottom, and setting the reaction condenser so that the set is just below oscillation. At the lower end of the band you will hear shipping, a little farther up you will pick up aircraft stations, and after this you will come to the long-wave stations one after the other.

Remember this set is designed for small indoor aerials. If you use it on an outdoor aerial, and are near to a station, you may find that the local station spreads itself over a very wide

part of the scale. If this is so you can soon run up a very simple little wave-trap on the following lines.

Take a piece of wood, about 5 in. long by 3½ in. wide, and a piece of paxolin or pirtoid tube 3½ in. long by 3 in. diameter. Wind on this 50 turns of No. 20 D.C.C. wire, leaving about 6 inches at each end for subsequent connection.

Make tappings at 5, 10, 15, 20 and 25 turns respectively, either by lifting up these turns after the whole coil is wound, scratching off the cotton and soldering small loops on to these points, or by making loops at the respective turns as you wind the coil.

Fasten the complete coil down to the baseboard in any convenient fashion (a piece of thick wood screwed into one end and this piece of wood screwed to the baseboard will do), and join the two ends of the coil to an adjustable condenser of .0005 mfd. maximum (Formodensor). Now take the aerial, attach a spring clip to it for convenience, and grip it on to, say, the twentieth turn from the bottom, and take a lead from the terminal of the adjustable condenser which is connected to the bottom of the coil to the aerial terminal of your set, the earth connection being made as before.

**Wave-Trap Adjustment**

Tune-in on your receiver to the local station, and then carefully adjust the knob of the adjustable condenser until the local station comes in at a minimum, a slight re-tuning of the receiver being necessary when this is done. It will then be found that the local station will only be heard on its proper tuning point of the receiver, giving very little interference either side. Try other taps, and finally choose the one giving the best results. The whole receiver will now tune very sharply.

**PLAYING THE "ACE"**

—continued from page 138

will probably note a light purple glow appear, but this is in order and will cause no damage to the electrodes provided the grid-bias connections are correct.

Also, if all is well, the set should not break into oscillation until the reaction condenser dial is advanced, but, if it does so, then the H.T. and leads to the H.F. valve should be re-adjusted according to the instructions given previously. Any trace of hum can be overcome by regulation of the potentiometer in the first H.F. compartment.

**The "Titan" Clippings**

To continue the initial operating test, bring the two variable condenser dials into tune somewhere on the upper range of the low wave-band, and to do this it is necessary to pull out the two wave-change switches. Also fix the aerial tapping clip on the first "Titan" coil unit on the 8th or 12th tapping, as this will give a compromise between selectivity and volume. The tapping clip on the 2nd coil unit in the central compartment should be fixed more or less permanently on the 16th (end tapping), while the clip to the loading coil on the same unit can be joined to the No. 25 terminal, the same applying to the aerial loading coil.

Further adjustments to the two variable condensers will now probably be more exacting, but having got them into tune, the reaction control should be more "lively" in its effect. The operator can now endeavour to tune in a station which will give him an exact idea of the positions of the variable condenser dials in respect to each other.

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

## Feed your set from the electric light supply

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

Connected to a lamp socket or wall plug the Met-Vick Model "B" will supply you with unvarying current for H.T., L.T., and G.B. It is remarkably compact, and of regular shape, and can be easily included in existing cabinets in place of batteries.

The Met-Vick Model "B" is also available for H.T. and G.B. only.

Ask your dealer for Section "C" of Radio Catalogue which fully describes all the eliminators shown here.

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A.C. TYPE 40-100 PERIODS

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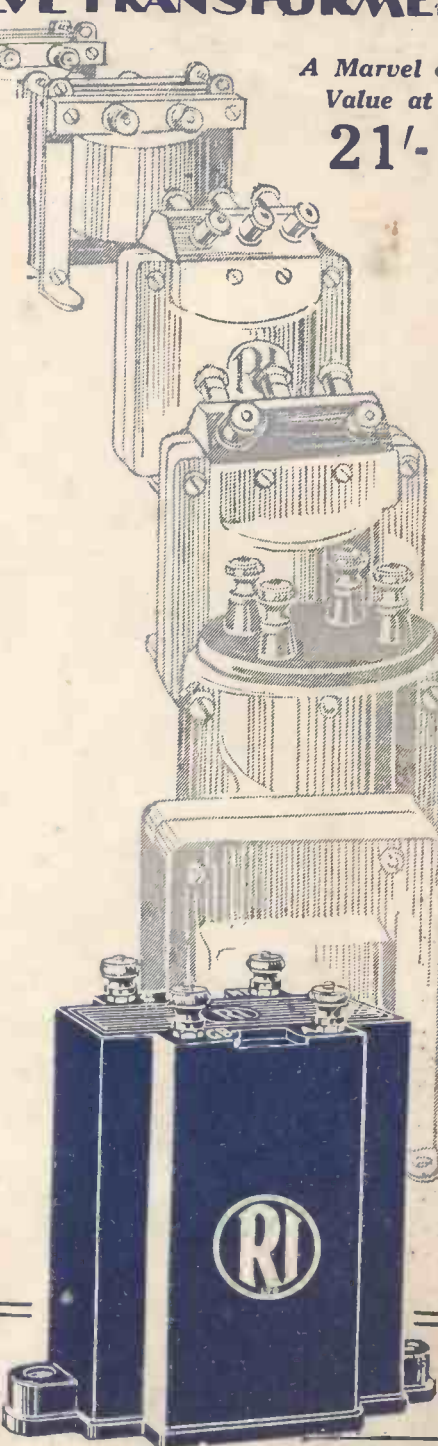
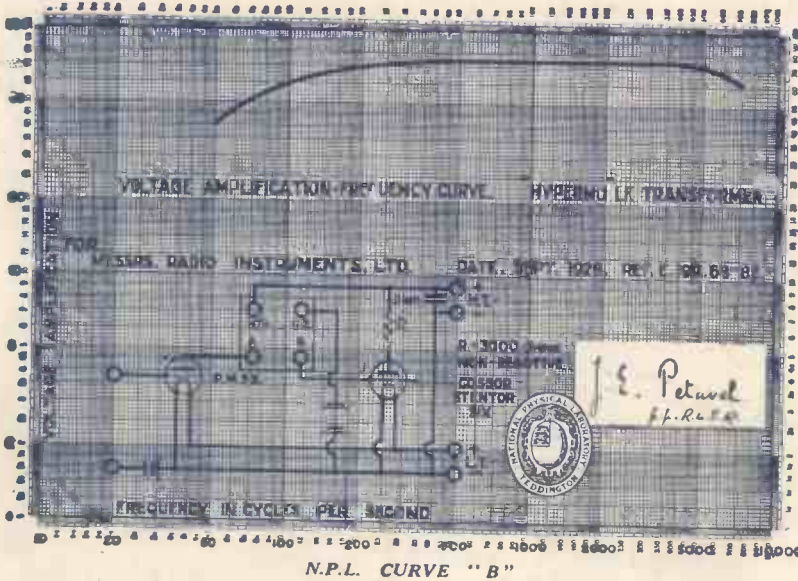
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L.F. INTERVALVE TRANSFORMER

A Marvel of  
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