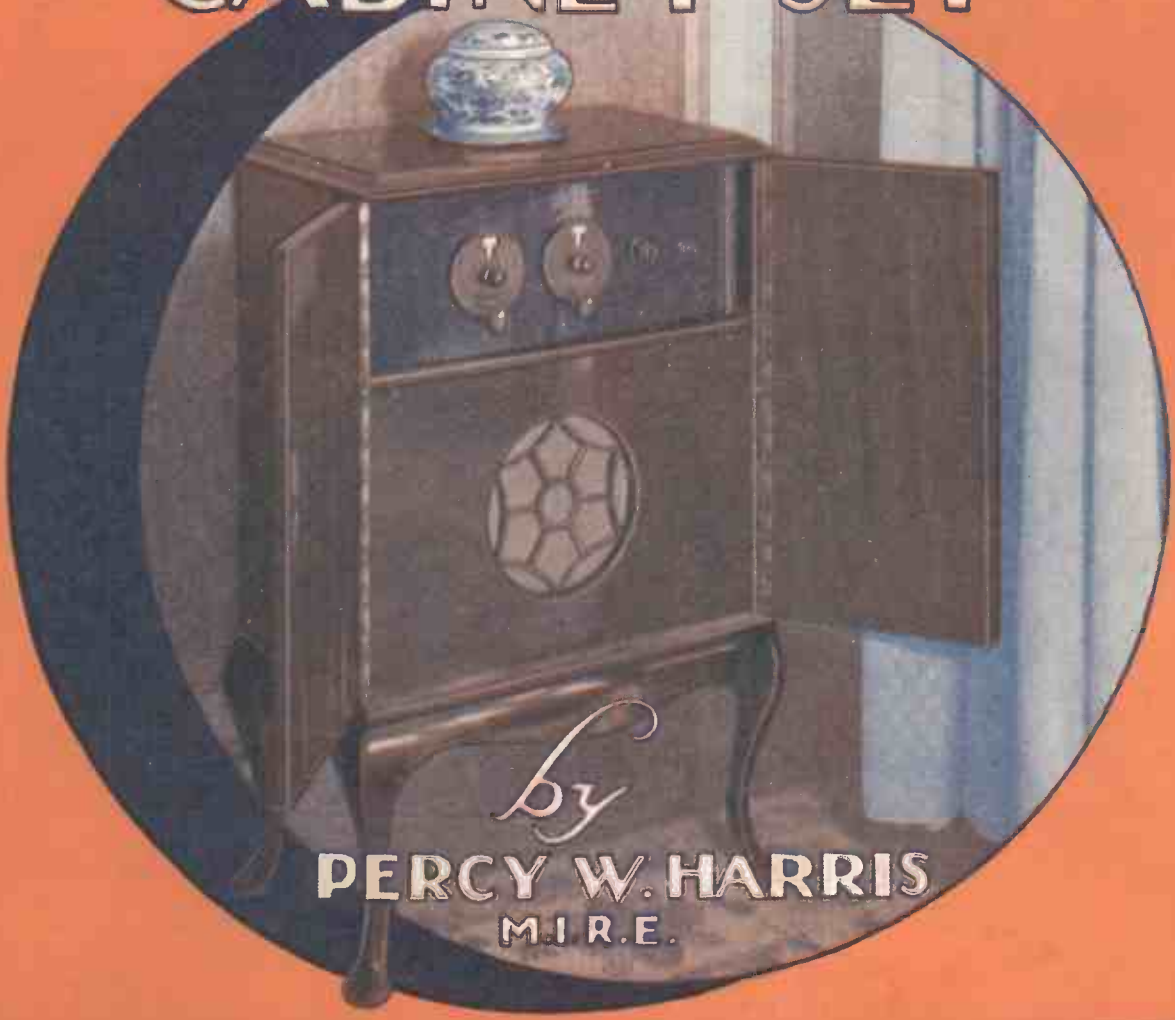


The Wireless Constructor

6^D
MONTHLY

EDITED BY
PERCY W. HARRIS, M.I.R.E.
Vol. IX. MARCH, 1930. No. 41

BUILDING AN ALL-MAINS CABINET SET



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



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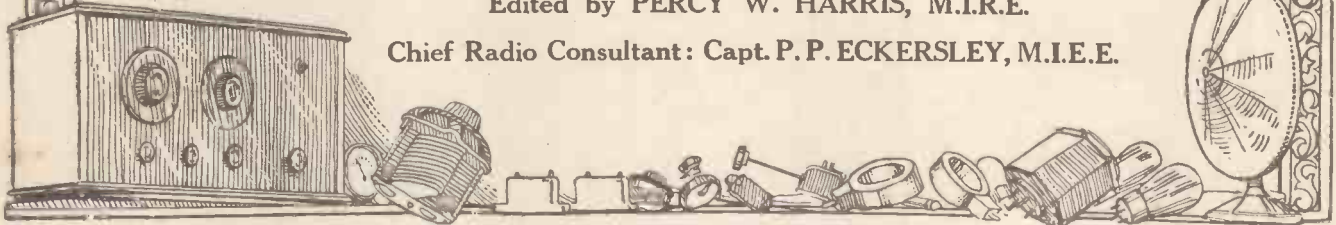
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As some of the arrangements and specialities described in this Journal may be the subject of Letters Patent the amateur and trader would be well advised to obtain permission of the patentee to use the patents before doing so.

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

Chief Radio Consultant: Capt. P. P. ECKERSLEY, M.I.E.E.



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THE WIRELESS CONSTRUCTOR

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

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

THE EDITOR'S CHAT

With the commencing of the first of the twin-wave broadcasters, many amateurs will find it necessary to revise their ideas regarding selectivity.

THE twin-wave transmissions from Brookmans Park have been running long enough for the wireless public to realise that the old standards of reception no longer apply. So long as stations were sufficiently widely separated geographically to prevent more than one station coming in very loudly, selectivity was of no particular consequence to the man who wished to listen to one station only, and that the nearest.

A New Problem

Now, however, with two powerful stations working within a few miles of London, thousands of sets and circuit arrangements which were perfectly satisfactory so long as the Oxford Street transmitter pursued its lonely course, have to be scrapped or rebuilt.

In the early days of American broadcasting, when stations were few and far between, the most popular arrangement was undoubtedly a detector with two transformer-coupled low-frequency stages, provision being made for loosely coupling the aerial and for getting a particularly fine adjustment of reaction.

Later, with the multiplication of stations, more selectivity became a very urgent problem, and as in most cases more selectivity meant more tuned circuits, sets have grown considerably in the number of valves and associated circuits used. Nowadays, across the "Herring Pond" the majority of receivers have no less than seven valves, some even with nine or ten.

Extra Valves Unnecessary

Consideration of these facts suggests that American receivers must be

exceedingly powerful; but this is not necessarily the case, and, indeed, many British sets with four valves are more sensitive than a number of American with seven.

The rule across the water seems to be a large number of tuned circuits, with associated valves and a comparatively small amplification per stage; whereas, in Europe, where motives of economy must play a prominent part in design work, fewer valves are used at greater efficiency.

It must not be imagined, however, as has been suggested in some quarters, that to obtain a consider-

able addition to the selectivity of our circuits we must necessarily add a number of valves. We have by no means reached the limit—perhaps we might say that we have scarcely touched the fringe—of selective "Det. and 2 L.F." receivers, which are very economical and simple to build.

Special Articles

In this regard we would draw readers' attention to the articles in the current number dealing with aerial circuits and containing a number of suggestions for experimental work at negligible cost.

Following up the A.C. Chassis receiver described in the last number, we present in the present issue an all-power A.C. unit supplying high-tension at three different voltages (with a special adjustment for screening-grid voltage), and also low-tension in the form of raw A.C. at four volts.

This power unit, which, as such units go, is quite inexpensive to build, will supply the power not only to the A.C. "Chassis" Three, but also to most other mains-driven sets, and owing to its special layout should prove popular among those who construct cabinet sets with built-in loud speakers.

Short-Wave Reception

The popularity of short-wave reception continues unabated and, indeed, shows signs of increasing every month. A further addition to the long series of short-wave constructional articles which have appeared in this journal is featured this month in the form of a special adaptor, to enable the short waves to be received at a minimum cost, and with maximum convenience.

TESTING-TIME



Accumulators should be tested at regular intervals of, say, once a week. They should be given both voltage and acid tests, a hydrometer, as shown above, being used for the latter. A hydrometer doesn't cost much and it can also be used for "topping up" the cells with distilled water.

SOME "CHASSIS SHORT-WAVER" HINTS

By L. H. THOMAS

Effects of poor earth—Suitable valves—Overcoming noisy conditions—Calibration of set.

A MONTH'S listening with the "Chassis" Three has brought to light several minor points of interest that may prove valuable to readers who have built the set since its description in last month's WIRELESS CONSTRUCTOR.

While the set in its original form proved so satisfactory that no alterations whatever have been found necessary, variations in externals of one or two particular points are probably worthy of mention.

A Simple Stunt

First, a friend who borrowed the set accused me of telling untruths when I stated that it was quite free from hand-capacity effects. Since it certainly *was* when I used it myself, I went in answer to his S.O.S. and found the set working, and there certainly *were* the most appalling hand-capacity troubles present that I have ever had the privilege to meet.

The set itself passed an examination, and we began hunting round outside to see if the earth lead had broken or fouled anything. Seeing that it was in order, but possessed the fault of being rather lengthy, I suggested, more or less as a joke, that we tuned it!

Accordingly we inserted in series with the earth lead a .0005 variable condenser, and, lo, we found a position on this condenser that gave complete freedom from hand-capacity troubles, with absolutely no loss of signal strength! So that this simple experiment may quite well prove of value to readers who are having trouble with this or any other set.

Wide Choice of Valves

Naturally, a set of this type with a metal panel and a metal "base-board," both earthed, can cause a lot of trouble if it should misbehave in this way—far more than the conventional ebonite-panelled affair.

Regarding valves, I have used a 6-volt "H.L." type of practically every make available, and found them all give excellent results as detector, and also as the first L.F. Those I used included the Mazda, Marconi and Osram H.L.610, Cossor 610 H.F., and Mullard P.M.5X.

The Mullard P.M.6D. was, if anything, a little better than the P.M.5X. as detector, but not quite so suitable for the note-mag. A P.M.5B. or a "D.E.H.610" type also served very well for this purpose. Any good 6-volt power valve available was used in the output stage.

For Noisy Nights

Two-volt valves were tried on two occasions and no difference in results was noticeable.

I found that on a "noisy" night (every short-wave enthusiast will know what I mean!) it was distinctly advantageous to reduce the common H.T. voltage from the usual 100-120 down to 80 or 85 volts.

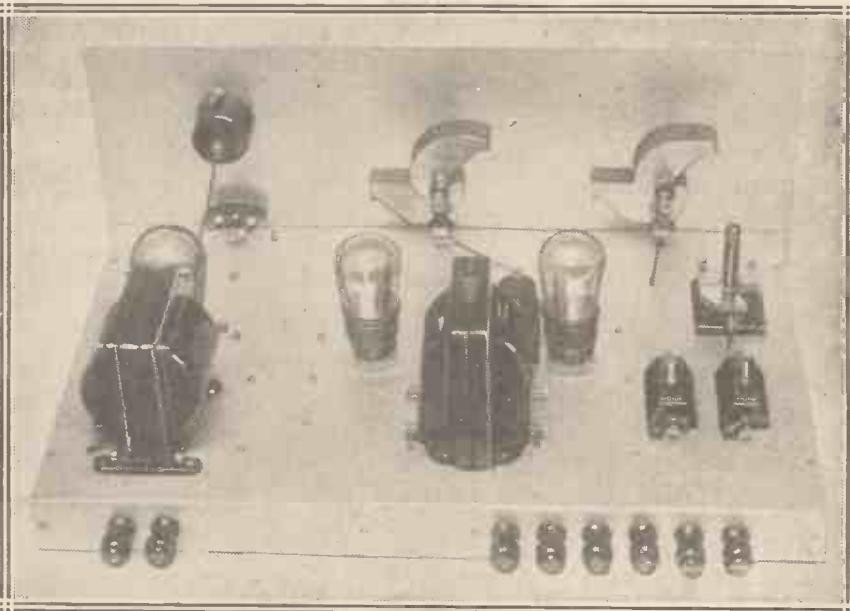
The same effect could be obtained by working with the volume control

producing oscillation if the aerial series condenser is kept well out, and at the same time sensitivity is not impaired, on account of the small coupling needed on these very high frequencies.

U.S.A. on the L.S.

If a small scratch on the ebonite base of this condenser be made for each coil (i.e. for the 6-turn and for the 4-turn, which is used for 20-metre work) the condenser can be set to a predetermined value, and the main dials can be calibrated for the two ranges. With two 4-turn coils 5 S W and the other 25-metre stations, on the original set, came in at about 35-40 degrees on the 100-degree dial.

It will usually be found that the strength of W 2 X A F on approximately 32 metres, on a good night, is



The "Chassis" Short-Waver which was described last month has a metal panel, and most of the wiring is under the chassis. Although you might not think it, the above photograph was taken after the set was completely wired!

farther in, but the H.T. method was slightly better and gave a still quieter background. Incidentally, the set has hardly ever been used with the volume control "all out."

The best coils for receiving the group of distant broadcasting stations round about 32 metres have been found to be a 4-turn for reaction and a 6-turn as grid coil. No trouble is experienced in

sufficient to work a loud speaker. Loud-speaker reproduction of several distant amateur stations has also been carried out. As a rule, it is painful to wear the headphones when searching round the 20-metre amateur band without putting the volume control well in!

Nothing remains now but to leave the set to speak for itself!

RECEPTION IN BLIND SPOTS

By
Capt P.P. Eckersley M.I.E.E.

If you take a little lamp and lay it down on a rough carpet, you will see that there is a quite fair general illumination—you can perhaps even find your stud—but a close examination shows all sorts of nearly black shadows. In among the pile of the carpet, behind the ruckle in the lee of a fallen spectacle case, it is quite black darkness, but here and there it glows with light.

If you substitute for the floor-level lamp the wireless station, and imagine the rough carpet to be the surface of the earth, you have a very good analogy of what happens when waves pass over the ground.

The analogy can be taken further because the floor of a room is not all covered with the same type of stuff; you have polished parquet, deep pile carpets, dull linoleum, and here and there perhaps even a bearskin, with long hair and gaping red mouth.

Radio's Ups and Downs

The surface of the earth is by no means covered homogeneously—here you have a vast tract of water, there flat marshy plains, forests rise upon the foothills, great cities sprawl in the folds of hills, industrial workings hide shamefully in the nicks between mountains.

The light on the floor travels easily over the polished parquet, it's not too troubled with the dull-surfaced linoleum, the pile of the carpet reveals a quick die-away of strength, and there are shadows everywhere, and no light finds its way into the nicks between the long hair of the bearskin.

The wireless waves find hardly any impediment as they travel over sea and plain, the hills throw shadows, the mountains may shield those in the valleys completely.

If you dwell up on the hill-tops your three-valver may simply flood your speaker with programmes, but should you be unfortunate enough to live in the darker valleys probably not even a super-heterodyne will tease faint sounds from the stagnant ether. Our Chief Radio Consultant explains why it is that some places are "deaf" to radio sounds—or, in other words, are "blind spots."

If we imagine little beings who get enjoyment out of the floor light as we do from the wireless wave, you will see that it's good to live in the middle of the parquet floor (if cold), it's practical to get good light along the dull linoleum, but woe betide the being who is forced to live deep down among the roots of the bear's hair!

If we imagine beings living on the

surface of the earth dependent for their nightly enjoyment upon getting into the strong field of the wireless wave, then it's good to live near a broadcasting station, and on the middle of the sea; it's more practical to find oneself living on the flat plain, it's a dire business if one happens to live among the mountains. And even the hills, like the pile carpet, hold their shadows.

Local Shielding

The whole question of whether our field strength is to be strong or weak depends upon our distance from the station and the type of ground between us and the station, and the particular local idiosyncracies of our neighbourhood. To make this latter point clear it must be realised that even if we are near the station, and if the ground between us makes little difference to the strength of waves, we may still have poor results if we are locally shielded.

I remember, in this latter connection, a lovely spring day, when you could hear things growing in the stillness, finding myself six thousand feet high up among the lower Alps. My view swept the long line of the Juras to one side, while the snow peaks of the Oberland froze against the blue sky on the other.

Marvellous Reception

And I saw a man with headphones on, sitting in the sun. And I asked him what he heard, and he rolled out the great names of the wireless firmament—Davenport, Koenigswusterhausen, Motala, Vienna, Budapest, Radio Paris, Radio Toulouse, Bruxelles, Huizen, and Hilversum. And I asked him what marvellous circuit held its stability in this high



A relay station placed in a valley in order to pass on programmes from a shielded station.

Reception in Blind Spots—continued

region, and he told me "a circuit of one lamp."

It would work a loud speaker, he said, nodding to something that looked like an old lady's ear trumpet, and, by Jove, there, in the still air, was the faint reminder that culture still firmly held its headquarters at Savoy Hill!

Down in the darker valleys I learned of super-heterodynes that could just tease faint sounds from the stagnant ether; but it was there more blessed to send than to receive.

Peculiar Variations

And it all is explainable by visualising that lamp on the floor and noticing how sitting on the upper side of a rucked carpet one may gaze full into the strength of the far away source of light, but down in the dusty

close to the tank, and you will not get a whisper from a super-set. Climb to the top of Ben Nevis with a portable set and enjoy the Brookmans Park transmissions no end.

By analogy, get inside a match-box an inch from the floor lamp and see no light, sit on top of the bear's head 20 ft. away and get it full.

If we were to plot all the field-strength contours very accurately in this country due to all our stations we should produce a map like a 1-in. ordnance survey of the coast of Norway. All we can do for practical purposes is to draw our field-strength contours as an average strength.

If you were to take readings of field strength from Brookmans Park in central London you would find even in moderately open spaces, and only a quarter of a mile apart,

However, one can say something helpful about certain cases where field strength may be abnormally weak. One must stress first that the unlucky he who finds himself in a very shadowed part of the hills is likely to have little remedy that is cheap and simple. The field strength is weak, and it's all the field strength there is, and that's that.

One may hopefully suggest that the strength of interference is also weak, but unfortunately the atmospheric suffers less shielding and diminution due to topography than the signal we wish to hear.

The Best Remedy

If, in a mountainous district, signals are apt to be very weak, the only solution is to rig up, at the expense of a village community wanting good service, a receiving station high up on the hill, and then running wires down to each house in the village. Such an idea is not fantastic, and one recommends it, free of charge, to municipalities in Wales and Scotland where mountain shielding does spoil individual reception as we know it.

Purely local shielding due to steel-frame buildings is easier to deal with. Here the sovereign remedy is to stick the aerial (in its proper sense—frame, capacity, wire, anything that is hitched on to the aerial terminal) out of the window. If you live in a flat, for example, your portable may seem a bit dull.

There is often a terminal on a portable for an aerial, and if you just dangle a bit of flex through a crack in the window you ought to bring things in roaring loud. (The signals as well as the wind.)

"Communal" Receivers

In general, however, you must beware the indoor aerial if your house has a lot of steel girders, and you must somehow push a bit of aerial outside the electrical "match box."

A blind spot is a blind spot. The B.B.C. policy is to try and so push up the general level of strength that even the holes in the contours are so small in absolute intensity as still to give decent results. Topographical shielding is only solved by communal receivers "high, high, high up in the hills"; local shielding is solved by letting an aerial out for a bit of fresh ether.

I have written.

HIGH, HIGH, HIGH UP IN THE HILLS!



"On one side my view swept the long line of the Juras, while the snow-clad peaks of the Oberland froze against the blue sky on the other."

cracks of the carpet pile one may look in vain for light, however near to the source.

Again, I have taken a portable set into the Savoy and found it difficult to pick up Brookmans Park; I have taken it into Savoy Hill and found it difficult to pick up anything else! The Savoy is in parts a steel-framed building, Savoy Hill is brick—there was local shielding in the one case, no shielding in the other.

Put yourself in a tank on the field where the new station stands

variations of 3 to 1 (this has been verified).

We knew all this vaguely some time ago—before we made an accurate study of the whole business, and so there grew up the idea that there were "blind spots." Now the Editor has asked me how people can get reception in blind spots. I don't really know if the spots are really blind—and that is possibly why I spent so long in describing why blind spots were blind rather than rushing in at once to say what to do about them.

FOR YOUR CABINET SET: AN ALL-MAINS A.C. POWER UNIT

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

With this unit and the A.C. "Chassis" Three described in last month's issue, the constructor who is "fed up" with batteries has an A.C. mains-driven receiver of superlative merit.



To readers who have alternating current electric light supply the use of the mains for running a wireless set is becoming increasingly attractive. Designs for mains sets, both A.C. and D.C., have

for supplying L.T. smoothed and rectified for any voltage up to six, for running ordinary sets.

The Harris "Stedipower" L.T. Unit has proved exceedingly popular, but with the increase in the efficiency

of building such a unit to work filaments from the mains.

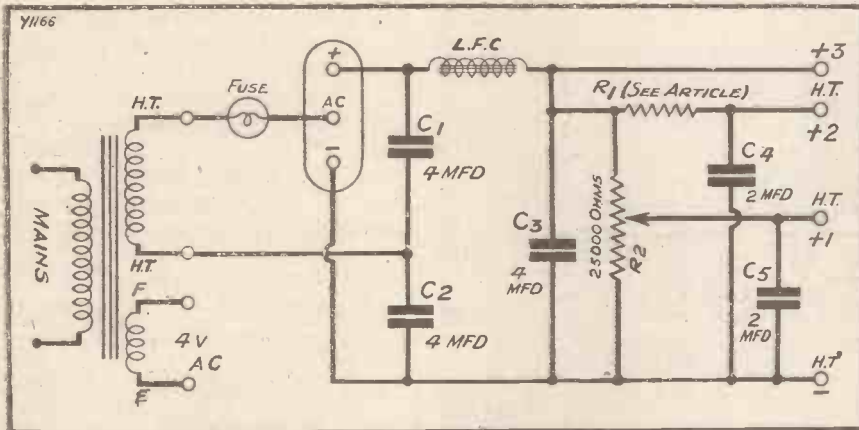
Last month we described an A.C. chassis set which readers will remember was designed to use three A.C. valves run from a 4-volt A.C. supply.

In the present article we are describing a special design which has been worked out to supply not only the four volts A.C., but also rectified and smoothed high-tension at three different voltages; one being continuously variable from zero to maximum, a second being adjustable in steps according to the fixed resistance chosen, and the third being the maximum for output valves and the like.

Many Special Features

The WIRELESS CONSTRUCTOR A.C. Power Unit has a number of points of special interest. First of all, its layout has been designed to meet the requirements of a large number of constructors of cabinet sets.

In such sets, which naturally include radio-gramophones and electric



As you can see from this, and from the list below, the unit requires but few components, so the cost is low.

already appeared in this journal, and the WIRELESS CONSTRUCTOR is proud to have been the first British journal to describe how to build an A.C. unit

and general availability of valves designed to run from low-voltage "raw" alternating current it is no longer necessary to go to the expense

HERE IS YOUR SHOPPING LIST

Suitable baseboard.

- 1 Climax Autobat transformer, type HLG1.
- 1 Westinghouse metal rectifier, type HL4.
- 1 H.T. fuse (Magnum). (Ready Radio, Bulgin, etc.)
- 2 4-mfd. fixed condensers, high-voltage type (T.C.C. 600-volt test). (Dubilier, Hydra, Lissen, etc.) Be careful that these are high-voltage type for mains units.
- 1 Good quality L.F. choke (R.I. 28/14 henry). (Varley Wearite, Igranic, Ferranti, etc.)

- 1 4-mfd. condenser (T.C.C. 200-volt working). (Ferranti, Dubilier, Lissen, etc.)
- 2 2-mfd. condensers (Ferranti, tested 500 volts).

NOTE.—The ordinary type of Mansbridge condenser will serve here, as the maximum voltage to which they are subjected is not so high as that of the two large condensers.

- 1 Wire-wound resistance with holder (Varley). (Ferranti, R.I., Lissen, etc.)

NOTE.—The value of this resistance

depends on circumstances, and this is dealt with in the article.

- 1 Mains unit potentiometer (Varley power potentiometer, type CP64, 25,000 ohms). (Truvolt 20,000 ohms, or near value.)
- 1 Panel bracket and grid-bias clip (Ready Radio, or alternatively a single panel bracket and a separate grid-bias clip of any of the well-known makes).
- Ebonite panel, 5 in. x 4½ in.
- 1 Ebonite strip, 3 in. x 2 in.
- 6 Insulated terminals, as marked (Belling-Lee).

A.C. Power Unit—continued

gramophones, it is often desired to build the speaker into the cabinet. This means that the lower portion of the cabinet has a certain space occupied by the cone or a moving-coil speaker. Such a speaker always comes in the middle of a compartment, and unless the cabinet is particularly deep it is often difficult to arrange the power unit in such a way that it does not foul the speaker.

Arrangement of Components

In the WIRELESS CONSTRUCTOR A.C. Power Unit the component parts of the apparatus are so arranged on the baseboard that there is adequate space in the middle for the chassis of a balanced-armature type

of speaker of the kind which has been described so often in this journal. Used in a slightly larger cabinet, there is also adequate clearance for the pot magnet and base of a moving-coil speaker.

Another point of considerable interest is the particular circuit used. This circuit, which is specially recommended by the Westinghouse Company, who make the metal rectifier incorporated, achieves what many readers would at first consider impossible, namely, the production of an output voltage which is considerably higher than that given by the secondary of the transformer.

The circuit includes, first of all, a transformer to take the voltage from

the mains and deliver it on the output side from 135 to 140 volts with no centre-tap. Here, to start with, there is a distinct advantage, as many of the rectifying systems designed to give an output in the neighbourhood of 200 or 250 volts require an output from the mains transformer of at least 500 volts, or even 600 volts, with a centre-tap, and such voltages are dangerous and require more than ordinary care in handling.

The Rectifier Circuit

In the WIRELESS CONSTRUCTOR A.C. Power Unit the maximum voltage obtainable from the mains transformer is about 140, and in practically all cases this is lower than the mains voltage itself. This transformer now feeds through a fuse of the flash-lamp variety to a special copper oxide rectifier, specifically designed for the circuit used, into which condensers and a choke are used for smoothing purposes and voltage increase.

At the output end of the "open circuit" voltage is somewhere in the neighbourhood of 220 to 230 volts; with a 30-milliamper output the voltage is somewhat in excess of 180; and with a 50-milliamper load (the maximum which should be taken from this unit) the voltage is not lower than 150, and is usually of the order of 155 to 160.

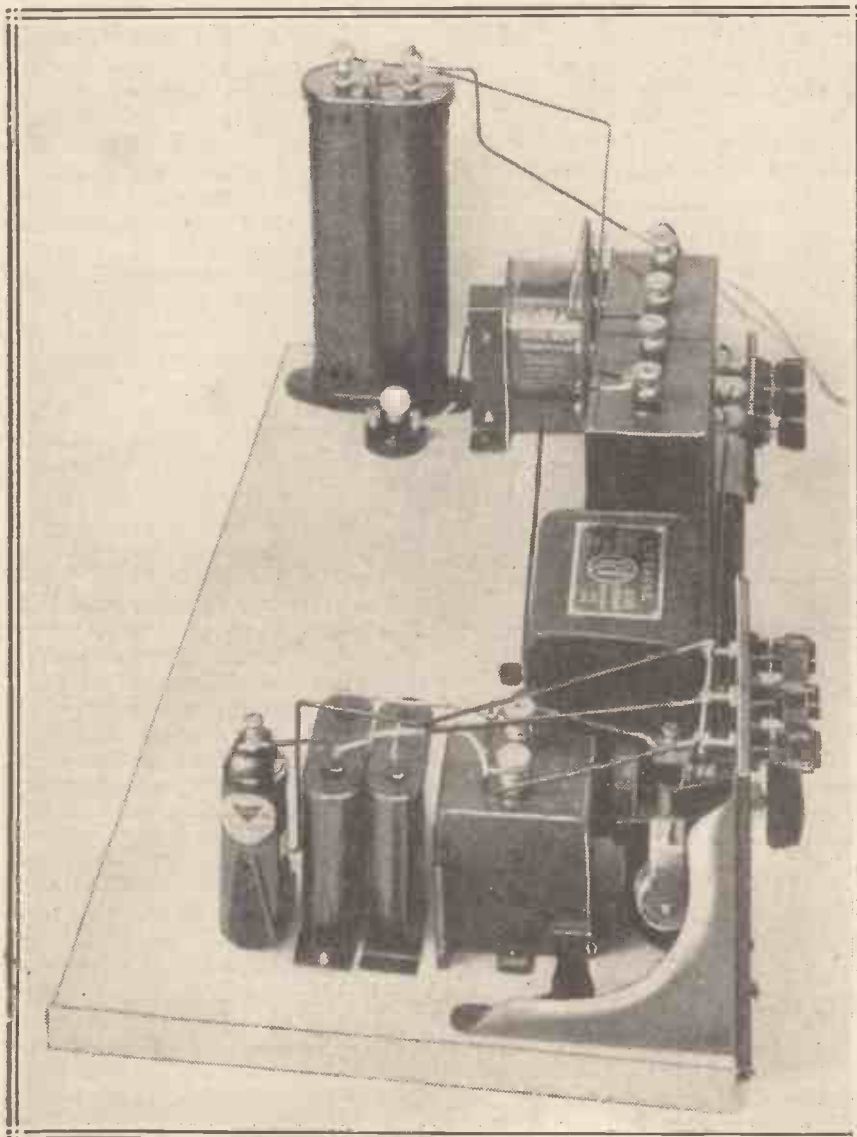
Now, as one is bound to lose some voltage in the resistance of the rectifier, and in the choke for smoothing, it seems absurd that the output voltage should be higher than that given by the transformer. The reason for the increase of voltage is the special circuit used.

Voltage Increase

In the more usual bridge-type of full-wave dry rectifier, a condenser at the output side is first charged through one side of the rectifier with one swing and then through the other side with the other swing, so that the voltage reaching the condenser is always of the same polarity.

Full-wave rectification is thus obtained quite simply, but without any considerable voltage increase. Actually there is a slight increase in voltage owing to the difference in the method of measuring A.C. and D.C. voltages.

In the special circuit used in the WIRELESS CONSTRUCTOR A.C. Power Unit, however, there is a real voltage



The components are grouped round a space in which room is left for the projecting back of a speaker to be mounted in the same cabinet.

A.C. Power Unit—continued

doubling, which occurs for the following reason. The explanation, by the way, is not complete, but will serve to give a general idea.

condenser, while the condensers themselves must be capable of standing the double voltage.

While all this sounds fairly com-

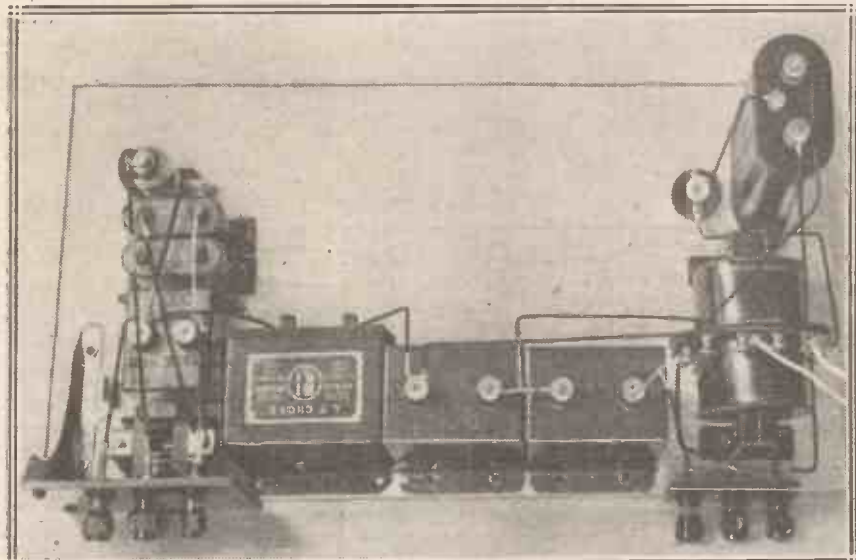
The rectifier is supplied by The Westinghouse Company ready for mounting on your baseboard and complete with terminals, and the remaining parts of the apparatus are comparatively few in number and reasonable in cost.

The smoothing circuit consists of one good quality choke, with suitable condensers, while the variable voltage is obtainable by means of a high-grade power potentiometer of very smooth action.

The H.T. Tappings

The unit has six terminals in all: two for the four-volt A.C. current, an H.T. negative, and three H.T. positives. H.T.+1 is, as previously mentioned, continuously variable from zero to the maximum, and is thus very useful in adjusting the voltage on the screening grid of a screened-grid valve. H.T.+2 can have any voltage desired from the lowest to the highest limits, the method of deciding upon the voltage required and just how to obtain it being explained later in the article.

For the moment it may be said that the necessary reduction of voltage from the maximum to that desired is obtained by a series resistance, and the arrangement of this part of the circuit is such that this, in itself, forms an anti-motor-boating device. H.T.+3 is designed



There is absolutely no doubt about the simplicity of the wiring, as this photograph clearly shows.

If a fixed condenser is charged up to the full voltage of the transformer and then applied to a rectifier, it will obviously discharge through the rectifier in a perfectly normal fashion.

The condenser, if it is a good one, is capable of holding the charge for some considerable time. If, now, we arrange that our transformer not only applies voltage to the rectifier, but simultaneously charges a suitable value of fixed condenser, then by a suitable circuit arrangement the charge stored in this condenser can be used to discharge *in series* with the next impulse from the transformer, thus *adding* this voltage to that of the transformer.

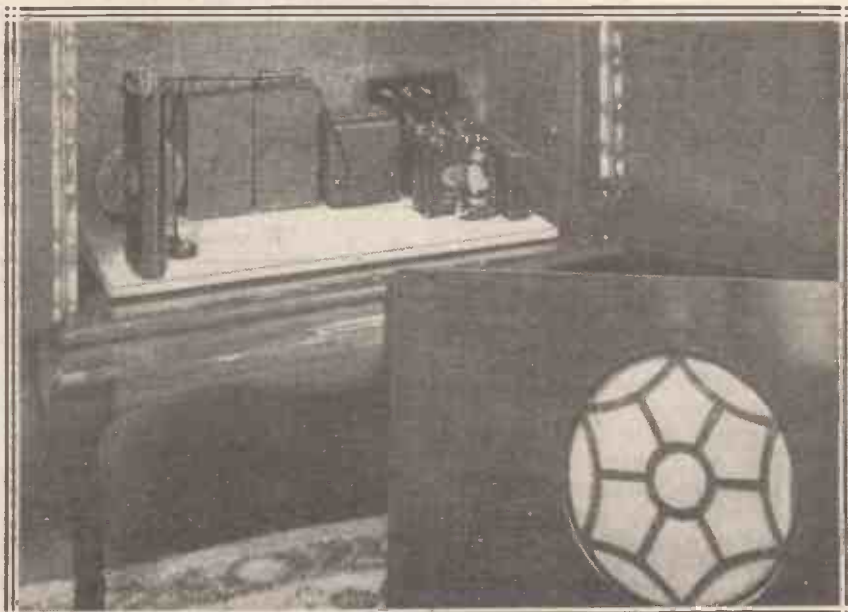
Ingenious Scheme

If simultaneously the next impulse from the transformer is charging a second condenser, we can carry on a chain of charging and discharging which will have a similar effect to that obtained with a much higher voltage, and this is, in effect, what is happening in the WIRELESS CONSTRUCTOR A.C. mains unit.

The rectifier and the circuit, of course, have to be specially arranged, and the rectifier has to be designed to carry at each swing twice the current it otherwise would do, for one-half the current is going through the rectifier and the other is charging one

plicated, the actual construction of the apparatus is exceedingly simple, and, simplicity being the keynote throughout, every endeavour has been made to keep the cost reasonable. One mains transformer is used for both the four-volt raw A.C. for filaments and the 140 volts for supplying the voltage doubling device.

HOW THE UNIT IS MOUNTED



Here the unit is shown inside the cabinet, and the speaker is mounted on the board which will form the front of the cabinet.

A.C. Power Unit—continued

to give the maximum of the unit, and this will vary according to the load put upon it, being as previously mentioned about 200 volts for a small output, about 180 for 30 milliamperes, and about 150 for 50 milliamperes.

Maximum Output

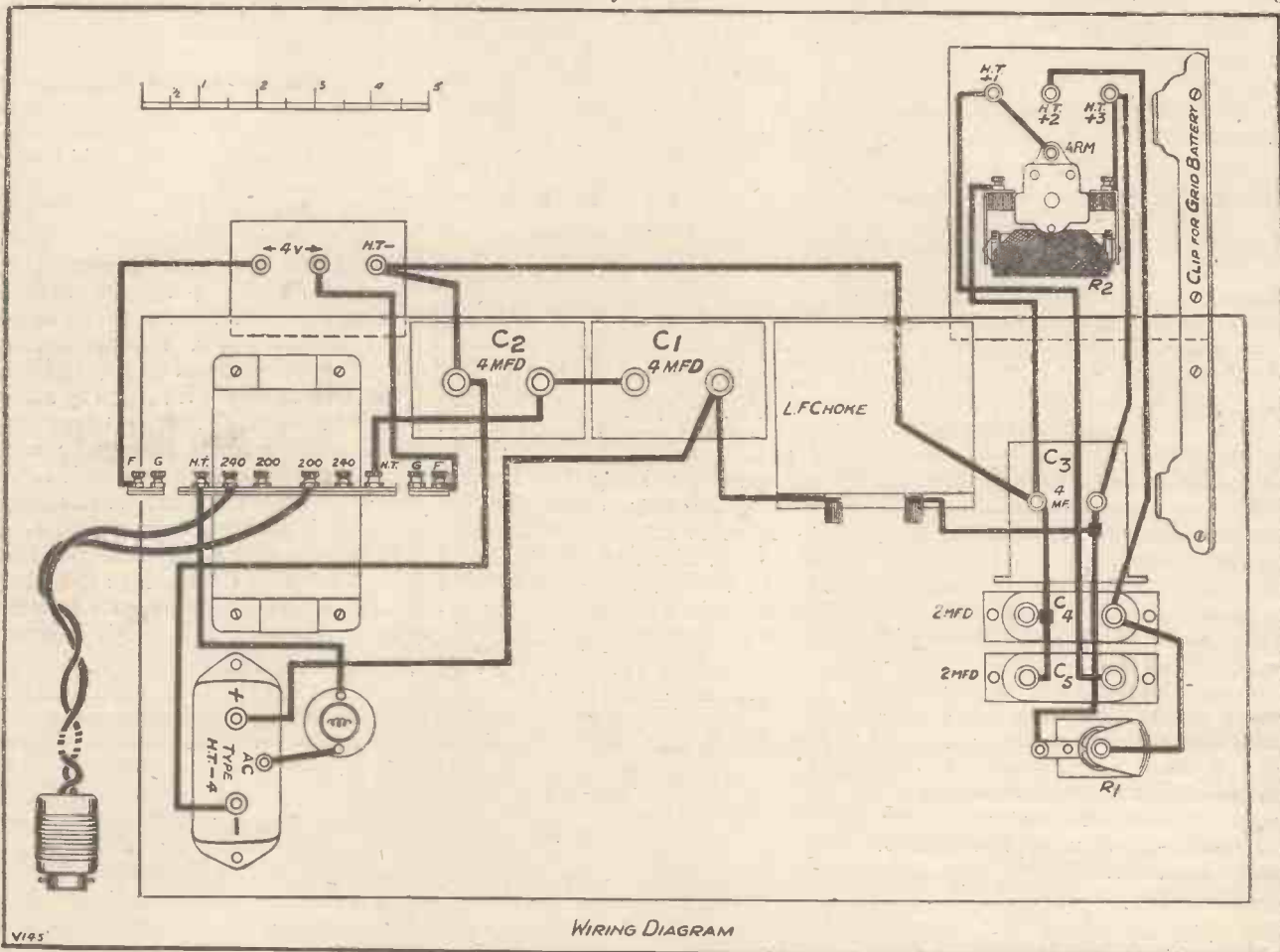
The 50-milliamper mark is the maximum which can be taken from the rectifier, and as the power potentiometer consumes a little current itself the maximum which should be

It will be noticed, by the way, that a clip is provided for holding the grid-bias battery, for although it is possible to obtain grid bias from the mains, grid-bias batteries themselves are very cheap and sometimes last a year, while the additional apparatus necessary in order to obtain grid bias from the mains costs more than your grid-bias batteries will cost for several years. So that, in my opinion, the additional cost of "automatic grid bias" is scarcely worth it.

speaker. If you have no special cabinet into which you can put the unit and wish to "box" it, then, of course, you can make it much more compact, but generally it will be convenient to arrange the layout as shown.

Transformer Connections

The transformer, it will be noticed, is placed in one corner of the base-board. It is provided with a number of terminals, two being



The plug shown on the left fits into an ordinary lamp socket, and is attached by a flexible lead to the input terminals of the transformer. The connections to the terminal strip on the right are clearly shown.

taken from the whole unit should not be greater than about 40 milliamperes, which means 40 milliamperes outside load. There are very few sets, as a matter of fact, requiring as high a current as this, even when super-power valves are used.

Before proceeding farther let us decide on our components. On page 307 is a list of those actually used in the set illustrated. The names of suitable alternatives are also given where possible.

In this set a fair amount of latitude is allowable in the layout or make-up, seeing that no high-frequency circuits are involved. If you already have a cabinet, in the bottom of which you wish to place this unit, then you should cut a baseboard of convenient size for fixing to the lower portion of the cabinet.

The layout of the set illustrated was worked out for Pickett's Radiola cabinet, which is provided with a baffle board for mounting a loud

marked 200 V., two 240 V., one pair H.T., one pair G., and one pair F.

The box in which the transformer is packed will contain a card explaining the connections to the various terminals, and by using two of the four first-named you can arrange to take the supply from different A.C. mains ranging from 200 to 250 volts. If your mains are 100 or 110 volts, then you should order a transformer for this voltage.

The two terminals marked H.T

A.C. Power Unit—continued

are connected up as shown in the wiring diagram, as are those marked F. The two marked G., which are designed to work with a special grid-bias dry rectifier supplied by The Westinghouse Company, are not used in the present design.

The Output Terminals

Two terminals for the 4-volt L.T. supply and a terminal for H.T. — are arranged on a small panel close to the transformer. The larger panel carries three H.T. positives and the power potentiometer, the latter serving to govern very accurately the voltage supplied by H.T. + 1 for the screening grid of an S.G. valve.

It is not necessary to have a voltmeter to check the voltage on this, as one can adjust it while the set is going. About half-way across its travel is about the right position.

H.T. + 2 is designed to give a voltage lower than that given by H.T. + 3, this latter serving to give the maximum of the unit for the output valve and other suitable connections. H.T. + 2 can be used for the detector alone should this show tendencies to motor-boat, for connected inside the unit is a series resistance and a condenser which serves as an anti-motor-boating device.

The Resistance Value

The value of the resistance is determined according to the use to which this tap is to be put. If, for example, it is being used for the detector valve alone, then a 20,000- or 30,000-ohm resistance will suit. If however, it is desired to use this tapping for, say, the first L.F. valve, or a high-frequency valve, or any other purpose, then decide first of all the voltage you wish it to give. Next find the current it will have to pass at this voltage.

If the total consumption of your set is about 20 to 25 milliamperes, then the maximum voltage obtainable from this unit will be about 180. Subtract from 180 the voltage you desire to get on H.T. + 2. We will say, for example, this is 90; 90 from 180 leaves 90, therefore you must arrange to "drop" 90 volts.

Next we find that the current to be taken from this tapping is 6 milliamps at 90 volts. You must add the anode current of all the valves to be taken from this tapping. Ohm's Law tells us that to find the resistance in such circumstances we must

divide the voltage by the current in amperes. In this case we want to divide 90 by .006 of an ampere (6 milliamps). This is the equivalent of dividing 90,000 by 6, and the answer is 15,000. The value of the resistance, then, will be 15,000 ohms.

A simple rule to find the resistance in such circumstances is to multiply the volts it is desired to lose by 1,000 and divide them by the current taken from the tapping in milliamperes.

Thus if we want to drop 50 volts with a 5-milliamper current we divide 50,000 by 5 and the answer is 10,000. Write this rule on a small piece of paper and stick it on the base-board of your mains unit for reference.

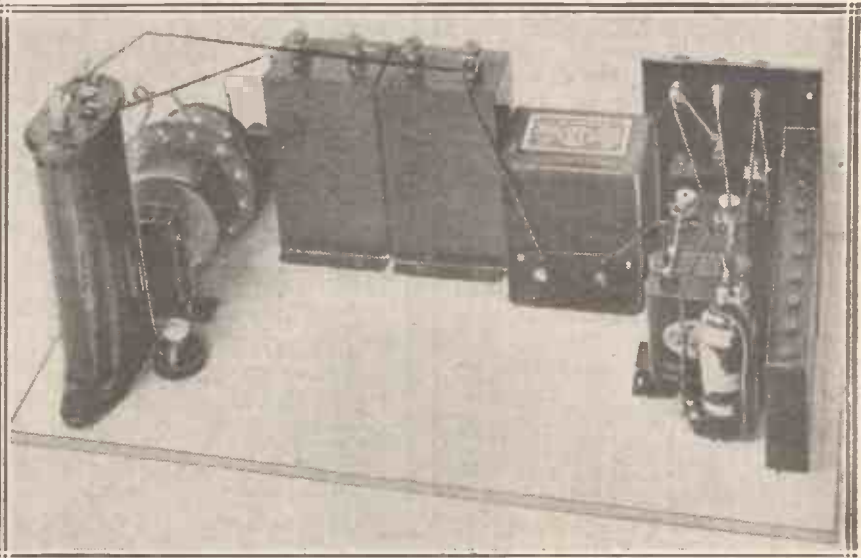
Just as the layout of this set will

up to a maximum of 40 or 50 milliamperes.

At the same time, it cannot cure faults which exist in badly designed wireless receivers and in some older sets, and in particular one or two of the earlier "kit" sets a little rewiring of the set may be necessary to avoid motor-boating, which in such receivers invariably occurs when they are taking H.T. from a power unit. It is for this reason that the special H.T. + 2 tapping is provided with its series resistance.

Stopping Motor-Boating

If your set motor-boats when using this unit, then trace out the detector



It could have been an easy matter to arrange for the grid bias as well as for H.T. and L.T., but most constructors prefer to use a G.B. battery as it requires changing only very rarely, and this is but the work of a moment. It fits nicely in the position shown.

be determined by the cabinet with which it is used, so it is just as well to make sure that you will clear the particular speaker unit with which the power unit will be used. In all layouts the transformer should be as far as possible away from the driving unit of the loud speaker, to avoid hum troubles.

Thoroughly Satisfactory

The WIRELESS CONSTRUCTOR A.C. Power Unit has been carefully tested with various kinds of A.C. valve receivers, and also as a high-tension supply for sets using battery-driven valves. In all cases it has proved to be thoroughly satisfactory and fully equal to all the demands made upon it

circuit and bring the detector H.T. + to its own terminal, separating it from the other H.T. tappings. Then take this detector H.T. + to H.T. + 2 on the power unit.

The illustrations accompanying this article show all that is necessary for you to build the unit just as shown, and now that A.C. valves are readily obtainable you will see it is quite a simple matter to build a receiver which is entirely driven from the mains.

This unit, used in conjunction with the A.C. "Chassis" Three described last month, will give you a receiver of which you will be proud from every point of view.



Some typical radio faults reviewed and questions answered.

By P. R. BIRD.

Unwanted Fireworks

AMONG the illuminations which invariably mark the dance and party season there are, unfortunately, some unexpected fireworks inside valves. Consequently, the question of inserting a flash-lamp bulb to act as a fuse has been agitating the minds of many readers, and as a low-consumption bulb of this type makes an easily-inserted, inexpensive and effective fuse, the trick of inserting it is worth mentioning.

The best place to wire it is between the H.T. negative and the L.T. negative terminals. You will probably find that inside the set these two are joined by a short wire. All you have to do is to break this, taking one side of it to one side of the new bulb-holder, and the other side to its other side. Insert the bulb, and there you are!

But remember that normally the bulb won't light up and it is only when excess current is passed that it gives a glowing account of itself!

Winding Your Coils

Considering the large number of people who wind their own coils nowadays, it is surprising to find how few can tell in advance the exact length of former required for any given coil. One Bedfordshire reader writes, typically enough: "I either get the coil-former longer than I want, or else I am unable to put on the full number of turns because there is no room for them."

All experienced constructors know that there is no need to leave this to chance, because all the various gauges of wire are of certain definite sizes,

and consequently if the diameter of the wire is multiplied by the number of turns you are putting on, the resultant length is that which will be occupied by the completed winding.

Allow a small margin for fixing off, and also because you will not be able to wind on the wire so exactly that

THE TECHNICAL QUERIES DEPARTMENT

Are you in trouble with your set?

Have you any knotty little Radio problems requiring solution?

The WIRELESS CONSTRUCTOR Technical Queries Department is now in a position to give an unrivalled service. The aim of the department is to furnish really helpful advice in connection with any radio problem, theoretical or practical. Full details, including the scale of charges, can be obtained direct from the Technical Queries Department, WIRELESS CONSTRUCTOR, Fleetway House, Farringdon Street, London, E.C.4.

A postcard will do. On receipt of this all the necessary literature will be sent to you, free and post free, immediately. This application will place you under no obligation whatever. Every reader of the WIRELESS CONSTRUCTOR should have these details, which will enable him to ask his 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.

each turn will lie perfectly side by side. Then you have only to add this small margin to the theoretical calculation of the length the winding will take, to see exactly how long your former should be.

Any electrician's handbook or table will tell you the diameter of the various types of wire.

For instance, the diameter of No. 28 D.S.C. wire is given as 0.017 inch which is the thickness of one turn of the wire. Consequently, 250 turns

will be 0.017 multiplied 250 times, which is equal to 4.25 inches.

As stated previously, it is almost impossible to wind wire perfectly, so it is necessary to allow just a little extra to cover small accidental spaces.

A very little experience will enable you to gauge to a nicety just how much to allow for different coils, and then the wrong-length former will be a thing of the past.

Using Two H.T.'s.

The bad old practice of connecting up an old H.T. battery in series with a new one, in order to get "full service" from the former, if possible, has been so loudly decried (and it gives such rotten results, anyway) that hardly anyone nowadays tries connecting up batteries in series! But questions are often raised about batteries in parallel. It does not seem to be generally realised that, in a set with several "H.T. positives," it is quite permissible to connect up two H.T. batteries, instead of the usual one withappings. In such a case, the negative on one battery is joined to the negative on the other battery, and to the H.T. negative terminal on the set.

Now the red wander plugs from the various H.T.+ terminals can be plugged in either battery as desired. When it is desired to use dry batteries as long as possible, and where a check can be made upon the amount of current actually drawn from the batteries by means of a milliammeter, the method is an economical one.

Power Valve Supply

For instance, if your set is a Det.-2 L.F., it is probable that the last valve is a power valve, and takes more current than the other two valves put together. If, therefore, the first and the second valves are fed from a common H.T. terminal, while the power valve has a positive terminal of its own, it is possible to use two different H.T. batteries with their negatives connected together.

Although the full set would require a double-capacity battery, when the load to the set is not distributed in this way, two ordinary batteries would be quite O.K. An advantage of this plan is that the two do not necessarily give out together, and consequently when one battery runs down only half the H.T. supply needs to be replaced.

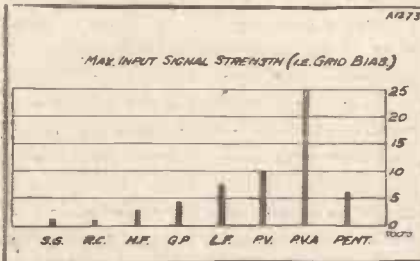
It will be seen that the batteries are not strictly "in parallel" (that is to say, with their negatives together and their positives together), but they are in parallel across the set, and the method is a very convenient one in certain circumstances.

WITHIN THE VACUUM



BEFORE commencing this article I must apologise to those readers who have already read an article written by me on the same subject some twelve or more months ago, but I feel that the subject is such an important one, and moreover one which is still rather neglected by the home constructor. I refer, of course, to the subject of valve overloading.

The valve is a hard worker, there is no doubt about that. It will work for hours and hours on end without fatigue, working at its fullest



This diagram shows the voltage-carrying properties of various types of valves. The pentode shown is the "small" 2-volt or 4-volt type, not the super-power pentode, while the P.V.A. valve is only a moderate-sized super-power. Such valves as the L.S.5A. and D.F.A.7 will deal with grid voltages ranging from 80 to 100.

capacity the whole time, but there comes a point where the valve can no longer work efficiently, where one reaches the proverbial straw which breaks the camel's back. In other words, one can keep on increasing the signal voltage of the input to a valve until one reaches a voltage which takes one past the limit, and overloading begins.

What Overloading Is

Now overloading is not to be confused with over-running, that is, running the valve with too much H.T. (or too little grid bias), or too much filament current. Overloading as

Valve overloading is one of the most frequent causes of distortion, because it is so easily caused. How very real is the danger of overloading, even in an ordinary three-valve set, is shown in this article.

By KEITH D. ROGERS.

referred to in these pages always means that too much signal strength is being put on to the grid of the valve for the valve to handle efficiently. This does not mean that the valve is being damaged mechanically or electrically, but that the output will be far from pure, that, is distortion will result.

Now, let us see exactly how this overloading takes place, and how by a glance at the makers' curves one can judge whether a valve is likely to stand a certain signal or not.

How it Begins

Assuming we have a good aerial, not far from a regional station, we can expect to get a field strength of 20 millivolts per metre of effective height in the aerial, which in a good average one will be about 18 ft., or 6 metres. This gives us about $6 \times 20 = 120$ millivolts, or .12 volt H.F. in the aerial. This is stepped-up by a fairly well-designed tuning circuit system to about .6 volt H.F. (Some distance away, say 40-60 miles, we should not exceed 7 or 8 millivolts per metre as a general rule.)

As the modulation is about 30-50 per cent, the most we can get out of this is .3 volt H.F., a more likely figure being .2 volt. However, we will take the outside limit as it will show more clearly the danger of overloading. This is amplified in the detector stage by not more than the amplification factor of the

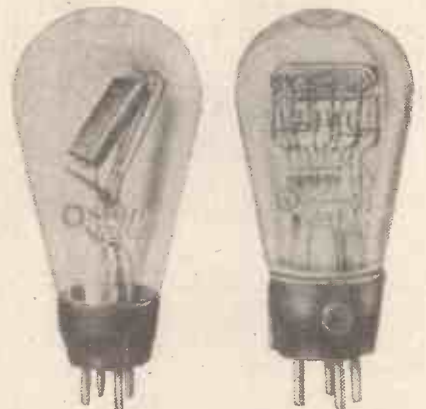
valve in the case of resistance coupling, and in practice usually about .7 times that of the amplification factor can be taken as really good amplification.

This, in the case of a valve with a magnification of 20, means about 15 times, bringing our peak voltage on the loudest possible note up to $15 \times .3 = 4.5$ for the grid of the first L.F. valve.

The Second Stage.

We thus have to put a valve in the second stage which will take about 4 or 5 volts grid bias. We are, of course, discussing radio reception; with a pick-up the voltages may be in excess of this, unless a volume control is used, but for ordinary radio purposes one can assume that the maximum voltage one would get would not exceed 8 volts on this second valve.

Assuming the L.F. valve is transformer-coupled, we find that theoretically we get not only the voltage



Two types of output valve. The P.625, on the left, will deal with input peak volts up to about 24 or 26 at max. H.T. voltage, while this 2-volt Pentode will only tackle 9 or 12 volts. Its 6-volt brother, however, will take 15 or 17 volts without overloading.

Within the Vacuum—continued

amplification factor of the valve as a possible step-up, but also the voltage amplification factor of the transformer, which is its ratio.

If we are using a transformer of 1 to 3, and a valve having a voltage amplification factor of about 10, we are going to get a theoretical maximum of about 30 times amplification for the stage; for every volt that we apply to the second valve we get 30 volts on the next. In other words, that stage is liable to provide us with 135 volts on the last valve, which would have to be larger than the L.S.5A. type in order to deal with it.

This, of course, is a purely theoretical case, and nothing like this voltage is required even for really good loud-speaker operation except where large halls are to be "filled." So we have a very large margin of safety in our set. But from these figures (which are the absolute maxima) we see that overloading is a very real possibility.

The Output Stage

In the last stage of any good L.S. set near the local station we can expect to get a peak voltage of at least 70, needing an L.S.5A., unless some volume control is em-



This special after-detector transformer for small sets gives a voltage step-up of 1 to 7 instead of the more usual 1 to 3.

ployed. In this latter event an ordinary super-power valve in the last stage of a three-valve set is usually quite sufficient, as it will carry quite sufficient to give good loud-speaker results.

Now, taking the .3 volt as a good

detector radio input, we see that the overloading danger is very real, but how much worse is it if we use H.F. in front, or use a pick-up giving us about twice the L.F. input to the detector? (It is assumed that the detector is being employed as the 1st L.F. when the pick-up is used.)

With a Pick-Up

Overloading is likely to be more frequent than it is in radio, because of the fact that a sensitive pick-up will give you quite half a volt more pure L.F. on the first valve than radio.

You start off with nearly a full volt, say. Multiply this by 15, assuming we get an amplification factor of 15 in the first stage, and we get 15 volts on the second valve. Overloading occurs at once if this valve is an ordinary L.F. valve of about 10,000 ohms, for it won't carry a peak voltage of 15 volts.

Then if this valve is transformer-coupled to the next, the theoretical result would be an amplification of up to 30, which will give us about 450 volts for the last valve—a tremendous figure.

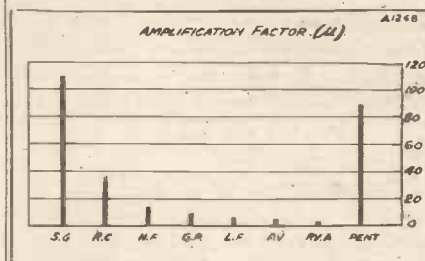
Obviously, then, we have to volume control heavily if we do not use a fairly large valve in the intermediate stage, for not only will a "larger" valve here enable the 15 volts to be carried, but will not magnify this so much and so will cut down the voltage on the last valve.

Naturally, if the 1st L.F. were overloaded it would not give the full voltage amplification, but this is just a theoretical consideration. If we use a valve with a magnification of 5, and capable of handling the 15 volts peak value on its grid (taking 15 or so volts bias), then we avoid overloading in the 1st L.F. valve and also cut down the voltage on the last valve. This will now be only $15 \times 15 = 225$ volts.

A better figure, but still rather troublesome, and showing that volume control is still necessary. In reality we can do without the middle stage with a pick-up of this sensitivity, taking the 15 volts straight from the detector to a high-mag. last valve; or taking the input of the pick-up to the second valve, when we get a theoretical 30 volts on the output valve, assuming the L.F. input valve

is our friend with a magnification of 10, still transformer-coupled through a 3 to 1 transformer.

We have taken a sensitive pick-up as an example, many do not give anything like 1 volt, but as an example it serves to show that it is almost essential to use a volume



This shows graphically how the various types of valves themselves can amplify the voltages applied to their grids.

control when a pick-up is to be employed.

With radio a volume control is also very useful, but is not quite so necessary, for one can detune, although this is a bad practice.

If, of course, the pick-up gives only a fraction of a volt, like certain pick-ups do, then the overloading problem becomes comparable to that in the case of radio input, and the volume control is not so much of a necessity.

Now, the figures I have taken are admittedly on the maximum side, because I wanted to show how very rapidly the input does mount up stage to stage, and for practical purposes one can take it that the limits and amplifications mentioned are never quite reached.

Choosing Your Valves

Remember, however, when choosing your valves to keep an eye on the curves supplied by the makers, and that if you use resistance coupling you should reckon you have got about 60 or 70 per cent of the voltage amplification factor of the valve in actual step-up for R.C.C.; and if you use a transformer, to reckon you have got not more than 70 per cent of your voltage amplification factor, multiplied by the step-up ratio of the transformer, and you will be quite safe in your calculations for the sizes of your valves.

For the last valve in a three-valver you will usually want a super-power valve in order to carry the input properly, unless you are a fair distance from the local station.

ACROSS the WORLD FOR 20/-

"Can I adapt my set to receive short-wave broadcasting?" is a query that is often received by the "Wireless Constructor." Here is an answer that will hold good for practically all cases, in the form of a simple but efficient adaptor that enables almost any set to be used as a really good short-wave receiver.

By G. T. KELSEY.



WHEN I suggested to the Editor that we might call this article by the above title, he laughingly remarked that the title would be all right providing the author's name underneath it were given as Jules Verne Kelsey!

But then, of course, editors (and let it be hoped that ours does not read this paragraph!) by nature are

if you glance at the photographs, the claims seem none the less remarkable in view of the extreme simplicity of the apparatus involved.

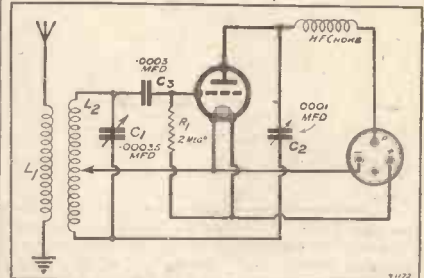
But perhaps I should be a little more explicit and get down, so to speak, to "brass tacks" by explaining at greater length precisely what all this is about.

Novel Fixing

The unit which is illustrated on this and following pages is actually a form of short-wave adaptor, and is so designed that by plugging it into the detector socket of any straight set with one or more L.F. stages, the set is instantly transformed into an efficient short-wave receiver, without having to make any additional battery connections.

The idea of a short-wave adaptor is, of course, not new. As far back as March, 1928, I worked out what

I believe was the first published design for such a unit, and since then the scheme has been extensively copied both in this country and in America.



A conventional and well-tried circuit is employed, ensuring success in the operation of the unit.

But the present design is rather away from the usual run of things, and is actually something of a super-effort. Quite apart from the ridiculously low cost of the necessary parts (which, might I add, is an item of

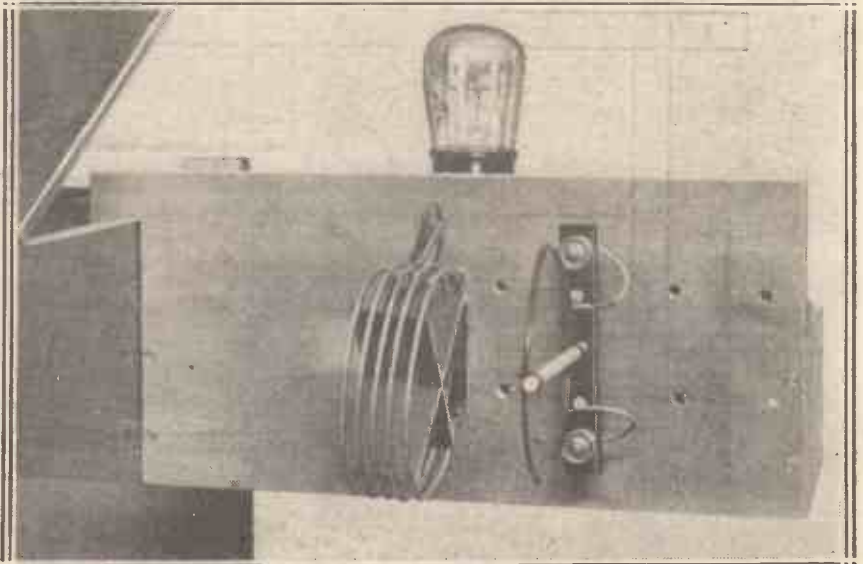
WHAT YOU WILL REQUIRE.

- 1 Variable condenser, .0003 or .00035 (Formo, Lissen, Dubilier, Keystone, Lotus, Raymond, Ormond, J.B., Burton, Igranic, Polar, etc.).
- 1 Slow-motion dial (Igranic, cheap type, or similar small dial).
- 1 Midget reaction condenser, .0001, .00013 or .00015 (Lissen, Lotus, J.B., Cyldon, Raymond, Magnum, Keystone, Polar, etc.).
- 1 Sprung-type valve holder (Lotus, Benjamin, W.B., Igranic, Precision, Burton, etc.).
- 1 Grid condenser, .0003 (Dubilier, T.C.C., Lissen, Mullard, Igranic, Clarke, Goltone, Magnum, etc.).
- 1 Single-coil mount (Lotus, Ready Radio, Lissen, Wearite, etc.).
- 1 Grid leak with terminals (Lissen, Pye, etc.).
- Ebonite strip, 1 in. × 10 in. × 1/8 in.
- Material for the aerial coil (see drawing), wire, flex, screws, small quantity of No. 36 enamelled wire for the H.F. choke, alligator clip, wood for the framework (see text), etc.

not given to over-credulity; and, on the face of it, it does seem a little difficult to believe that reception from countries as far off as Australia can be achieved with apparatus costing a mere twenty shillings, or possibly even less.

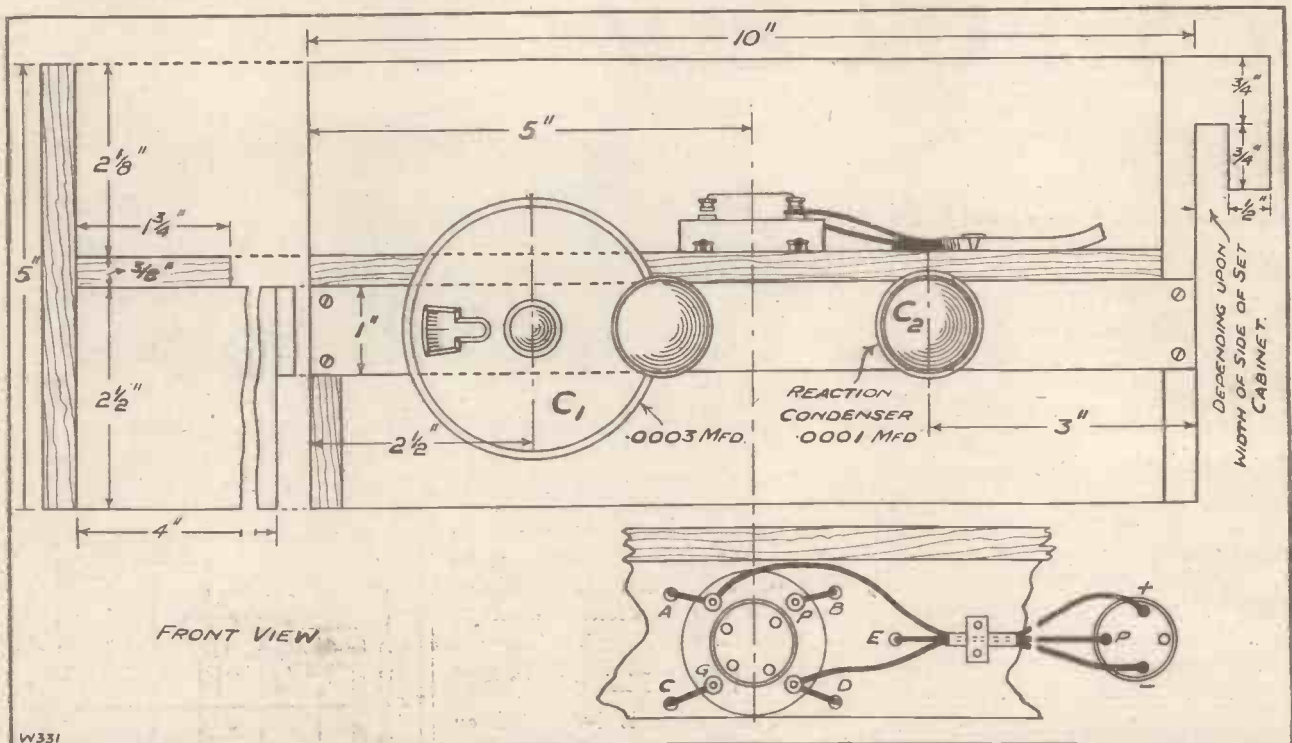
Very Simple Unit

When, however, I let him into the secret, he became almost as enthusiastic as I was over the simple unit which is to be described in these pages; and, as you will notice

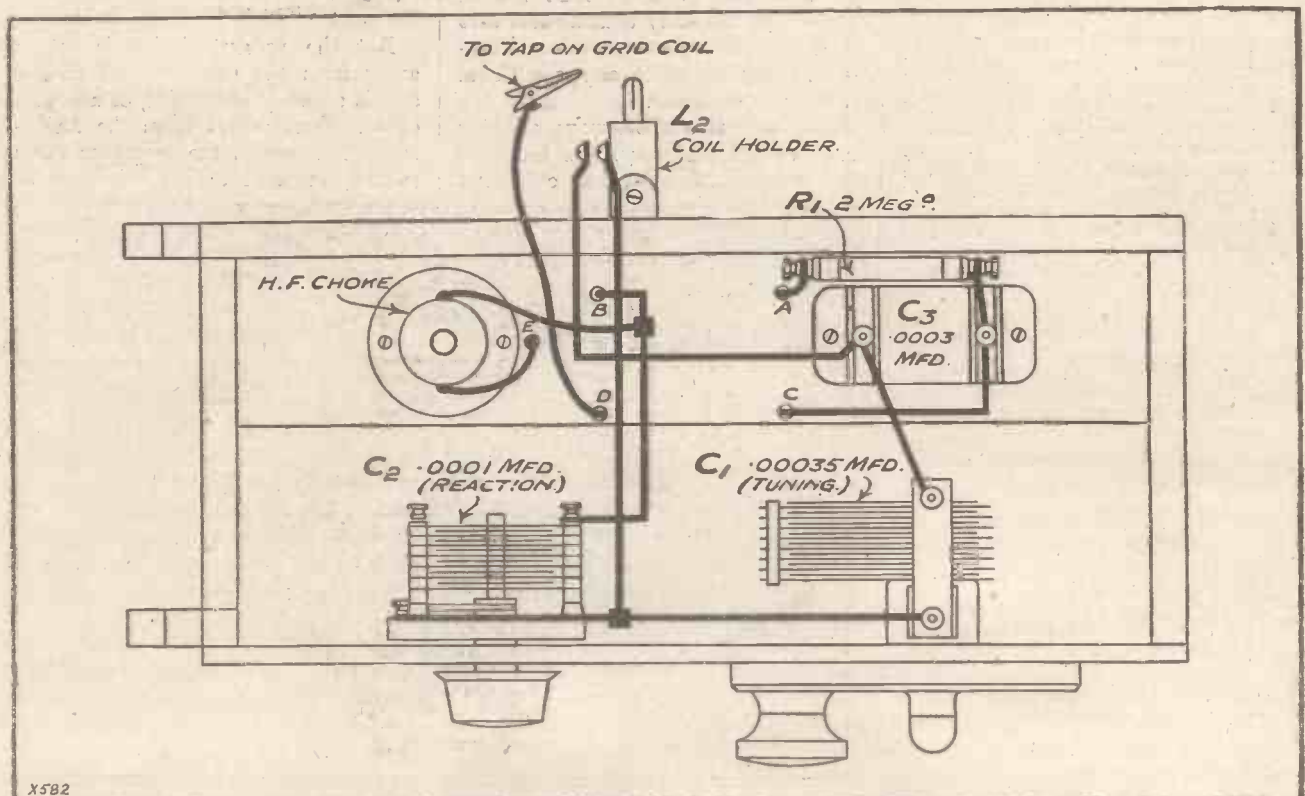


This photograph shows very clearly how the adaptor fits on to the side of the ordinary wireless cabinet, to form a short-wave detector unit that is suitable for almost any radio receiver.

Across the World for 20/-—continued



You will be able from this front and side elevation of the unit to get all the necessary details for the construction of the "cradle." The drilling centres for the two "panel" components are also clearly marked. There is a special way in which to arrange the filament leads to the valve plug, and they should be joined up so that the one marked plus connects through to the set L.T.+ terminal when the plug is inserted. In some cases, of course, this may be opposite to the way shown above.



The wiring of the unit is simplicity itself, and if you use this diagram in conjunction with the lower part of the one shown above you should not encounter any difficulties.

Across the World for 20/-—continued

considerable importance to most of us), the unit is arranged to hook on to the side of the existing set cabinet, so that it does not even call for extra table room.

Your present detector valve is utilised in the adaptor, thus apart from the cost of the unit, which, at a conservative estimate, I have given as twenty shillings, there is only one short-wave plug-in coil to buy, and even this can, if desired, be home-made.

Choosing the Components

And now I think quite sufficient has been said for you to decide whether you intend to have a shot at short-wave reception, and next, therefore, I am going to confine my remarks first to the question of components, after which I will give what constructional and operating hints are necessary for the building of this unique adaptor.

With such a wide scope from which to choose components the total cost of the unit could be anywhere between about 18s. and £2 10s. Therefore, in giving first in the list of components the make used in the original set it should be understood that this is only to qualify the statement to the effect that the cost need not exceed 20s. Actually, even with this limit, certain alternatives are possible, and almost any parts can be used quite successfully in the construction of the unit providing they are of reliable manufacture.

It is best to begin the constructional work with the wooden "cradle," details of which can be obtained from the diagram showing the front of the unit. In making the original I found it convenient to use $\frac{3}{8}$ in. thick wood, although, of course, any thickness up to about $\frac{1}{2}$ in. will be quite satisfactory, and possibly you may have some suitable material by you.

Construction Very Easy

Having obtained the material, to ensure the maximum efficiency from the finished unit dry the wood very thoroughly in an oven, after which the necessary parts can be cut out.

In order to keep the ebonite "panel" parallel with the wooden back piece, the side support on the right (looking from the front) should be shorter than the one on the left to the extent of the thickness of the front wooden hook. This arrange-

ment is clearly shown in the drawing of the underneath of the adaptor.

When you have completed the woodwork part of the business, you can proceed by drilling and mounting the ebonite strip which takes the place of the panel.

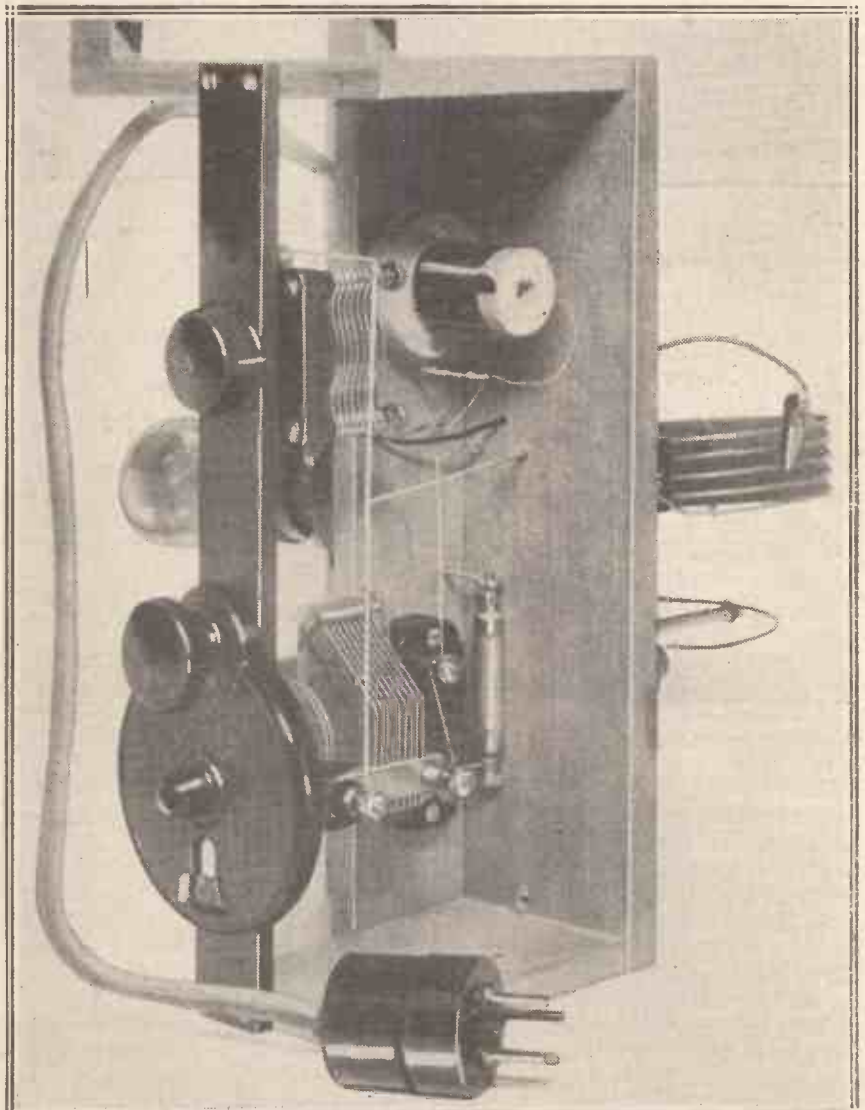
Incidentally, perhaps at this juncture I should mention that the distance between the back wooden support and the ebonite is dependent upon the depth of the variable condenser; and if you choose one deeper than that employed in the original it may be necessary to make allowances accordingly.

The H.F. choke, the construction of which should next occupy your

attention, can be made from an old wire bobbin, or, if this is not available, the end of a broom-handle, which should be obtained with due tact when the lady of the house is at the pictures!

The diameter of the former should be 1 in., and the winding consists of 100 turns of No. 36 enamelled wire, finished off at each end with a blob of Chatterton's Compound or sealing-wax. For extra support it will not impair the efficiency of the choke if you use a small tack or screw at the top and bottom of the former around which to fix the ends of the winding.

With the choke completed it can be fixed in position, as can also the rest



The "works" of the unit can clearly be seen here. Note the home-made H.F. short-wave choke in the top right-hand corner of the adaptor. The four-pin adaptor plugs into the detector socket of your ordinary receiver, the detector valve being removed and placed in the unit shown above.

Across the World for 20/-—continued

of the components. There is, of course, the special aerial-coupling device yet to be made, but since this is not connected in any way with the main part of the unit, it can be left for the time being, and the next job, therefore, is to do the necessary wiring.

The Wiring

Altogether there are only about a dozen connections to be made, and if you use the drawing of the underneath in conjunction with the diagram of the front of the unit, you should not experience any difficulty.

Those wires which pass through the wooden shelf from the valve holder to the underside are best insulated with Systoflex, although if the wood is thoroughly dry such a precaution should hardly be necessary. The same thing applies, of course, to the wires passing through the back wooden support to the coil mount.

the detector-valve socket the one marked plus is joined to the set L.T. plus terminal. In many cases this may, of course, be the reverse to the arrangement of connections shown to the plug in the drawing, and it is a point which, if maximum efficiency is to be obtained, requires careful attention.

It is hardly necessary to say very much regarding the construction of the aerial coupling unit, since the details given below are in themselves fairly complete.

The ebonite strip into which is mounted the wooden coil supports should be about $3\frac{1}{2}$ in. long, and the actual coil, which consists of three turns of No. 22 or 24 enamelled or D.C.C. wire, is 3 in. in diameter.

Mounting the Aerial Coil

The two wooden pegs forming the support for the ebonite base should be glued into the base so that when

finer adjustments of coupling.

When the aerial coil is completed, the adaptor is finished and ready for testing.

First, therefore, join the aerial and earth leads to the terminals on the aerial coil unit (it does not very much matter which way round they are connected), and after removing the detector valve from your present set replace it with the plug from the short-wave adaptor.

The Unit in Operation

Next place the detector valve which has just been removed from your set into the socket in the unit. Incidentally, if your present set employs H.F. stages, all valves preceding the detector should be removed, and the sockets should be ignored.

To say that the adaptor is simple of operation would perhaps be rather a misleading statement. Any short-wave set is slightly difficult at first if you have not previously had experience of short-wave operating, but as short-wavers go the present unit is about as simple as it is possible to make one, and after a little practice you should be able without difficulty to obtain completely satisfactory results.

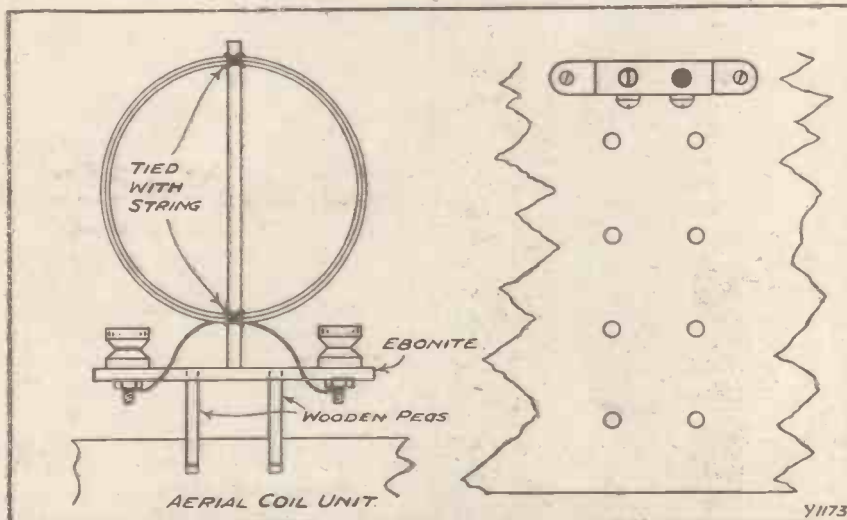
The only dials which require manipulation are those on the actual unit. The controls on the main set should not be touched. Therefore, after having joined a pair of 'phones to the L.S. terminals of your existing set, place a five-turn plug-in short-wave coil in the fixed coil socket, and attach the clip at about the centre of the coil. For the preliminary tests the aerial coupling unit should be fixed with a separation of $1\frac{1}{2}$ or 2 inches from the main coil.

Smooth Reaction Essential

Now slowly rotate the reaction condenser and note whether the set will oscillate. In this connection may I emphasise the necessity for absolutely smooth reaction control if satisfactory short-wave telephony results are to be obtained.

To obtain perfectly smooth control, variations of aerial coupling, the position of the clip on the main coil, and H.T. on the detector valve should all be tried.

Actually the ideal place for the aerial coupling coil is as near to the main coil as possible. If you bring it too close, however, you may find it



This diagrammatic view shows clearly the scheme by which the degree of aerial coupling is made variable. More than four sets of holes would, of course, give even more accurate adjustment.

The cable which connects the unit to the set proper is made up of three lengths of flex wire twisted together—one red, one black, and the third any colour to distinguish it from the other two. This latter lead is joined direct from one side of the H.F. choke, through the hole "E," to the plate pin on the adaptor plug, which latter, to save expense, can conveniently be made from an old valve base.

Filament Connections

The two filament leads should be connected to the plug in such a way that when the plug is inserted into

the coil is withdrawn for purposes of altering the coupling they remain in position.

If you glance at the photograph showing the back of the unit you will see a series of holes in the wooden back support drilled between the fixed coil holder and the edge of the support. The distance between these two lines of holes should be exactly equal to the distance between the two pegs in the aerial coupling unit.

The actual number of holes, however, does not very much matter and the more you make the better, because it will enable you to make

Across the World for 20/-—continued

will stop the set oscillating altogether, and the finding of the correct position therefore is purely a matter for experiment.

Incidentally, the best position for this coil will not necessarily remain the same over the whole range of the tuning condenser, and periodical re-adjustment may be required.

How to Tune

Remember, the rotation of the main tuning condenser, which should always be carried out with the set just oscillating, should be done very, very slowly. As soon as a carrier-wave, or in less technical language, a howl, is heard, the reaction setting should be reduced until the set just ceases to oscillate, after which with possible slight readjustment of the tuning control the desired station should be heard.

If any doubt exists as to whether the set is oscillating, a very simple test will enable you to satisfy yourself on this point. Touch with a moistened finger the side of the plug-in short-wave coil holder which is connected to the grid condenser and to the fixed vanes of the tuning condenser, whereupon, if the set is oscillating, a double "click" will be heard—one upon touching and one when withdrawing the finger.

Should you hear only one click when making this test, you can take it as an indication that the set is not in an oscillating condition.

There is, of course, a great deal more of interest to be heard on short waves for those who are fortunate enough to be able to understand the Morse code. But even without this knowledge there are now so many telephony stations at work as to make it possible at almost any hour of the day to hear signals from some far-off country.

Listening for Foreigners

In the case of the Australian and American stations, however, the time observed in those countries is so much ahead and behind respectively the time in England that it is essential to study carefully the published transmission hours in order to obtain results, and to avoid hours of fruitless searching.

Remember that in travelling west the local time observed becomes behind our own, and that in consequence an American short-wave trans-

mission advertised to commence at 7 p.m. there would not be received in this country until midnight.

The opposite, of course, is the case with the Australian stations, and 7 p.m. in Melbourne would be equivalent to 9 a.m. the same day in this country; in other words, ten hours earlier.

From our own point of view, these times do not seem particularly convenient, but actually conditions are not quite so bad as they seem.

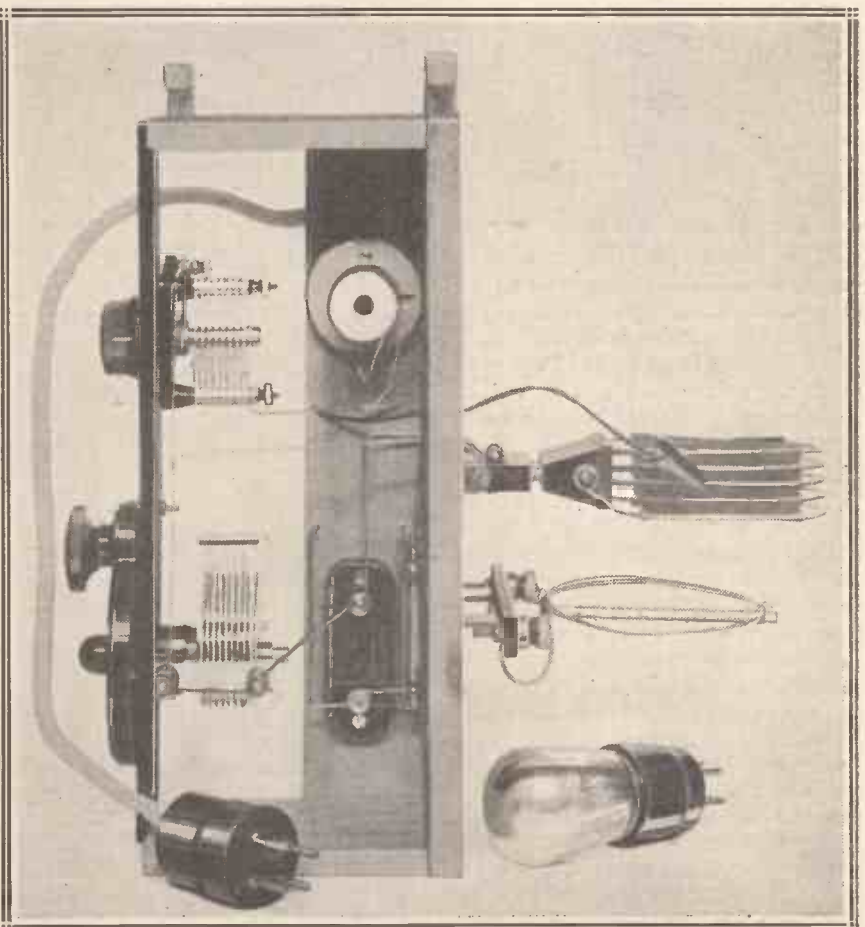
The afternoon transmissions from

of the morning in order to provide us with an opportunity of hearing them during the evening of what is, to us, the previous day.

But, unfortunately, these tests are not carried out to any regular schedule, and it may therefore be several days before you manage to locate one.

Well-Spent Money

Bear clearly in mind what has previously been said about acquiring the knack of short-wave operating, and if at first you are not entirely



The position of the crocodile clip on the grid-reaction coil is varied to give best reaction control. The coils shown cover the most important telephony stations round about 30 metres.

America are also sent out on short waves, and, under favourable conditions, it is often possible to hear them here during the early evening.

Advance Australia

Also, in the case of the Antipodes, the enterprising Australians frequently carry out tests during the early hours

successful, do not be afraid to have another go!

You will succeed in the long-run, and when once you have experienced the thrill of listening to stations thousands of miles away. I venture to think that you will not have any regrets about that twenty shillings and the way in which you have disposed of it!

Further Notes on THE A.C. "CHASSIS" THREE

Constructional details of the A.C. "Chassis" Three were given last month. This month it is shown that, if desired, the new differential reaction scheme can be applied. Also certain component alternatives are discussed and the importance of the output choke is stressed. The valves are dealt with, and it is shown how ordinary types can be used as well as the A.C. varieties. Finally, reference is made to the suitability of the power unit described in this issue for the A.C. "Chassis."

By THE EDITOR

So far as results are concerned, on even a small indoor aerial a good deal of high-quality long-distance reception can be effected, while a modest outdoor affair will give you an excellent bagful any evening. Twenty stations were brought in in as many minutes on the first evening the A.C. "Chassis" Three was tried, and this has been beaten on many occasions.

The Reaction Condenser

It will be noticed that an ordinary reaction condenser is used and not the differential type. The use of differential reaction will give a slight improvement in results, and if you are building this set anew then I would recommend you to obtain one.

The only alteration necessary will be to take the lead which goes from the plate of the detector valve to the moving plates, taking one set of fixed plates to terminal No. 6 on the second six-pin base and the other set of fixed plates to the chassis. The incorporation of an ordinary reaction condenser in this design is to enable readers to use parts they have on hand.

While it is necessary to have a split-primary aerial coil in the first six-pin base and a split-primary transformer in the second, either the solenoid, binocular or super coils of the split-primary type can be used. For best results I personally prefer binocular in both sockets, but the ordinary cylindrical six-pin coils can be used successfully. Quite a good arrangement is a cylindrical aerial coil and a binocular split-primary transformer.

Alternative Components

With regard to alternative components, the neutralising condenser can be either of the interleaving plate type, as shown, or the screw up-and-down type, such as those made by Jackson Bros., and Messrs. Gambrell. Any good radio-frequency choke will do, as its purpose

here is to enable reaction to be obtained.

In view of the relatively low impedance of the output valve, a good quality low-frequency choke should be used for the output filter. Some cheap L.F. chokes have a very high D.C. resistance and unduly cut down the voltage applied to the plate of the last valve. Any of the makes named in the list of alternatives will be found to be perfectly satisfactory, but, of course, this list does not include all of the good chokes.

up this set and use his existing valves for the time being.

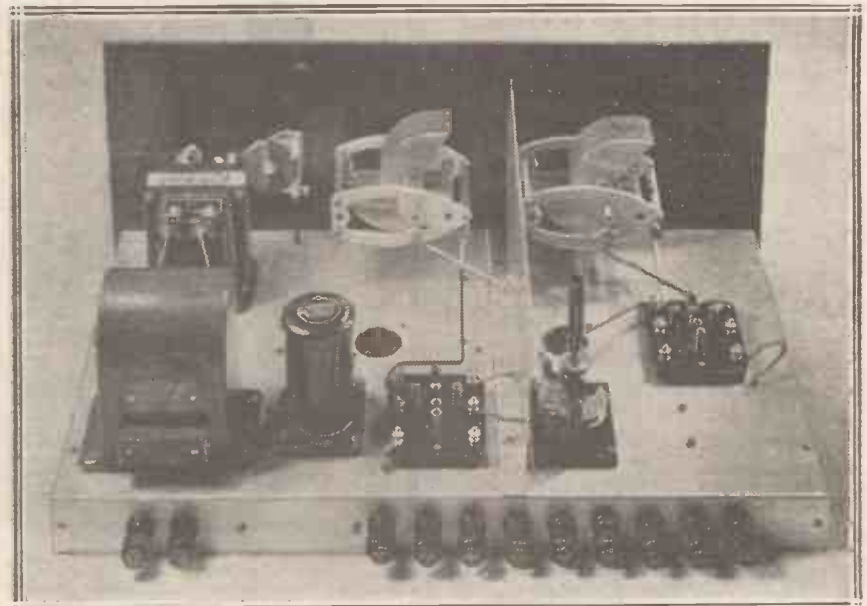
In such a case the first valve should be of the ordinary H.F. type, for either two, four or six volts; the detector valve either of the detector or H.F. type (a lot depends upon the transformer here, a less-expensive transformer seeming to work better with a detector type, while the higher-priced instruments work better with an H.F. type). The last valve can be either power or super-power, depending upon the type you are using or have on hand at the moment.

Grid bias will be used exactly as explained for the H.F. valve, but in this case, however, the slider of the potentiometer should be pushed over to the side connected to L.T. negative.

Sensitive and Selective

Tests carried out on this receiver with both A.C. and ordinary battery-driven valves have shown that it possesses a high degree of both sensitivity and selectivity, and, in fact, makes a most interesting addition to the line of first-class receivers published in this journal. This month

THE NEW SET-ASSEMBLY SYSTEM



This is a view of the A.C. "Chassis" Three, which is one of a series of receivers designed by the Editor on a quite new principle. Instead of a wooden baseboard a metal "chassis" is used, and most of the wiring and some of the smaller components are accommodated underneath. The result is, as you can see, a remarkably neat and workmanlike layout. Chassis sets are not difficult to assemble; indeed, in many ways they are easier to construct than those designed on conventional lines.

An interesting point about this set is that while it is designed for use with A.C. valves, ordinary battery valves can be used just as successfully, so that the reader who ultimately wants to use A.C. valves, but does not find it convenient to purchase them at the present time, can build

we publish a description of the power unit designed to provide both the H.T. and the L.T. for this receiver, as well as any other receiver using A.C. valves of this type. The set is also shown on the cover, built into a complete instrument including speaker and power supply.



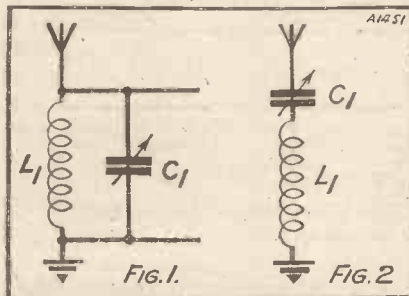
A CHAT ABOUT AERIAL CIRCUITS

Now that the B.B.C.'s Regional Scheme is planned to provide every listener with at least two "local stations," the question of aerial coupling becomes of great importance. Here is a very interesting article dealing with the whole question.

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

IT is rather a remarkable fact that while almost every other part of the wireless set has received a good deal of attention from the home constructor and experimenter, the aerial circuit and its associated grid circuit has become practically standardised.

A single coil tuned by a condenser, with the aerial tapped on to the coil, perhaps variably, is the arrangement adopted in about 90 per cent of the sets of to-day (excluding, of course, the portable, which works with a frame).



On the left C_1 is "in parallel" with the coil, but on the right it is "in series."

With the advent of the regional scheme and the need for much greater selectivity, even with simple sets, the aerial circuit may well receive more attention from experimenters. To help them in their studies I propose this month to run through various aerial arrangements and discuss them in some detail, beginning with Circuit No. 1, which is generally called the "direct-coupled aerial."

Circuit 1 has the advantage of simplicity, for the aerial is merely connected to the grid side of the coil

and the earth to the filament side. It is the most inselective of all the circuits discussed in this article, and for a given coil gives a very limited range of wave-lengths, for the aerial itself has a capacity generally in the neighbourhood of $\cdot 0002$ or $\cdot 0003$ mfd.,

Inefficient Circuit

and we thus get a circuit which is the equivalent of a closed grid circuit in which the variable condenser will not go lower than $\cdot 0002$ or $\cdot 0003$!

If the tuning condenser has a maximum of $\cdot 0005$ mfd., then when the condenser is at its maximum setting the total capacity across the coil is in the neighbourhood of $\cdot 0007$ or $\cdot 0008$ mfd. Measurement as well as practical trials with tuned circuits will soon show you that for a given wave-length it is much preferable to have a large inductance and a small capacity, rather than a small inductance and a large capacity.

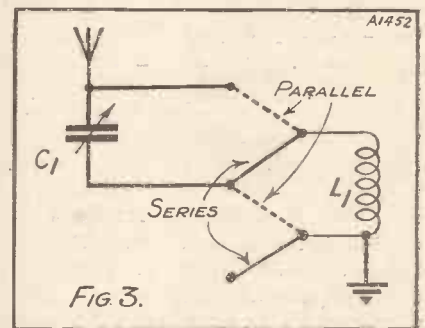
If we have two circuits, the first tuned to the wave-length by means of a small coil and a large condenser, and the second tuned to the same wave-length by means of a large coil and a small condenser, larger voltages will be developed across the coil in the second scheme and accordingly we shall get much louder signals. We can thus see that Circuit No. 1 is bad from three points of view.

Poor Tuning Range

Firstly, it is very inselective and totally unsuitable for modern conditions; secondly, the ordinary tuning condenser covers a very narrow band of wave-lengths compared with that obtainable with some of the other schemes to be mentioned, and, thirdly, on the upper end of the scale the arrangement is inefficient owing to the very large proportion of capacity

to inductance. There are also other objections of importance.

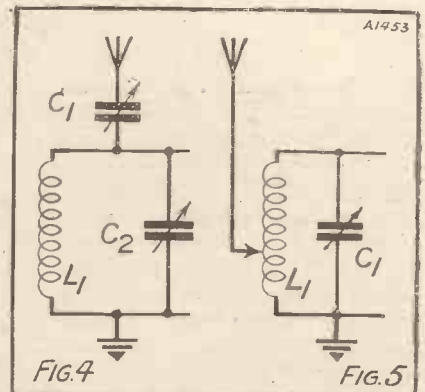
Circuit No. 2, which was widely used in the early days of wireless, consists of a coil with a condenser in series. Here we can use a larger



Here the switch places the coil and condenser either "in series" or "in parallel," as required.

inductance coil than in Circuit No. 1 for a given wave-length, but again the tuning range covered with any one coil is small, for if we consider the aerial capacity to be connected from the upper side of the tuning condenser to the lower end of the coil, then the tuning condenser and the aerial capacity are in series and the maximum capacity which can be put across the coil is bound to be less than the smaller of the two capacities, which in this case will be the aerial capacity.

Again, as we run down the wave-length scale with a given coil we shall



The Fig. 4 arrangement is not used as much as its merits deserve, but the Fig. 5 circuit is very popular, an "X" coil often being employed for L_1 .

A Chat About Aerial Circuits—continued

need to place a smaller and smaller condenser in series with the aerial, and this will considerably cut down signal strength. The arrangement shown, however, can be made quite efficient for a very small band of wave-lengths, and for general working we must have a large number of coils.

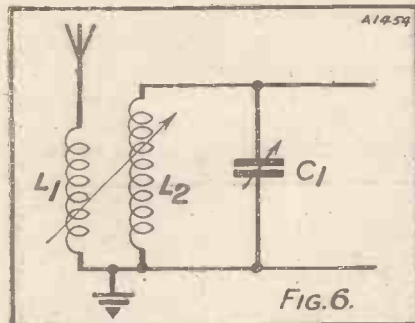
A disadvantage of this scheme which is not immediately apparent, but which is nevertheless real, is that the tuning curve has a very bad shape when, for example, a .0005-mfd. variable is used, and it will not be a straight-line either for wave-length or frequency.

Series or Parallel

Circuit No. 3 shows how a switch can be arranged to place the condenser either in series or in parallel with the coil. At first, this seems to be a very good idea, as for a given wave-length it might appear that we could use the better of the two arrangements, according to the ratio of inductance to capacity, but a few moments' consideration will show that it has many defects.

When the switch blades are in the "full line" position the condenser is in series, and when in the "dotted line" position, in parallel. The chief trouble with this scheme is that there is a bad gap in the wave-length range.

We have already seen that when the condenser is in parallel the minimum wave-length will be dependent

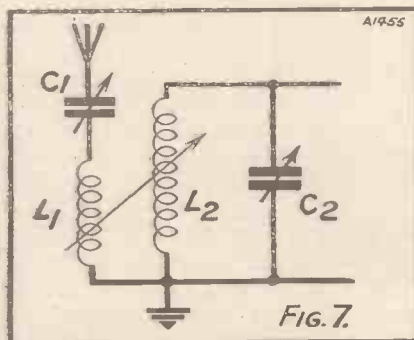


Here the aerial is coupled by a separate coil (L_1), and this is often provided with tapings so that in effect its size can be altered easily.

upon the minimum tuning condenser capacity and the aerial capacity in parallel with the coil, but when we place the condenser in series the maximum wave-length is bound to be less than the minimum obtainable with the parallel condenser. Although quite common in early wireless receivers where many bands of wave-

lengths had to be covered, the scheme is very rarely found nowadays.

Circuit No. 4 is of considerable interest and utility, and probably would be more widely used if it were better known. Here we have the parallel condenser C_2 , and at the



The trouble with this modification of the Fig. 6 circuit is that the combination of $L_1 C_1$ introduces unwanted tuning effects.

same time the series condenser C_1 . C_1 can have a maximum value of .0003 mfd. and C_2 of .0005 mfd. By suitably adjusting C_1 the effective capacity of the aerial can be considerably reduced, thus enabling us to use a larger coil and therefore get a better inductance to capacity ratio than would be the case with Circuit No. 1.

Simple Wave-Changing

C_1 also determines to a large extent the selectivity of the set, and as there is only one winding the arrangement in Circuit No. 4 lends itself to a simple wave-change scheme for going from the short to the long band. For example, the coil can consist of a short- and a long-wave winding in series, the total inductance of the two being suitable for the upper band. For the lower band the long-wave winding can be shorted out by a simple switch.

For a given wave-length several arrangements are possible. For example, we can have C_1 at its maximum and C_2 of a fairly small value, giving rather flat tuning, or C_1 at a small value and C_2 at a larger value, with considerably sharper tuning, but at some sacrifice of signal strength owing to a certain amount of loss due to the small capacity of C_1 .

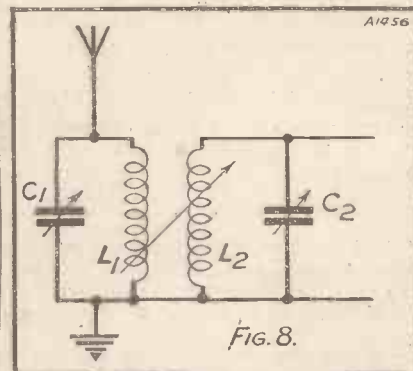
For simple home sets working with an indoor aerial, in which it is desired to have just sufficient selectivity to separate two or three programmes and yet a good signal strength, the

arrangement on Fig. 4 is very useful.

Condenser C_1 can be one of the compression type such as a Form-densor, Igranic Pre-Set, or the new Radio Instruments condenser of this type.

Circuit No. 5 is very popular, and has a grid coil tuned by a condenser with the aerial tapping adjustable. A very popular form of this coupling is that obtained with an "X" coil, two tapings for the aerial being provided on these coils. The six-pin aerial coils are of this general type, two and sometimes three tapings being provided. In early sets a large number of tapings for the coil were often taken out to a stud switch, but generally three tapings are all that are required.

Circuit No. 6 shows the aerial inductively instead of directly coupled. The aerial winding is sometimes tapped. If the aerial coil is made on a movable former, such as a pivoted



A good arrangement, but one involving some rather bulky apparatus and variable coupling.

ring, then widely adjustable coupling is obtainable.

Designing the Coils

Sometimes, however, the aerial coil is fixed in its relation to the coil, and often it is found preferably to use this form of inductive coupling rather than the direct coupling on the Daventry 5 X X range. To get the best efficiency with this type of coupling the coils require to be very carefully designed so as to give a maximum of inductive coupling between the aerial coil and the grid coil, and the minimum of capacitive coupling.

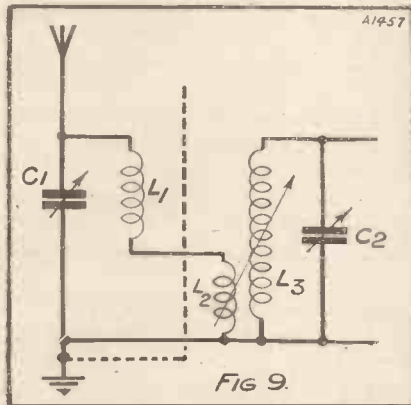
Probably the best plan here is to have the grid coil space-wound, the turns being separated by the thickness of the wire, with the aerial coil wound

A Chat About Aerial Circuits—continued

of very fine wire in a slot at the lower end of the coil.

Fig. 7 shows a modification of Fig. 6, with a series condenser C_1 to adjust the degree of coupling. Here again careful design is necessary if we are to avoid several troubles.

For example, the aerial coil plus the condenser C_1 and the aerial will



This is a variation of the Fig. 8 circuit, the aerial coil being divided into two parts (L_1 and L_2), only one of which is coupled to the grid circuit.

have a definite wave-length, and if the aerial coil is large this will tune to a wave-length within the broadcast section.

When this happens a very large current flows in the aerial circuit and the coupling between the aerial coil and the grid coil becomes extremely tight. Very often in a receiver it is found that tuning is very flat at the lower end of the scale, due to this very tight coupling, occasioned by the aerial coil coming in tune with the wave-length it is desired to receive.

Untuned Aerial Circuit

Contrary to what the beginner might expect, the aerial coupling shown in Figs. 5, 6 and 7 acts best when the aerial itself is not in tune with the grid circuit, but has a wave-length considerably removed from this. We shall have more to say of this a little later.

When the particular phenomenon just referred to upsets reception, the value of C_1 should be altered considerably so as to throw the aerial out of tune with the wave-length it is desired to receive. If there is no condenser in the aerial, a fixed condenser which can be thrown in or out by means of a switch is often a great help, particularly in receivers which have to cover the widest

possible band of wave-lengths with a given coil and condenser.

It must not be imagined that it is always bad to tune the aerial. Occasionally it is extremely helpful, particularly when we desire to get maximum signal strength and selectivity. We must not, however, use any of the schemes so far shown.

An Efficient Method

Fig. 8 is a good arrangement, but here the coils in the aerial and grid circuit respectively must be comparatively widely separated, and the coupling must be easily adjustable. This circuit was popular in the early days of wireless and can be made very efficient and highly selective, but the apparatus required is bulky, and does not lend itself to the compact design required of modern broadcast receivers.

If you do not mind occupying the space, and you are in the habit of using a large board layout for your sets, try this arrangement, the aerial coil

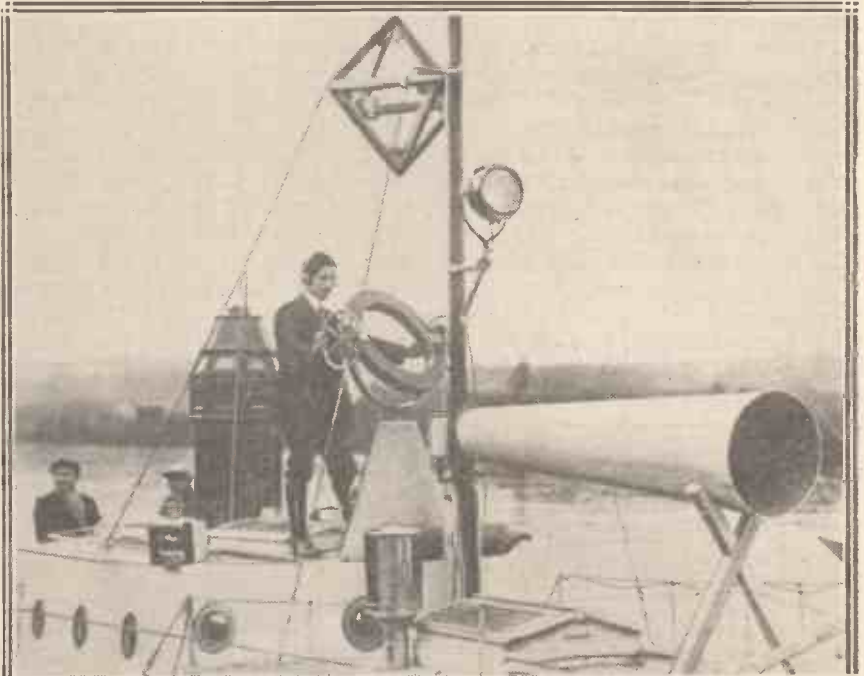
Remember that in the aerial circuit we have the large and important effect of the aerial capacity upsetting our tuning, whereas in the grid circuit the only capacity other than the tuning condenser is the minute self-capacity of the inductance coil and the small stray capacities of the wiring, plus the capacity of the valve itself.

The condenser C_2 will cover a much wider band of wave-lengths with its coil than will the condenser C_1 , for reasons already explained in connection with Circuit No. 1. You will therefore have to have a number of coils on hand to tune to a reasonable band.

Better Selectivity

Circuit No. 9, if properly made up, is an improvement on that of No. 8, so far as selectivity is concerned. The aerial coil is now divided into two parts, the larger part, L_1 , being screened from L_3 , the only coupling between the two circuits being through the coils L_2 and L_3 . The coupling

THE UNSEEN "PILOT"



This boat is being steered down the Seine by means of signals from a submerged cable, laid in the navigable channel. All the helmsman has to do is to wear 'phones and "keep her tuned in."

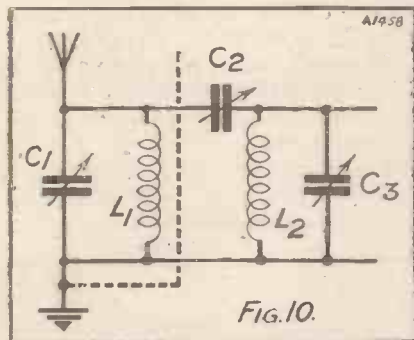
and the grid coil respectively being placed in a two-coil holder with adjustable coupling. Both condensers can be of .0005 mfd., but the coils should not both be the same, and you must not expect to be able to "gang" the two condensers.

between L_2 and L_3 should be variable, and very interesting experiments can be carried out with this circuit.

Circuit No. 10 may seem peculiar to many readers, but it is, nevertheless, highly selective and very useful. The aerial coil and the grid coil are

A Chat About Aerial Circuits—continued

screened from one another, or so placed that there is no coupling whatever between them, the sole coupling being through the condenser C_2 , which must be of a very small value.



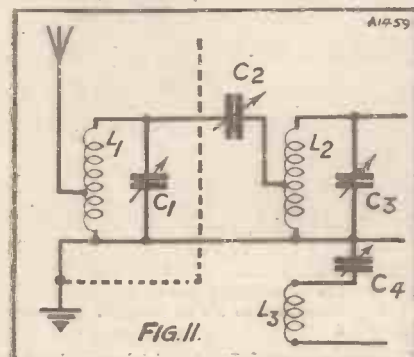
Here the two tuned circuits are widely spaced, coupling being varied by the small "neutralising" condenser C_2 . The method is a very good one.

A neutralising condenser makes an excellent coupling condenser in this circuit. Set the condenser C_2 at its maximum, tune in on both condensers C_1 and C_3 , and then reduce the coupling condenser C_2 , re-tuning after having done so.

Still Further Improvements

By careful adjustment a very highly selective arrangement can be obtained, but the effect of the scheme is entirely lost if through lack of screening or bad placing of coils inductive coupling is possible between the aerial coil and the grid coil. The coupling in this circuit, to get proper results, must be purely capacitive through C_2 .

Circuit No. 11 is a further modification which will give us still higher



Although Fig. 10 gives great selectivity, this can be increased if the lead from C_2 is tapped into L_2 , as shown here.

selectivity, and most remarkable results can be obtained, particularly when a well-designed reaction circuit is employed. For this reason the

reaction winding is also included in this diagram.

The coil L_1 can be an "X" coil, the larger of the two windings being generally preferable; the condenser C_2 a neutralising condenser, and the coil L_2 another "X" coil again, the large tapping being more suitable. The condensers C_1 and C_3 are both of .0005 mfd., and owing to the aerial being tapped off the coil L_1 the two condensers C_1 and C_3 will keep approximately in step, although not sufficiently so for "ganging."

Very Useful Scheme

The condenser C_4 can be a .0001 mfd. reaction condenser, and the coil L_3 can be a 50 coil of the plug-in variety for the lower band or 150 for the upper band. Here again care must be taken to screen the coil L_1 from L_2 and L_3 .

Coil L_1 and the coil L_2 can be binocular aerial coils quite conveniently, and this will obviate the necessity for screening. C_2 should be, as before, a neutralising condenser. If reaction is used in this circuit, then instead of a binocular aerial coil the coil L_2 must be a Reinartz transformer of binocular type.

Circuit No. 12 has been very little used in England, mainly because in the past the very high selectivity which it gives has not been found necessary, but it should certainly be tried in these days when even single-valve users must have a measure of selectivity in excess of that required before.

It is known as the Cockaday circuit, from the inventor, Mr. Laurence M. Cockaday, and when properly made up is remarkable both for the very sharp tuning which it enables the user to achieve, and also for the particularly smooth reaction which can be made to operate with it.

Practical Details

The actual make-up of the tuner is very important, and a certain amount of experimental work is necessary in order to get the best results. It will not be found efficient on the 5 X X range and does not lend itself to wave-changing schemes.

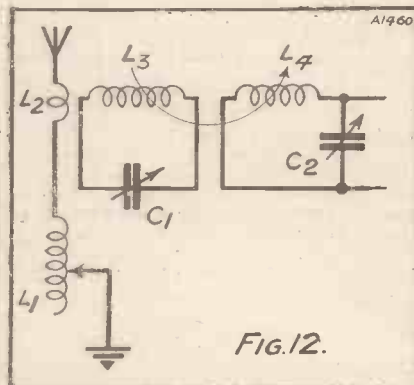
The coils L_2 , L_3 and L_4 are all wound on the same former, a 3-in. Pirtoid or Paxolin tube or a ribbed ebonite former being very suitable. L_3 can be 60 turns of No. 22 D.C.C. wire, and L_4 the same number of turns, separated

about a quarter of an inch from L_2 .

Although it is not shown in the diagram, immediately following L_4 should come a fine wire winding, say, No. 26 or 28 D.C.C. wire of about 25 turns, to form a reaction winding. The two condensers for tuning are both of .0005 mfd.

Coil L_2 should consist of one or two turns only (you should experiment here) wound directly over the aerial end of L_3 . A single layer of waxed paper serving to separate the two windings to prevent possible short-circuits.

The coil L_1 should consist of about 75 or 100 turns of wire hand-wound and brought out to a number of



This American circuit has great possibilities for the man who is close to a powerful station. Constructional details are given in the article.

tappings (say, six or eight), these windings being equally spaced. It is important that the position of the coil L_1 should be such that it does not couple with L_3 and L_4 , so as to confine the coupling to L_2 and L_3 .

Critical Tuning

Tuning on this circuit is rather peculiar, and requires care. While it might at first seem that it is simply a matter of bringing L_3 and L_4 in tune with the wave-length it is desired to receive, actually the tuning is done on L_4 , and L_3 is kept slightly off tune. The final adjustment of the condenser across L_3 serves to give an extremely fine control of reaction, which has already been approximately set on the reaction condenser not shown.

The circuit L_3 serves both to pass on the energy from the aerial and also to act as a variable damping upon the circuit L_4 . Properly made up and carefully handled, the Cockaday circuit will give a real knife-edge selectivity.



SAVOY HILL NEWS

The Battle of the Talks—The Wave-length Conundrum—More Centralisation—A Spring Sensation?—Mr. Gielgud's Recruit—Sir John Reith Opens Out—Song-Plugging—B.B.C. and the Civil Service.

By OUR SPECIAL COMMISSIONERS

The Battle of the Talks

THE famous "Battle of the Talks" raged furiously all the autumn right up to a Christmas armistice. Casualties were sustained by both sides; but on balance, Miss Hilda Matheson emerges victorious and in possession not only of the field but of some new territory adjoining.

The News has been detached from Miss Matheson and taken under the personal wings of Mr. Roger Eckersley and Mr. Cecil Graves, his deputy. Adult Education, with staff complete, has been absorbed by Miss Matheson, who is now virtually the dictator of the spoken word of broadcasting.

She has stout henchmen in Messrs. Siepmann, Marshall, Brennan, and Fielden. The move to add Mr. Cock and Mr. Filson Young to Miss Matheson's following did not succeed "for the first time of asking," anyway. No doubt more will be heard of this later.

The result of the Battle of Talks is regarded as having made Miss Matheson a serious candidate for the succession to Mr. Roger Eckersley, head of programmes at Savoy Hill. It is to be hoped that fresh power and the flush of victory will not induce Miss Matheson to yield to her highbrow tendencies still more.

The Wave-Length Conundrum

The B.B.C. is not happy about the position of the two waves at Brookmans Park. The agreed plan is to try to secure the acceptance of the Regional programme on the longer wave (356 m.) and the national programme on the shorter wave (261 m.), it being understood that 5 X X will always relay the national transmission synchronising with the transmission on Brookmans' 261 m.

The snag is that there are parts of London itself where neither 5 X X nor the 261 wave can be got intelligibly with simple apparatus. People who live in areas of this kind will have to take the transmission on 356 m., and, naturally, they want the national programme on it.

If the B.B.C. transposes the functions of the two Brookmans' channels it would throw out of gear the whole scheme of the Regional stations. So they will try and ride out the storm. One blessing may flow from this predicament.

I mean that if there are a considerable number of active listeners solely dependent on the 356-m. London Regional, they will insist on its being a reasonably popular service. This would kill the plan to dump a lot of dull talks and education on the London Regional.

More Centralisation

It is stated with some show of authenticity that both Sir John Reith and the Board of Governors of the B.B.C. have now been completely and finally converted to the doctrine of centralisation. If this is so, it is a singular triumph for Mr. Roger Eckersley.

Whether it is good for broadcasting is another matter. Demobilisation outside London gains momentum almost daily. All offices at Sheffield and Dundee and Hull have been disposed of. The orchestras in the Midlands are to go in September of this year.

Apparently no musical organisation of any kind is to be maintained at either Manchester or Birmingham. How long the National Orchestra of Wales will be relieved remains to be seen.

REMOVING THE "PARASITES" OF THE ETHER



To the right of this photograph is M. Beauvais adjusting an instrument which he has invented for overcoming parasitic noises, such as atmospherics. M. Beauvais is already well known as the originator of a scheme for guiding aeroplanes by wireless.

Savoy Hill News—continued

seen. I would bet on its disappearance in September, 1931, unless there is a change of heart and policy at Savoy Hill in the interim.

Belfast will be dealt with in the spring of 1931. The resources thus released will be used in London. Programmes will be more expensive and more professionally produced. They will be almost certainly more acceptable to certain classes.

Will this improvement in artistic standard and quality more than counterbalance the disappearance of the factor of local interest and distinctive contrast? This admittedly is an open subject and only time will tell. But I would be much happier about the statesmanship of Savoy Hill if I felt they were not being unduly influenced by purely accounting considerations.

The Midlands, which for years contained the most ardent supporters and friends of the B.B.C. in the whole country, are now the home of a seeth-

ing mass of discontent and disappointment. No amount of skilful handling can repair the affront to local feeling, and there is open talk of a licence strike.

There are rumblings of big trouble in the North, which is more effectively vocal in Parliament than the Midlands. No one can accuse Savoy Hill of any lack of courage in this business.

A Spring Sensation?

I hear that Mr. E. C. Henty and Mr. Eric Dunstan are being invited by an enterprising publisher to collaborate in a book of disclosures about the inner workings of the B.B.C. If the book is anything of a reflection of the real views of its authors, it will be one of the big sensations of the spring publishing season. It may well involve several startling legal actions.

Mr. Gielgud's Recruit

Mr. Val Gielgud, the dramatic producer at Savoy Hill, has just "absorbed" Mr. Jack Watt, the brilliant young radio dramatist who has made such a name for himself in Belfast. Mr. Watt specialises in adapting from novels, and will develop this technique in London.

They go straight on looking neither to right nor to left.

Song-Plugging

Last year's attempt by the B.B.C. to kill song-plugging did not succeed. Indeed, the present position is, if anything, worse than that which existed before the abolition of title-announcing. So Savoy Hill is taking stock afresh. If it had not been for the attitude of the Performing Right Society, the B.B.C. would never have given way.

But the P.R.S. is an even more effective monopoly than is the B.B.C., and it simply indicated that unless the B.B.C. resumed the practice of announcing the titles of dance-band numbers of its members, there could be no agreement about anything else.

If this were made effective the programmes would be hung up seriously. So there was no alternative to yielding.

It may well be that Savoy Hill will abandon all relays from hotels, and confine the transmission of dance music to what can be done from the studios by B.B.C. bands.

B.B.C. and the Civil Service

It is common knowledge that for some time the B.B.C. has been under review by the heads of the permanent Civil Service. This movement has received considerable impetus from certain influential Labour Party circles in close touch with the Government.

The position now is that the Prime Minister will be asked before the House rises for the summer holidays to appoint a departmental committee of inquiry into the early incorporation of the B.B.C. staff into the Civil Service.

Those who are behind the move would make all members of the staff at Savoy Hill and in the Provinces undergo the customary examinations for admission to the Civil Service. Those who succeeded would be posted in the usual way according to standard gradings. Those who failed would be turned out with a small gratuity and the thanks of a grateful country.

In high Civil Service quarters it is hoped that there would be so many changes as a result of the examinations that there would be much-needed openings for some of the numerous Civil Servants about to be displaced from the fighting services!

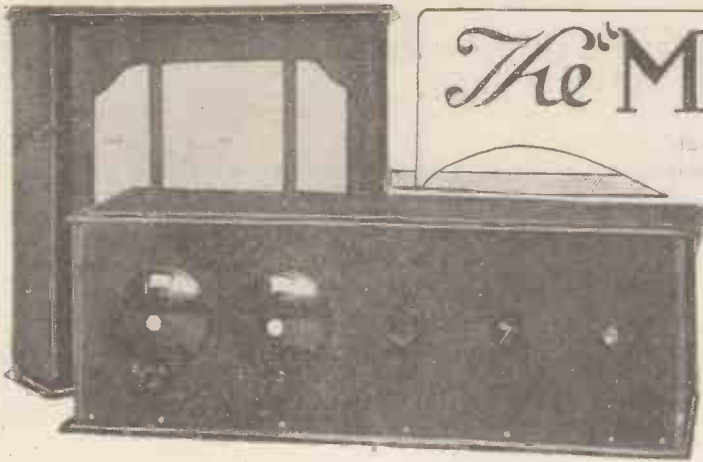
POLICE BEFORE THE MICROPHONE



The Metropolitan Police Force has its own Minstrel Troupe, the members of which are here seen before the microphone at the Central Hall, Westminster. When this photograph was taken they were recording for the gramophone.

Sir John Reith Opens Out

There is general approval of Sir John Reith's departure in explaining personally his policies and views in the columns of the press. He has chosen the "special article" form of expression, which avoids the possibility of misunderstanding. Incidentally, the competition amongst



The "MAXIMUM" FOUR

This set has "plenty of beef" behind it, since it has been specially designed with the idea that each valve should be made to do its full share.

By A. S. CLARK.

THE "Maximum" Three, which was described in the last November issue, proved such a delight to many readers, and gave such good results, that I came to the conclusion a four-valve set built on the same lines would be very welcome.

This four-valve set is called the "Maximum" Four, after the original set, because the chief point borne in mind when designing it was to obtain the maximum results possible with four valves.

Strength and Selectivity

You may be a little puzzled to know in what light the question of maximum results was viewed. For instance, it would be possible to consider local programmes only and go all out for maximum volume; on the other hand, long-distance reception could be made the point.

In the latter case the set would have to be very selective, possibly at the expense of volume. Unfortunately, however, it is not always necessary for a long-distance receiver to be

particularly selective, since every listener does not live "in sight" of a broadcasting station's aerial.

What, you will therefore wonder, has been made the definition of "maximum results"? Well, here



The detector part of the receiver is completely screened from the H.F. stage by means of the copper box seen on the right of this illustration.

COMPONENTS REQUIRED

- Panel, 24 in. × 8 in. (Resiston, Tro-lite, Goltone, etc.).
- Cabinet to take above, with baseboard 10 in. deep (Cameco, Gilbert, Pickett, etc.).
- Standard screening box, 6½ in. × 6½ in. × 6 in. deep, with hole cut for S.G. valve (Paroussi, Wearite, Ready Radio, Magnum, Keystone, etc.).
- 2 .0005 variable condensers, with slow-motion dials (Lissen, Lotus, J.B., Polar, Ormond, Burton, Utility, Dubilier, Igranic, Colvern, Formo, etc.).
- 1 Differential reaction condenser, .0001 (Ready Radio, Dubilier, Ormond, Burton, Lotus, Utility, etc.).
- 1 5-megohm volume control potentiometer (Igranic, Gambrell, Varley, Rothermel, R.I., etc.).
- 1 L.T. switch (Igranic, Lissen, Lotus, Benjamin, Bulgin, Wearite, etc.).

- 3 Shock-absorbing valve holders (Lotus, Igranic, W.B., Benjamin, Lissen, Precision, Magnum, etc.).
- 1 Vertical-mounting type valve holder (Junit, Parex, etc.).
- 2 Single-coil mounts (Lotus, Lissen, Ready Radio, Igranic, Raymond, Wearite, etc.).
- 2 1-mfd. fixed condensers (T.C.C., Ferranti, Mullard, Lissen, Dubilier, etc.).
- 1 4-mfd. fixed condenser (T.C.C., Dubilier, Lissen, etc.).
- 1 H.F. choke (R.I., Dubilier, Lissen, Varley, Lotus, Lewcos, Climax, Ready Radio, etc.).
- 2 L.F. transformers of different make or type (Brown "A" and Marconi 4:1 in set), Ferranti, Lissen, Varley, Mullard, R.I., Lotus, Telsen, Igranic, Lewcos, etc.).

- 1 Output L.F. choke (Wearite, Varley, Ferranti, R.I., Igranic, Magnum, etc.).
- 1 2-mfd. fixed condenser (Dubilier, Lissen, etc.).
- 1 600-ohm fixed resistance and holder (Ready Radio, Bulgin, Paroussi, Wearite, etc.).
- 1 25,000-ohm fixed resistance and holder (Ready Radio, Ferranti, Varley, Igranic, R.I., etc.).
- 1 6-pin coil holder (Lewcos, Colv n, Keystone, Magnum, Bowyer-Lowe, etc.).
- 1 .0003 fixed condenser (Lissen, Dubilier, T.C.C., Atlas, Mullard, Clarke, Igranic, etc.).
- 1 2-megohm grid leak and holder (Dubilier, Ediswan, Lissen, etc.).
- 11 Terminals (Belling-Lee, etc.).
- 3 Terminal strips, all 2 in. wide. 2 in., 3 in. and 8 in. long respectively.
- 5 Wander plugs, wire, Systoflex, screws, etc.

The "Maximum" Four—continued

it is. An attempt, and a very successful one, was made to design a set which would give the best results from near and distant stations that are possible with four valves, and provide the degree of selectivity necessary for any particular local conditions.

Detailed Refinements

This may seem like aiming at something out of range, but when you read about the scheme employed which makes it possible to have any desired degree of selectivity you will appreciate how our object has been attained.

If you glance at the theoretical circuit diagram you will see that there is one H.F. stage, a det., and two low-frequency valves. Wave-change switching has not been employed, because it must obviously introduce

has already been pointed out as being highly desirable.

Let us consider here one of the small points which serve to indicate how carefully the set has been designed in every little detail—in fact, right down to each lead. You will see that there are two grid-bias batteries indicated; the usual one for the L.F. valves and another one for the screen-grid valve.

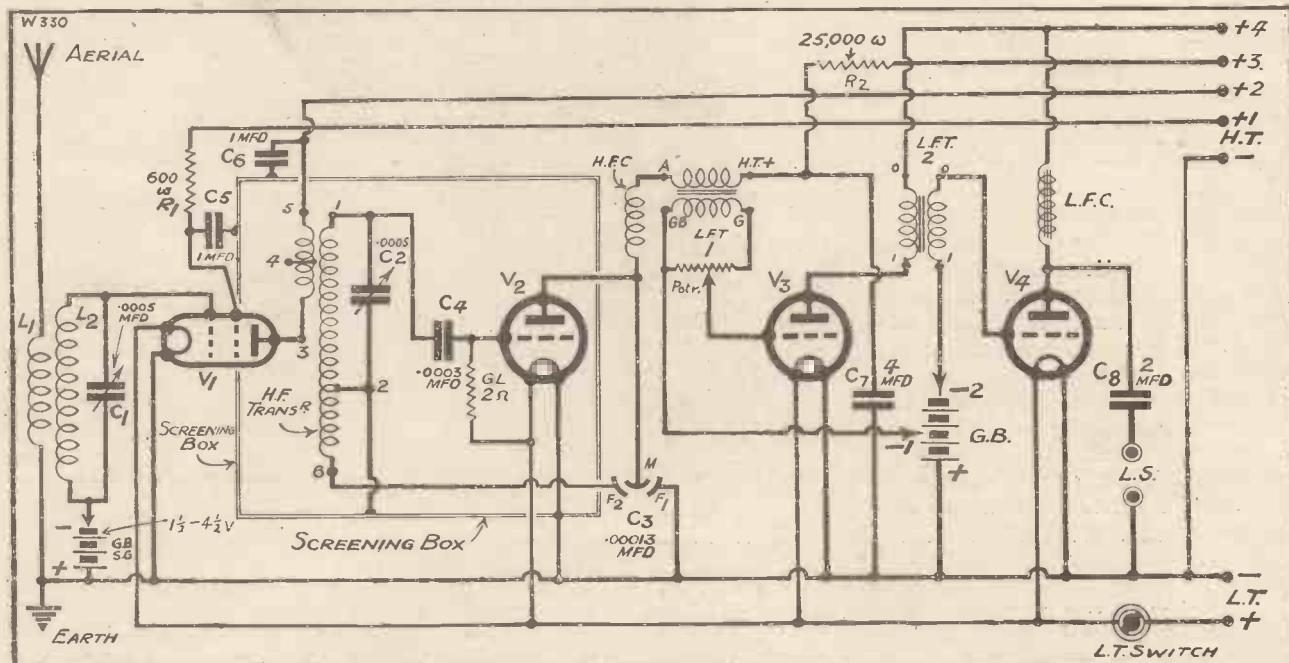
A small negative bias on the grid of a screen-grid valve often improves its amplification. Particularly does this apply to modern screen-grid valves—namely, those introduced about the time of the last wireless exhibition. Even if the bias does not appear to improve results, so long as it does not weaken them it is desirable because it keeps the H.T. consumption down.

amplification from a screen-grid valve the anode circuit should be a tuned one, but the selectivity with this arrangement suffers rather.

So by using an H.F. transformer with interchangeable primaries we are able to improve the selectivity and obtain good amplification, together with just the desired sharpness of tuning, by using the right primary.

Enormous Amplification

The grid coil of the screen-grid valve is coupled to the aerial by an aperiodic aerial coil. Selectivity can be adjusted here as well as in the H.F. transformer. The smaller the aerial coil the better the selectivity. The best scheme is to obtain the desired selectivity partly in the aerial arrangement and partly by means of the interchangeable primaries.



Although powerful, the circuit is arranged along conventional lines. In order to prevent overloading of both the L.F. valves the volume control is connected across the secondary of the first L.F. transformer. Note also that grid bias is provided for the screen-grid valve.

some slight complications at least, and it is desirable to keep the set as simple and straightforward as possible.

Naturally, a screen-grid valve is employed for H.F. amplification. Every reader will appreciate that these valves can give a far higher degree of amplification from one stage than was ever thought possible before their introduction.

Also, they overcome one of the greatest drawbacks of a three-electrode H.F. valve, namely, the necessity for neutralisation. This helps simplicity, which

In order to ensure that the H.F. stage can be kept quite stable without difficulty, and in order to avoid the use of astatic coils, which are not quite so efficient as ordinary ones, complete screening is employed for the H.F. coupling and the detector valve. Also, since astatic coils are not required we are able to employ those very useful six-pin coils with interchangeable primaries.

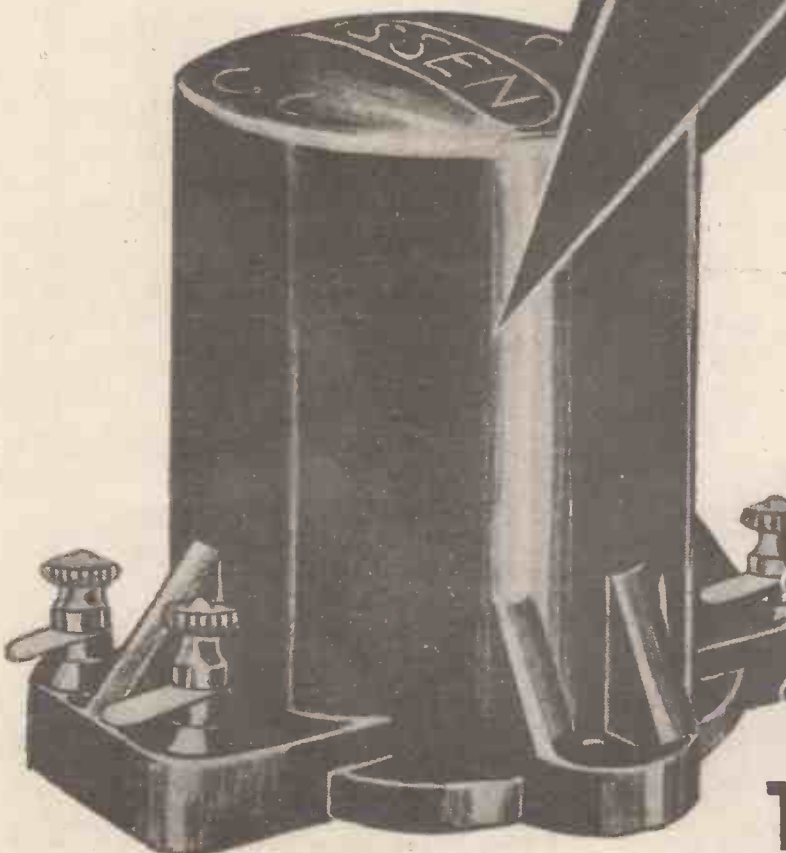
This brings us to one of the means of varying the selectivity. In order to obtain the maximum possible

The detector is quite normal and works on the leaky-grid condenser principle. However, it is worth mentioning that a differential reaction condenser is used, since we desire to take advantage of every little increase in strength that can be conjured up.

Now we come to the L.F. part of the receiver. As you are no doubt aware, an L.F. transformer gives more amplification under ordinary conditions than other forms of L.F. coupling. For this reason transformers

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The "Maximum" Four—continued

are used to couple the two L.F. valves in the "Maximum" Four.

In order to make sure that there will be no trouble from L.F. instability, and to obtain good quality from the set, a decoupling resistance is employed in the H.T. lead for the detector valve.

along to the constructional part. So we will not delay further.

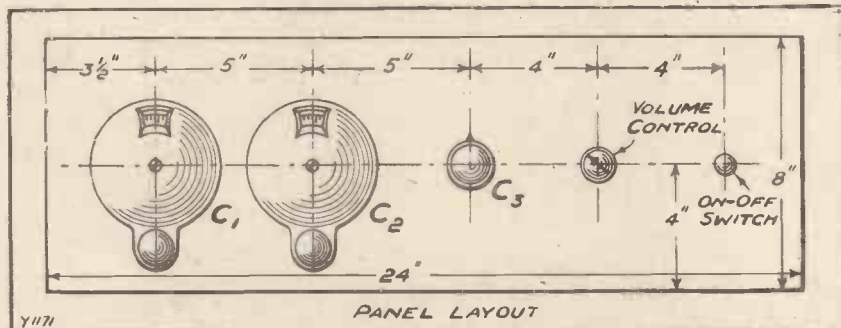
The construction of the set is similar to that of any other receiver, and is quite simple. First of all drill the panel, the dimensions for the positions of the holes being obtained from the drilling diagram below.

The marking out is very easy since all the components are at the same height on the panel. Generally all the components will be of the one-hole fixing type, so that few holes will be necessary.

The Screening Box

No panel brackets are required, since the screening box helps to hold the panel rigidly in place. A little care is needed to see that the hole for the variable condenser spindle in the box is at the right point. In this connection, do not forget to allow for the thickness of the baseboard.

A small baseboard has to be cut to fit inside the screening box. After drilling the panel, screw it to the baseboard, and then screw the box to the baseboard with a small counter-sunk screw or two. The next step is



All five of the controls are arranged at the same height along the centre of the panel, thus greatly simplifying marking out.

An output filter is utilised in the plate circuit of the last valve. Most readers will be familiar with the reasons for using this output scheme, and it must suffice to say that they are real advantages in this case since the last valve will have to handle large volume.

Works on a Frame, Too!

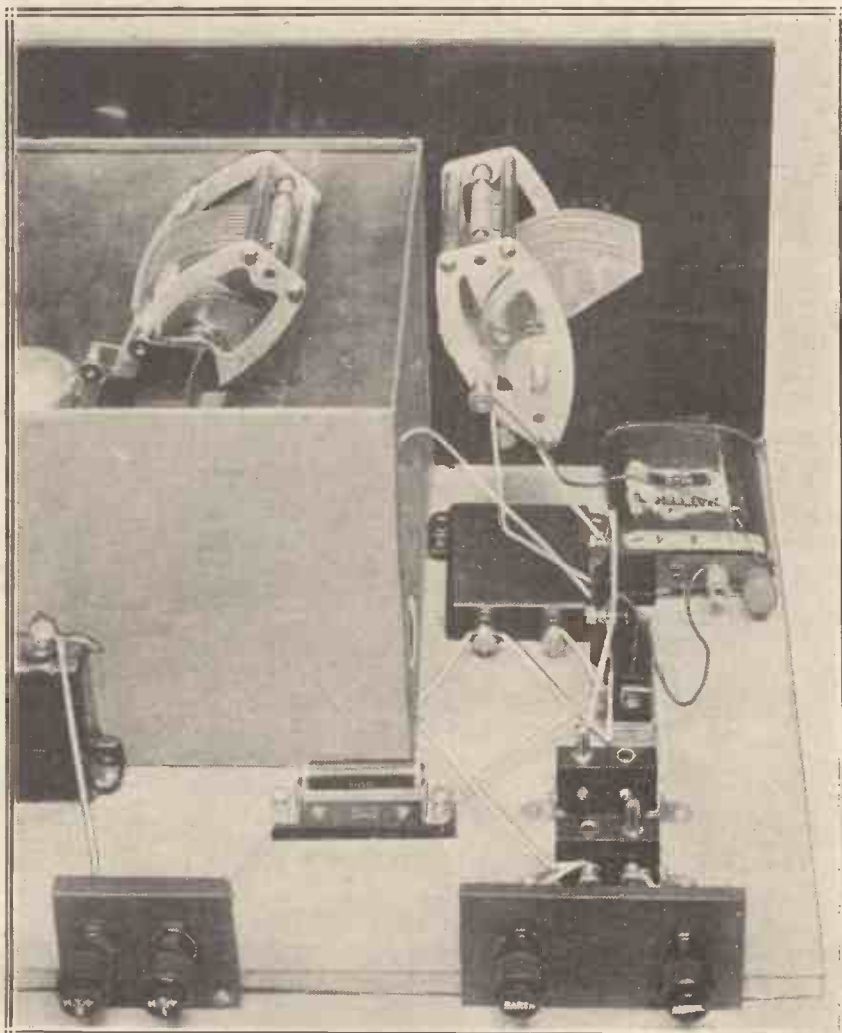
You should note the position of the volume control. This is arranged before the first L.F. valve, so that the volume can be controlled immediately after the detector. In this way we can avoid overloading both the first and the second L.F. valves; by no means a small consideration with a good S.G. stage at work.

Like the "Maximum" Three the set is designed so that it will work very well indeed on a frame aerial. It is just as stable on a frame as with an ordinary aerial and earth, a fact which is to some extent due to the complete H.F. screening.

A frame aerial has a very large field, and the slightest coupling with the field of the H.F. transformer would lead to instability. All possibility of such coupling, however, is avoided by the H.F. transformer's coat of copper mail which is impenetrable by the field from the frame.

Drilling the Panel

Having thoroughly grasped the "wheres and whyfores" of the circuit and considered the merits of the set, you are no doubt anxious to get



A view of the H.F. end of the set, showing the two variable condensers, one of which is completely enclosed by the screening box. The grid-bias battery for the screen-grid valve may be seen lying on the baseboard.

YOU

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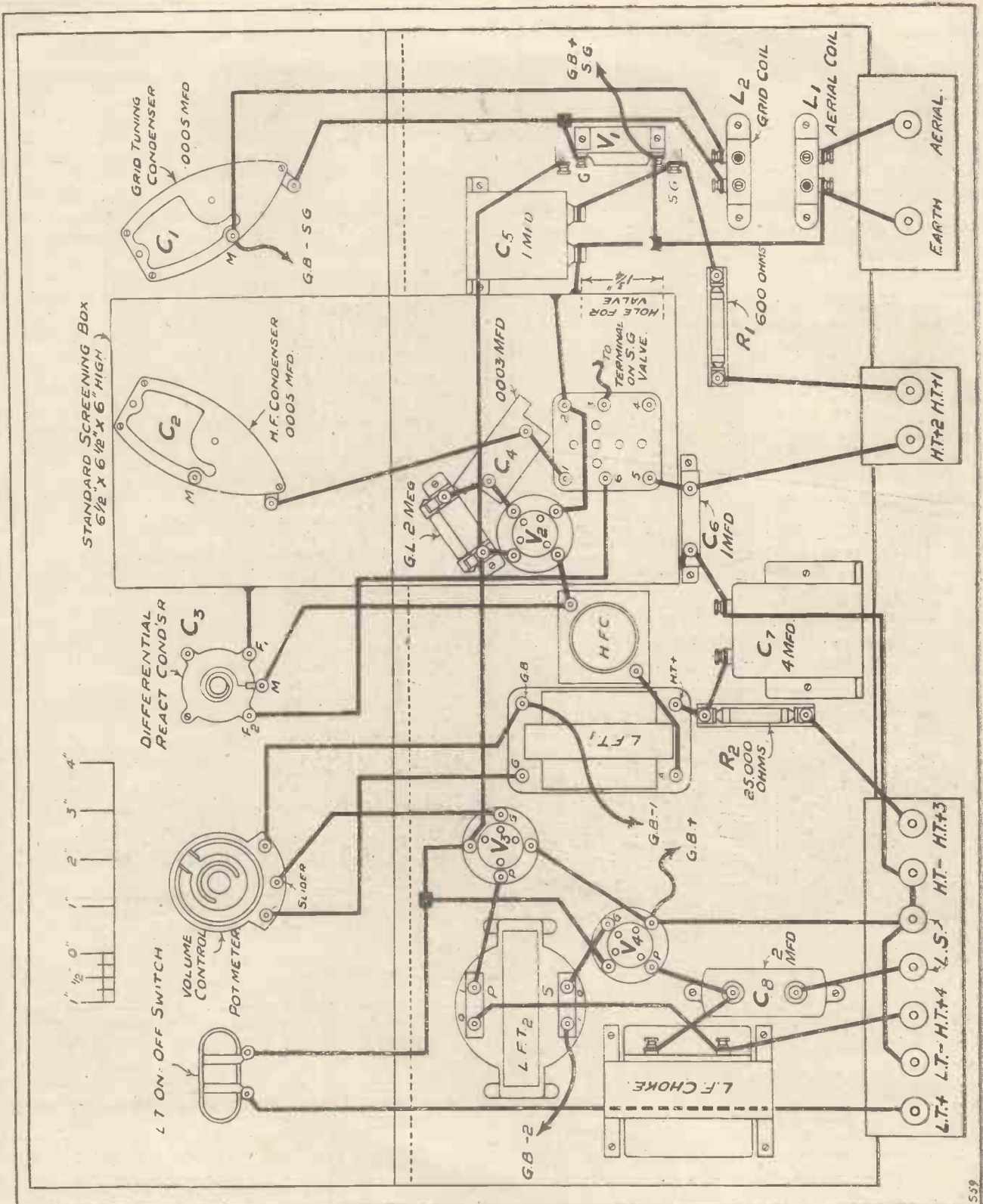
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to mount the components which go on the small baseboard, and then to wire it as far as possible before inserting in the screening box and screwing into position.

With reference to the hole in the screening box through which the H.F. valve is passed, you should

order the box with this ready drilled, unless you have suitable tools for the purpose. It may be necessary to mount the valve holder of the S.G. valve on a piece of wood to bring it to the correct height. This, however, will depend upon the particular valve holder employed.

A separate small terminal strip is used for the screen-grid valve, since this makes the wiring of the set more straightforward.

The layout of the components should be followed very accurately. This applies particularly on the H.F. side of the set, where it will be noticed

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The "Maximum" Four—continued

that the by-pass condensers for the plate and S.G. H.T. supply are arranged as close to their respective leads as is convenient.

The 600-ohm resistance in the H.T. lead for the screening grid acts in a manner similar to the decoupling resistance of the detector valve, but in this case it is for the purpose of preventing H.F. getting through to the L.F. side of the set.

Simplifying Wiring

No particular efforts have been made to make the wiring look "pretty." It has been wired intentionally as the average constructor would wire it, so that the conditions under which the set will usually work are reproduced as far as possible. Right-angle bends are

mentioned that the reaction condenser works in the way opposite to usual.

Turning its knob to the right decreases reaction effects, and turning to the left increases them. (This arrangement allows the wiring to the reaction condenser to be most efficient and convenient.)

The wiring is carried out with tinned copper wire, with lengths of Systoflex (insulating sleeving) slipped over it. If the constructor prefers, it may be wired with bare wire, but the leads which pass through the screening box must, of course, be insulated.

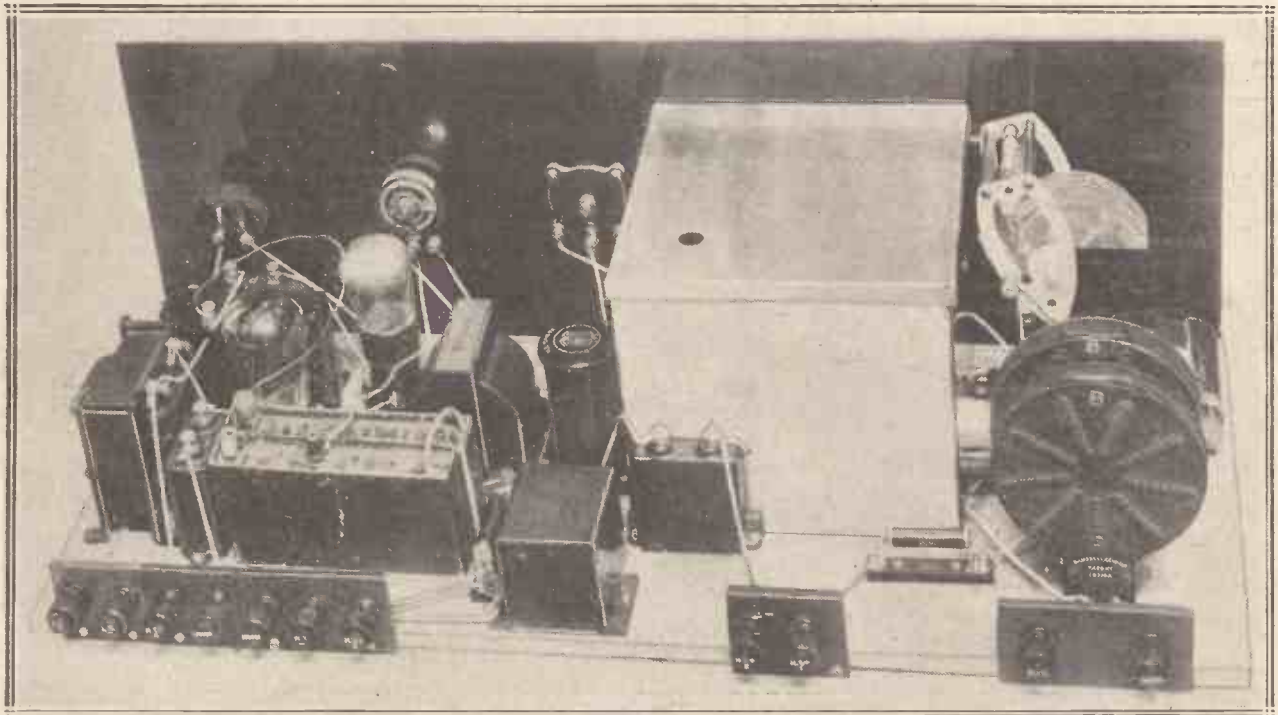
The grid-bias batteries stand on the baseboard, the one for the L.F. valves being placed between the 4- and 2-mfd. fixed condensers. Room is allowed here for three grid-bias units of the 9-volt variety, so that

screen-grid valve to terminal 3 on the 6-pin base as short as possible.

Having thoroughly discussed all the important points in the construction of the set, we will proceed to consider the accessories. First of all as regards valves. These may be of either the two-, four-, or six-volt type. Number one is, of course, of the screen-grid variety. The detector should be an L.F. or general-purpose valve.

Your Valves

I know it is usual nowadays to recommend an H.F. type valve in most cases for detector, but with the "Maximum" Four the amplification obtained from the L.F. side is so colossal that the slightest tendency of the detector valve towards being microphonic will cause trouble. If,



With coils, valves and grid-bias batteries in position the set presents a very compact and businesslike appearance. In order to keep the wiring neat and efficient a separate ebonite strip is provided for the H.T. terminals of the S.G. valve.

made in only a few cases, most leads being taken direct.

Although the wiring of the H.F. end of the set may look a little crowded, a careful study of it will reveal that the two important wires, namely, the aerial and the grid leads, are short and are kept well away from the other leads.

The wiring is greatly simplified by taking many of the earth potential wires straight to the screening box. In this connection it must be

sufficient grid bias can be available for a very large power valve in the last position. The wire running from one of the L.S. terminals to the valve holder for the last valve is arranged close to the baseboard so that it does not interfere with the grid-bias batteries.

If more convenient, the wire from the L.T. positive terminal may be run at the side of the L.F. choke instead of under it. Keep the piece of flex which joins the plate of the

however, you have an H.F. valve on hand there is no reason why you should not try it before buying a new valve for the detector.

At first it was thought that the tendency for an H.F. valve to be microphonic as detector might be due to instability in the set. This was, however, proved not to be the case by trying the set without an aerial or earth, ordinary capacity dry H.T. batteries, an H.F. valve in the first L.F. position and a pentode in the

The "Maximum" Four—continued

last! With this arrangement the set was quite stable even when the volume control was at its maximum.

(Of course, in practice the third valve *must* be an L.F. type, and the last a power or super-power valve. The other valves just mentioned would be overloaded on any but the weakest of stations.)

The higher the H.T. voltage that you can provide the better, up to the maximum rating of the valves. The H.T. +1 terminal has to have the voltage recommended by the makers for the screening grid. H.T. +2, 120 to 150 volts; H.T. +3, about 60, since this feeds the detector valve, the voltage of which must be adjusted to give a moderately smooth control of reaction.

There is no need to get the reaction control ever so gradual as very little reaction will be required, due to the sensitive nature of the receiver. The

The H.F. transformer for the lower broadcast band is a Lewcos C.S.P.5, with a No. 8 or 10 primary for ordinary purposes, and a No. 4 for extra selectivity. The H.F. transformer for the long waves is a C.S.P.20 coil, with a No. 18 primary for ordinary purposes and a No. 14 when very good selectivity is necessary.

Foreigners Like Locals!

There is no reason why any of the other sizes of primaries on both the long and short wave-bands should not be tried if desired. For short waves the numbers range from 4 to 14, and for long waves from 14 to 22. Do not forget that the smaller the primary the higher the degree of selectivity obtained, although with a slight but definite loss in sensitivity.

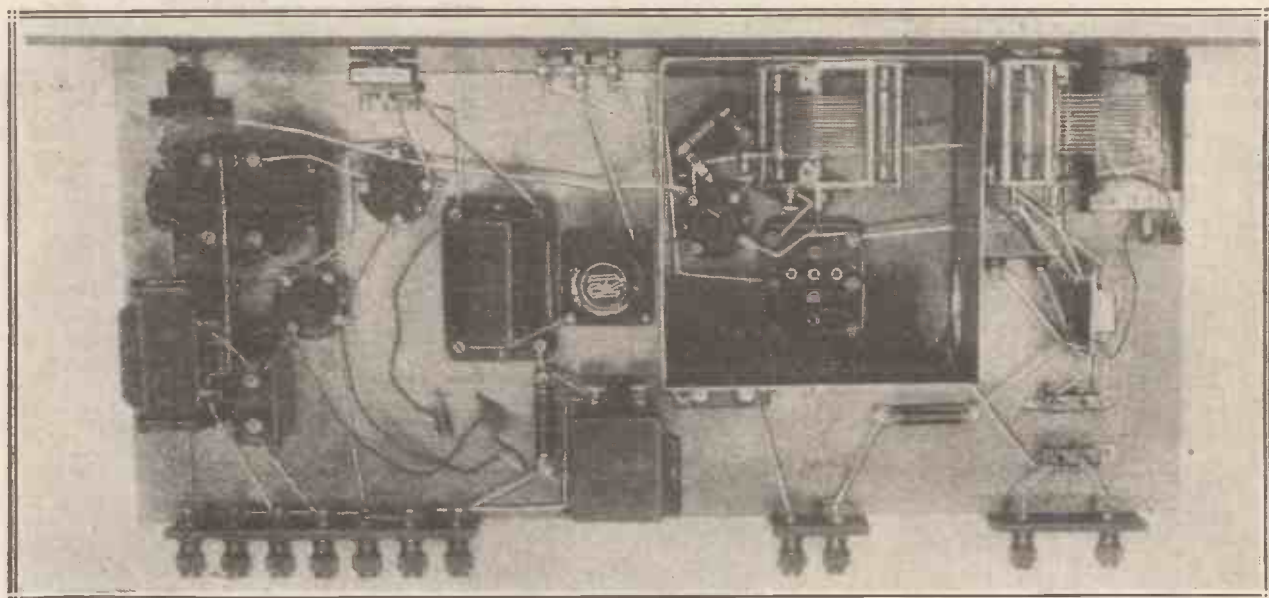
The receiver will be found particularly easy to operate. Although slow-motion dials are provided, it would

required. On others it may be turned to the left until volume is at the desired strength, which in the case of the local station will be a good way round.

In order to make sure that the set was capable of really delivering the goods, it was tested on a small indoor aerial consisting of about 24 ft. of D.C.C. wire around the room. Stations simply seemed to roll in on both wave-bands, some being so strong and clean that they were nearly as good as a local station.

In this connection Radio-Paris was so crisp and loud that when it was radiating a talk in English a number of people believed it to be London, and asked why the lecturer was speaking so slowly!

In the early part of this article it was indicated that the set could be used on a frame aerial. All that you have to do is to remove the two



The components in the screening box (apart from the variable condenser) are mounted on a separate small baseboard, and much of their wiring can be carried out before this baseboard is screwed in place.

H.T. for the first L.F. and power valves is fed to H.T. +4, and should be as near 150 volts as possible.

The Question of Coils

Now we come to the coils. For most purposes the aerial coil for the lower broadcast band may be a No. 35, or for long waves a No. 100. Where very good selectivity is required a No. 25 or 75 respectively should be employed. The lower-wave-grid coil should be a No. 60 and the higher-wave one a No. 250.

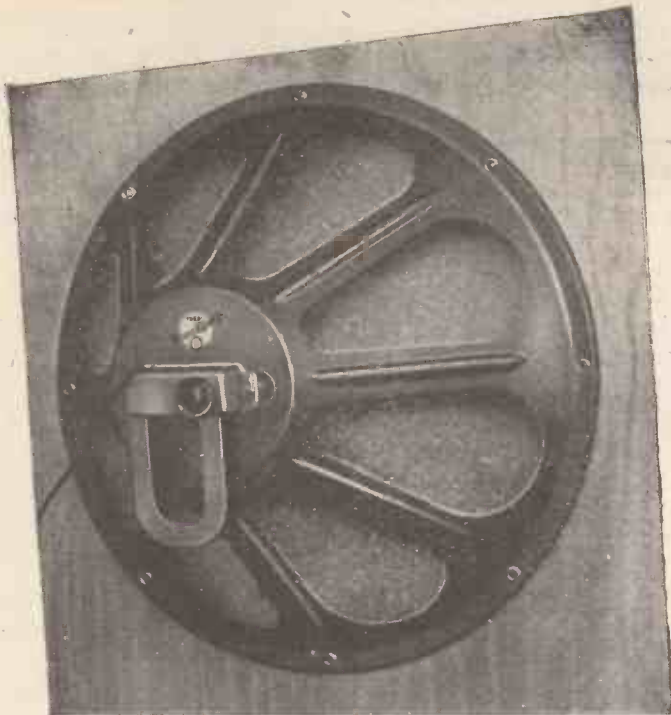
still be an easily-operated set with ordinary direct-drive dials. The reaction condenser will only have to be adjusted for about every 20 degrees movement on the second tuning dial, the reaction remaining otherwise more or less constant.

The first two dials will not remain in step, as far as degrees go, owing to the different types of coil employed, but it is easy to put them in step on a powerful transmission. The volume control should be set at maximum for any stations on which reaction is

plug-in coils and connect your frame across the grid coil mount. As reaction is obtained on the H.F. transformer, a plain frame aerial without any taps is suitable.

When Using a Frame

With a frame aerial having 2-ft. sides results were nearly as good as with the indoor aerial, except that fewer stations were heard. When employing a frame the earth may be left in position or removed as desired.



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What Actual users say about

LEWCOS

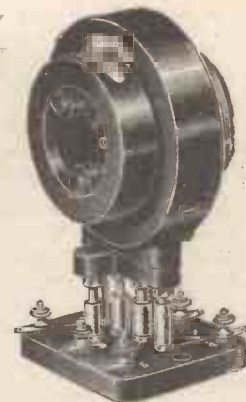
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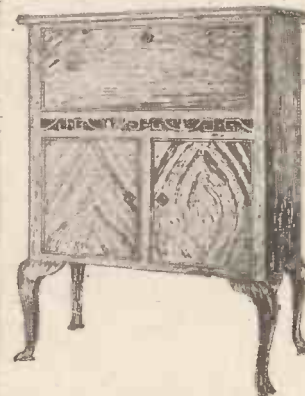
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THE Mudbury Wallow Wireless Club was in full session round the big table at the Club-house. I will say one thing for our little club: we *do* have comfortable chairs, which is a jolly good thing, considering that Goshburton Crump and a few others I could name have even the topicalist and talkiest of broadcasting gasbags beaten hands down in their sleep-producing effects.

I must say, though, that I myself consider it exceedingly bad form for any member to go to sleep at club meetings, no matter how great a bore may be holding the floor. I always make a point of keeping wide awake, though, as I have previously explained,



Willing hands extracted Professor Goop from his little "beddy-bye."

I listen better with my eyes shut, and sometimes when I am attending really hard I do make unconsciously little noises that the unkind mistake for snores.

Primpleson, or somebody, was at it, and I was feeling very warm and comfy, for I had stoked up the fire before the meeting began. Suddenly Captain Bucket rammed his elbow into my ribs in the most brutal manner, roaring into my ear: "Wake up, you ass. The chairman says he's got something really interesting to tell us."

"Great News"

"A pleasant change," I said, looking round the table with a smile and meeting the stony glare of Primpleson. "I see by his expression that Sir K. N. Pepper has great news for us. It would be a pity if Miss Worples missed it. If anyone wants to win a pair of gloves now's his chance."

Nobody apparently did, but Tootle dropped the minute book with a

bang and Miss Worples was galvanised into wakefulness. She told us that she had heard and thoroughly enjoyed every word of Primpleson's oration. Primpleson looked pleased, but everyone else expressed polite disbelief by suitable gestures.

"But where's the professor?" cried Goshburton Crump. "I am sure he was here ten minutes ago, but his chair is empty, and certainly he hasn't gone out of the room."

The professor was discovered curled up beneath the table with his head pillowed upon Sir K. N. Pepper's hat, which looked rather as a hat does when somebody's head has been pillowed on it. Willing hands extracted him gently from his little "beddy-bye," pounded him into consciousness and replaced him in his chair.

Invitation to Prof. Goop

"Ladies and gentlemen," said Sir K. N. Pepper. "I have momentous news. The Mudbury Wallow Wireless Club has always been one of the fairest flowers of this country; we have seen it progress, if I may so put it, from puppyhood into full growth and now the time has come when it must shine more brightly than ever in the firmament of radio."

I held up my hand.

"Well?" said Sir K. N. Pepper.

"On a point of order," said I, "do flowers have a puppyhood and can blossoms or full-grown dogs really shine in any firmament?"

Of course, I was simply howled down and the chairman went on.

"I have in my hand," he said, "a letter which indicates the rising tide of the club's prestige and shows that we are progressing steadily towards the zenith of achievement."

"On a point of order," I said.

"Shut up!" roared everybody else.

I shut up.

"This letter," said Sir K. N., "comes to me as president of the club from no less a body than the B.B.C."

There were storms of applause from the rest of the members, and my

query whether he had at last been caught in the act of oscillating was met with frowns.

"It contains," he proceeded, "an invitation for Professor Goop, whom I think I may call by far our most distinguished member."

"Here, here!" yelled the professor, whacking the table and stamping his feet.

A Broadcast "Debate"

"An invitation to the professor to take part in a broadcast debate. He is asked to maintain that the regional scheme is an excellent thing, whilst he will be opposed by his old friend Professor Bonehead, who will present the other side of the case."

The professor pulled out an enormous clasp-knife and proceeded to sharpen it upon the sole of his boot.

"I shall be more than charmed," he cooed, smiling blandly round the assembly.

It was arranged that the whole of the club should go up to London on the great night. We decided to give the professor a dinner first of all and then to conduct him to the studio,



The Professor pulled out an enormous clasp-knife and proceeded to sharpen it on the sole of his boot.

where the B.B.C. had kindly agreed that we should act as part of the usual audience.

I took the opportunity of pointing out to the professor on the morning of the great day that evening dress was compulsory at Savoy Hill. He told me that he understood exactly and that he had always been told that the announcers wore it.

When I went round to collect him half an hour before the train was due to start I found him garbed in what I believe are known as jazz pyjamas, and bearing a bottle under his arm. In reply to my expostulations he

In Lighter Vein—continued

explained that his was merely late evening dress and that anyhow it was what was worn, or at any rate used to be worn, by the best announcers. Somehow or other I got him into the proper kit, though as we couldn't find any studs the front of his shirt had to be done up with paper fasteners.

The dinner was an enormous success. Sir K. N. Pepper said that he would pay the bill, and that we could settle up with him for our shares afterwards. The worst of some people is that they have got such a silly idea what afterwards means. When I proffered him an I.O.U. dated a few paltry years ahead he was quite inclined to cut up rusty about it.

A Preliminary Set-Back

In a string of taxis we made our way to Savoy Hill. Unfortunately, that bearing the professor and two or three others broke down. The professor immediately leapt out, raised the bonnet, brushed aside the driver and explained that he would have matters right in two ticks.

It was not until the professor had got himself and his shirt front thoroughly oily that the driver discovered that the tank was dry. We all stood waiting for him, wondering what could have happened, at the corner near the main door.

At long last he turned up, looking more like a negro minstrel than anything else. The party having been completed we advanced in serried ranks up the steps to the door.



"This" said I... is Professor Goop."
"Ho, his it?" quoth the commissionaire. "Pm the Prince of Wales."

"This," I said, to the commissionaire, "is Professor Goop."

"Ho, his it?" quoth the commissionaire. "Pleased to meet you. I'm the Prince of Wales. Now you just take my advice. Turn to the left as you go out, then left again, and that takes you straight down to the Embankment. There are some nice comfortable seats there. Just you go and sleep it off like a little gentleman."

It took us quite a little while to convince the commissionaire that it really was Professor Goop, and that we were the audience for the debate. At length we did convince him, and the lift bore us skywards.

The official receiver—no, I beg your pardon, the official receptionist came forward to greet us.

Left to "Fraternise"

"Come along, gentlemen," he said, "the debate will be in studio No. 5, where Professor Bonehead with members of his club are already waiting. There are still ten minutes to go. Let me introduce you all and leave you to fraternise."

I felt glad that I had put on the chain mail undervest sent me as a Christmas present by a Chicago friend.

Still, after a good dinner there is nothing like a decent scrap to aid the digestive juices. Fearing the worst, and hoping for something even worse than that, I accompanied the rest to the studio.

"Professor Goop and Professor Bonehead have, I think, met before," smiled our conductor, "but let me introduce the rest of you."

Taken all round, the Slushton-Almost-on-the-Sea fellows who accompanied Professor Bonehead were a pretty hefty lot, and there were suspicious bulges in their pockets and down the legs of their trousers that looked rather like knuckle-dusters and Indian clubs. Still, I felt somehow that the stalwarts from Mudbury Wallow would be able to give the professor the support that he needed at the friendly discussion.

Well Prepared

We were, of course, entirely unarmed, for no properly brought up person would dream of going to such a meeting carrying lethal weapons. Still, we felt that we had a certain standby in the Goop life-preserver belts that we all wore beneath our waistcoats.

This little garment consists fundamentally of a stocking with a pound of lead shot tied into the toe. Thanks to the Goop quick-release device, it can be pulled out in a jiffy and it comes in very handy for socking (or should I say stocking?) an assailant one on the jaw.

Professor Goop and Professor Bonehead immediately became immersed

in the friendliest of conversations.

"I don't in the least mind broadcasting," said Professor Goop, "but when I have as my opponent a knock-kneed, cross-eyed, flop-eared son of a gun like you I do begin to wonder what wireless is coming to."

"And I," snarled Professor Bonehead, "am prepared to debate anything with anybody, but when it comes to having a spindle-shanked, lantern-



"Oh, you do, do you?"

jawed half-wit as my opponent, then I begin to ask myself questions."

"Oh, you do, do you?" queried Professor Goop, feeling under his waistcoat.

"Yes, I do," returned Professor Bonehead, feeling down the leg of his trousers.

"You do?"

"Yes, I do!"

"Then take that!"

"And you take that!"

End of the Debate

Both of the "thats" missed their intended targets, but Professor Goop's shivered the timbers of the microphone, whilst Professor Bonehead's laid out another device housed in a knob-studded box. Sir K. N. Pepper rushed forward to separate the combatants before any real damage should be done, but tripped over the microphone leads and went hurtling into the midst of the Slushton-Almost-on-the-Sea party, which engulfed him as a wave engulfs a sand castle.

"To the rescue!" I yelled.

At the next moment I was leading a charge of the Mudbury Wallow stalwarts, each of whom had drawn his life-preserving belt in self-defence.

Taken all round it was one of the prettiest little debates that I can remember, each side stating its case with force and emphasis, and keeping strictly to the point. Since all of the Slushton-Almost-on-the-Sea fellows were carried out on stretchers, whilst of the Mudbury Wallowites Professor Goop and I remained fully conscious, I take it that our side won.

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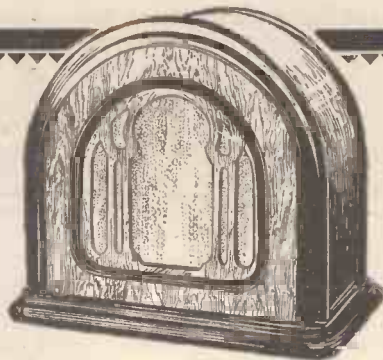


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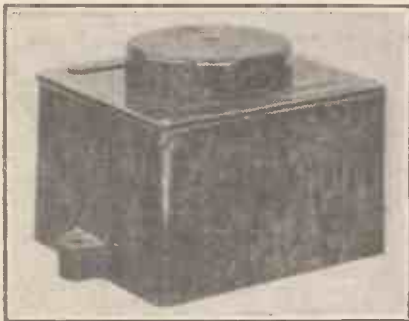
"AS WE FIND THEM" NEW APPARATUS TESTED

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



The Dubilier Wave-Trap
FROM the Dubilier Condenser Co., Ltd., we have received a wave-trap which differs from any we have previously tested in being sold pre-adjusted to the London 356-metre wave-length.

Its appearance can be judged from the accompanying photograph, from which it will be seen that the trap—or, to give it its correct title, the "Dubilier Anti-Interference Unit"—



The "Anti-Interference" Unit described above.

is made up in a handsomely moulded bakelite case, with a kind of circular cap held in position with a brass screw.

To use the trap this cap is unscrewed, whereupon two terminals are revealed, one of which is connected to the aerial and the other to the aerial terminal of the receiver. The cap is then replaced.

On test the selectivity of a receiver with which the trap was used was very considerably sharpened, and in practically all cases it should enable the 356-metre transmission to be received quite free from the other London station, and certainly from 5 G B.

We think it is rather a pity that the manufacturers of this device did not provide a simple switch so that the trap can be cut out of circuit when desired, without the necessity of unscrewing the cap and altering the wires, but no doubt a large number of users will desire to keep this trap permanently in place.

If, however, it is desired to listen to the lower wave-length programme, to the exclusion of the upper transmission, then a separate trap must be used. It will thus be seen that the trap has distinct limitations, but if these are recognised it will serve excellently for the purpose for which it is designed.

In those few cases where a slight alteration of the adjustment of the trap is necessary, this can be effected by removing the cap and turning slightly in one direction or the other a screw which controls a variable condenser.

In most cases this adjustment need not be touched (for the trap is sent out already fixed for the 356-metre transmission, and should suit most sets), but one setting will not suit all sets, particularly if they have direct-coupled grid circuits.

The "Music Magnet"

Among the valve-makers' kits the General Electric Co.'s "Music Magnet" has proved very popular, for it is handsome in appearance (as can be judged from the accompanying photograph), simple to construct and particularly efficient both as regards sensitivity and selectivity.

One of these kits was recently submitted to us for test and report, and we must say that we were very favourably impressed by its performance. The quality of reproduction is admirable, the handling simple, and the distance-getting powers exceedingly good.

Although both the grid circuit of the screened-grid valve and the detector grid circuit are tuned, these two condensers are ganged and operate on one knob, the approximate



A view showing the inside and general arrangement of the Osram "Music Magnet," as made up from the kit of parts.

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"As We Find Them"—continued

wave-length calibration being indicated on an edgewise drum which shows a small window in the centre of the front panel, that incidentally has a pleasing brown crystalline finish.

Fine Finish

The knob on the left controls the double gang condenser tuning, and the knob on the right reaction. The change from one wave-length to the other is made by lifting the lid and making a small adjustment on top of each coil.

The kit includes not only the parts of the receiver and valves, but also a "knock-down" wooden cabinet, the construction being made exceedingly simple by means of a chart on the lines of the "Radiano" scheme, first described in this journal, and any novice can easily assemble the set from the instructions given.

Altogether this is a very good kit, with high sensitivity, excellent selectivity and remarkably good quality.

A Well-Designed Cone Speaker

The Marconiphone Company have produced several admirable loud speakers, not the least attractive of which is the cone cabinet model



A well-made wave-trap.

illustrated in the accompanying photograph. This is known as the type 60 cabinet cone, and costs only £3.

The reproduction is very pleasing, with good uniformity of output, and while, of course, it does not pretend to

give the full depth of bass obtainable with the company's more expensive moving-coil speakers, sufficient bass is given to produce a pleasing and natural tone, which, after all, is the main requirement in any speaker.

A special note of commendation must be given to the finish of this speaker. It is tastefully designed and should please the most fastidious.

Instead of the hard and, to some people, distastefully shiny finish to be found on many loud speakers, the Model 60 cabinet cone has what we believe is known in the trade as a satin finish. It certainly enhances the pleasing appearance of the instrument. An excellent speaker for the money, both in appearance and performance.

The I.D.S. Wave-Trap

The I.D.S. wave-trap illustrated in the accompanying photograph is one of the types made with variable tuning, and is therefore adjustable to any of the B.B.C. stations on the lower range.

It is pleasingly made up in green bakelite, with convenient terminals and adjusting knob, and when used as directed gives an excellent performance, making the tuning of the flattest set very sharp, with very little loss of strength on each side. This trap can certainly be recommended.

Climax Transformers

From the makers of the Climax components we have received for test and report the Climax Auto-Bat transformer type H.50, and the Climax Auto-Bat transformer type H.L.G.4. The H.50 is designed for use with the Westinghouse rectifiers types H.T.3 and H.T.4, for full or half-wave rectification.

Six terminals, in all, are provided, four being connected to the primary in such a way that a variety of mains voltages can be utilised without a change of instrument. The two secondary terminals give 140 volts, as desired for the particular Westinghouse rectifier. Tested with 220-volt mains, the measured voltage was found accurate within the necessary limits.

The insulation between primary and secondary windings and between the windings and core was also found to be of a satisfactory order, and we can recommend the component for the use for which it was designed.

The Climax Auto-Bat transformer type H.L.G.4 is a particularly useful instrument, and a somewhat similar unit is incorporated in the A.C. Power Unit described in this issue of the WIRELESS CONSTRUCTOR. The H.L.G.4 has four terminals on the primary, by means of which connections can be made to suitable varying mains voltages from 100 to 125 in



This is the cone-cabinet type Marconiphone loud speaker.

one model and 200 to 250 in the other. The high-tension winding gives 140 volts for the H.T.3 and H.T.4 Westinghouse rectifiers and a further winding provides for a Westinghouse G.B. unit, whilst a 4-volt winding gives the necessary raw A.C. low-voltage current for indirectly-heated valves.

The appearance of these two units can be gathered from the accompanying photographs, and our tests indicate that the devices will find a wide use among home constructors.

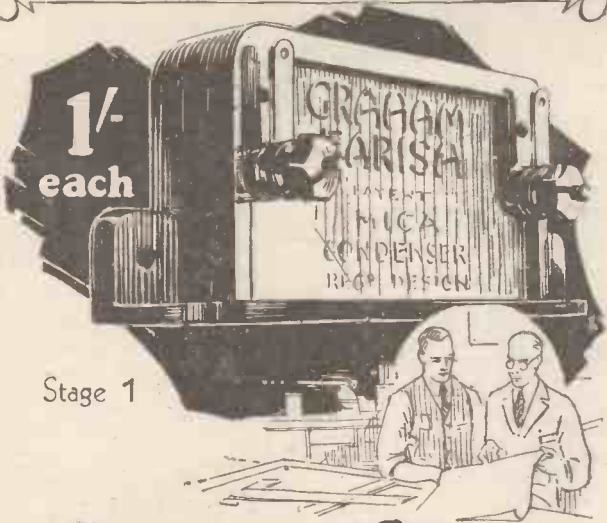
Radiolegs

Messrs. Belling & Lee, Ltd., have frequently displayed great ingenuity in providing the home constructor with most useful accessories, and in providing the Belling-Lee Radiolegs they have excelled themselves. A large number of WIRELESS CONSTRUCTOR readers who are in the habit of building sets have often found it inconvenient to place a receiver on the table, and yet do not wish to purchase an expensive stand.

The Belling-Lee Radiolegs comprise two pairs of wooden strips

(Continued on page 360.)

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2,000	"	100,000 "	
3,000	4/6	150,000 "	
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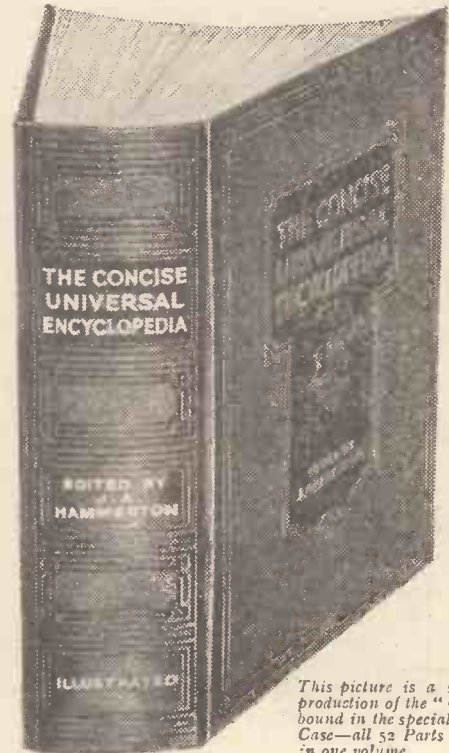
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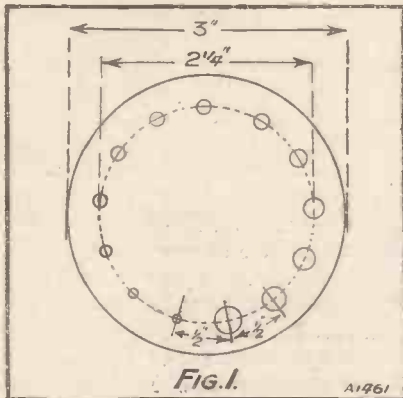
A PRACTICAL MAN'S CORNER

This is a special section for the set-builder, in which he will find many valuable hints.

By R. W. HALLOWS, M.A.



THERE can be no question that by far the soundest and most satisfactory housing for drills is the automatic canister or magazine. This consists of a metal-mounted wooden cylinder in the top of which are made cavities to contain the drills.



The holes for the various sizes of drills are arranged in a circle, and are made in the wooden part of the drill container.

To obtain any particular drill, all that one has to do is to turn the lid until an indicating mark is opposite the figure for the size required, the drill is then shaken out into the hand.

Expense Saved

Unfortunately these canisters are nowadays very expensive. Before the war they could be purchased for about five shillings apiece, but to-day the canister—empty, mind you, not filled with drills—leaves little change out of a pound-note. This kind of magazine would, therefore, have to be looked upon rather as a luxury if one were compelled to purchase it; it is, however, quite possible to make one that will answer the purpose very well at a cost of a few pence.

About five years ago I described the making of a very rough-and-

ready magazine, I have now evolved one which is a very great improvement and quite easy to make. The design was worked out because there was a set of drills crying for something better than the cigarette-tin in which they reposed.

The worst of cigarette tins is that they don't protect the business ends and cutting edges of drills, which is rather an important point. I already had a canister for Morse drills from 1 to 60, it was the inch-fraction drills that lacked a home.

My own set of these is probably typical. It consists of thirteen, starting at $\frac{1}{16}$ in. and rising by sixty-fourths as far as $\frac{1}{8}$ in.; after that the increase is by thirty-seconds up to $\frac{3}{8}$ in. During the Christmas holidays I had some time to spare. Could not something be done to provide them with better quarters?

Domestic Materials

At first sight the problem is a perfectly simple and straightforward one. All that one has to do to make the foundation of a canister is to obtain a piece of curtain pole some 3 in. in diameter and to mark out on the top of it, as shown in Fig. 1, a circle $2\frac{1}{4}$ in. in diameter.

With a pair of dividers one then marks off on this circle centres half an inch apart. This gives the required number of thirteen recesses. The next step is to drill them out. And here again at first sight there is no difficulty.

That for the $\frac{1}{16}$ -in. drill is made with the help of the $\frac{1}{8}$ -in. drill, so that there may be ample clearance, and one goes on all round the circle, using for each recess a drill one or two sizes larger than that which is to be found a home.

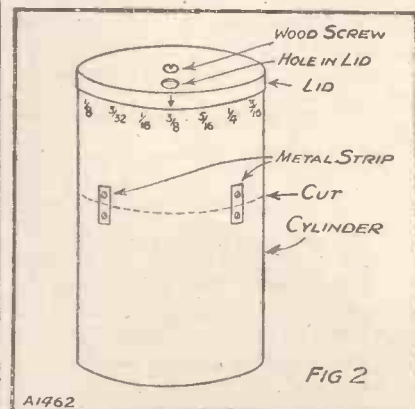
There is no drill one or two sizes larger than the $\frac{3}{8}$ -in., but the recess is

easily enlarged with a red-hot poker. The task is easy. Everything is plain sailing. Let us get on with the job!

But if we stop to think for a moment we shall realise that we are up against a rather serious snag. For a magazine of this kind to work properly each recess must be so deep that the top end of the drill contained in it drops below the surface. Of course, if your own drills happen to be especially short ones, and you can borrow a set of long drills, the job is straightforward.

Overcoming a Snag

Otherwise it appears that a rather serious obstacle has presented itself, for if, say, the $\frac{3}{8}$ -in. drill goes half an inch or more into the jaws of the chuck of the hand or bench drill, it



The canister is made in two parts so that the holes for the drills will be deep enough. The sections are joined together with metal strips.

clearly cannot be used to make a recess anything like as deep as its own length. What is to be done?

Fortunately, there is generally a way out of the workshop problem, even if at first blush it does appear to be insoluble. Here's a method

A Practical Man's Corner—continued

by which the difficulty can be surmounted.

Obtain a length of curtain pole, or of turned hardwood, 3 in. in diameter and about an inch longer than the longest drill that is to be housed. See that the faces are quite square; then cut right through it 2 in. below what is to be the top face, as shown in Fig. 2, in which the finished canister is seen.

Mark out the top of the 2-in. length as shown in Fig. 1, and drill the recesses required.

Joining the Sections

Having drilled the top portion, lay it aside for the moment and place the cut-off piece of the cylinder in the vice with what is to be the bottom uppermost. We will suppose that this piece is 3 in. in length. In the centre drill a $\frac{3}{8}$ -in. hole 2 in. in depth.

Withdraw the big drill and go right through with the $\frac{3}{16}$ -in. Fit the two portions together, and fix them with a wood-screw driven upwards from beneath. To keep the top half from moving upon the bottom half of the canister, secure with four short metal strips as shown in Fig. 2.

Now use the top part of the cylinder as a template and mark the lower part by inserting the appropriate drill into each recess. Take the halves apart again and drill recesses of suitable depth in the bottom half of the cylinder. Make sure that each drill will now drop completely into its recess; then fix the two parts permanently together.

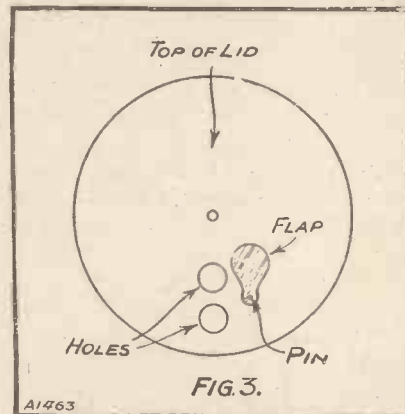
Drill Indicator

The revolving cap consists of nothing more elaborate than the lid of an old cocoa tin. The diameter must be such that it is an easy fit over the cylinder—it does not matter very greatly if there is a fair clearance between the vertical rim of the lid and the walls of the cylinder. In this drill, first of all, a central hole.

Then make another, $\frac{3}{8}$ -in. in diameter, whose centre is exactly $1\frac{1}{2}$ in. from the centre of the lid. Enlarge this hole slightly with a round file. Put the lid in position and fix it with a screw as shown in Fig. 2. With a scribe mark an arrow on its rim opposite the large hole. Turn the lid until this large hole is exactly over the recess made for the $\frac{3}{8}$ -in. drill.

Just under the arrow write " $\frac{3}{8}$ "

in Indian ink on the cylinder. Then go on to the $\frac{5}{16}$ -in. recess, marking in the figures as before, and so on right round the circle. The drills may now be dropped in *point downwards*, and the canister is complete. If you want at any time, say, the $\frac{7}{32}$ -in. drill, you simply turn the indicator to " $\frac{7}{32}$ " and shake out the drill.



If a metal flap is provided in the lid you can have two or even three circles of holes to take different types of drills.

Always put your drills in point downwards, for their cutting edges are then in contact with wood, which will do them no harm.

Many constructors, besides inch-fraction sizes, will also possess, if not a complete set, at all events a certain number of Morse drills, such as the tapping and clearance sizes for 2, 4, and 6 B.A. These can quite well be

THAT CHARGING RATE!



It is quite a common practice to connect accumulators of various capacities in series when charging them. It should be remembered when using this scheme that the charging rate must not exceed that specified for the smallest of the accumulators.

housed in the same canister. A second circle of recesses is made inside the first in the way already described. Fig. 3 shows how the lid is arranged when two separate lots of drills are dealt with.

There are now two delivery holes, one for each circle of recesses. We naturally want to prevent the delivery of two drills at a time, and this is done by providing a sheet metal flap like that seen in the drawing. The flap is pivoted on a pin, which should be riveted over on the inside of the lid.

Simple Rivet for Flap

A small brass nail with a round head will serve admirably for the purpose. Make in both the flap and the lid a hole which is just a good fit for this nail. Push it through from the top of the lid and cut it off quite close on the inside. Rivet over the cut-off end with a ball-pane hammer.

When two circles of recesses are used two rings of figures must appear on the body of the canister. We will suppose that the upper ring represents inch-fraction sizes and the lower Morse numbers. One of the Morse drills—say, a No. 26—is needed from the inner circle of recesses.

The indicator is turned until it is opposite 26 on the wall of the cylinder and the flap is pushed over the inch-fraction delivery hole. The required Morse drill can now be shaken out of the canister.

The design given in Fig. 1 is for a set of thirteen drills from $\frac{1}{16}$ in. to $\frac{3}{8}$ in. Any reader who has a greater or less number of drills than this of inch-fraction sizes can easily modify the design for himself by increasing or decreasing the diameter of the cylinder.

Three Rings of Drills

Another scheme which will appeal to those who use taps is to use a cylinder of rather larger size and to make three rings of recesses, one for clearance drills, one for tapping sizes, and one for taps. In this case there will be three delivery holes in the lid, and the flap must be so made that it covers two at once.

Drills kept in a canister of the kind described have the best chance of remaining in good condition since they do not get knocked about. One finds, too, that they do not rust, provided that the lid is a good fit.

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OUR NEWS BULLETIN

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

Germany Going Ahead

IN Germany there were 3,066,682 registered wireless listeners on a census taken on January 1st. This represents an increase of 431,115 during the last twelve months.

Good-bye America

Our Ambassador in America will have broadcast his farewell to American people by the time this issue is on sale. Sir Esme Howard has proved a very great success as an ambassador in America, and the broadcasting authorities in the United States decided to co-operate in arranging a big American-wide broadcast of his farewell speech.

Unlucky Uruguay

But, as the "Evening Standard" pointed out, the United States authori-

ties are rather scrupulous and careful about these things, and they now propose to extend the courtesy of a broadcast farewell to all other foreign representatives at Washington!

This is a privilege of "making themselves known to the American people." It is to be hoped that this practice won't be followed in Great Britain, for, as has been pointed out, there are exactly fifty-nine foreign representatives accredited to the Court of St. James, and even if they were being dealt with by the B.B.C. at the rate of one a week and alphabetically, the turn of the Minister for Uruguay would not be reached until March, 1931!

A Good Time Coming

In a letter to the "Times" the other day, Sir Walford Davies remarked *inter alia*: "I believe that only when an efficient wireless and

gramophone room, efficiently controlled and used, has become a matter of routine equipment in every school, will there arise enough keenly capable musicians, enough posts for them with enough school orchestras and choral teams to release our musical powers and bring music into its own throughout national life."

Coming from such an authority as Sir Walford Davies, this advocacy of wireless and the gramophone will do much to offset those stupid critics who still sneer at what they call "canned music."

North to South Radio

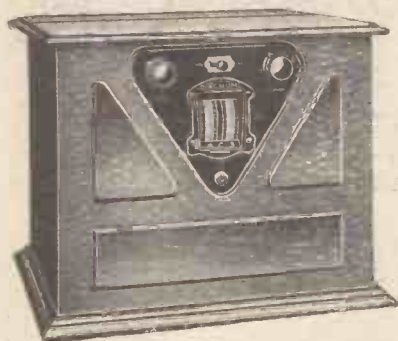
A week or two ago communication by radio over a distance of more than 12,500 miles was established by the Soviet wireless station in Franz Josef Land, when they succeeded in holding radio conversation with the Byrd Expedition in the South Polar Regions.

B.B.C. and "DX"

It is reported that the B.B.C. is sympathetically considering the requests of British listeners who wish to pick up foreign stations. Complaints have been made that certain foreign stations are very careless in announcing their identity. The idea is that

(Continued on page 352.)

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1 Brown L.F. Transformer, type A	1	10	0
1 Wearite L.F. Choke	18	6	
1 S.G. Valve Holder	2	0	
3 Sprung Valve Holders	3	9	
1 Screening Box	10	0	
1 6-pin Base	2	0	
1 Lissen Leak and Condenser	2	0	
2 Lissen Variable Condensers	12	6	
2 Lissen S/M Dials	7	0	
1 Differential Condenser	6	0	
2 Lotus Single Coil Holders	1	4	
1 On-off Switch	1	6	
1 T.C.C. 4-mfd. Condenser	6	3	
2 T.C.C. 1-mfd. Condensers	5	8	
1 T.C.C. 2-mfd. Condenser	3	10	
2 Resistances with Bases	5	6	
1 R.I. 28/14 Choke	1	1	0
1 Igranite Resistance as specified	6	0	
1 Terminal Strip with 7 Terminals	4	6	
2 Terminal Strips with 2 Terminals	2	6	
1 Lewcos Super Coil, C.S.P.	7	6	
1 each Lewcos Plain Coils, 35 and 60	7	0	
Connecting Wire	1	2	
	£11	15	0

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The Very Soul of Music

OUR NEWS BULLETIN

—continued from page 330

in future foreign stations should announce their names separately three times, so that distant listeners can recognise them.

Manchester's Share

Out of a list of nineteen large towns, worked on a basis of the number of wireless licences taken out per thousand of population, Manchester comes fifteenth. In the Manchester Postal Area there are approximately 1,400,000 people, and about 81,000 licences. This works out at an average of 57.8 per thousand, points out the Manchester "Evening News."

Liverpool's Lead

Liverpool has a 10 per cent better average than Manchester, and London a 30 per cent better average. From these figures it has been inferred that Manchester is a hot-bed of pirates, and special efforts are to be made to comb out listeners in the Manchester district who have hitherto evaded paying a wireless licence fee.

A Fine Gesture

It was a very fine gesture made by the Radio Trade some time ago when, in response to an appeal made by Captain Ian Fraser, the blind Vice-President of the Wireless for the Blind Fund, members of the R.M.A. agreed to a proposal that they should supply, as a free gift to the Fund, 1,000 com-

ANOTHER
"WIRELESS CONSTRUCTOR"
TRIUMPH!

NOEL ASHBRIDGE,

Chief Engineer of the B.B.C.,

Contributes the first of a special series of articles to the "Wireless Constructor" next month. If you want to know all about the results given by the New London Stations you must read his first article.

ORDER YOUR COPY NOW.

plete wireless sets. The Marconi Company also offered to forgo royalties on the sets.

It is reckoned that the value of this gift is £10,000.

Eye's Peculiar Property

Sir Ambrose Fleming recently read a paper on television, present and future, at the Imperial College of Science and Technology, South Ken-

sington. He pointed out that true television depended essentially upon a peculiar property of the eye, of which we were not generally conscious, the persistence of vision, or the fact that the stimulation of the retina by a ray of light remained for a fraction of a second.

Sight and Synchronisation

Sir Ambrose then gave examples by lantern slides of the principle of persistence of vision and its application to television. He pointed out, also, that the television image, contrary to a general belief, was not made up of dots, but of lines of varying intensity, and each line of light varied in brightness along its length. The problem of synchronism had been, for a long time, in the way of making television a commercial proposition.

Some Set!

Two hundred families, living in a big block of flats near Baker Street, will all listen to the B.B.C.'s programmes via one central receiving set. In these flats wireless has been laid on like water, gas, or electricity.

Two Hundred for 10s.

This installation raises a very important point. The Post Office
(Continued on page 354.)



**WHEN
CONTROL
IS EVERYTHING**

Storm, sleet, fog, darkness . . . the aeroplane must "carry on."

At such a time Control is everything. Your radio must "carry on" whenever you snap the switch. Your control (volume control) must function smoothly . . . easily . . . consistently—if you would be rewarded with clear-sounding entertainment. Your radio will do just that if it is CENTRALAB equipped.

Centralab



Write for free booklet, "Volume Controls, Voltage Controls: Their Uses." Our new 1930 68-page catalogue is now ready. It tells you all about pick-ups, volume controls, dynamic speakers, and, in fact, everything you wish to know to obtain perfect reproduction with your radio set. Send for your copy, 6d. post free.

The Rothermel Corporation, Ltd.,

24, Maddox St., London, W.1.

'Phone: Mayfair 0578'9



Another Benjamin Component Success!

Once again the Benjamin Electric, Ltd., have designed a radio component of outstanding merit. The new Benjamin ball-bearing Turntable is indispensable where Portable Receivers are concerned, it being equipped with hinged and folding legs, which enable the Receiver to be used out of doors, with the best possible results.

For indoor use the legs are folded up, being equipped underneath with rubber buffers so as to avoid damage to furniture, etc.

Price 7/6d. complete.

Write for illustrated leaflets on all Benjamin Products.

BENJAMIN BALL-BEARING TURNTABLE

Buy Benjamin & buy the Best!
The Benjamin Electric Ltd., Brantwood Works, Tottenham, N.17.

HEAYBERD

ALL-MAINS TRANSFORMERS

Built to give long and satisfactory service. Use these free-from-breakdown Transformers—next time!

TYPE

21/-

W.14

21/-

135 volts 70 m.a. (H.T. Rectifier).
2-2 volts 4 amps. (L.T. A.C. Valves).

F. C. HEAYBERD & Co.,

10, Finsbury St., E.C.2.

Telephone: Clerkenwell 7216

DUBILIER RESISTANCES

RESISTORS

Any Standard Value. Each 1/-

HOLDER (Horizontal or Vertical). Each 1/-

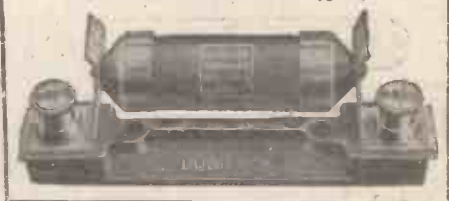


DUMETOHMS
25, 5, 1, 1/5, 2, 3, 4, 5, and to Megohms. Other higher values specially to order.

HOLDERS (Horizontal or Vertical). Each 1/-

DUWIROHMS

10,000 to 100,000 ohms 5/- 250,000 ohms 9/9
150,000 and 200,000 " 8/- 300,000 " 11/6
Holder for horizontal type 1/6



If unobtainable from your dealer, write direct to us, giving his name and address

Dubilier Condenser Co. (1925) Ltd., Ducon Works, Victoria Road, N. Acton, London, W.3.

WIRELESS CONSTRUCTOR

Advertisement Rates

Single Insertion	£60 0 0
per page and pro rata.	
6 CONSECUTIVE Insertions	55 0 0
per page and pro rata.	
12 CONSECUTIVE Insertions	50 0 0
per page and pro rata.	
ONE INCH single col. (2 1/4" wide)	2 5 0
Minimum Space, half-an-inch	1 2 6

IMPORTANT. Copy and Blocks must be in hand by 22nd of each month for issue placed on sale 15th day of the following month.

ALL communications respecting advertising must be made to:

JOHN H. LILE, Ltd., 4, Ludgate Circus, London, E.C.4

Phone: CITY 7261.

OUR NEWS BULLETIN

—continued from page 352

claimed that two hundred licences should be taken out, i.e. one for each family listening in, but on investigating the matter they have now decided that only one 10s. licence need be taken out. Therefore, two hundred families will get their wireless programmes for the total sum of ten shillings.

Last Month's Chassis Sets

Quite an unexpected tribute to the simplicity of the Chassis system is the fact that the drilled panels of last month's two sets could be interchanged—in fact, quite accidentally, this was done by the printer, and the "Short-Waver's" panel was shown as belonging to the "A.C. Chassis" Three, and vice versa.

Suppose He Did—!

A writer in the "Daily Dispatch" the other day suggested that, for the next Budget, Mr. Snowden should tax dogs according to weight, cats that have outlived their usefulness, cycles, horses, and wireless sets according to power, i.e. crystal sets, 7s. 6d. ;

one valve, 10s. ; two valves, 12s. 6d. ; three valves, 15s. ; and 2s. 6d. for each additional valve. What do some of our multi-valve experts think of this ?

More Power for Belgium

"Radio-Belgique" states that two more high-power stations are to be constructed at Veltham, between Brussels and Louvaine. One will be built for Radio-Belgique and the other for N.V. Radio, the two transmitters being housed in the same building.

The power will be 15 kw. in the aerial, so there is no doubt that it will be sufficient to cover the whole of Belgium.

A Famous Listener

According to the "Evening Standard," President Doumergue is one of France's most enthusiastic listeners. He is reported as having a habit of leaving his bed to listen in to American broadcast transmissions, and even after conferences, receptions, etc., the President turns to his wireless set or to one of his three gramophones.

Radio Week Success

National Radio Week was undoubtedly a great success, but it is

still too early to say definitely how many extra licences were taken out. Before Radio week began the number of set owners was estimated at three million, and it is hoped that when the result of Radio Week is known it will be shown that there is a big increase. Incidentally, a two-million increase in licences would provide additional revenue for the Postmaster-General of £1,000,000, of which the B.B.C. would receive about a quarter of a million.

More Employment in Radio

If the five-million mark is reached through the great drive in Radio Week, it is estimated that another 100,000 people will be employed by the radio industry, which already employs half a million workmen.

B.B.C. Touring Company

According to the "Daily News," the B.B.C. is forming a permanent dramatic repertory company for radio performances. The actors and actresses are likely to be employed direct by the B.B.C., and from time to time they will be sent on tour to the provincial broadcasting stations.

(Continued on page 356.)

The circuit

for a new high-tension eliminator

which will give

from 30 milliamps at 180 volts to 50 milliamps at 150 volts with full-wave rectification.

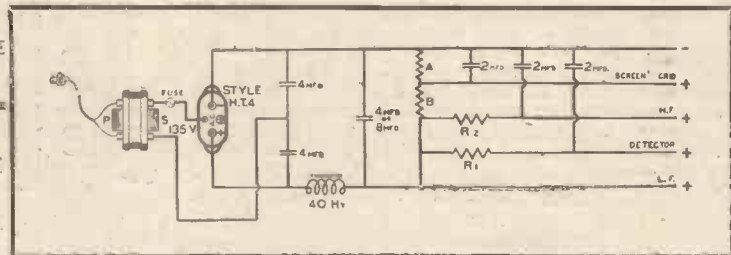
It is built up round

THE METAL RECTIFIER



TYPE H.T.4

which has been specially designed to obtain full benefit from the valuable "voltage doubler" principle.



Price 37/6

Full details of this and other circuits for eliminators and chargers for A.C. mains operation of every kind are given in our book:—

"THE ALL-METAL WAY, 1930," containing 32 pages of valuable eliminator information.

Have you had your copy yet ?

If not, send a 2d. stamp, with your name and address, to:—

The Westinghouse Brake & Saxby Signal Co., Ltd.,
82, York Road, King's Cross, London, N.1.

"M.W." and Sir John Reith

THE DIRECTOR-GENERAL OF THE B.B.C.

Contributes a series of special and exclusive articles to "Modern Wireless" on the problems of British Broadcasting, and his first article appears in the February issue, now on sale.



Other Special Features include:

Is Radio Realism Possible?
by Capt. P. P. Eckersley, M.I.E.E.

Humour via Radio
by "Philemon"

A Revolution in Selectivity

Microphone Mannerisms

Television in 1930?

etc., etc.

Three Fine Sets for Constructors

The "B.P." Five
(A special high quality set)

The "Eckersley" A.C. Three
(For all-mains working)

and

The "Electric" Two
(Another fine mains set)

"Leasing Out Britain's Ether"

IS THE TITLE OF SIR JOHN'S FIRST ARTICLE
IN THE FEBRUARY ISSUE OF

"MODERN WIRELESS"

NOW ON SALE

PRICE 1/-

NOW ON SALE

EXCLUSIVE TO "M.W."

OUR NEWS BULLETIN

—continued from page 354

The Most Powerful Yet?

What is claimed to be the most powerful broadcasting station in Europe was inaugurated at San Palambo, near Rome, a few weeks ago. We should like to hear from listeners who pick up the transmissions from this station, with any details as to the quality of the programmes, power, etc.

A World-Wide Broadcast

The King certainly had the largest audience of any speaker in the

history of the world when he broadcast the opening address of the Naval Conference the other day. The Royal

"MODERN WIRELESS."

SIR JOHN REITH

Director-General of the B.B.C., is contributing a series of exclusive and special articles which no broadcasting enthusiast should miss.

On Sale 1st of every month. Price 1/-.

BUY A COPY NOW.

speech and the speeches by the various delegates were heard in

France, Germany, Norway, Denmark, Sweden, Hungary and Czechoslovakia, relayed by telephone line from Savoy Hill to Berlin and thence by wireless. Belgium and Holland picked up the transmission from 5 X X and retransmitted by wire; the United States (N.B.C. of America), Australia, New Zealand, Japan, and Finland picked it up from 5 S W; Canada employed the Beam transmission system; while the United States Columbia chain of broadcasting stations used the Rugby transatlantic telephone service.

 * **LOUD-SPEAKER** *
 * **CLICKS** *
 * By A. S. CLARK. *

A FRIEND of mine was recently very much worried by the fact that although his set was completely switched off, as soon as he connected up his loud speaker there was a loud click.

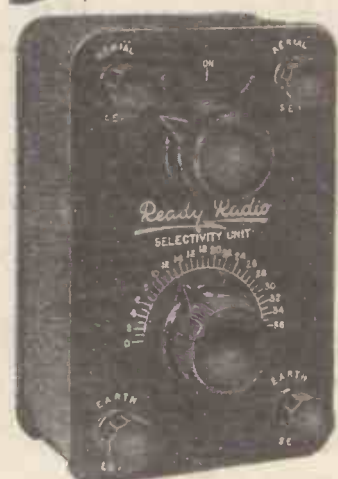
He thought that this quite definitely indicated that a current was flowing, and therefore in order to avoid running his batteries down he used to disconnect the loud speaker every time the set was switched off.

Getting fed up with this business, he decided to search for the trouble, and in his searching he came across the 2-mfd. fixed condenser of the output filter in series with the loud speaker. Now, as you will remember, one side of such a condenser is joined to H.T. negative via the loud speaker, and the other to H.T. positive via the L.F. choke.

Cause of the Current

In view of this, my *cher ami* decided that the condenser must be leaky, and lightly threw it away and bought another. On connecting this up he was nonplussed to find matters just as before, and wrote to me about it.

Well, perhaps you, being a little more knowledgeable on the fundamental principles of wireless, have already seen the reason for the clicks. Actually no current was flowing and the fixed condenser was not faulty. Although connected via the L.S. and choke, the condenser, was in effect across the H.T. battery, and therefore the momentary current to charge it when the circuit was completed naturally flashed through the loud speaker, causing the misleading click.



PRICE 20/-

Recommended and Used by
 MR. PERCY W. HARRIS,
 Editor of the
 "WIRELESS CONSTRUCTOR."

Enjoy both Brookmans Park Stations, 5 G B, 5 X X, or your Local Station, and be happy in the knowledge that, on account of the Ready Radio Selectivity Unit, they cannot interfere with your listening to any alternative programme you choose.

You get a clear run through to the station you want, because this Unit wipes out all interference from other stations.

The Unit is easily attached to any set. A turn of the knob removes interference; another turn safeguards your set by earthing your aerial.

Proven Performance.

Ready Radio

SELECTIVITY UNIT
 (PATENT PENDING)

SAY 'SUSIE' FOR SHORT!

READY RADIO,

159, Borough High Street, London Bridge, S.E.1.

Telephone: HOP 5555 (Private Exchange).

Telegrams: READY, HOP 5555, LONDON.

THE SET YOU WANT

will be found in

THE

“BESTWAY”

TITAN SETS

This 6d. book is profusely illustrated, and contains full constructional details of

FOUR Titan Sets

The reader has the choice of anything from a simple one-valver to a de-luxe 4-valve set with built-in wave-trap, and wonderful long-distance loud-speaker performance.

“BESTWAY” BOOK No. 350



6^d.
Everywhere.



6^d.
Everywhere

THE PROGRAMME IS ALWAYS GOOD

if you use a radio-gram receiver, which enables you to listen to broadcasting or gramophone records at will, by electrically reproducing your records.

This is not at all difficult, and “Bestway” Book No. 349 tells you how to use your present set, your present gramophone, and your present loud speaker as an up-to-date electric gramophone.

The “Bestway” Radio Gramophone Book is a mine of practical information on all phases of this latest branch of radio, and also includes full directions for building an up-to-date radio-gram receiver, specially designed for the home constructor. It is amazingly simple to operate, and enables you to

Choose Your Own Programmes

WITH PICK-UP and SPEAKER

Where should the volume control be placed when using a pick-up? This question is answered and various other points discussed in this corner for the radio-gramophone enthusiast.

Conducted by A. JOHNSON-RANDALL.

THE placing of the volume control in a radio-gramophone outfit is a point which does not often receive very much consideration, but all the same it is one which affects quite considerably the convenience of operation or otherwise of the complete outfit. Its actual position in the circuit, that is to say, its electrical position, is not the one referred to here, by the way, since this is a point which is usually decided by other considerations than those of convenience alone.

The question the writer had in mind concerns the actual placing of the volume control when a pick-up is used with a normal type of wireless receiver, and a separate gramophone unit. We have here the obvious choice of placing the pick-up volume control either on the set itself or somewhere in the neighbourhood of

the gramophone, and the usual practice no doubt is to place it on the set. When the control is placed in the grid circuit of the last valve in the amplifier, of course, the question does not arise; the control must be on the panel and one has no choice.

Placing the Control

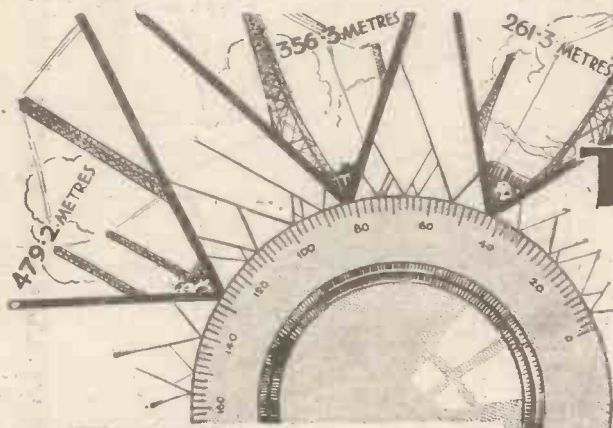
On the other hand, when the receiver has no volume control of its own and one has to be added for gramophone work, we have the choice of incorporating it either on the panel or on the gramophone, and the latter position has several advantages. It is sometimes argued that the correct place for a volume control is in the grid circuit of the last valve, chiefly because it then becomes available for radio as well as gramophone work, but a separate control in the pick-up circuit is very convenient at times,

and it is much more easily added, since one has no alterations to make in the set itself.

It is sometimes alleged that placing a volume control in the pick-up circuit is apt to alter the quality of reproduction in an undesirable way, but experiments with the H.M.V. "constant frequency" records have shown that the results obtained with the control here are to all intents and purposes identical with those obtained when the control is in the grid circuit of the last valve, provided always that the control is of the modern high-resistance potentiometer type, not the plain parallel variable resistance used in the earlier days of pick-up work.

Having decided that a volume control in this position is a permissible device, we evidently have a free choice as to its position. If you put it on the panel of the set every time you put on a record and start up the gramophone you may have to dodge over to the set and readjust volume to the level you desire for this particular item. If, on the other hand, it is upon the gramophone, the moment you have started the record you can reach straight over to the control and adjust the volume to just

(Continued on page 359.)



WIDE TUNING RANGE

Because Polar Condensers are scientifically designed—have accurately spaced vanes and low minimum self capacity—they give you a definitely wider range of tuning.

There is no need to sacrifice listening to 5 GB (479 metres) because you want Brookman's Park (261 metres) transmission. The Polar "Ideal" or Polar "No. 3" Condenser of .0005 capacity will tune them all in on any standard circuit receiver.

Polar Condensers give velvet smooth control, and the "Ideal" with both Fast and Slow motion gives knife-edge selectivity. Both the Polar "Ideal" and "No. 3" will make a wonderful difference to your range of reception.

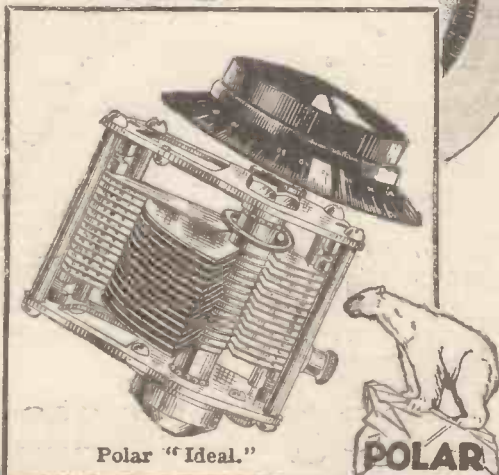
POLAR "IDEAL" .0005, 12/6. POLAR "No. 3" .0005, 5/9.
.0003, 12/- (as illustrated). .0003, 5/6. (Dial I/- extra).

POLAR CONDENSERS

Obtainable from all Dealers. Write for Free Copy of "Polar" Catalogue (C).

WINGROVE & ROGERS, LTD.,
188-9, STRAND, LONDON, W.C.2.

Polar Works: Mill Lane, Old Swan, Liverpool.



Polar "Ideal."

WITH PICK-UP AND SPEAKER

—continued from page 358

the right level. A small point, but a decidedly important one in reducing the "trouble element" which is apt to mar one's enjoyment of gramophone reproduction.

No Deleterious Effect

This volume-control point reminds the writer of another which has been raised once or twice lately in correspondence by readers. It has been pointed out that the plain variable shunt-resistance type of volume control across the pick-up is very apt under some conditions to upset the quality of reproduction, and it is therefore natural to inquire whether the connection across the pick-up of the potentiometer type of volume control does not do the same thing to some extent.

Actually, so long as the resistance of the volume control is above a certain value nothing objectionable takes place which is capable of being detected by the ear: a resistance of the order of 100,000 ohms or even less in some cases is required to produce any alteration that can be heard. With the usual value of half or one megohm for the resistance of the potentiometer type volume control there is nothing whatever to fear. With such high resistances as this careful measurements with test records do not show any effect whatever upon the shape of the reproduction curve of the pick-up.

Interference from Motors

Here are some hints for those who use electric driving motors for their gramophones and experience trouble with interference in the amplifying circuits. A well-designed motor does not, as a rule, cause trouble in this way unless the gramophone is built in as part of the amplifier assembly, and it does not always do so even then.

Electric motors are apt to cause a little noise, however, if they are placed very close indeed to the amplifying circuits, and the only cure in such cases is usually to be found in a certain amount of screening. Iron is usually the best material in such cases, and an almost complete box, such as any tinsmith can make for you quite cheaply, is really the best way out. The box should be

(Continued on page 360.)

Your Radio Deserves the Best Controls

Improvements in broadcasting, in radio circuits and in A.C. operation make good receivers imperative. And remember that no receiver or eliminator can be better than the parts that go into it. You can rely on **ELECTRAD Voltage Controls** for every radio purpose.

SUPER-TONATROL

5-Watt Volume Control.

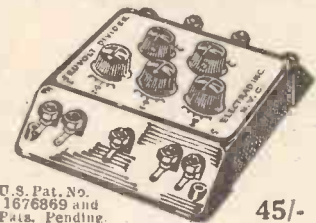
Electrad's remarkable development for regulating volume in high-powered receivers. Different in principle, and **LASTING** beyond all expectations. Resistance element fused to enamelled metal base. Pure silver floating contact. Riveted metal cover. Bakelite insulation. Amazing smoothness that actually improves with use without change in resistance value.



U.S. Pats. 1034103-1034104 and Pats. Pending.

Seven resistance ranges. 12/6 and 15/- each.

TRUVOLT DIVIDER



U.S. Pat. No. 1676869 and Pats. Pending.

45/-

A bank of connected TRUVOLT Resistances in a handsome Bakelite case. Five variable control knobs are calibrated to provide exact H.T. and G.B. voltages (without calculations), from any type eliminator to any type receiver using up to 12 valves. May be used as front panel of eliminator or mounted on base-board.

TRUVOLT All-Wire Resistances

TRUVOLT Fixed Resistances may be adjusted to desired value by the sliding clip contact—an exclusive *Electrad* feature. TRUVOLTS are uniquely wound. They are accurate and they keep cool. TRUVOLT Variables simplify Eliminator construction, by making difficult calculations unnecessary. Made in all desirable resistance values and current ratings.

ADJUSTABLE SLIDING CLIP



U.S. Pat. No. 1676869 and Pats. Pending.

COUPON.

The Rothermel Corporation, Ltd. (Dept. C.W.), 24-26, Maddox Street, Regent Street, London.

Please send **ELECTRAD** Voltage Control data to:

Name

Address.....

ELECTRAD

THE ROTHERMEL CORPORATION LTD.
24-26, Maddox Street, Regent Street, London.



NOW HERE IS THE SET YOU WANT!

"My advice—certainly, get a Lotus, because it's undoubtedly the easiest set to work and the cheapest to run."

Worked from any A.C. Mains light socket—no batteries needed—the Lotus 3-valve S.G.P. All-Electric Receiver is highly selective and covers a good range of British and Foreign stations. Cash Price (including Royalties and Valves), **£21.**

Where electric light is not available, get the Lotus 3-valve S.G.P. Battery Receiver. Cash Price, **£13.15.0.**

HOME CONSTRUCTORS
Home Constructors should get the Lotus 3-valve S.G.P. Battery Model Kit. Easy to assemble. Main components mounted on panels. Cash Price, **£7.12.6.**

All above Sets available on **Hire Purchase Terms.**

Ask your dealer for a demonstration in your own home, or write for the Lotus Sets Catalogue and Hire Purchase Terms.

LOTUS
ALL ELECTRIC RECEIVER

Gets the Best Reception

Made by the makers of the famous Lotus Components in one of the most modern radio factories in Great Britain.

GARNETT, WHITELEY & CO., LTD.,
Dept. W.C.2, Lotus Works, Mill Lane, Liverpool

Causton

WITH PICK-UP AND SPEAKER

—continued from page 359

earthed, and you should also try earthing the metal frame of the motor.

"Earth" Frame First

As a matter of fact, it is as well to try earthing the frame of the motor before you do anything else, since this, in some cases, will affect a complete cure without going to the trouble of having a box made. Similarly, you should always try earthing the metal parts of the tone-arm or carrier-arm of the pick-up, since this, in many cases, reduces the trouble considerably, even if it does not effect a complete cure.

When the gramophone stands at some little distance from the amplifying portion of the outfit motor noises are decidedly unusual, and the customary device of earthing the tone-arm is generally quite sufficient to prevent them. A particularly "noisy" motor may on occasion cause a little trouble, however, and the same dodges of a metal box and earthing the motor frame can be tried.

"AS WE FIND THEM"

—continued from page 344

pivoted, notched and held in such a way that they can be made to fit the bottom edge of any wireless cabinet within wide limits of size. Equally a panel and baseboard without a cabinet can be supported at a convenient height above the floor in

the same manner. The adjustment for various sizes is made in a few moments.

By using these legs a receiving set either in the cabinet or out of it can



This transformer (H.50) is reviewed on a preceding page.

be supported in any convenient part of the room at a proper height for working, while when they are not needed the legs can be folded up and put away in a very small space. These

NEXT MONTH

THE "VI-KING" 3

Designed and described by VICTOR KING,

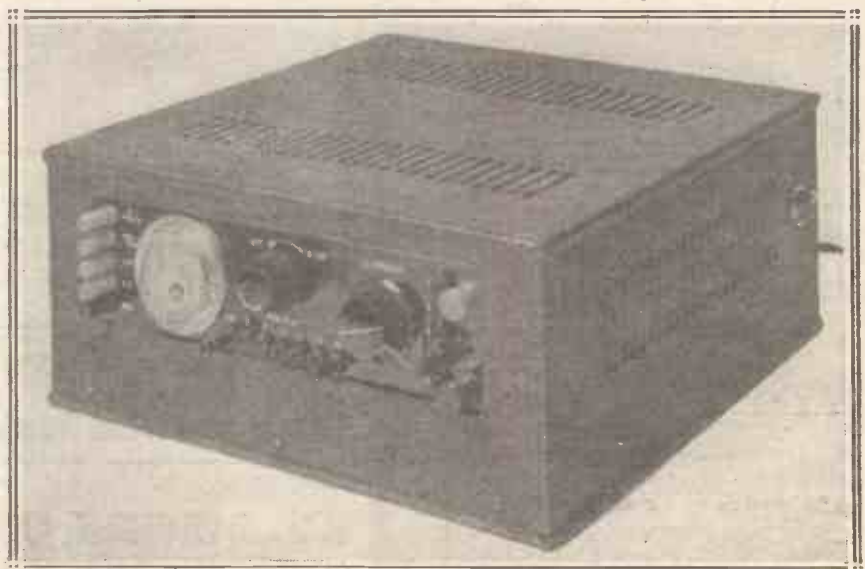
Something quite new in all-wave receiver design.

You must read about it.

Order Your Copy Now.

legs have been found most convenient in the WIRELESS CONSTRUCTOR laboratory and can be heartily recommended to the experimenter who is limited in space and table room.


(Continued on page 361.)



An Ekco all-power unit, giving high-tension, low-tension, and grid bias.

"RADIOLA"

← For YOUR Set,
SPEAKER and
Batteries



NOTE.—Improved Baffle and Sound Chamber. Used for "B.P." Five, "All-Electric" Two. ("Modern Wire-less.")

For ALL Sets or Radio-Gram
The sort that people desire to possess and keep. Graceful design—sound construction—hand finished (plano finish), snug, compact, adding to the life of your set.

Over 3,000 delighted clients.
(Used by Radio Press—by W. James, Percy Harris, etc.)

For your OWN set!
"Radiola" de luxe, from £5 5 0 to £11 11 0
"Popular" Oak Model, from £3 15 0

Cash or easy payments.
Sent ON APPROVAL—direct from the makers. If you wish to part with it we will willingly Refund FULL MONEY.
Photographs and full particulars FREE!

PICKETT'S, RADIO FURNITURE MAKERS.
"W.C." WORKS, BEXLEYHEATH, KENT.
Established since the beginning of Broadcasting.

SOLVE ALL H.T. TROUBLES

Per doz. No. 1. No. 2.

Jars (waxed) 1 1/2 1 6

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Special sizes for Pentodes

WET BATTERIES

TAYLEX

— SELF GENERATING

LONG LIFE : SILENT : ECONOMICAL

Sample doz. (18 volts), complete with bands and electrolyte. No. 1, 4/1; No. 2, 5/-; post 9d; terminals extra. No. 3, with terminals, 7/6 (10,000 milli-amps), sample unit 6d. Orders 16/- carr. paid. New illustrated catalogue post free.

FREE Bargain List of Receivers, Amplifiers and Components.

C. TAYLOR, 57, Studley Road, Stockwell, London.

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Any make of L.F. Transformer, Loudspeaker or Headphones repaired and despatched within **48 HOURS—TWELVE MONTHS' GUARANTEE** with each repair. 4/- Post free.

Terms to Trade.

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15,000 SUCCESSES

Is the record of **The T.I.G.B.**

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The Picture Paper with the **MOST** News

SUNDAY GRAPHIC

Please be sure to mention **WIRELESS CONSTRUCTOR** when replying to Advertisements.

"AS WE FIND THEM"

—continued from page 330.

New "Ekco" Units

One of the romances of the wireless industry is the rapid growth of the firm of E. K. Cole, who make the Ekco mains units.

This firm started in a very small way only a year or two ago, and now has an enormous output of mains devices. Much of the popularity of their products is due to the reasonable prices at which they are sold.

Two of their latest units have recently been submitted to us for test, namely, the model 2A10 and the model C1A, both for A.C. mains. The first is a particularly cheap unit designed for sets using from one to three valves, and gives on one



"A particularly useful instrument."

tapping a nominal 60 volts at approximately 2 milliamperes, and on the other tapping a nominal 120 volts at 8 milliamperes.

Ten milliamps. is the maximum current that should be taken from the unit. Although it sells for the low price of £3 10s., it includes a Westinghouse metal rectifier and adequate smoothing.

The Current Output

A very large number of sets now in use, including most of the valve-makers' kit sets, do not take more than 10 milliamperes, and thus this unit should prove very popular.

Although provision is not made in this particular model for applying a "screened-grid voltage," the 60-volt tapping will in many cases be found to be quite suitable for this.

Our measurements show that with a 10-milliamperere drain on the unit the voltage was exactly 100, while a 6-milliamperere load gave 120 volts, and thus the model gives an output

(Continued on page 362.)

The Easy Way TO PERFECT RADIO

In addition to their own extensive range **PETO SCOTT** offer YOU every known Radio Receiver or Component. The list given below merely illustrates our terms for a few well-known lines and we ask you to fill in the coupon or send us a list of your requirements for which we shall be pleased to quote for cash or on our famous system of

EASY TERMS with SERVICE AFTER SALES

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THE "MAXIMUM" FOUR

(described in this issue).
Complete kit of components, including valves, cabinet and panel.

CASH £12.11.7

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A.C. POWER UNIT

(described in this issue).
For complete kit of components send only 12/6, balance in easy instalments.

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EXIDE 120-volt H.T. Accumulator, TYPE W.J., in crates. Cash £3.15.0. or 12 monthly payments of 6/11. **TYPE W.H.,** 120 volts, in crates. Cash £4.13.0. or 12 monthly payments of 8/6.

REGENTONE W.1 B.S.G. H.T. ELIMINATOR (for A.C. Mains) Ideal for S.G. Three sets. Cash £4.19.6. or 12 monthly instalments of 9/2.

EXCO 1.V.20 H.T. ELIMINATOR, also for S.G. Three sets. Cash price, A.C., £4.12.6; D.C., £2.10.0. or 12 monthly instalments of 8/6 or 4/7 respectively.

ULTRA AIR CHROME Speakers. Special model at special price. Type K chassis in handsome Oak or Mahogany cabinet. Cash £4.4.0. or 12 monthly instalments of 7/6.

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Advertisement of Belling & Lee, Ltd., Queensway Works, Ponders End, Middlesex

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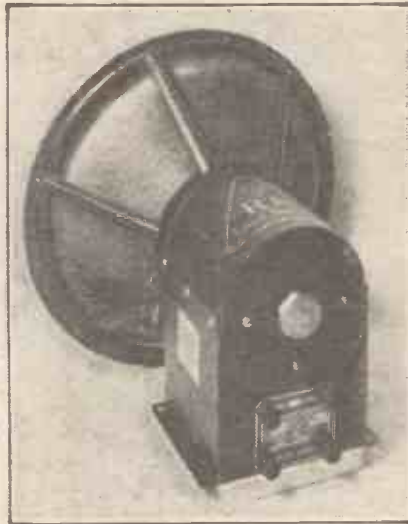
JOHN H. LILE, LTD.,
4, LUDGATE CIRCUS, LONDON, E.C.4.

"AS WE FIND THEM"

—continued from page 361

which, while a little under its nominal rating, is still very useful. At £3 10s. this represents excellent value.

The model C1A is a far more ambitious affair, and, in fact, it is a true all-power unit giving high-tension, low-tension, and grid bias. The maker's rating is 60 to 80 volts on the screened-grid tapping, a variable voltage from 0 to a nominal 120 on one tapping, 120 on a further tapping, and on the power tapping a nominal 200 volts at approximately 25 milliamperes, 175 at 35, or 150 at 50 milliamperes.



The new "R.K." loud speaker is marketed by the Ediswan people.

The grid-bias tapping gives voltages of 1½, 3, 6, 9, 12, 15, and 21 volts approximately, and on the L.T. side 2 or 6 volts as desired, provided the drain does not exceed a total of 1 ampere; this part of the apparatus being designed on the lines of the Harris "Stedipower" L.T. unit.

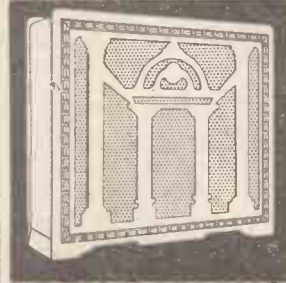
L.T. As Well

Practical tests of the output of voltage and current showed that they were somewhat different from rated figures. For example, on the power tapping of a nominal 150 volts and approximately 50 milliamperes, a load of 50 milliamperes showed only a 100-volt reading, while the other tappings gave voltages in similar proportion. The L.T. supply was up to standard, and the voltmeter accurate, while the grid-bias voltages checked up very well.

This unit, considering its capabilities, is a masterpiece of compact

(Continued on page 363.)

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Scientifically balanced for area and mutual tension. Even frequency response. Music, speech and song with lifelike volume, atmosphere, character, vitality and vividly natural. If your dealer cannot supply send his name and address to manufacturers.

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Baldry Ad. U149.

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Are you satisfied with the results of your Set? If not, why not reconstruct or build a new set?

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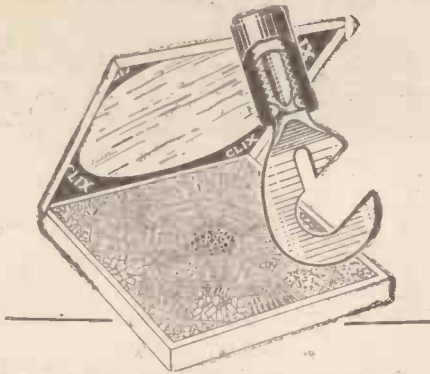
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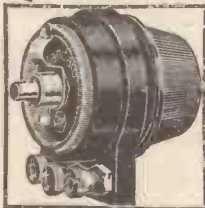
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- 2 Megohms,
- 7 Megohms.

Used by all the best set manufacturers.

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- Type 6/6

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LONDON RADIO SUPPLY COMPANY
11, Oat Lane, Noble St., London, E.C.2
NATIONAL 1971.

Advertisement of Oliver Pell Control Ltd., Kingsway House 109, Kingsway, London, W.C.2. Telephone: Holborn 5303

"AS WE FIND THEM"

—continued from page 362

design, and the makers are to be congratulated not only upon this, but upon the general construction of the unit.

Naturally, the price of such an all-power unit as this is not low, but it still represents excellent value for money, and enables practically any set to be run entirely from A.C. mains.

It thus completely replaces all batteries without the necessity of re-designing the set or changing the valves from the existing battery-driven types to the A.C. types, and will thus be welcomed by that large section of the public desirous of working entirely from A.C. mains, without the necessity of scrapping receivers which otherwise function excellently.

An Excellent Moving-Coil Loud Speaker

In our January issue, in an article, "Why Not Loud-Speaker Curves?" we indicated that many moving-coil speakers, while possessing an



This photograph clearly shows the corrugated cone which is a feature of the new R.K. speaker.

excellent low-frequency response, are poor in the upper register.

This led the Ediswan Electric Company to invite us to test the latest model Rice-Kellogg loud speaker with particular regard to its response to the upper frequencies. This we have had great pleasure in doing.

First of all, this latest model has been very considerably improved in a number of ways. It is now fitted with a 10-inch corrugated cone and a particularly free suspension, while the general mechanical make-up of the speaker has also been improved.

(Continued on page 364.)

PRECISION CONDENSERS

J.B. UNIVERSAL LOG

J.B. UNIVERSAL LOG

Now as always!

There is an impressive finish and neatness about J.B. Condensers which give an atmosphere to a set. They are always "in tone" with the Receiver as well as "in tune." Behind their excellent appearance lies skilful designing and unerring manufacturing—in fact all the qualities of a good job.

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PRECISION INSTRUMENTS

Advertisement of Jackson Bros., 72, St. Thomas Street, London, S.E.1. Telephone: Hop 1837.

**USING OLD
TERMINAL NUTS**

MOST of us, I expect, very much admire the terminal nuts which are used upon some of the latest components. The ones I mean are milled so that they can be tightened fairly well with the fingers, but they also contain a nick for the screwdriver, which means that they can be tightened thoroughly well down when connections have been made.

I have not been able to find any firm which will supply the constructor with nuts of this kind, but there is no reason why he should not make his own. Most of us have found the ordinary milled nuts unsatisfactory for use in those circuits that we call permanent, as opposed to mere bench hook-ups.

New Lease of Life

By "permanent," of course, the real enthusiast means as a rule something that will remain in position for at least a fortnight, since he is seldom content for longer with any circuit or arrangement of components. I have previously recommended that milled terminals should be discarded and hexagon nuts used in their place.

With a hexagon nut and a hex spanner one can feel sure that connections are pretty well as they should be. Those who have adopted this suggestion must have dozens of old milled nuts, both 4 B.A. and 6 B.A., lying about.

These may be given a new lease of usefulness in the following manner. Place the nuts one by one between the jaws of a vice and make in the top of each a cut with a fine hacksaw. Provided that the threaded part of the terminals are not too long, you can then tighten the nuts thoroughly with a screwdriver.

"AS WE FIND THEM"

—continued from page 363—

The actual model tested is known as the Senior R.K. speaker, with a 6-volt field winding. No transformer is incorporated, as the makers rightly point out that the ratio for this depends upon the valves used in the output circuit.

After careful tests, we were not only very favourably impressed with its excellent response over the whole frequency range, but we have no hesitation in saying that it is the best of all the moving-coil speakers

**When Writing to the
"Wireless Constructor"**

please remember the following points :

- (a) Letters must be on only one side of the paper.
- (b) Non-technical Queries cannot be answered unless a stamped addressed envelope is enclosed.
- (c) Technical Queries should be written on an Application Form, which will be sent on receipt of a postcard.

we have tested in the WIRELESS CONSTRUCTOR laboratory, and this is no small number ! The high-frequency response is admirable, and the bass, while at first not appearing so marked as that given by some moving coils, is really a true bass, and not merely a boom depending upon resonance and thus giving a false rendition.

The price is seven guineas for either a 6-volt field or a 100-125-volt or 220-250-volt field, and we have no hesitation in recommending it to the discriminating user who is anxious to get the best moving-coil results.

The same makers supply speech transformers of different types for different valves.

TRADE JOTTINGS

FROM Wright & Weaire, Ltd., 740, High Road, Tottenham, London, N.17, we have received a folder describing the Wearite components. These include a dual-wave tuner, the famous Titan coils, and various switches, rheostats, chokes, etc., as well as a very attractive range of Paxolin formers and panels.

A recently-received leaflet from the Igranic Electric Co., Ltd., 149, Queen Victoria Street, London, E.C., deals with the Igranic Elkon rectifiers for L.T. and H.T. supply units.

There are two types for use in L.T. supply units, one supplying a current up to three amperes and another a maximum of one ampere. An interesting point to note is that either of these is suitable for delivering a current to energise the field coils of a moving-coil loud speaker.

All the Igranic Elkon rectifiers provide full-wave rectification, and full details of the instruments and of the range of power transformers and chokes specially designed for use in conjunction with them, together with appropriate circuit diagrams, will gladly be sent free upon request.

Wingrove & Rogers, Ltd. (Polar Works, Old Swan, Liverpool, and Arundel Chambers, 188-9, Strand, London, W.C.2), have forwarded us a copy of the "Polar" catalogue dealing with the many products of this well-known firm. There is a wide and useful range of variable condensers, including the new "Polar" differential condenser which in a .0001-mfd. capacity sells at 6s. 6d., and a .0003-mfd. at 8s. 6d., intermediate values being correspondingly priced.

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HYPERMITE

L.F. TRANSFORMER



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matchbox & weighs
ONLY 7 OUNCES*

12/6

PRIMARY INDUCTANCE OVER 50 HENRIES

Here at last is a transformer built with a **CORE OF A NEW NICKEL ALLOY** of enormous permeability, yet sold at a price which places it within the reach of the average home constructor.

The "Hypermu" at 21/- is, of course, the best transformer it is possible to buy, but the "Hypermite" gives an opportunity of acquiring at the popular price of 12/6 a modern transformer with a high inductance, which **GUARANTEES THE RETENTION OF THE LOW FREQUENCIES WITHOUT SACRIFICING THE HIGH.**

A "Hypermite" leaflet with full diagrams will tell you all about it. Ask your dealer for a free copy or send direct to the manufacturers.

The name **RI** on radio products is a guarantee of excellence throughout the world, and a comparison of this transformer with any of the bulky, expensive transformers will definitely establish its value.

A NICKEL ALLOY CORE is now recognised as an essential feature of modern intervalve transformer design. The "Hypermite" is an absolute boon to **SET MAKERS**, who are most enthusiastic with its performance. They have already placed contracts for the 1930 Season for **PORTABLE SETS.**



The "Hypermite" will be one of the outstanding features of progress in Radio during the 1930 Season. Try it in your set. It justifies our claims.

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