POPULAR WIRELESS, October 18th, 1930.

REGISTERED AT THE G.P.O. AS A NEWSPAPER.

# HERE'S ANOTHER GREAT "P.W." GIFT!

# Popular Wireless

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No. 437. Vol. XVIII. INCORPORATING "WIRELESS" October 18th, 1930.

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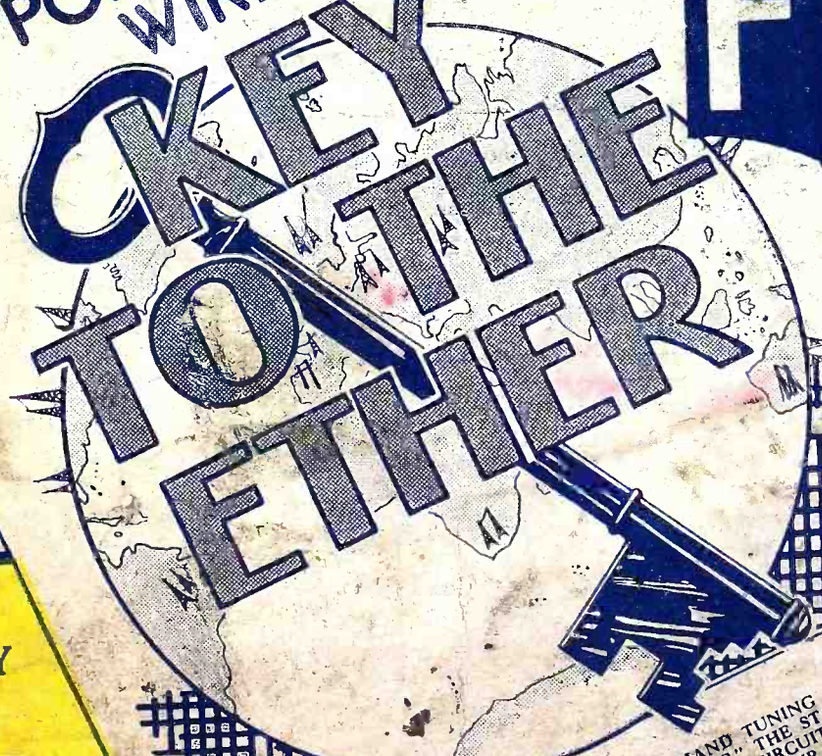
6d

THE "POPULAR WIRELESS"

## KEY TO THE ETHER



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IMPROVING YOUR SET
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WHAT WAVELENGTH WAS THAT?

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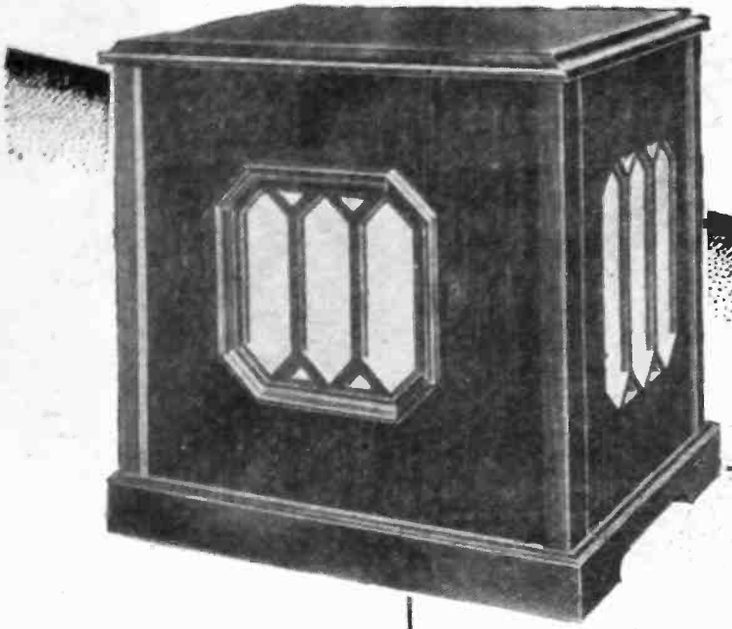

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Yours faithfully,
(Signed) John D. Davies, A.C.G.I.
Capt.

* *This letter which has been received from a purchaser of a Ferranti Electro-Dynamic Speaker is reproduced for comparison with our own claims made in advertisements for this product:*

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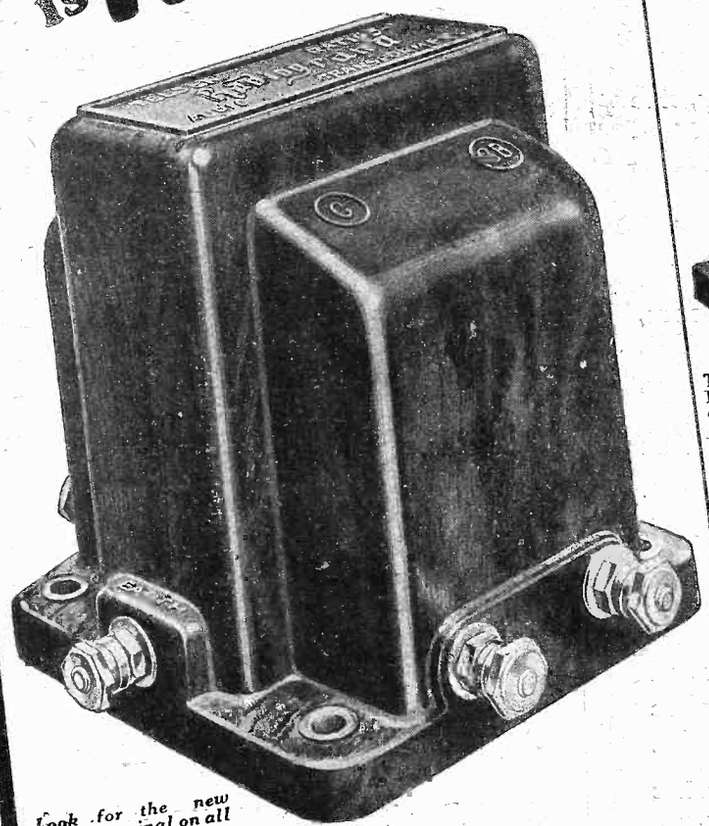

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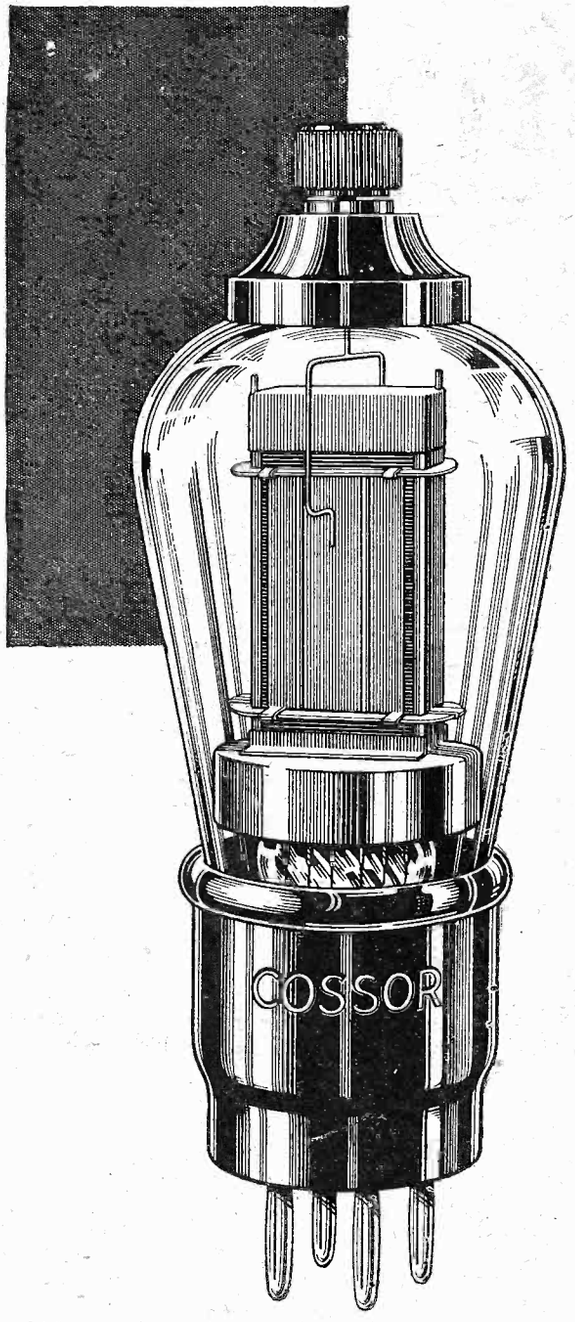


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# Popular Wireless

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**"P.W." GIFTS.**
**AN OLD FRIEND.**
**ULTRA SHORT WAVES.**
**A SAVOURY TIT-BIT.**

## RADIO NOTES & NEWS

**RAISING RASIN.**
**THE OSCILLATOR.**
**RADIO SHORTS.**
**THE "TINY" TWO.**

### Blue Print Bouquets.

JUDGING by a host of joyful noises last week's blue prints were, to say the least of it, greatly appreciated. I may as well confess that, though those blue prints mean a lot of work, I personally look upon them as Bread Upon the Waters. For every time that "P.W." gives away blue prints, "P.W." readers give back bouquets. (I am not being flowery—that's a solid fact that back numbers of "P.W." will bear out.)

### "The Key to the Ether."

UNLESS I am very much mistaken, "P.W." is going to get another batch of appreciative *billet-doux*-ings about the "Key to the Ether." So far as I know nothing like it has ever been done before, and, although it seems like taking coals to Newcastle to attempt to tell some of you chaps how to handle a set, there are many others who are only just "getting their hands in" to this great game of radio. Lucky lads! I wish I could start it all over again.

Well, we have played the opening move. You have the "Bloops." You have the facts and tips for tuning. Now it's up to you.

### An Old Friend.

BEFORE I leave this subject I should like to thank an unknown friend for the bit of a shock he gave me. Enclosed in his envelope was a well-thumbed, read and re-read, torn and tattered mass of paper, which, upon careful examination, proved to be the remains of a gift book that "P.W." gave away on October 18th, 1924. (How tempus fugits!)

With it no name and address, but the message "All that remains of an old friend—going but not forgotten. His offsprings are doing splendidly."

### The Yorkshire Station.

HUDDERSFIELD and district listeners will soon be sitting up and taking notice of Moorside Edge, for the station is growing apace and waxing lofty withal. Two of the masts are practically completed, and as the lengths go up at the rate of about 36 ft. a day it will not be long before they are thinking of hauling up the aerials.

They say that Huddersfield is taking it very coolly at the moment, but wait till their Uncles start testing. There will be just one big rush for radio. "Huddersfield United!"

### An Interesting Service.

THE other day I ran into an old friend of mine—an interesting chap who always reckons to build three or four sets a year. But the sets he builds are not receivers. They are transmitting stations, and he must have put up more than one of those that you have heard, for Europe is fairly dotted with them.

And he told me about the Sardinia service, of which I knew nothing at all.

### Ultra Short-Wave Telephony.

IT appears that Sardinia—which, you remember, is just south of Corsica—has a first-class telephone service to the mainland of Italy. Not cable, mark you, for the Mediterranean between is a hotbed of earthquakes and volcanic disturbances.

Not ordinary wireless either, because the district is a home for X's. But a short-wave regular and reliable service on *about five or nine metres*. (I forget which).

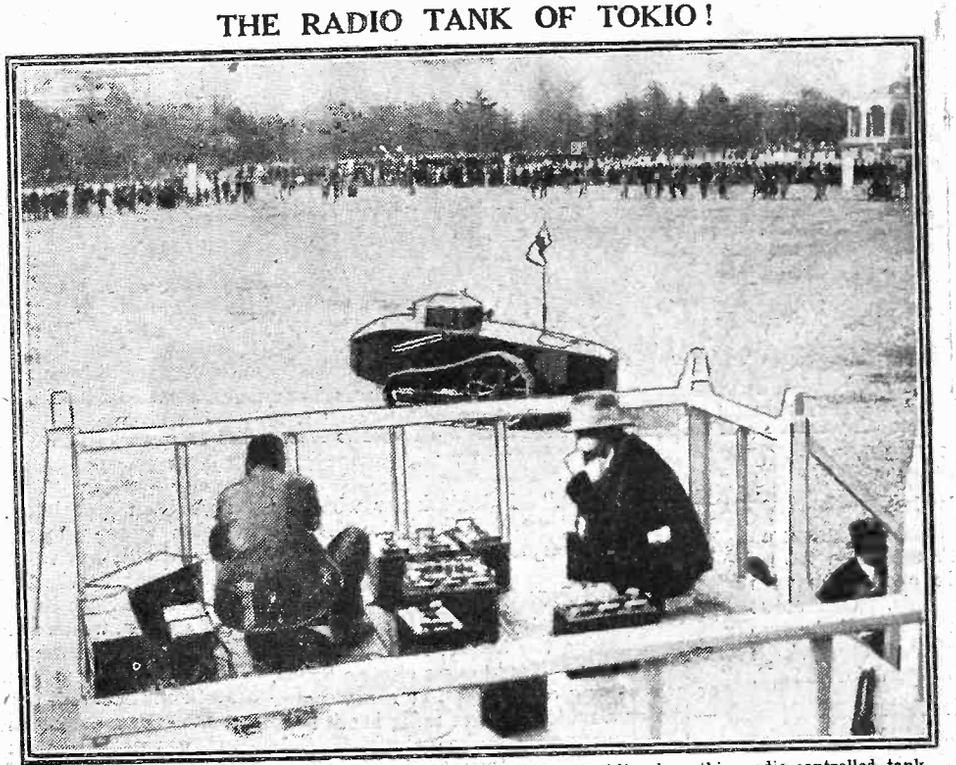
It's been working for quite a time and is absolutely satisfactory. Yet only a few years ago telephony on that wavelength would have been looked upon as a minor miracle!

### A Savoury Tit-Bit.

EVERYONE who has dabbled about with expensive instruments, and every owner of a milliammeter or a voltmeter, must have envied the people who play with possibilities of radio and work in huge research laboratories. The envious man in the street wonders what goes on behind those closed doors. Sizzling sausages!

(*Continued on next page.*)

## THE RADIO TANK OF TOKIO!



Thousands of excited Japs gathered round and shouted "Banzai" when this radio-controlled tank obeyed its wireless orders in a public park of Tokio. It is the invention of an army officer, who has trained it to obey his radio commands with uncanny promptitude.

# RADIO NOTES AND NEWS

(*Continued from previous page*)

### Sizzling Sausages.

YOU might not think it, but, according to Dr. Willis R. Whitely, the director of the General Research Laboratories, that is what they are now doing with wireless waves. Testing heat radiation.

He explained it scientifically, and said: "By putting a wire over a table a few feet from a radiating aerial, formed by a copper bar about ten feet long, a sausage in a glass container suspended from the bar was soon thoroughly cooked."

But what I want to know, and what you will want to know, is *Who Ate It?* Radio's First Sausage!

### Raising Rasin.

"RASIN" is the name of the place just outside Warsaw where the great new Polish broadcasting station is to be erected by Christmas. It is far and away the most powerful broadcasting station in the world, with an aerial power of no less than 160 kw.

And as they have erected already on the site two of the highest broadcasting masts in the whole world, it's pretty safe to say that in raising Rasin they're raising Cain!

### The Oscillator.

I SUPPOSE you think you know what an oscillator is, don't you? But have you ever had one to drink? A convivial pal of mine, always ready for an excuse, tells me that the "Oscillator" is now all the go at the Trocadero cocktail bar. It is the very latest in cocktails.

And it's no good writing to ask me if I went round and tried one, for, like the cork, I refuse to be drawn.

### Radio Shorts.

ILFORD Town Council has passed a bye-law prohibiting the carrying of L.T. batteries and accumulators inside the council's trams.

* * *

The Columbia Broadcasting system has applied for permission to put up an experimental television broadcast station in New York to work on a wave-length of about 120 metres, with the power of ½ kw.

* * *

The Irish Radio Traders' Association arranged to hold their Wireless and Gramophone Exhibition in the Mansion House, Dublin, from October 20th to October 25th.

### The Thunderer.

A WRITER to the "Catholic Times" has beaten all the radio critics with one terrific blast of heavy artillery. He was criticising a "talk" and levelled against the editor of "The Listener" a "severe criticism of the Professor's rigmarole of paradoxical nonsense—ultra crude pragmatism, with its concomitant jargon of spurious metaphysics, topsy-turvy psychology and deplorable logic—which I stigmatised, apparently, I contend, Macmuddleism." I don't know what the row was all about, but I admire the way he goes into a fight!

### Television at the Berlin Show.

IN the article on page 169 ("P.W.," October 4th issue) it is stated, ". . . the two leading German television companies, the Fernseh A. G. and the Telehor Co., working with Mihaly patents . . ." etc.

The Baird Television Co. points out that "the Fernseh A. G. is a combination of companies, and the patents worked are the Baird and not the Mihaly patents."

### The Tiny Two.

BACK at the end of September (27th issue) I referred to a New Southgate reader's experiences with the "Tiny Two." At the same time, alas! I dropped a brick.

The farm where this reception feat was carried out was not "some hundreds of feet below sea-level," but some hundreds of feet below the level of the top of the moor, and in a combe.

Actually it was 800 feet high and dry above sea-level.

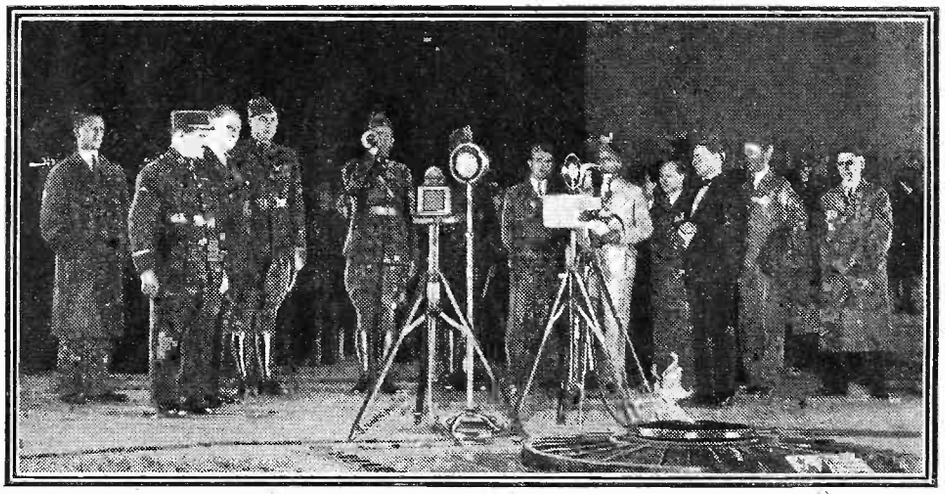
### An Accidental Exaggeration.

I HASTEN to correct this because the reader in question says he wonders whether it was a genuine mistake or just a bit of "Arielesque" exaggeration.

Old readers and keen critics will bear me out when I say I never knowingly exaggerate such reception reports, but I try to give them fairly for the benefit of others interested in the sets.

As a matter of fact, there is no *need* to exaggerate. You fellows keep me primed with so many good things in the way of remarkable radio reception that the bare truth makes good enough reading!

## ALL AMERICA LISTENS TO A COMMEMORATIVE BUGLE-CALL FROM FRANCE



The scene at dead of night when an American bugler sounded "Taps" at the grave of the Unknown Warrior, under the Arc de Triomphe, Paris. The sound was relayed to America and broadcast from all stations there.

### That Hornet's Nest.

THERE is still a bit of buzzing going on around that hornet's nest I stirred up a few weeks ago in connection with reception on earthed aerials. One stout fellow (who writes from Cromwell Avenue and constitutes himself my Protector) wields a pretty pen, so I'll let him speak for himself.

### "Up and Smite Them."

THIS is what he says: "A few weeks back I was told that signals were just as strong when the aerial was earthed as when it was not. 'Strange,' thinks I to myself; 'it was not always thus.'

"On investigation I found the earthed contact very much blackened owing to corrosion and the sooty nature of London's atmosphere, and now, after a few minutes' work with a file and emery cloth, I defy the hornets to detect the trace of a signal when our aerial is earthed.

"Up, then, and smite them!"

So, ye doubters and earthed aerial-users, consider yourselves smote.

### It Pays to Advertise!

TO which industry belongs the distinction of having the biggest roof sign in the country? You'd guess electric lamps, or advertising contractors, or a newspaper—but as a matter of fact radio has it!

The sign runs right along the E. K. Cole Southend-on-Sea factory (which is 400 ft. long) and it tells the world about "Ekco All-Electric Radio."

### "Mullard Magazine."

THIS is the name of a monthly periodical issued by the Mullard Social and Athletic Club, price threepence. There are no circuits in it, but lots of fun, naturally of more interest to Mullardites than others. Welcome to the little stranger and good luck to its editors. As I have edited a "house organ," I know that they need our prayers.

### The Vatican.

ALL good Catholics will be interested in the news that the Vatican wireless station has now been completed. Marchese Marconi, under whose supervision the work was carried out, has formally handed over the equipment to the Pope, and Father Gian Francheschi has been appointed director of the station, which is now ready for working.

Father Gian Francheschi is a distinguished scientist who has spent much of his life in mathematical and chemical research. His name was quite recently before the public in connection with General Nobile's Polar expedition, of which he was a member.

### Too Much Like Home?

NOW that Turin has its lady announcer going strong, they say that the Italians are wondering whether they have done the right thing in banishing men from the "mike." One paper puts it: "What man will buy a wireless licence just to hear a woman talking—he can get that at home any time!"

Somewhere behind that quip I see a sad journalist, speaking from experience.

**ARIEL.**

# WHAT I SAW AT MANCHESTER


By G.V. Dowding, Assoc. I.E.E.

**A racy review of the Great North Country Radio Exhibition that is now in progress.**

WELL, here I am in Manchester. And, at the time of writing it is *not* raining. But then, although there is often rain in Manchester, Mancunians do enjoy quite a lot of fine weather during the course of the year, despite the statements of music-hall comedians.

Personally, I like the great city, and always enjoy my visits to it. It is a very workmanlike, busy centre, and it hasn't the architectural frills to be encountered in other places.

But one feels its importance, its vitality, the moment one steps from the train.

Taken all round, it is just that part of the country where one would expect, as a matter of course, to find the north country replica of the National Radio Exhibition.

As I explained last week, the Manchester Radio Exhibition is organised jointly by the "Manchester Evening Chronicle," (an enterprising newspaper that has sponsored wireless almost since its inception), the Radio Manufacturers Association and Provincial Exhibitions, Ltd.

### "Come Inside."

The show is always very well supported by the trade and it is becoming as traditional as the yearly Olympia display.

And it grows in size like its Southern brother. On this seventh occasion I also find it improved in its whole presentation.

I think, on the whole, it is now slightly superior to Olympia from that point of view. And you see just as much diversity of apparatus at the City Hall, although for sheer bulk it must take second place.

In general the exhibits are of a more inexpensive character—not so many of those sets-for-the-very-rich.

But come with me, spiritually, on a visit to this very attractive exhibition.

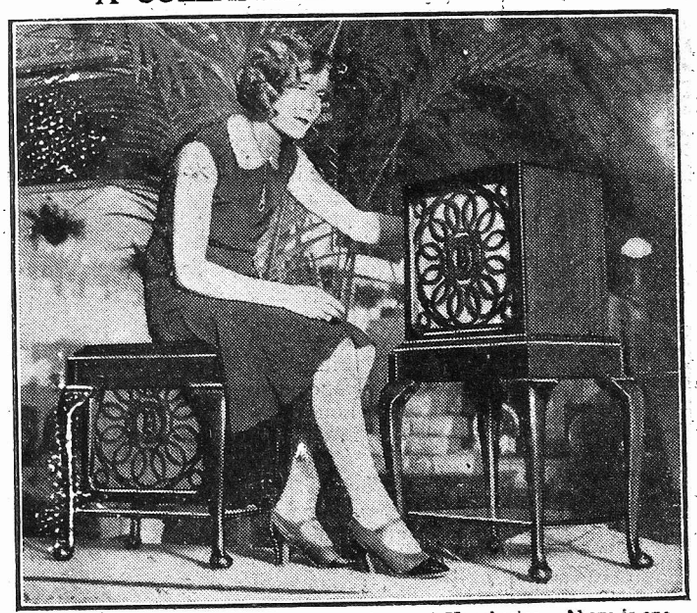
The approach to the City Hall is via a long, rather depressing thoroughfare lined with dingy buildings ranging from the squat to the very tall.

### A Blaze of Colour.

The City Hall stands back a bit from the main thoroughfare, and it is not particularly inviting in appearance. The tiny splashes of colour on it, due to the posters, form the only relief from a dark, forbidding pile that reminds one of an old-fashioned railway terminus.

But once you are through the entrance, you find yourself in an entirely new world.

## A COLLAPSIBLE LOUDSPEAKER.



**Many moving-coil loud speakers are shown at Manchester. Above is one, carrying a very famous initial, that expands and contracts in an ingenious and unusual manner.**

Here are scores of bright lights and heaps of gay colouring and crowds of chattering people. The difference between the City Hall and Olympia is at once most apparent.

It literally hits you in the eye.

At Olympia some authority has laid it down that stand decorations must be uniform, and the result is a somewhat monotonous blue and gold that is repeated year after year. That, above everything else, in my mind, is the one great mistake.

Olympia is too big to carry such uniformity. It kills it! You have 200 stands, for the most part displaying the same sort of gear, blended into one huge blue and gold whole.

But at the City Hall the exhibitors seem to be left an entirely free hand. And don't they take advantage of it. Why the result is one riotous blaze of colouring rendering the entire interior of the building a sight worth travelling hundreds of miles to see.

### Outstanding Stands.

And this added to really artistic stand layouts focuses attention on individuals. The exhibitors seem to achieve a vital personality that is lacking at Olympia, except in a few outstanding cases.

Who could help noticing the Ferranti stand in the City Hall? This is a bright medley of glittering sparkles against a full-bodied background of tints.

Then, again, there is Cossor, with a blue, gold and cream scheme, and Varley in restful green, with cunningly illuminated window effects.

G.E.C. with very bright blue and Lotus with bright greens "get over" with considerable artistic forcefulness. But Ediswan, with more sombre browns, is just as effective in its way, and the stand constructed in Cubist form is holding visitors' attention.

### Plenty of Valves.

The Graham Amplion show reveals a burst of colouring giving just that happy blend of the futuristic and orderly that marks the master hand at this kind of thing.

Marconis have let themselves go on valves. Their stand is absolutely studded with them. Valves are used as liberally as buttons on a pearly king's barrow. I am sure few amateurs will have seen so many valves before in one place.

The Exide display has a character entirely of its own. In the centre there is a huge pylon and at the corners of the stand are gigantic replicas of Exide cells.

R.I.'s play on their "Nickel Age" slogan, and their imitation road safety signs strike a novel note.

I said last week that the stands at the

(*Continued on next page.*)

# WHAT I SAW AT MANCHESTER.

(Continued from previous page).

Manchester show are usually on the small side. I now stand corrected. This year they are of generous dimensions all round, and far from being "pocket" duplicates of the London stands, they are in many cases just as large.

The whole of the ground floor is packed with stands. You have the main hall and from that you pass first through one large annexe—a small exhibition in itself—to another large annexe. And in neither is there an overflow of "small fry," but both hold their shares of exhibitors, large and small.

**Unbounded Enthusiasm.**

There is a gallery after the style of Olympia, and up there are located demonstration rooms. A full-size talkie outfit is being exhibited. I spent a few minutes in this theatre and the results were excellent. The pictures are brilliant and the speech and music as good as anything I have heard.

In the other demonstration rooms models of various sets are being put through their paces by urbane young gentlemen extolling the virtues of the various pieces of apparatus.

Standing on the gallery, looking down on the stands in the main hall, another point of real importance strikes one, and that is that the display is arranged to be just as attractive from above as from ground level.

The roofs of the stands are gaily coloured and you get the effect of a sea of people swirling round brightly-tinted islands.

The floral decorations are lavish and this contributes greatly to the attractiveness of the scene.

There is music from scores of loud speakers working from artfully-placed amplifiers. And altogether it is a show that makes one feel there is unbounded enthusiasm behind it. Olympia is the bigger show, but honestly I think Manchester is by far the better show as an exhibition.

And isn't it packed! The public are backing it up to the extent it deserves.

I am sorry to see that the home constructor is rather badly catered for. It is true that plenty of components are being shown, but the trade must be concentrating very largely on complete sets. And this applies to all the exhibitions.

But at Manchester they are not giving the mains sets quite as much prominence as they did at Olympia.

In general, though, I think the exhibits follow very much on the same lines as those at the National Radio Exhibition.

You know by now what was shown there, and in this regard I think you can say Manchester follows London in fashion as in data!

**Good Grouping.**

However, there are concerns exhibiting that did not go to Olympia, although I have seen no gear that is peculiar to the City Hall.

There are about 130 stands as against Olympia's 200 odd. The grouping is rather similar. There are the smaller stands around the sides of the main hall, and those stands occupying the centre are broken into convenient blocks by "avenues."

The "avenues" are narrow and, of course, there is no lavish outlay of "walking" space anywhere.

When I paid my visit it was hard to make one's way round. And I went in the afternoon, when by all precedents it should have been only partially filled with visitors.

What it is like in the evenings when the Mancunians descend on the City Hall in full strength I hesitate to imagine.

**"Go To It!"**

However, crowded or empty (which it never is), it is a wonderful show and I am sure no one will regret having visited it.

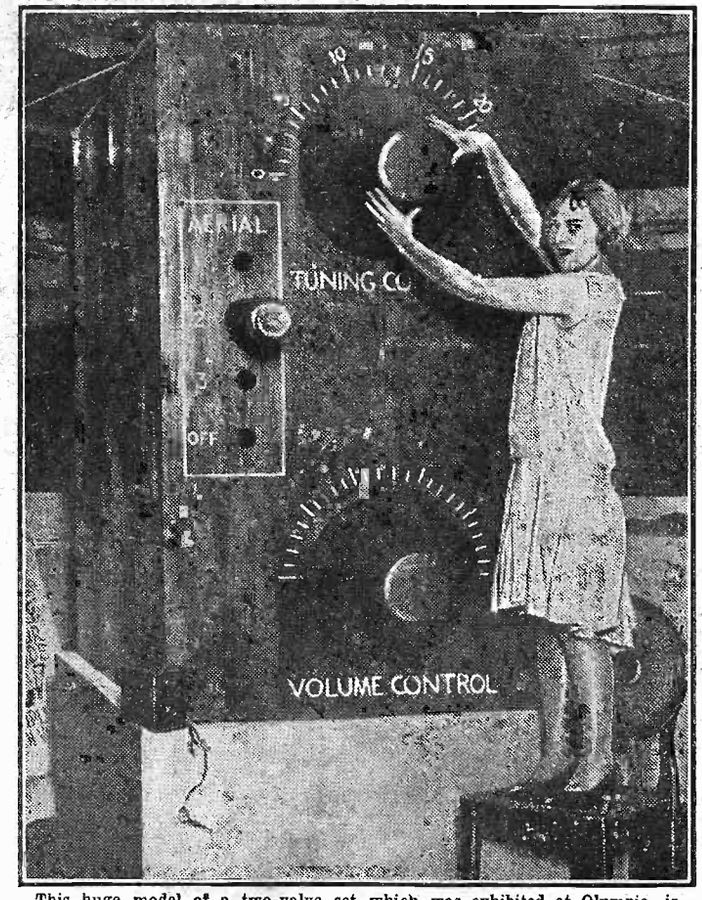
By the time you see these words the Exhibition will have only a day or two to run. My advice to all those who possibly can is to find time to go along to the City Hall.

The "Evening Chronicle" and its collaborators are to be complimented on the best show they have put over to date. And that is saying a good bit!

## SHOW-TIME AT VIENNA

Huge crowds invaded the Radio Exhibition recently held at Vienna.

## THE BIGGEST TWO-VALVER SHOWN




This huge model of a two-valve set, which was exhibited at Olympia, is also to be seen at the Manchester Show.

# RECEPTION WRINKLES.

**Some cone loud speakers are inclined to over-emphasise the high notes, so a pentode valve should not be used with these unless it is provided with a pentode output transformer.**

* * *

**One way of making a valve "soft" is to employ far more H.T. than the makers recommend for it.**

* * *

**To get the maximum amount of power from a crystal set both the aerial and crystal circuits should be tapped into the tuned circuit.**

* * *

**A sure way of shortening the life of an H.T. battery is to place it in warm quarters like a cupboard backing on to a fireplace or a shelf with hot-water pipes underneath it.**

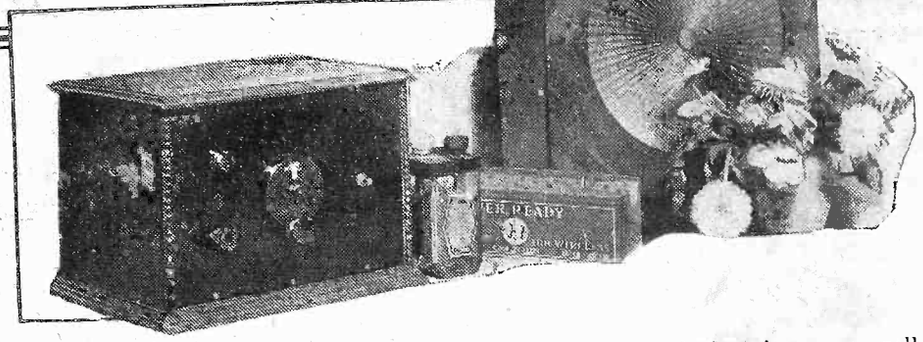
* * *

**As atmospheric disturbances generally come from a definite direction it is sometimes possible to minimise them by using a frame aerial.**

* * *

**Although the joining of a ·25-meg. grid leak across the secondary windings of an L.F. transformer is apt to cut down the strength a little, it is often very efficacious in stopping a slight tendency to instability.**

# THE "SHARP-TUNE" TWO



**Here are some interesting notes to supplement the constructional details of one of the sets described in the blue prints given away last week.**

"SELECTIVITY," how tired we are all getting of that word! It can't be helped, though, for "Regional" conditions have come to stay, and sharp tuning has become the first essential in all sets to be used in many large areas.

How to get it, too, is no easy question to answer where the simpler kind of set is concerned. At least, it is not easy if the set is to stay simple. Anyone can add another tuned circuit with some sort of loose coupling, but that means an extra dial, a certain amount of difficulty with the reaction arrangements, and almost certainly rather awkward handling.

The kind of set we have in mind is the detector and one or two low-frequency stages, and the extra-dial method is obviously barred here if the receiver is to keep the simplicity which is one of its greatest attractions.

Experience of a tremendous variety of circuits working under all sorts of different conditions has shown us that much can be done to help these sets to cope with "Regional" conditions with the aid of a very simple device.

### THE PARTS YOU WILL NEED.

- 1 Panel, 8 in. × 12 in. (Paxolin, or Lissen, Trolite, etc.).
- 1 Cabinet with baseboard, 7 in. deep, to fit (Pickett, or Camco, etc.).
- 1 ·0001-, ·00013-, or ·00015- mfd. differential reaction condenser (Ready Radio, or Lissen, Igranic, Lotus, J.B., Formo, Dubilier, Wearite, Magnum, etc.).
- 1 ·0005-mfd. "Brookmans" condenser (Ready Radio).
- 1 ·0005-mfd. variable condenser (Lotus, or Lissen, J.B., Ormond, Dubilier, Ready Radio, Formo, etc.).
- 1 Slow-motion dial if condenser not of slow-motion type (Igranic, or Lissen, Ormond, J.B., Ready Radio, Lotus, etc.).
- 1 On-off switch (Igranic, or Benjamin, Lissen, Lotus, etc.).
- 1 H.F. choke (Lewcos, or Lissen, Varley, Dubilier, R.I., Ready Radio, Telsen, Lotus, Wearite, Magnum, Parex, etc.).
- 1 2-meg. grid leak and holder (Dubilier, or Lissen, Ediswan, Ferranti, Mullard, Igranic, etc.).
- 3 Single-coil holders (Wearite, or Lissen, Bulgin, Red Diamond, Igranic, etc.).
- 2 Sprung valve holders (Benjamin, or Lissen, Lotus, Igranic, W.B., Telsen, Bulgin, Dario, Junit, etc.).
- 1 ·0003-mfd. fixed condenser (T.C.C., or Lissen, Dubilier, Ediswan, Mullard, Ferranti, Igranic, etc.).
- 1 L.F. transformer (Lissen, or Ferranti, R.I., Lewcos, Varley, Igranic, Telsen, Mullard, Lotus, etc.).
- 1 Terminal strip, 12 in. × 2 in.
- 9 Terminals (Belling and Lee, or Eelex, Igranic, etc.).
- Screws, wire, flex, plugs, etc.

### Simple But Effective.

Most readers of experience will know that a series condenser of suitable size in the aerial lead produces a marked increase in selectivity with the majority of circuits. The difficulty is, as a rule, to find just the right capacity, for if it is too large the selectivity is not improved sufficiently, and if it is too small there is an undue sacrifice of volume.

A condenser of fixed capacity is obviously not an ideal method, for you really want different capacities on different aerials, and even in some cases at different points on the tuning scale on the same aerial.

A fixed condenser may be satisfactory with a fair-sized set, particularly if it has the advantage of the greater selectivity inherent in two tuned circuits, but for the smaller type of "det. L.F." you really want an adjustable capacity for the best of results.

### Need For Close Control.

The point is this: what you really require is the power to reduce the capacity only just far enough to get the selectivity you must have for any given occasion. In this way you can avoid going too far and losing strength unnecessarily.

One expedient which is sometimes used is to provide an adjustable type of condenser, such as the compression variety, and put it on the baseboard near the aerial terminal. This, again, is a method more suitable for the larger type of set than the smaller. With a set having a good reserve it is easy enough to hit upon a setting for the condenser which represents a good compromise for the whole of the tuning range.

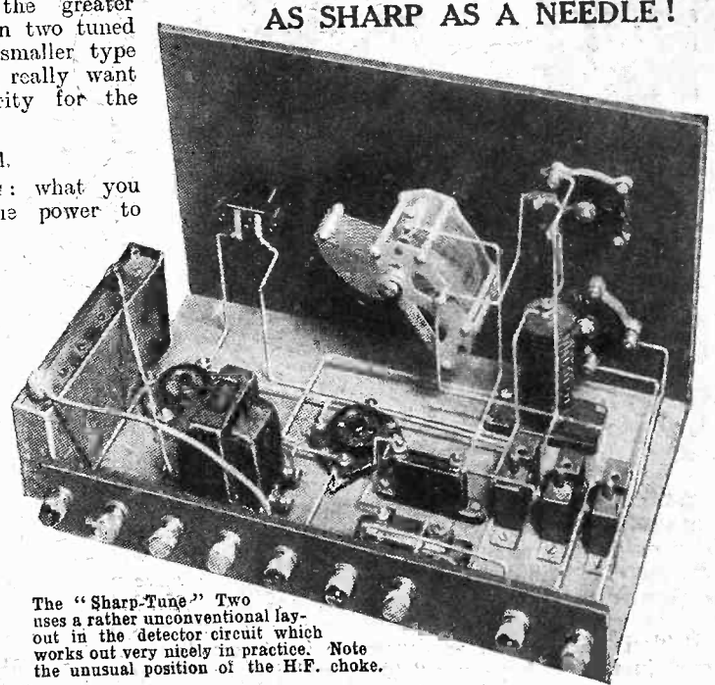
With a small set, on the other hand, a compromise method doesn't go so well. Here you really cannot afford to lose any unnecessary power, and so it is advisable to adjust your series capacity pretty exactly to the needs of the moment, and even alter it for different parts of the tuning range.

This is likely to become a bit of a nuisance if you have to open the cabinet and grope inside every time. It is evidently desirable to have it on the panel in the case of these smaller sets. Given this location, you have it right under your hand, and can reset it with ease to meet exactly the conditions you find at any particular point on the tuning range.

### Perfect Control of Selectivity.

This last really means the nearness of the wave of the station you are trying to receive to that of the local station. If it is very close you will have to cut down the capacity very considerably, but with care you can take it only *just* far enough, and so avoid any more loss of volume than is inevitable when you try to extract the last drop of selectivity from a small set.

## AS SHARP AS A NEEDLE!



The "Sharp-Tune" Two uses a rather unconventional lay-out in the detector circuit which works out very nicely in practice. Note the unusual position of the H.F. choke.

Then when the station you want is further away on the dial from the local you can bring up the capacity again and get better volume once more. (You won't be needing so much selectivity then, of course.)

(*Continued on next page.*)

## THE "SHARP-TUNE" TWO.

*(Continued from previous page.)*

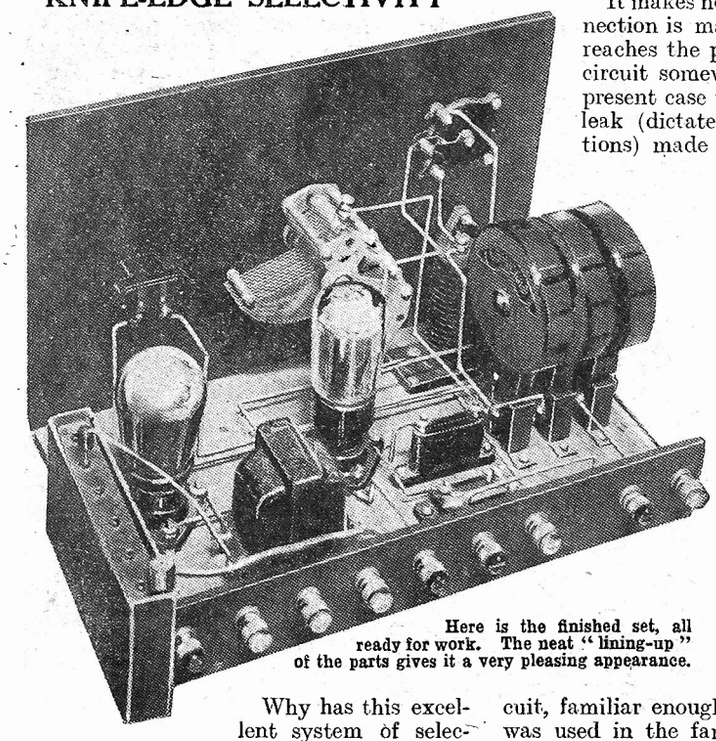
This idea of a real panel-operated control of selectivity is one of the main special features of the "Sharp-Tune" Two, the very attractive little set you see illustrated in the photos on these pages, and of which complete constructional details appear in the sheet of blue prints given away with last week's issue. It may seem a small point, but you have only to try the set to discover what a surprising and impressive difference it makes.

### A Valuable Feature

The way a correct setting of this control can sharpen up the tuning is most extraordinary, and you need not be alarmed about its effect on the volume. As a matter of fact, you can reduce the capacity of this condenser quite a lot before it begins to have any serious effect on strength so long as you make judicious use of reaction.

It is particularly easy to do this last in the case of the "Sharp-Tune," of course, because it uses one of the best forms of differential reaction, just as do practically all "P.W." designs nowadays.

## KNIFE-EDGE SELECTIVITY



Here is the finished set, all ready for work. The neat "lining-up" of the parts gives it a very pleasing appearance.

Why has this excellent system of selectivity control not been more largely employed in small sets? It was probably a matter of cost until quite recently, but now we have available the solid-dielectric type of variable condenser at very reasonable prices, and this objection vanishes.

This is the kind of condenser we have used in the "Sharp-Tune" Two, and it only means a very small increase in the cost of the set which we think you will agree is well worth while, in view of the wonderful things it enables you to do. It really gives you a degree of selectivity when required which is far above the usual level for a set of this type.

To identify the condenser in question just observe that it is on the panel immediately underneath the reaction condenser. Its control knob is therefore the lower one on the left as you look at the front of the panel.

The general scheme of the circuit is otherwise extremely straightforward, as a glance at the diagrams on the blue print sheet itself will show you. Here you will recognise all the well-tried features of a modern, efficient design. There is differential reaction in one of its best forms, a separate aerial (primary) coil to give a rough adjustment of selectivity by the choice of different sizes, and a quite normal transformer-coupled L.F. stage.

There are some miscellaneous points about the circuit which we had better attend to before we go any further. These are rather matters of detail, for you will get the general idea elsewhere.

For a start, there is the matter of the detector grid leak. Its connections may look a little peculiar at the first glance, but they are really normal enough.

### Why It Was Done

If you will examine the circuit diagram on the blue print (No. 57) you will discover that the leak is wired between the grid of the valve and a point on the L.T. circuit between the L.T. switch and the L.T.+ terminal. More often, of course, the leak would be wired straight to a point on the L.T. circuit close to the detector valve itself.

It makes no difference how the connection is made, really, so long as it reaches the positive side of the L.T. circuit somewhere or other. In the present case the position of the grid leak (dictated by layout considerations) made it better to adopt the connection we have mentioned.

A glance at the wiring diagram on the blue print will show you why. Just note how nicely the wiring of the grid leak (marked "2 meg.") works out with the scheme we have used.

The reaction circuit may look a trifle out of the way to those accustomed to the older form of Reinartz, and again there is a matter of detail which might be the better for a little explanation.

In this type of circuit, familiar enough to regular readers (it was used in the famous "Magic" Three) the reaction coil is included directly in series in the anode circuit of the detector valve.

Observe that the steady anode current of the valve passes through the reaction coil, then the H.F. choke, and finally the primary winding of the L.F. transformer in order to get to the H.T. positive terminal on its way to the battery.

### Those Detector Currents

Next remember that when signals are being received there is what is called an H.F. component in the anode current, as well as the L.F. currents which are passed on by the transformer to be amplified by the next valve. These H.F. currents cannot get through the choke, so they make their way down to the filament circuit through one or other half of the differential reaction condenser.

Which way they go depends on with which set of fixed plates the moving ones are chiefly engaging. Refer to the circuit diagram again, and you will see that when the moving vanes engage completely with the "$F_2$" fixed ones the H.F. currents pass straight from plate to filament without going through the reaction coil.

### How Reaction Is Obtained

In this position you get no reaction, but a plain by-passing effect which improves the sensitivity of the valve. Then when the moving vanes engage with "$F_1$" the H.F. currents pass through the reaction coil before getting down to filament by way of the "$F_1$—M" path in the reaction condenser.

In this case you get full reaction and the set will oscillate. By choosing various intermediate settings for the reaction condenser you can get any desired amount of reaction, the currents dividing up and passing through both the paths we have explained.

There, now you know how your reaction circuit works, and when you turn the knob you will be able to imagine what is happening inside the set.

You will probably have gathered that the "Sharp-Tune" Two will work on short waves, and a few notes on the necessary adjustments may be welcome. Well, it's really very simple, and requires little more than the substitution of suitable sizes of coils.

### On Short Waves

First, though, you should set the selectivity control ($C_3$) almost to its minimum (moving vanes right out). This is not because you want exceptionally high selectivity, but because the aerial circuit behaves rather differently on short waves.

Now you just want the coil sizes, and then you are ready to have a try at the short waves. Here they are for the interesting band of wave-lengths between 20 and 50 metres: $L_1$, No. 4; $L_2$, No. 4; $L_3$, No. 6 or No. 9.

## ROUND THE STATIONS

**Barcelona has two radio stations, one on 349 metres and the other on 268 metres, the latter being the more powerful.**

* * *

**Belgrade, working on 432 metres, can often be identified from the fact that it employs a metronome which beats 60 times per minute.**

* * *

**"Achtung," the German call, means "attention."**

* * *

**Most of the German broadcasting stations close down with "Deutschland Uber Alles," which is set to the familiar hymn tune (by Haydn) called "Austria."**

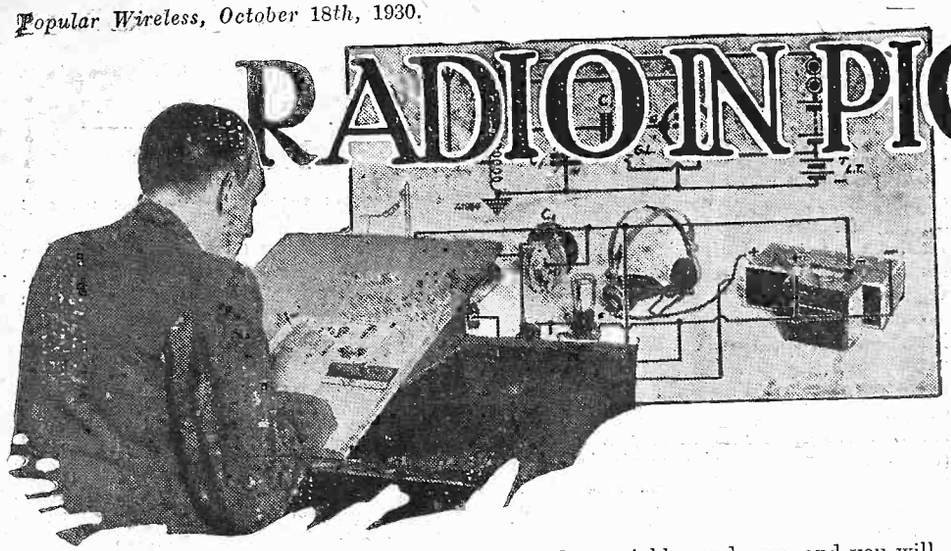
* * *

**A tune on a musical box is the opening signal of the Berne, Switzerland, station which works on 403 metres.**

* * *

**Bratislava, Czecho-Slovakia (wave-length 279 metres), has a lady announcer and an interval signal of the four musical notes C E G G.**

# RADIO IN PICTURES



By "PENTODE."

**A popular "P.W." contributor shows you, in a short series of articles, how easy it is to read and understand diagrams. His novel and fascinating system of diagram pictures should prove most interesting and helpful to all classes of radio enthusiasts.**

## 1. SELECTING THE STATION.

THEORETICAL diagrams are the simplest possible things to understand providing you know exactly what all the various symbols indicate and providing you have some idea as to the work the components symbolised have to do, and how they do it.

Perhaps you think that the "providings" infer too much. Well, in the course of three or four articles I hope to show that there is a fairly quick way to the acquisition of sufficient knowledge to enable you both to understand and appreciate diagrams.

And I am writing these articles so that they should prove useful and interesting to a very large number of readers. The regular reader will find them a helpful refresher, and the new reader a nice high stepping-stone to a fuller appreciation of radio and all its possibilities.

### Photographic Diagrams.

The constructor who does nothing but assemble and operate receivers is missing a great deal of the real fascination of his hobby; circuit reading, to mention only one further aspect, is much more absorbing than cross-words!

However, all this will be so very obvious to the "old hand" that I had better get down to brass tacks.

A glance at the accompanying illustrations will show you exactly what line I am going to take. Each illustration comprises a theoretical diagram and a photograph of the actual parts symbolised. And these parts are connected up in accordance with the diagram.

Before I describe the actual circuits there are one or two important things you should note. The symbols used are quite standard and are not liable to change in form except in very unimportant details. But components of different makes are sometimes very different in appearance. However, you will soon learn to recognise the purpose of a component by its main structure and, in any case, their names at least, are fairly standard.

### What Tuning Is For.

Thus a condenser is never called anything else, although there are several kinds of condensers in general use, viz., "variable," "fixed," "differential," etc.

The relative physical dimensions of components form no safe guide as to their electrical values or dimensions. One coil that looks much bigger than others might not tune to such long wavelengths and so on.

Now for the circuits. The first one shows an aerial tuning circuit which comprises a coil and a variable condenser, and you will have no difficulty in identifying the symbols for these in the theoretical diagrams.

The purpose of the aerial tuning circuit is to adjust the wavelength of the aerial to that of the station you want to receive. You will notice that the aerial wire can be joined to either one of two points on the coil. These are known as tappings.

### Connecting the Coil.

The earth lead, a wire from a metal rod driven into the ground or from a water pipe, is connected to the one end of the coil. The particular coil shown in the photo is of the "X" type.

An "X" coil is one that has two tappings placed well down towards one end of the winding. Connection to these tappings is via the two terminals that can be seen fixed to the sides of the coil, while the ends of the windings are connected to the plug and socket which fit into the coil holder, the two terminals of which are clearly to be seen in the illustration.

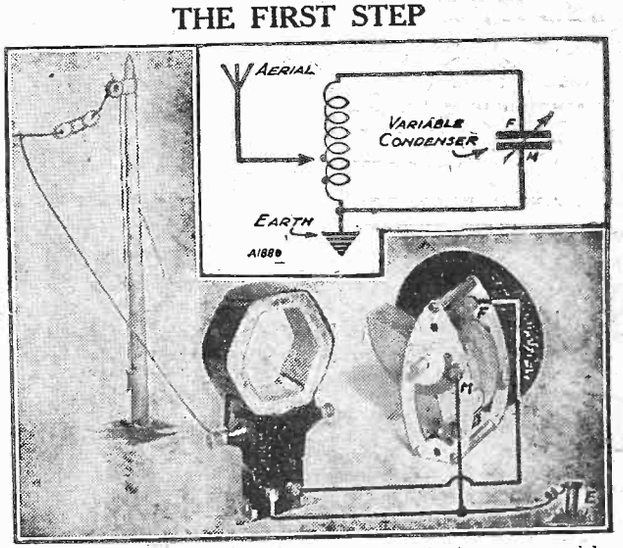
The lower down on the coil the tappings are taken, that is the nearer to the earth, the greater will be the selectivity. That is to say, the more sharply defined will be the various stations to which you tune. There will be a smaller tendency for any of them to overlap. But you must not have your tappings too far down the coil, otherwise you will lose in sensitivity (the amount of energy you are able to derive).

The two tappings on an ordinary "X" coil are admirably disposed to provide a compromise between these two conditions, and you have the choice of two degrees of selectivity.

The larger the coil the more you step up the wavelength of the aerial. The variable condenser gives you an adjustment of wavelength which is very smooth and very gradual, from the minimum imposed by the coil used, up to a maximum depending upon the capacity that the variable condenser adds to the circuit.

Capacity is reckoned in farads, but a farad being a unit that represents an enormous amount of capacity, for practical purposes it is divided into millionths, and so we get the microfarad (a millionth of a farad).

### THE FIRST STEP




**Before anything else can happen you have to tune your aerial to the wave-length of the station which you wish to receive. Here is a simple tuning circuit shown both theoretically and in pictorial form.**

The maximum capacity of a variable condenser such as is generally used in an ordinary tuning circuit is ·0005 mfds. (microfarads). A variable condenser labelled thus, (·0005 mfds.) provides you with a variation of capacity from a certain minimum up to that value of ·0005 mfds.

### "Fixed" and Moving.

The minimum capacity will depend upon the construction of the condenser and it is generally about a tenth of the maximum.

You will see that the letters "F" and "M" occur in reference to this condenser. These denote "Fixed" and "Moving" vanes respectively.

Although you do not often see such letters in a theoretical diagram they assume considerable importance when it comes to a wiring diagram. From a theoretical point of view it does not matter a scrap which way the condenser is joined in circuit, but in an actual set it is often very much better to join the moving plates to earth, because these vanes are electrically connected to the metal framework of the condenser and thus provide a kind of shield over the fixed vanes.

(*Continued on the next page.*)

## RADIO IN PICTURES.

(Continued from the previous page.)

By the way, if you find that you are not able to follow closely anything I write here, do not get disheartened, and turn to some other article. I am aiming to get over the few essentials and I think you will absorb these almost without knowing it. At least, I hope so.

We have got our aerial wire going direct to the tuning circuit, and you will notice how the wire is insulated from the mast by means of aerial insulators.

### Tuning the Circuit.

By adjusting the variable condenser we can tune in a station whose wavelength lies within the range covered by our coil and condenser combination. When a station is tuned-in in this manner it develops high-frequency electrical current, which flows round that circuit comprised by the coil and condenser.

High-frequency currents are so called because they flow backwards and forwards at terrific speeds, the actual frequency (that is, the number of times per second they flow first in one direction and then in the other) depends upon the wavelength and can be discovered by dividing the wave-length in metres into 300,000,000.

When you tune in a station of, say, 300 metres, a current flows backwards and forwards one million times per second. This current is of little use to us, owing to its rapidly alternating nature.

### Very Rapid

As you can see, these reversals occurring a terrific number of times per second, from ordinary points of view, almost constitute a wipe-out. The H.F. currents would never work a loud speaker or telephone receivers, because such devices would not be able to respond to them.

A loud speaker might try to start operating while the current was flowing in the one direction, but before it could get going, the H.F. would be off in the other direction, with a completely cancelling effect.

The simplest way to use the H.F. is to employ a simple crystal detector, for a crystal detector allows current to flow through it only in the one direction.

### The Rectifier

Put a crystal detector and a pair of telephone receivers across the variable condenser in our tuning circuit and every time the H.F. goes off in the one direction, a little of it would be able to filter through the phones-detector path. Of course, in the other direction the current would find that path barred to it owing to the "one-way" properties of the crystal detector. (We have said nothing yet about modulation!)

Another way of dealing with this H.F. current is to employ the thermionic valve. So let us leave our aerial circuit with its H.F. energy "oscillating" backwards and forwards in it, and build up some suitable valve apparatus.

Our second illustration shows two new items—a valve and an L.T. battery. In the photograph the valve is stood in a holder, the holder does not appear in the theoretical diagram and there is no reason why it should, for a valve holder is merely a terminal adapter. It provides the terminals for the valve and enables it to be connected to the other parts of a set.

The L.T. battery in this particular instance is an accumulator, although there is no reason why it should not be a special type of Leclanché battery.

### Note the Marking

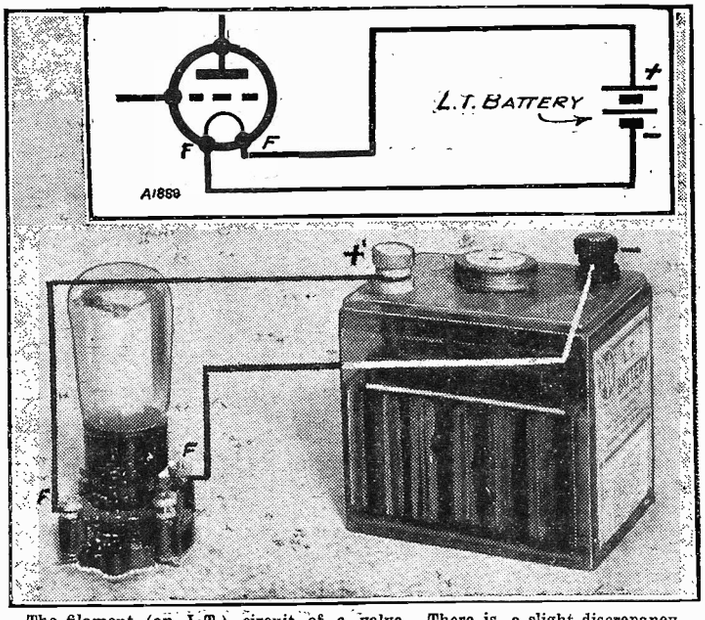
Take careful note of the markings on the accumulator; you will see that there is a + and a — sign and these stand for positive and negative respectively. The positive and negative terminals of batteries represent important points in a circuit, and you must not join a negative where the positive should go, or vice versa.

You will see that the L.T. battery is symbolised by small strokes, two long and two short. A long stroke denotes a positive terminal and a short stroke a negative terminal.

Thus the symbol really indicates two cells—the negative terminal of one cell being connected to the positive terminal of the other cell, the two remaining terminals, denoted by the + and — signs on the diagram, being connected to the circuit.

I have purposely introduced a slight discrepancy between the theoretical diagram and the practical hook-up in the illustration. Can you spot it? I will explain what it is in my next article.

## "LIGHTING" THE VALVE

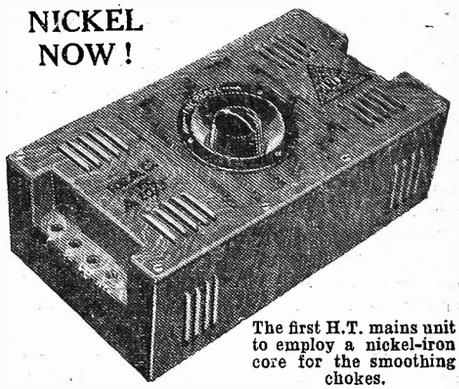



The filament (an L.T.) circuit of a valve. There is a slight discrepancy between the theoretical and pictorial representations. Can you spot it? Don't trouble to write, it will be explained next week.

## H.T. FROM THE MAINS.

FOLLOWING the successful application of nickel iron in the cores of L.F. transformers, comes its application to H.T. mains units.

First in this field of radio research, Radio Instruments, Ltd., have produced two all-insulated H.T. units in which the advantages of compactness, small size, and low weight, conferred by nickel-iron cores, are strikingly demonstrated.




The first H.T. mains unit to employ a nickel-iron core for the smoothing chokes.

They are intended for use with self-contained and most other receivers of up to five valves. The A.C. model, which retails for £4 15s. is for mains with voltages from 200 to 250, and 40 to 100 cycles.

Adequate current and voltage are available from the three output tappings, one of which is marked S.G. +, and gives up to 80 volts for S.G. valves. The detector tapping is variable up to 150 volts, and approximately 3 milliamps can be taken from it.

The "power" H.T. positive terminal gives 140 volts at the 20 milliamps, and as the unit measures only 9 in. × 5 in. × 3 in., there is no doubt that the claim for compactness is amply substantiated.

### Pleasing Appearance

Moreover, there are no projecting plugs to bother about and get in the way, for these have been cunningly recessed so that they are protected when in use. The variable H.T. control knob also is recessed into the body of the instrument.

A particularly pleasing external appearance has been obtained by making the case of handsome bakelite, and when tested on a large four-valve set taking 18 milliamps there was not the slightest trace of hum, motor-boating, or any other of these troubles often associated with mains units supply.

A Westinghouse metal rectifier is incorporated in the A.C. model, and ample ventilation has been arranged for, the whole instrument being quite a triumph of compact efficiency.

The D.C. unit is even smaller than the A.C. model, measuring only 6 in. × 4 in. × 3 in., and although nominally able to give the same output as the A.C. type, the milliamps available are nearer 30 than the 20 claimed by the makers.

Here, again, the voltage of the detector is variable from 0 to 150. The price of the D.C. model is £2 12s. 6d., and upkeep costs are hardly worth considering.

# CAPT. ECKERSLEY'S QUERY CORNER

AERIAL FOR A FLAT-DWELLER—DECOUPLING VALUES—SILENCING A RADIOGRAM MOTOR.

**Under the above title, week by week, Captain P. P. Eckersley, M.I.E.E., late Chief Engineer of the B.C.C., and now our Chief Radio Consultant, comments upon radio queries submitted by "P.W." readers. But don't address your queries to Captain Eckersley—a selection of those received by the Query Department in the ordinary way will be dealt with by him.**

### Aerial for a Flat-Dweller.

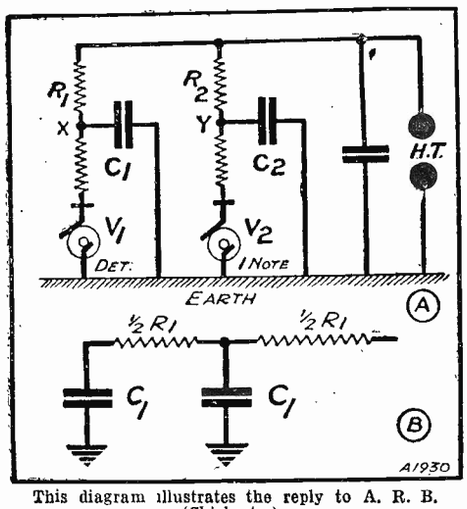
M. A. (Ilford).—"I have been told that the regulations require the metal casing of house lighting wiring to have no greater resistance to earth than two ohms.

"If this is the case, it seems that connecting the earth terminal of a wireless set to this metal casing would provide an excellent earth for flat-dwellers and others to whom the provision of an earth is a problem.

"Would so doing be safe? Or is it similar to earthing to a gas-pipe, which I have been told is unsafe?"

If you earth to the electric conduit of house-wiring, it is true that you are connecting the earth through a low resistance. But suppose you are in a flat, 30 ft. above the earth level, then you will see that you are really connecting your earth to a very effective aerial because the waves get picked up by the casing; and the casing is, from the point of view of high-frequency currents, alive.

## HOW MANY OHMS?




This diagram illustrates the reply to A. R. B. (Chichester).

If you are on the ground floor, you are tied on to a considerable aerial system; but, of course, the path to earth is shorter and you will not, in all probability, get deleterious effects.

As a matter of fact, frequently when I am confronted with this problem I do not use any earth at all, and use the earth conduit of the electric-light wiring as an aerial. So it comes to this that if you are on the ground floor, use an aerial on to the aerial terminal and the earth on to the conduit; that should be quite satisfactory in the majority of cases.

If you are high up in a flat, do not use an earth at all, but put the aerial terminal on to the conduit. If you are in a flat high up, and you connect an indoor aerial to the aerial terminal, and the earth terminal to the conduit, you will find that you get less signals than if you take off the earth, but the best signals if you put the aerial on to the conduit (at least, this has been my experience in two or three cases).

* * *

### Decoupling Values.

A. R. B. (Chichester).—"What determines the value of a de-coupling resistance for the anode circuit of a detector valve, assuming the question of reducing the H.T. voltage is of no importance? I notice the value normally given is 20,000 to 25,000 ohms."

I have drawn the two valves of a low-frequency chain as $V_1$ and $V_2$. Now points X and Y must be at A.C. earth potential, otherwise $V_1$ is going to affect $V_2$ spuriously, and more particularly $V_2$ is going to affect $V_1$.

So if we merely parallel points X and Y by a common condenser, this condenser has to be enormous to be an effective A.C. "short" to earth. So we take resistances and condensers $R_1$ $C_1$ and $R_2$ $C_2$ to make the current from $V_1$ and $V_2$ go straight back to earth.

Thus the impedance of $R_1$ must be much greater than $C_1$, and $R_2$ much greater than $C_2$. At the worst condition (lowest frequency), $C_1$ at 4 mfds. has a resistance of 1,000 ohms, so $R_1$ has to be great compared to 1,000. 25 to 1 is a good ratio, so 25,000 ohms is usually about right. *But*, if it's not, instead of increasing $R_1$ do as shown at B.

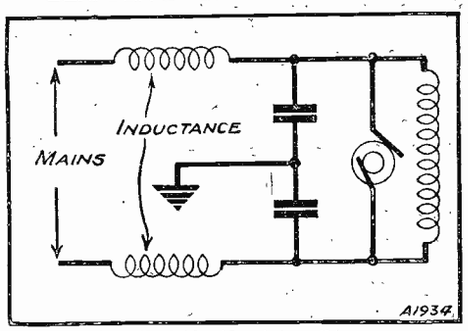
* * *

### Silencing a Radiogram Motor.

R. W. T. (Hackney).—"Is it possible to purchase a D.C. electric motor for driving a gramophone turntable that does not cause trouble by 'sparking' after some few weeks use? Alternatively, assuming such a motor is not available (I have not yet come across one), can you please offer suggestions for definitely overcoming the 'interference' from sparking?"

Well, you know there is quite sparkless clockwork. I am not particularly knowledgeable on the whole subject, but if, as you say, you have not found a D.C. motor which is electrically silent, I should think it was hard to come by one.

## GETTING RID OF HUM

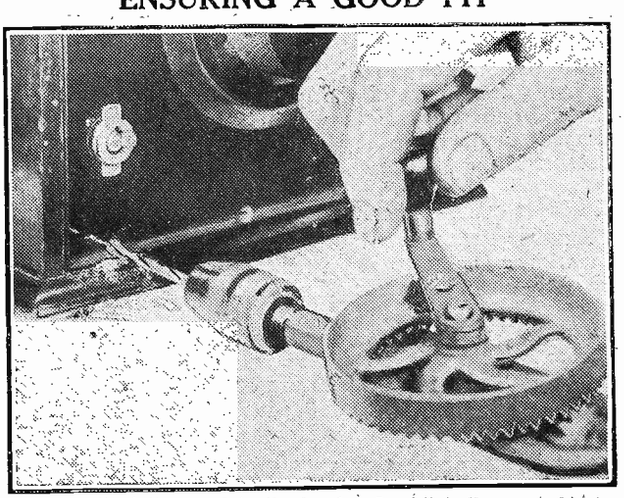



A method of mid-point earthing.

It's so difficult, too, to know if the brushes on a motor initially silent will stay put without endless trouble. Of course, I assume you have tried shunting your D.C. motor by condensers, and been careful to see the motor is not earthed also? And perhaps tried inductance in the way shown?

Really, if I were you, I'd use clockwork.

## ENSURING A GOOD FIT



When fitting the panel to the baseboard put it in the new cabinet before drilling for the fixing screws if you want to make sure of a good fit.

LATEST BROADCASTING NEWS.

## DR. BOULT'S DEBUT.

### SCOTTISH PROGRAMME PLANS—A SOCCER COMMENTARY—"MEDICINE AND THE STATE"—LORD RIDDELL ON CAREERS—ETC., ETC.

DR. ADRIAN BOULT makes his first appearance on the concert platform since his appointment as Music Director of the B.B.C., when he conducts the opening concert of the 1930 season at the Queen's Hall on Wednesday next, October 22nd. This will also be the first opportunity the public will have of seeing the full B.B.C. orchestra of 114 players.

**Scottish Programme Plans.**

Mr. David Cleghorn Thomson, the Regional Director for the B.B.C. in Scotland, is quite convinced that there are occasions when something should be done to make himself and his work known to listeners. The policy of the B.B.C. generally is that programme builders and other high officials of the Corporation should stay rather in the background than push themselves into the limelight.

Although this may be a perfectly sound ruling on most subjects, there are, nevertheless, times and places when a little more of the personal element would help listeners to better appreciate the problems of those who direct the vast machinery of broadcasting.

So Mr. Cleghorn Thomson has decided to tell Scottish listeners all about their forthcoming programmes and his plans for Scottish broadcasting during next year.

The "Aberdeen Press and Journal" has recently published a series of critical articles which have no doubt caused the Scottish Regional Director to think a bit, so that here is an opportunity for him to get a little of his own back. In any case, his talk will no doubt be as interesting as it is unusual.

* * *

**A Soccer Commentary.**

No running commentary on an Association Football Match has been broadcast to London listeners this season, although several have already been included in Scottish programmes.

This fact of itself must therefore accentuate the importance of Mr. George F. Allison's description of the game between Arsenal and West Ham which is to be relayed from Highbury on Saturday, October 25th.

* * *

**"Medicine and the State."**

Another new series of talks of outstanding importance is due to begin next Monday, October 20th, when Sir George Newman will speak on "Medicine and the State."

The series is intended to acquaint the layman with medical subjects under the general heading of "The Future of Medicine," and several of our leading authorities on the science of health will contribute talks, among them being Dr. John Mellenby, Sir Norman Bennett, Professor Russ, Lord Moynihan, Dr. John Freeman, and Sir Humphry Rolleston.

**Lord Riddell on Careers.**

The series of talks dealing with Careers is to be brought very much to the forefront on Tuesday, November 18th, when Lord Riddell speaks on "Salesmanship."

Lord Riddell takes the view that people should not be allowed to drift into a job without proper preparation, and he will show how the adolescent may be trained expertly for skilled employment.

* * *

**"A Sister to Assist 'Er."**

Few items were more popular with music-hall audiences of pre-war days than the humorous sketch by Sydney Fairbrother and the late Fred Emney entitled "A Sister to Assist 'Er," which is to be included in a vaudeville programme for London Regional listeners on Saturday, October 25th.

It will be played by Vernon Watson (in the part in which he succeeded Fred Emney) and Fred Emney's daughter, Doris, in Miss Fairbrother's part.

* * *

**L. du G. Up North.**

Amateur theatrical societies in the North may consider themselves lucky, inasmuch as their members are to have an opportunity of hearing a series of four talks by Mr. L. du Garde Peach on Play Producing.

L. du G., besides being a writer of distinction, has his own little theatre at Great Hucklow in Derbyshire where performances are given by a company of villagers. Mr. Peach is a member of the Council of the British Drama League and his talks should be valuably informative to a wide audience.

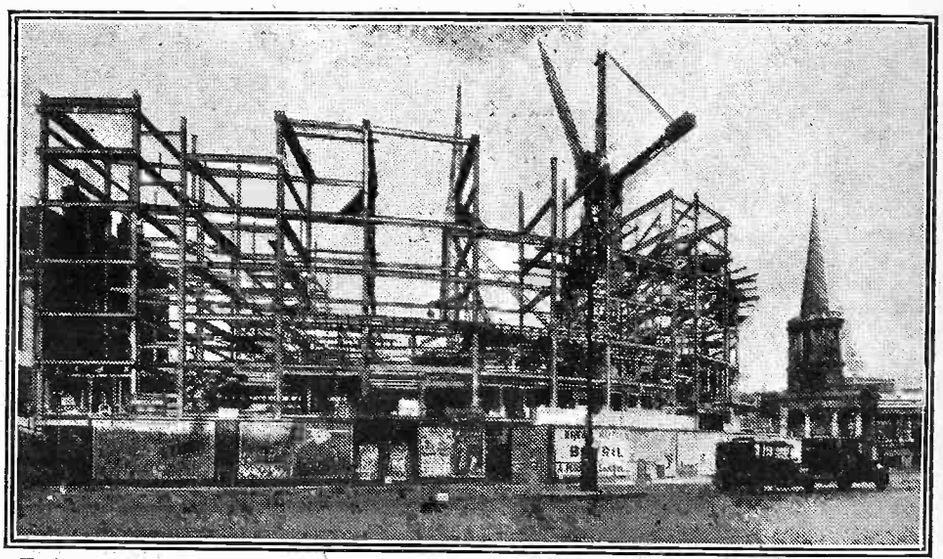
* * *

**Huddersfield Choir.**

Yorkshire is a county of famous choirs, but none has a greater reputation than that of the Huddersfield Choral Union, whose performance of Handel's "Solomon" is to be relayed from the Town Hall, Huddersfield, for North Regional listeners, on Sunday, November 2nd.

This choir, which is under the direction of Sir Henry Coward, is well-known on the Continent. It visited the Hague in 1928 when the Dutch press acclaimed it as the best ever heard in that country.

## NEW LONDON HEADQUARTERS FOR THE B.B.C.



**Having outgrown Savoy Hill, the B.B.C. is building a new headquarters in Portland Place, London, W., and this illustration shows the building in progress.**

TECHNICAL NOTES. By Dr. J. H. T. Roberts, F.Inst.P.

## CHANGING OVER TO THE MAINS

### Re-Wiring the Set—Modern Receiver Design—Background Noise—Dual Purpose Amplifiers.

I AM often asked by readers of these notes whether it is a difficult matter to convert a set which is working on batteries so that it will work direct on the electric light supply.

Of course, any set can be made to derive its H.T. current from the electric light by the very simple process of using an H.T. mains unit. This involves no interference with the set; it merely means substituting the H.T. unit for the H.T. battery.

**Re-Wiring the Set.**

When it comes to the low-tension supply, however, as I mentioned in these notes a week or two back (unless you use a low-tension mains unit, which is not the general practice now) you are under the necessity, for all practical purposes, of changing your valves and substituting the indirectly heated A.C. type.

Inasmuch as there are the usual three electrodes, anode, grid and cathode (I use the word "cathode" as a substitute for "filament" in the ordinary valve) and as, in addition, there are two terminals required for the heating element, it means that there are *five* terminals altogether instead of the usual *four*.

This involves using a five-pin holder, and also, of course, the low-tension heating

(*Continued on page* 309.)

**Pages 278-279 are missing**

# TACKLING TUNING

By P. R. BIRD.

**A helpful article on the operation of different types of receiver, with special reference to the sets described in the Blue Prints given away in last week's "P.W."**

WHEN that new set is finished down to the last screw, when you have connected up aerial and earth, when the loud-speaker leads are on and you have proved that the set sounds all right, does your heart sink a bit when you come to tackle tuning?

The "old hand" never gives a second thought to it. He simply ropes in the stations. But how about the man who has just built or bought a set and does not know how to handle it properly—what is the easy way for him to bring in foreign programmes?

### Invaluable Book.

Obviously "The Key to the Ether"—"P.W.'s" gift book presented with this week's number—is going to be invaluable in such a case. Especially to those who have not an experienced friend at hand to help them with tips on tuning.

But some people will tell you that every set is different from every other set, and the only way to learn to handle it properly is to keep on trying until you get the knack. That is not true.

Although different sets have little peculiarities of their own, all the popular present-day sets fall into two or three different classes, and once you have had experience with any particular class of set you can handle the whole tribe.

Suppose you have just built the "Sharp-Tune" Two, from "P.W." blue print No. 57. What is the right way to handle it?

### One of the Sets.

The "Sharp-Tune" Two belongs to the detector and low-frequency class. That is to say the aerial is fed into the detector's grid circuit, and there is no high-frequency amplifying valve stage in front of the detector, such as has been employed for the "Three-Coil" Three or for the "Maxi-Power" Four (blue prints Nos. 59 and 60 respectively.)

In sets which do not employ an H.F. amplifying stage, the reaction control is very important for long-distance work. As soon as you look at the panel of the "Sharp-Tune" Two you see that the tuning condenser is the big one in the middle, and you know that turning this alters the wavelength to which the set is tuned. To the left of it are two other condensers, the upper one being the aforesaid reaction control, and the lower one ($C_3$) a selectivity control.

### Selectivity Control.

The chief function of $C_3$ is to prevent your aerial being "overpowered" by the local station. As you know, a big aerial erected very close to a powerful broadcasting station cannot pick up many foreigners because the strong local signals monopolise it.

Proper adjustment of $C_3$ will have the same selectivity-increasing effect as shortening your aerial, so that a point can be reached where the local station is not too troublesome, and yet it is still possible to receive the foreigners, though not quite so strongly as before.

If you adjust $C_3$ "all in" you get maximum power from the foreigners, but too much maximum power from the "local." Correct adjustment of $C_3$ reduces foreign stations slightly, but nevertheless you will hear them far better because the new $C_3$ adjustment has "narrowed down" the local station so that it does not interfere with the foreigners.

So you see there is nothing to worry about in the selectivity adjustment. In practice $C_3$ does not need constant readjustment, but when the set is first installed it has to be adjusted to bring the powerful local station's programme within a reasonable margin on the dial.

If your local station is within a few miles you will need $C_3$ set towards its all-out position, and you should use a *small* coil in $L_1$. At greater distances the larger coil may be used and the $C_3$ capacity increased, as recommended in the blue print.

### Reaction Control.

Once the degree of selectivity required has been adjusted by $C_3$, this condenser can be considered as finished with, and the handling of the set resolves itself into the correct operation of $C_1$ and $C_2$ (tuning and reaction). You will find all about how to handle reaction and tuning in "The Key To The Ether" which "P.W." is giving away this week.

Read it carefully and then take the trouble to have half an hour's practice in oscillation-control, etc., at some time when the local station is not working, training yourself to keep the set sensitive, but not oscillating as you alter the tuning. Once you have mastered this you can handle the "Sharp-Tune" Two or any other detector-L.F. set in a way that will seem amazing.

Worked in this way the "Sharp-Tune" Two will probably give you a dozen stations on the ordinary broadcasting allowed in any one evening without the slightest difficulty, and it will be surprising if some readers do not tune in thirty, forty or even more stations in one evening!

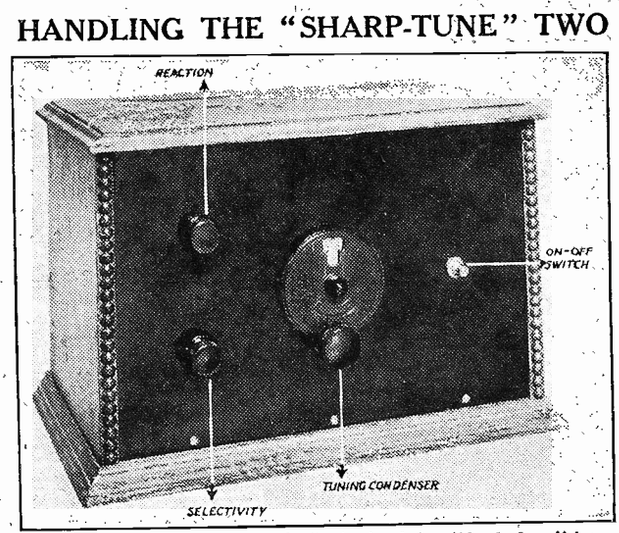
### Two Important Dials.

Turning to blue print No. 58, The "Easy-Change" Three, we find that this also is a detector and L.F. set. True, it has *two* low-frequency stages, instead of one. But this does not affect the main point mentioned before—namely the absence of the high-frequency amplifying valve between the aerial and the detector.

So in this set, as in the "Sharp-Tune" Two, the two really important dials are the tuning dial ($C_1$), and the reaction condenser control ($C_2$). When you can handle these two in unison, as explained in "The Key To The Ether," following up the tuning and the reaction and keeping the set sensitive all the time without oscillating,

*(Continued on next page.)*

## HANDLING THE "SHARP-TUNE" TWO




**This is a very easy set to handle, the tuning being "backed up" by reaction when necessary, and the selectivity control left alone after it has once been set to cope with the conditions prevailing.**

## TACKLING TUNING.

*(Continued from previous page.)*

you can be sure of a steady stream of foreign stations pouring out their programmes from the loud speaker.

And, of course, they will be really loud, for here you have detector, two low-frequency amplifying stages (R.C.C. unit and L.F. transformer) giving much greater power than a two-valve set can possibly provide.

Remembering how important reaction is for long distance work with all detector-L.F. sets, you will appreciate the fact that to get good long-distance results you must set the $L_3$ socket properly on the baseboard if you are going to get plenty of foreign programmes. It is very easy provided you follow the blue print instructions.

### Coil Adjustments

If you line up the three coils close together you will probably find that although reaction is "beautiful" on long waves—coming up stronger and stronger as you move away from zero to more and more capacity on the reaction condenser, and giving you plenty of oscillation when full in—the medium waves do not, at first, give such good control.

You may find that even when the reaction condenser is turned right off, the set still oscillates, or has too much reaction and is too near the oscillation point. So swing the coil holder round on its screw, getting it further and further away from $L_1$, until it gives just as good reaction control on the medium waves as on long, and then you can screw it securely to the baseboard.

Do not forget that in order to obtain this desirable state of affairs it may be necessary to readjust the wander plug which goes from H.T. + 1 terminal on the battery, and that different sizes of coil for $L_1$ will have a marked effect on reaction results, the larger size giving stronger reaction than the smaller.

Here is another tip about the tuning of this particular set that will interest you if you have built it, or intend to do so. On the blue print it states that for medium waves the panel plug goes into No. 1 socket, and for long waves in No. 2.

### Unusual Effect

The change-over of the flex on the panel and alteration of $L_2$ is simple enough, to be sure, but you may find that for 5 X X it is not even necessary to do this. In some localities 5 X X will come in strongly if you open $S_2$ but leave the aerial on the No. 1 terminal and simply retune on the main tuning condenser ($C_1$)!

If you get good reception of 5 X X in this way there is no objection to doing it, but much will depend upon local conditions, so you may find it necessary to do as explained on the blue print when changing over from short to long waves. It is just a matter of aerial distance, and luck, etc.

Now we come to the other main class of receivers, namely, those in which a high-frequency valve *is* employed. Both the "Three-Coil" Three and the "Maxi-Power" Four use an S.G. high-frequency valve, and with these, as with the older-fashioned neutralised stages, the reaction control has to "take a back seat."

### Keep in Step

It still plays a big part in programme-getting, of course, but with all high-frequency receivers, the great thing is not so much to keep aerial and reaction in close co-operation with each other, as to *keep the aerial and the high-frequency tuning "in step."* It is absolutely vital that you do this for if you do not, you might as well throw your high-frequency valve away.

Just to make it perfectly clear, let us suppose you have the "Three-Coil" Three in action. There are two tuning dials $C_1$ and $C_2$, and one reaction dial, $C_3$. *The latter is now comparatively unimportant.*

With this receiver, with the "Maxi-Power" Four, or with any other receiver employing an H.F. stage, you must keep the two *tuning* dials in step, even if you have to neglect reaction. And keeping the two tuning dials in step is quite an easy matter if you will only give your mind to it.

Once you have mastered it you will find it is so easy that you wonder however anyone could light-heartedly just twiddle knobs about, and listen for stations. But unless you knew the trick you might twiddle the dials for hours without getting much from the set, so be sure that you understand the following hints upon how to keep two tuning dials in step.

The underlying idea is simplicity itself. The first condenser (in this case $C_1$) is tuned to receive a certain wave-length or station. These signals are to be amplified by the H.F. valve, and passed on to the next stage, which consists of the condenser $C_2$ and the condenser coil $L_2$.

Now if this second coil and condenser ($L_2$–$C_2$) are tuned to exactly the same wave-length as the other coil and condenser ($L_1$–$C_1$) the foreign station signals go straight through from aerial and land on the detector dial with a bang! All other signals are excluded because the circuits are out of tune with them.

But if $L_2$ and $C_2$ combination are *out of step* with the $L_1$ and $C_1$ combination, nothing happens except perhaps the owner's sighs and lamentations. For if the $C_1$ adjustment is bringing in one station and the $C_2$ adjustment is bringing in a different station, the net result is not worth listening to.

They *must* be set to receive the same wave-length. They must be "in step."

This does not necessarily mean that when one dial is reading ten degrees the other must also read ten exactly, or when one is reading twenty-six the other must also read twenty-six. True, that would be the ideal plan, but unfortunately coil sizes, etc., vary, and it is impossible except in a set made under stringent factory conditions.

Even in such a set the tuning gets a little "out" usually, as wave-lengths are altered. But there is no need for you to put up with wrong tuning, for you can easily tell exactly when the circuits are in tune.

### The Best Method

Here is the way to do it. Prop the loud speaker up close to your ear, and choose a quiet moment when every sound from it can be heard distinctly. It must be quiet in the ether, too, so a Sunday morning is ideal.

What you have to do first is to listen to the effect of tuning. So turn your first tuning dial, $C_1$, somewhere near the middle of its travel, say about 80° and clear of any signals, turn the reaction to zero, and then bring your H.F. tuning dial $C_2$ slowly round from zero to maximum.

Listen *intently* as you do this, for although no station may be sending, the set will probably, just in one place, sound suddenly "alive" and perky. With $C_1$ set to, say, 80° you will find that there is just one position of $C_2$—it might be 83°, or perhaps 79°—where the loud speaker sounds lively.

### The "Lively" Position

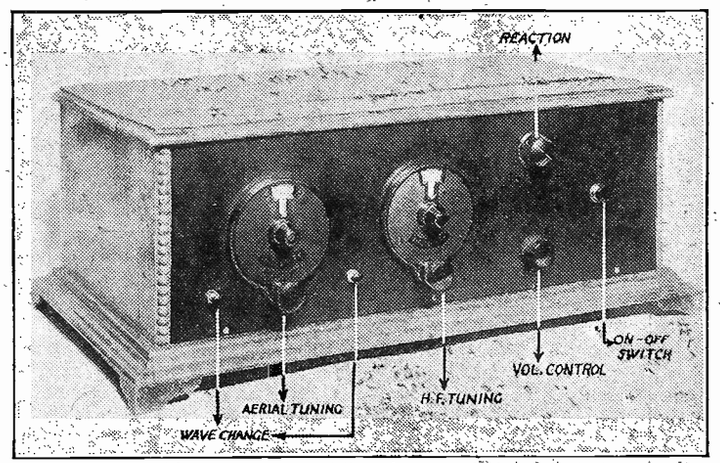
Make a note of the two readings on a piece of paper, and then turn the $C_1$ dial round towards the bottom of the scale, say 20°, and find a corresponding "lively" position on H.F. dial for *that* reading. It may be exactly 20°, or it may be a little more or less, but it will be somewhere near that, so make a note of that reading, too.

Finally go up to the top of the $C_1$ dial (somewhere about 90 on a 100 dial, or 160 on a 180 dial), and see if you can get the same result up there. There should, of course, be no real oscillation, but if you listen carefully you will soon tell when the circuits are exactly in tune because of the tiny little noises that always occur then.

But let us suppose that you cannot be sure when the set is "in tune," because really it seems to make very little difference. This is where reaction comes in!

You advance the reaction condenser a few degrees, taking care not to make the set oscillate, and then try bringing the H.F. dial into step with the other dial again. With a *little* reaction you will soon find quite unmistakable signs of extra liveliness when the two circuits come exactly into step.

## THE KEY TO THE CONTROLS OF THE "MAXI-POWER"




**Plenty of control is afforded, and yet there is no confusing complexity on the panel. The main thing when searching with a set of this type is to keep the two tuning dials "in step." All the other controls are subsidiary.**

**Pages 284-285 are missing**

# The "Three

**Here are some interesting general details (intended to supplement the fu of the finest "threes" ever designed. It is a set which gives you real sim and adjustment, yet the**

**DESIGNED AND DESCRIBED BY TE**

SIMPLICITY is a term which can mean much or little when applied to a wireless set. It may only mean that the designer hasn't taken the trouble to include any of those little refinements we all like, and that is just what most people suspect it does mean when used as a description of the main feature of a set.

Then, again, there is the kind of simplicity which is the result of the designer having taken not less but much more trouble than usual over his work. In these cases he has spent lots of time and care in obtaining the results he wants from really simple means rather than the usual more complicated ones.

Instead of taking the easy way in getting his effect by elaboration he has done it by dint of perseverance and ingenuity with quite simple schemes.

### Points About the Design.

That kind of simplicity is worth having, for it means that you get the sort of performance you want at a lower expenditure of cash and work in building, and with less trouble in operating the set. This is the only kind of simplicity which we tolerate in "P.W."

Looking back over the last year or two we cannot remember any set which was quite such a good example of this worth-while kind of simplification as the "Three Coil" Three which we are just going to describe. It is a really outstanding bit of work.

Just look at the photos. Isn't it obviously one of the simplest possible "threes" of the H.F., detector, and L.F. type? Yet just consider what it is and does: it is a highly sensitive long-range receiver, it gives you *real* selectivity, it is beautifully easy and pleasant to operate, and it has those desirable refinements of differential reaction, efficient volume control, adjustable selectivity, and so on, which make such a difference to a set.

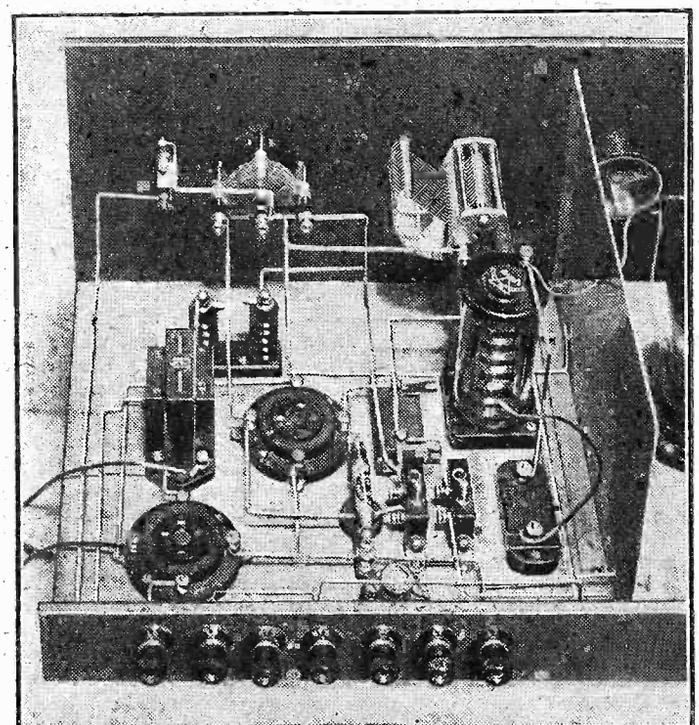
### Simplicity, Economy and Performance.

To get all this and yet maintain such wonderful simplicity and economy in first cost (note the use of entirely standard components, many of which you will have) meant a lot of hard work and scheming. As a matter of fact, we probably spent more time over the design than any of the others in this year's batch of blue print sets, with the possible exception of the "Maxi-Power" Four.

Of course, similar efforts in the direction of what we may call rational simplification were made in all four of these receivers, but it was in this one that the greatest difficulty was met. It is almost always in the H.F., detector, and L.F. type of three-valver that the temptation to elaboration is greatest, and it is just here that it should be most carefully resisted. This is, above all sets, the average man's ideal of a general-purpose receiver.

We feel sure that even the most casual glance at the photographs will convince you that we are justified in our claim to have succeeded in giving the set real simplicity of the best sort. We are even more sure that if you build the set you will soon confirm also our claim that we have at the same time achieved a most exceptionally fine performance.

## RESULTS GUARANTEED



Really neat and simple wiring is only possible when the layout is a good one, and it is one of the best possible guarantees of efficient performance.

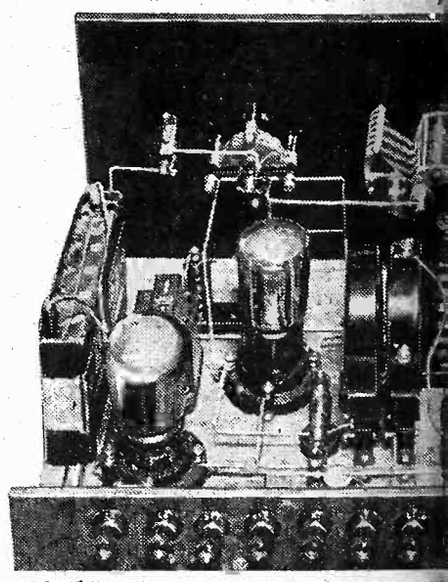
We have the utmost confidence that you will, because the original set gave extraordinarily good results, and the circuit is one which can be guaranteed to give the same performance every time it is made up.

### Absolute Reliability.

It is one of the most reliable of all types of circuits, and it is delightfully free from any kind of preliminary adjustment calling for any degree of skill on the part of the user to ensure proper results. All you have to do is to make a reasonably good copy, refrain from taking any serious liberties, use good parts and accessories (especially the valves and coils), and the result is as near to a certainty as anything can be in radio.

This is a set which you can confidently expect to bring you in a real string of foreign stations any night after dark so long as

## PLENTY OF PUNCH,



Selectivity without other qualities is useless, but addition to wonderful

### HERE ARE THE PARTS THAT YOU WIL

1 Panel, 18 in. × 7 in. (Lissen, or Paxolin, Goltone, etc.).
1 Cabinet to fit, with baseboard, 9-in. deep (Cameo, or Pickett, etc.).
2 ·0005-mfd. variable condensers (Ready Radio, or Lotus, Lissen, J.B., Ormond, Igranic, Dubilier, Formo, etc.).
2 Slow-motion dials, if condensers not of slow-motion type (Lissen, or Igranic, J.B., Ready Radio, Ormond, etc.).
1 Filament rheostat (Gecophone or Igranic, Lissen, Wearite, etc.).
1 ·0001-, ·00013-, or ·00015-mfd. differential reaction condenser (Ormond, or Lissen, Dubilier, Lotus, J.B., Igranic, Polar, Rea
1 Filament switch (t Ready Radio, Benja
3 Sprung type valve Lissen, Bulgin, Tels
3 Single coil holders ( etc.).
1 ·01-mfd. fixed cond Dubilier, Ferranti,
1 ·001-mfd. (max.) co or Lissen, Lewcos,
2 H.F. chokes (Vark Lissen, Telsen, Lotu Magnum, etc.).

# -Coil" Three

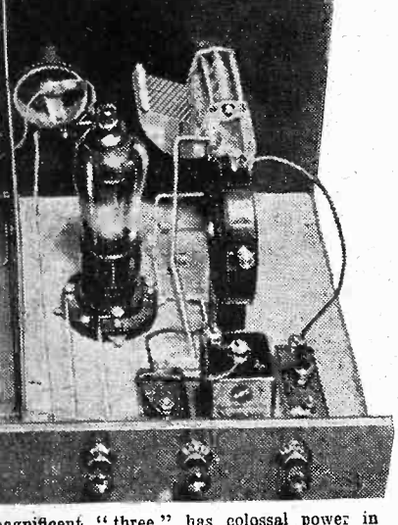
**ical instructions on last week's blue print sheet) for building one of the best sort; easy and economical construction, simple tuning possible results.**

**.W." RESEARCH DEPARTMENT.**

you can give it anything like a decent aerial. Once you have got the hang of the dials it should bring them rolling in one after another.

On the long waves it should even do it in daylight, and give you programmes from, at any rate, Hilversum, Kalundborg, Eiffel Tower, and Huizen. We must be careful not to mislead you, though; we are assuming an outdoor aerial of just reasonable efficiency. Neither this nor any other normal "three" can be expected to do a great deal on the foreigners on an indoor aerial.

## VER AND PURITY



agnificent "three" has colossal power in d high selectivity.

### Extra Power.

On such an aerial you really want at least a "four" to get the foreign stations really well and reliably. A good deal, of course, can be done by using a pentode instead of an ordinary power or super-power valve for V3 in the present set, and this is worth remembering. Such an "output" valve will bring it up somewhere near to the level of a four-valver.

The blue print gives you all the practical information you really need to build the set.

There remain, however, quite a few general matters to tell you about. For example, there is the question of wave-change switching.

Here the reader may be inclined to wonder whether we have not taken our simplification too far, and sacrificed something worth having. Well, granted that the set is not one having wave-change switching, just consider whether what you gain by its absence is not in some cases a sufficient compensation for the lack of this convenience.

### Only Three To Change.

The point is that wave-change switching inevitably puts up the cost of a set, and means, at any rate, a slight increase in the constructional work involved. Note that the present instrument uses entirely standard plug-in coils, which most people already have, and you will realise how much the cost has come down as a result of our decision to make it non-wave-change.

Naturally, the set will not suit everybody, and some will feel that they would prefer to face the expense and extra work involved in one possessing wave-change switching. All the same, we felt that very many would appreciate a set in which economy and simplicity had been taken to even this length.

Non-wave-change it is, then, but part of our simplifying effort was directed to reducing as far as possible the inconvenience of coil-changing on going over to long waves. Accordingly we took pains to limit the number of coils requiring to be replaced, and you will see that we have got it down to only three.

A look over the circuit diagram will show you how we have done it. Really, it is a matter of the judicious employment of the ever-useful "X" coils.

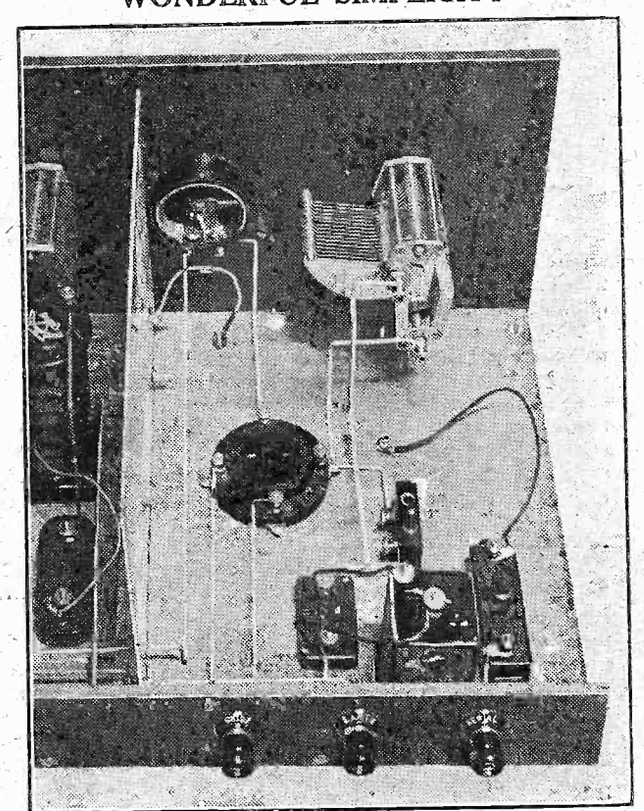
### The Final Flex-Lead Adjustments.

These are used in both tuned circuits. In the first place, one provides the tuned grid circuit of the H.F. valve and at the same time takes care of the aerial coupling arrangements. The second forms the detector tuned grid circuit, with the "X" portion of the coil giving us our intervalve coupling.

Now, just a point or two about the selectivity adjustments, and then we have finished. First, there are the flex-leads to the tapping points on the "X" coils. In general you will find it best to put the one for the second coil ($L_2$) on the point which gives the best volume, and get your control by means of the one to $L_1$.

The compression-type condenser in the aerial lead is meant entirely as a supplementary control. Keep it at maximum (knob screwed right down) if you can, and only reduce it if you must.

## WONDERFUL SIMPLICITY



Here is the H.F. end of the set, and the first thing you will notice is there is hardly anything to be seen! That's just another proof of the care and ingenuity expended on the design, for simple as it is the results are wonderful.

**ED TO BUILD THE "THREE-COIL" THREE.**

**lo, Wearite, Magnum, etc.).**
**or Igranic, Lissen, Bulgin, Lotus, Red Diamond, etc.).**
**(Lotus, or Igranic, W.B., hit, Magnum, Wearite, etc.).**
**or Lissen, Igranic, Bulgin,**
**(T.C.C., or Mullard, Lissen, n, Goltone, Igranic, etc.).**
**ion-type condenser (Formo, R.I., etc.).**
**Watmel, or Lewcos, R.I., ilier, Ready Radio, Wearite,**

**1 ·001-mfd. fixed condenser (Dubilier, or Lissen, Ediswan, T.C.C., Mullard, Ferranti, etc.).**
**1 ·0003-mfd. fixed condenser (Graham-Farish, or Lissen, etc.).**
**1 2-meg. grid leak and holder (Graham-Farish, or Lissen, Igranic, Dubilier, Ediswan, Mullard, etc.).**
**1 L.F. Transformer (R.I., or Ferranti, Lissen, Varley, Igranic, Telsen, Lotus, Lewcos, Mullard, etc.).**
**1 Fuse (Magnum, or Bulgin, etc.).**
**1 Standard "P.W." screen, 10 in. × 6 in. (Wearite, or Paroussi, Ready Radio, Magnum, etc.).**
**1 Terminal strip, 18 in. × 2 in.**
**10 Terminals (Igranic, or Belling & Lee, Eelex, etc.).**
**Screws, wire, flex, etc.**

# RADIO—EAST AND WEST

By OUR AMERICAN CORRESPONDENT.

**Having been present at the opening of the London Radio Exhibition, our correspondent immediately left for New York, where he was able to attend the Radio World's Fair at Madison Square Garden. Below he contributes exclusively for "P.W." an impartial comparison between the two shows.**

AS the "Aquitania" steamed out of Southampton, bound for New York, it occurred to me that I perhaps would shortly be the only person who had actually been present at both the London and New York Radio shows.

Although the shows ended concurrently, the London one opened three days ahead of the New York counterpart, otherwise it would not have been possible by present methods of transport to reach New York in time to be at Madison Square Garden, before the show closed on September 27th.

As it was, however, we steamed into New York Harbour with a good few hours in hand, and I was able to view in comfort the exhibits at the Radio World's Fair (as my compatriots prefer to call it !).

### Plenty of Portables.

I was asked after I had visited Olympia what struck me most about the British exhibition. My reply was: "The overwhelming popularity of portable radios." In New York there never was a vogue for portable sets, and to find every firm in England manufacturing one sure is strange.

In America we are now perhaps nearer than we ever were to the portable set, for automobile manufacturers are incorporating compact, yet powerful, receivers on the dashboard. At first this was a luxury, but it was soon taken up, and at the show in New York there were to be seen many components specially designed for automobile radios.

Among these are several patterns in midget dynamic speakers which are quoted as being equal to their parents in quality of reproduction.

An interesting outcome of the demand for automobile radios is the resultant entry into the ordinary radio set manufacturing field of General Motors, who supply a most efficient line of multi-valve receivers.

They guarantee that if future developments call for the redesign of their receivers, such receivers will be built upon a standard chassis already incorporated, thus it will not be necessary to discard an expensive cabinet which perhaps harmonises with its surroundings, and may even have been chosen for this reason.

### Artistic Sets.

It was disappointing to find so much "junk" at the Wireless Exhibition in London, but presumably this is to cater for a large community who are able to afford a very small minimum for their radios.

In New York we do not have nearly so many of these extremely cheap outfits, the most popular type of radio being the artistic upright cabinet containing a multi-valve radio of six to ten valves.

For this type of receiver the price is perhaps lower than in England, a Brunswick Panatrope radio-gramophone, for example, costing but $185·00 (£37), or an ordinary carved walnut upright cabinet affair, $139·50. These are average prices, which can be exceeded or undercut.

### Better Cabinet Work.

Cabinet work, although perhaps hybrid in character, has reached a much higher level in New York than in London, in so far as the radio industry concerns itself, and I must admit that probably the best-looking receiver housings at Olympia were those of a firm which originated in America.

I am told that the necessity for selectivity in receiver design is just as acute in Europe as in America, yet there were very few so-called armoured, or all-metal, chassis to be seen. Why is this ? Their usefulness has been proved by American manufacturers, yet your people do not seem to have "cottoned-on" nearly so quickly as they might have done.

A general survey of the New York show denotes it to be an exhibition of refinements. There are no radical developments, but rather a general tendency to perfect and elaborate upon existing and tried circuits.

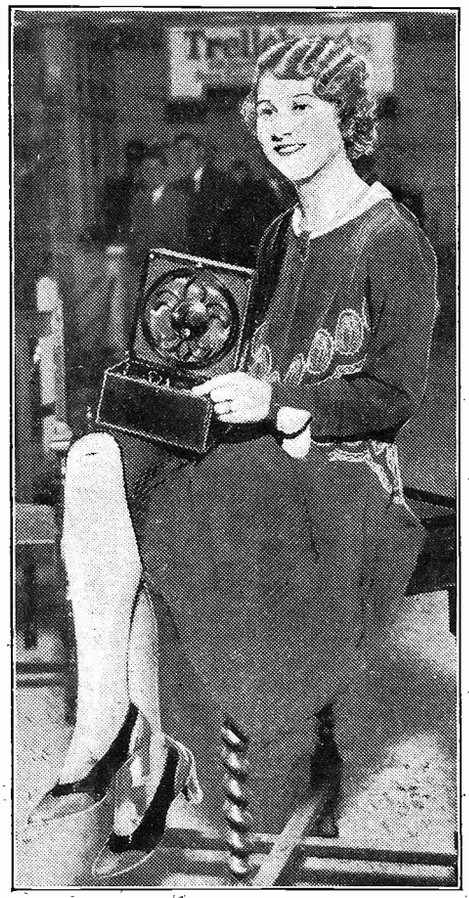
The super-heterodyne seems to be in its element once again; there is universal adoption of the screened-grid valve; there are so-called "fading eliminators," whose function is to control volume automatically so as to render fading unnoticeable; the midget set, calculated to simplify the selling of two or three radios to a family, makes its bow; the A.C. tube appears in a more perfected pattern.

The development of screened-grid tube receivers has come on with leaps and bounds, their inclusion in ten-tube super-heterodynes being common practise. Incidentally, it is to you Britishers that credit must be given for the popularising of the screened-grid valve, for I, personally, remember receiving my first valve of this pattern from London before they were on the market in New York.

The pentode is still on probation over here, and whether it will be universally adopted remains to be seen.

There were the usual novelties at the New York show, such, for example, as the Wurlitzer radio, which embodies a time-clock device for automatic tuning. The receiver may be set in the morning to switch itself on and off for any number of desired programmes, and it will be found to accomplish its duties in most worthy style.

## VERY NEAT!



**The smallest two-valve portable seen at the National Radio Exhibition. Including the loud speaker, it is only eight inches square.**

### Talkie Demonstrations.

For those interested (and this included the majority of persons present) a demonstration of talkie film producing was given, an attraction which might very well have been presented at Olympia.

As it was, all I saw among the British exhibits which bore witness to the existence to this closely allied business was a talkie film projector which attracted considerable interest.

The arrangements at Olympia I found worthy of commendation, the demonstration salons being sufficient to excite the envy of any American exhibitor.

Gadgets for making one's own records, electrically recorded, have appeared in New York as well as London. Their main purpose, it appears, is to make permanent the broadcast of a favourite artist as it is received over the air. The first question that arises in my mind is, what will the artists say to this new form of competition to the legitimate record business, which is going to affect their royalties ?

In summing up, the London and New York exhibitions may be compared as follows: Whereas the New York show devoted most of its space to the exhibition of completed multi-valve sets in elaborate cabinets and rarely of less than six valves apiece, the London Show catered for a leaner purse, and as adequately to the home constructor as to the fan interested solely in the purchase of a completed set.

### High Standards.

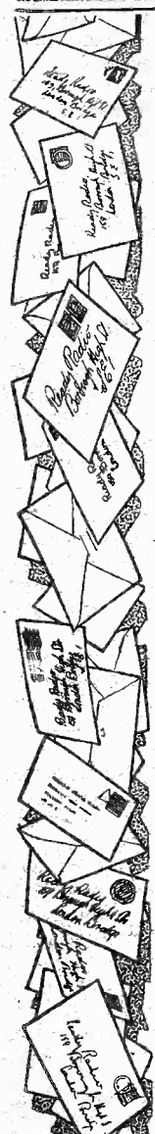
Cabinet work on the whole was definitely better at the New York show and, for the elaborated type of receiver, the prices lower.

Bearing in mind, however, that America entered the field of radio construction for home use some time before Britain, the difference between the standards of the manufacturers of both countries is surprisingly little. I shall look forward to a flying visit to London again next fall.

# TROUBLE-FREE SET BUILDING

## USE READY RADIO APPROVED NON-SOLDERING KITS ONLY

# USE "JIFFILINKS" FOR WIRING-UP



## "THREE-COIL" THREE

| | £ | s. | d. |
|---|---|---|---|
| 1 Drilled ebonite panel, 18 × 7 ins. | | 6 | 0 |
| 1 Hand-polished oak cabinet with 10-in. baseboard | 1 | 10 | 0 |
| 2 ReadiRad ·0005 variable condensers | | 9 | 0 |
| 2 ReadiRad duograph slow motion dials | | 13 | 0 |
| 1 ReadiRad differential condenser, ·00015 | | 5 | 0 |
| 1 ReadiRad on-off switch | | | 10 |
| 1 ReadiRad filament rheostat | | 2 | 0 |
| 3 Benjamin Vibrolders | | 4 | 6 |
| 3 ReadiRad single coil holders | | 2 | 6 |
| 1 Formodensor type G | | 1 | 6 |
| 1 T.C.C. ·01 fixed condenser | | 3 | 0 |
| 1 ReadiRad ·001 fixed condenser | | | 10 |
| 1 ReadiRad ·0003 fixed condenser | | | 10 |
| 1 Varley H.F. choke | | 9 | 6 |
| 1 ReadiRad "Hilo" H.F. choke | | 4 | 6 |
| 1 ReadiRad 2-meg. grid leak and holder | | 1 | 4 |
| 1 R.I. Hypermu L.F. transformer | 1 | 1 | 0 |
| 1 ReadiRad H.T. fuse and holder | | 1 | 3 |
| 1 ReadiRad Standard screen | | 2 | 0 |
| 1 Drilled terminal strip, 18 × 2 ins. | | 2 | 0 |
| 10 Engraved Belling Lee terminals | | 2 | 6 |
| 2 Lewcos coils, No. 60X. | | 9 | 6 |
| 1 Lewcos coil, No. 50 C.T. | | 3 | 6 |
| 2 Lewcos coils, No. 250X | | 13 | 0 |
| 1 Lewcos coil No. 100 C.T. | | 4 | 6 |
| 3 Valves as specified | 1 | 19 | 0 |
| 1 Set ReadiRad Jiffilinx | | 2 | 6 |
| Screws, plugs, etc. | | 1 | 5 |
| TOTAL (including valves and cabinet) | £9 | 16 | 0 |

## "SHARP-TUNE" TWO

| | £ | s. | d. |
|---|---|---|---|
| 1 Drilled ebonite panel, 12 × 8 ins. | | 6 | 0 |
| 1 Hand polished oak cabinet with 7-in. baseboard | | 19 | 0 |
| 1 ReadiRad ·00015 differential condenser | | 5 | 0 |
| 1 ReadiRad ·0005 Brookmans condenser | | 3 | 6 |
| 1 ReadiRad duograph slow motion dial | | 6 | 6 |
| 1 ReadiRad ·0005 variable condenser | | 4 | 6 |
| 1 ReadiRad on-off switch | | | 10 |
| 1 ReadiRad "Hilo" H.F. choke | | 4 | 6 |
| 1 ReadiRad 2-meg. grid leak and holder | | 1 | 4 |
| 3 ReadiRad single coil holders | | 2 | 6 |
| 2 Benjamin Vibrolders | | 3 | 0 |
| 1 ReadiRad ·0003 fixed condenser | | | 10 |
| 1 Lissen super L.F. transformer | | 19 | 0 |
| 1 Drilled terminal strip, 12 × 2 ins. | | 1 | 6 |
| 9 Engraved Belling Lee terminals | | 2 | 3 |
| 1 Set ReadiRad Jiffilinx | | 2 | 6 |
| 1 Lewcos coil, No. 40 | | 3 | 6 |
| 1 Lewcos coil, No. 60 | | 3 | 6 |
| 1 Lewcos coil, No. 50 | | 3 | 6 |
| 1 Lewcos coil, No. 100 | | 4 | 6 |
| 1 Lewcos coil, No. 250 | | 4 | 6 |
| 1 Lewcos coil, No. 150 | | 4 | 6 |
| 2 Valves as specified | | 19 | 0 |
| Screws, flex, plugs, etc. | | 1 | 3 |
| TOTAL (including valves and cabinet) | £6 | 7 | 0 |

ANY OF THE ABOVE COMPONENTS CAN BE SUPPLIED SEPARATELY IF DESIRED.

**KIT A** less valves and cabinet .. .. **£6:7:6**
or 12 equal monthly payments of 11/9.

**KIT B** with valves less cabinet .. .. **£8:6:6**
or 12 equal monthly payments of 15/8.

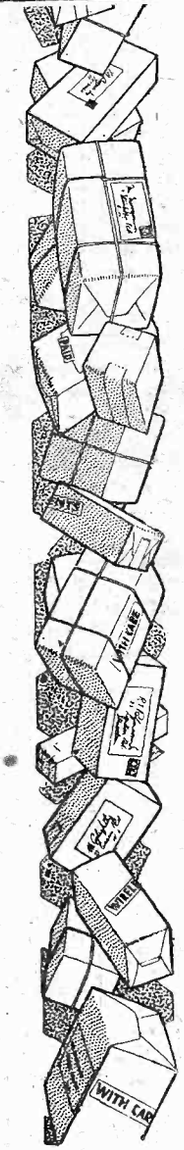
**KIT C** with valves and cabinet .. .. **£9:16:6**
or 12 equal monthly payments of 18/-.

**KIT A** less valves and cabinet .. .. **£4:9:0**
or 12 equal monthly payments of 8/3.

**KIT B** with valves less cabinet .. .. **£5:8:0**
or 12 equal monthly payments of 10/-.

**KIT C** with valves and cabinet .. .. **£6:7:0**
or 12 equal monthly payments of 11/9.

## OFFICIAL BLUE PRINT SUPPLIED FREE WITH ALL KITS



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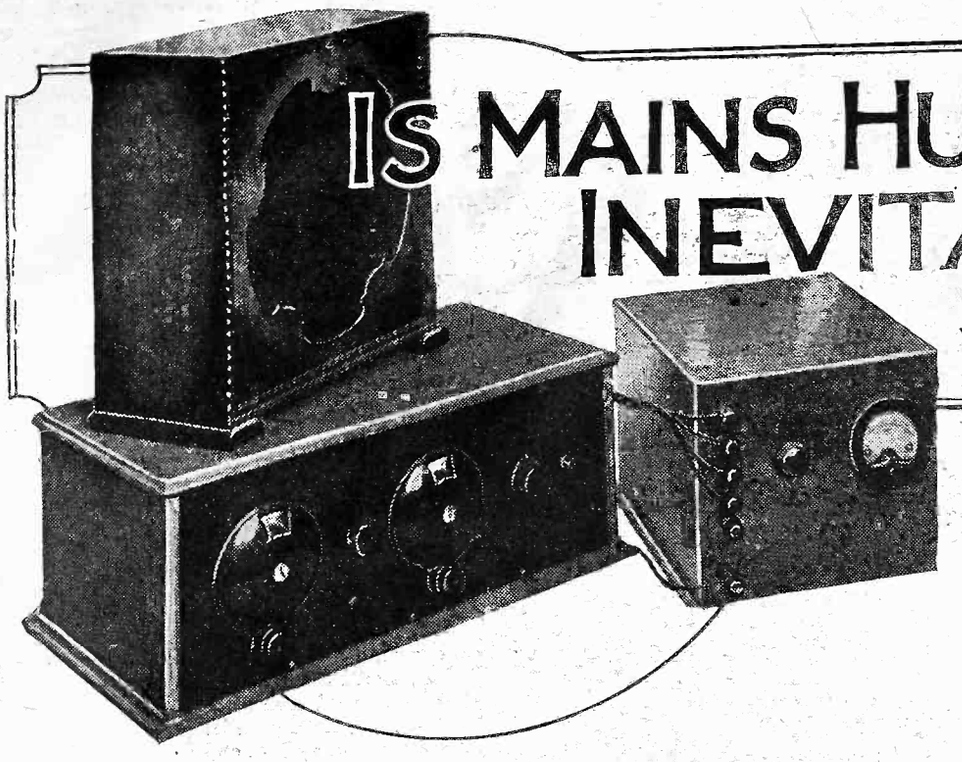


# IS MAINS HUMMING INEVITABLE?

by VICTOR KING

**Even if it is not, must a degree of hum be tolerated in circumstances where economy is essential? And if so, can we lay down a scale of hum percentages? This challenging article, by one of the world's most eminent set designers, raises and answers many such vital queries in relation to radio power from the mains.**

SOME of you may consider that such a question is entirely unnecessary. But I assure you that that is far from being the case. Within recent weeks I have had the opportunity of examining quite a few mains sets in operation in various districts. Some of these are commercial and some home-made receivers.

In very few instances were there silent "backgrounds." For the most part the "humming" was quite distressingly prominent. That is, at least, to me. Curiously enough, the ears of the owners of these sets seemed to have become rather "blunted" to the persistent interference. When I referred to the noise, "Yes, but you do not notice it much when the music is on," was the kind of reply I received.

### It Can Be Eliminated

But if I now make the statement that with practically any public power supply both L.T. and H.T. can be obtained sufficiently free from ripple not to cause hum I do not want you to think that the question raised by the title of this article has been answered. It hasn't.

If modern valves are used properly, a string of even three will give considerable amplification. The smoothing necessary to silence mains hum is a somewhat costly business in comparison with the components used in the set.

And here we arrive at the crux of the matter. And that is bound up in another reading of this article's title: should a degree of mains hum be tolerated on the grounds of apparatus economy? and if so, how much?

### Hum is a Fault

Pursuing the points further, should any hum at all, even though it is barely audible, be permitted?

I feel it would be impertinent for me to answer that, because it is up to the individual listener to set his own standards. From a purely personal point of view, I must say that I am unable to tolerate any hum at all, for I regard its presence as indicating a fault, and a fault that can nearly always be removed these days.

I think the makers of the better-class mains sets and units mould their policies around such a view.

Any attempt to build a mains device "down to a price" is almost certain to result in inadequate smoothing. You must have nice big chokes and plenty of "microfarads" before you can smooth out the ripples completely.

Any move towards the toleration of hum on economic grounds on the part of manufacturers is bound sooner or later to lead to disaster for very sound psychological and physiological reasons.

I mentioned just now that I have noticed that listeners tend to get "hardened" or "blunted" to persistent interference.

## A RADIO ROBOT

**The Hon. Mrs. Victor Bruce and her two-seater 'plane. This is fitted with a complicated automatic radio transmitter, which is able to send out prearranged sequences of signals.**

Well, I might have added then that it is a well-known fact that the ears will adapt themselves almost to anything.

During the war we were afforded ample proof of that. I remember that when I was with an artillery battery, one got so used to continuous bombardment that one hardly noticed the terrific noise! And workers in the noisiest of factories will tell you that they do not find the deafening din unbearable, and that they can converse quite freely through it, although visitors are nearly deafened and have to shout at each other.

Of course, it takes some considerable time to get one's aural nerves acclimatised to such conditions.

### Easily Unnoticed

To revert to our mains apparatus makers. If their testers once tolerate a certain amount of hum they will eventually get quite distorted views as to what constitutes a "tiny hum." Remember, it is a persistent interference and one that generally has a constant frequency. With such a noise ringing in their ears all the time, how can they possibly retain an impartial criticism of its intensity?

You might say that it would be enough to measure the intensity. It is fairly easy to do that, although I have the idea that few concerns in this country carry their tests to such conclusions.

Regarding the listener's attitude to the question, I am afraid that there is a very marked tendency to accept a certain amount of hum with mains sets as being quite inevitable. And that is why I wrote this article; it is an attempt to kill that idea.

### Should Be Silent

Modern mains working should be every bit as silent as when the best of batteries are used. If you pass a certain degree of "hum," then you should do so with a complete realisation that it is a fault that should not exist in any modern high-class set.

It is very hard indeed to classify "humming." Broadly speaking, any hum at all is bad, technically, although a "hum" that can only faintly be heard by

(*Continued on page* 307.)

# RESISTANCE REALITIES.

**Some interesting notes about a very vital factor in radio reception.**

THERE are many factors which influence the resistance of a material. Its temperature, its physical structure, and its degree of purity, for instance, all influence a metal's conductivity.

Silver is the best electrical conductor we know of. Then comes copper, and, after copper, in decreasing order of conductivity, gold, zinc, iron, platinum and mercury, to enumerate only a few of the better-known metals.

The physical structure of a metal influences its conductivity. A bar of metal which is crystalline in structure will have a resistance considerably higher than a bar of non-crystalline metal.

### Increase in Resistance.

This fact is one of very great importance because, in time, all wires tend to become more or less slightly crystalline in nature, and, therefore, to increase in resistance. An aerial wire, for instance, which for many years has been subjected to the inclemencies of the weather gradually takes upon itself a slight crystalline structure. It becomes brittle, and eventually it breaks.

If you examine the fracture under a microscope or even a strong hand-lens, the crystalline cross-section of the fracture will be apparent. It is, of course, very possible that slow changes of this nature may have a lot to do with the gradual decrease in signal-strength experienced by many crystal users, although, of course, there are many other greater factors which work together to produce the same effect.

Another factor which influences the resistance of any material is temperature. Generally speaking, the hotter a wire or a bar of metal is, the higher its resistance becomes.

### The Effect of Heat.

The explanation of this fact is not difficult to grasp. When we put heat into a material, what we really do is to increase the energy of its vibrating molecules, and, more usually, a stream of electrons finds it more difficult to push its way through a maze of molecules which are in a state of violent agitation, than it does when the molecules are in a less rapid state of movement.

Some materials, notably carbon, however, *decrease* in resistance with increase in temperature. A red hot bar of carbon, therefore, has a smaller resistance than a similar bar at normal temperatures. This, however, is one of the few exceptions to the general rule.

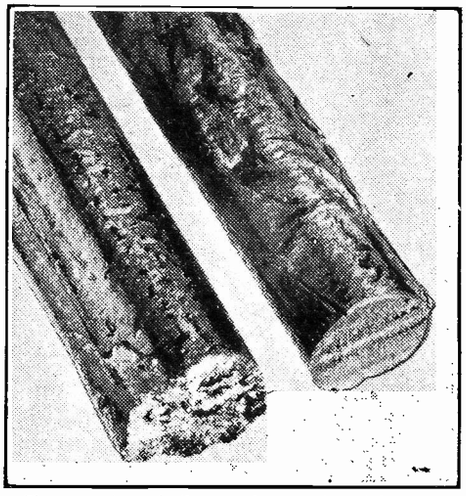
What happens, you may ask, to the resistance of a wire when it is very greatly cooled? As you would expect, the resistance of the wire is lowered with decreasing temperature. This, of course, because of the fact that as we lower the temperature of a metal, or of most materials, for that matter, we decrease the vibrational energy of its constituent molecules, thus providing a freer path for the electron stream of the current.

### Elimination of Resistance.

If a metal rod or wire could be cooled down to Absolute Zero, that is, to 273 degrees centigrade below the freezing point of water, all its constituent molecules would be at rest. There would be a perfectly free and frictionless path for the electric current to traverse, and so, one assumes, a current started in a closed circuit, cooled down to Absolute Zero would flow round and round the circuit indefinitely, thus constituting a species of perpetual motion.

But no one has ever cooled a wire down to Absolute Zero, although a temperature only a few degrees above this point has been reached. At such a temperature a current started in a closed circuit has been found to be present many hours after its commencement, the resistance of the wire at that temperature having become vanishingly small.

## INCREASING RESISTANCE



**Here are two similar specimens of metal rod—the one on the left has the greater resistance because the metal has crystallised.**

# SHORT-WAVE NOTES

**By W. L. S.**

I APPEAR to have been properly "caught out" concerning my flourish of trumpets about the return of good conditions. Conditions, as such, are negligible again at the moment, and all the promise of DX reception has gone once more.

I am not so conceited as to imagine that it is all a conspiracy against me, as was one amateur to whom I listened one Sunday morning, but I admit myself fairly beaten, and retire from the uneven contest. Henceforth "conditions" do not interest me, and I will do without them. If I hear a DX station, so much the better; if I don't, then I have a poor receiver. But "conditions"—never!

### A Truly Crowded Band.

Surely 40 metres, in London, on a Sunday morning, is the most congested spot of ether that one can find. Just before writing this I have heard upwards of thirty British stations on telephony, all fairly loud, intermingled with two South London stations using the most awful R.A.C. notes, dozens of Frenchmen slightly (but not much) worse, interrupted C.W. from an unknown source, *spark* from somewhere or other, and a general confusion of noise described by a visitor as sounding "like Hades on a Bank Holiday." The only thing for a modest, unassuming person like me to do is to withdraw and leave it until there is a little more room.

I wonder whether it is possible that at the two ensuing conferences (at Copenhagen and Madrid) the amateur will be allowed a little more space to work on? It is only the spirit of incurable optimism that keeps him alive with the narrow bands he is allowed at present.

### Introducing Short-Wavers.

A station I recently heard, namely S T 2 C, in the Sudan, probably has the distinction of having introduced the first short-wave transmitter into that country. He is, as a matter of fact, a British amateur away from home, which makes it all the more interesting to hear him.

Another enthusiast, this time from India, also had what I believe was the honour of introducing the first short-waver into British Somaliland, with the Anglo-Italian Boundary Expedition. No transmitter was used, but some very useful work was done.

Two or three readers have reopened the rather puzzling business about hand-capacity effects occurring when the receiver is completely screened in a metal box. I am still of my former opinion that the whole thing depends upon the length and character of the earth lead.

If one loses a signal by approaching the box, then a variable condenser in series with the earth lead will be found capable of tuning it to a position where the trouble completely stops. Unfortunately, the setting will need altering for different wave-lengths.

### A Cure for Hand-Capacity.

I have found a more satisfactory scheme for this, which consists of introducing a ·0005 compression-type condenser into the short-waver, and not connecting the filament supply to the metal box at all. Instead, it is taken to the metal in series with this condenser.

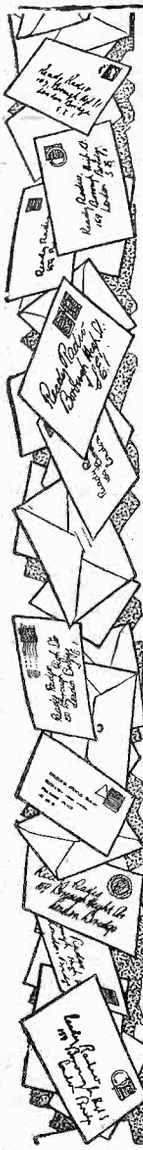
For some reason it will generally be found that a value for this can be arrived at which gives immunity from capacity-effects at all frequencies. The circuit arrangement, if you think it out, is not the same as that produced by the external condenser, since the box is earthed but the filaments are not.

An Essex reader wants to know the whereabouts of G F W D, who was heard calling the B.B.C. on 23·25 metres or somewhere in that region. Telephony was used. The same reader has a single-valver that works perfectly, and yet gives trouble with threshold howl when an external R.C. amplifier is coupled up. Probably an H.F. choke in either or both of the headphone leads would cure this, E. H. It is worth trying.

**TROUBLE-FREE SET BUILDING**

**USE READY RADIO APPROVED NON-SOLDERING KITS ONLY**

**USE "JIFFILINKS" FOR WIRING-UP**



## "EASY-CHANGE" THREE

| | | £ | s. | d. |
|---|---|---|---|---|
| 1 | Drilled ebonite panel, 18 × 7 ins. | | 6 | 0 |
| 1 | Hand-polished oak cabinet with 10-in. baseboard | 1 | 10 | 0 |
| 1 | ReadiRad ·0005 variable condenser | | 4 | 6 |
| 1 | ReadiRad ·00015 differential condenser | | 5 | 0 |
| 2 | ReadiRad on-off switches | | 1 | 8 |
| 3 | ReadiRad single coil holders | | 2 | 6 |
| 3 | Benjamin vibrolders | | 4 | 6 |
| 1 | ReadiRad ·0003 fixed condenser | | | 10 |
| 1 | ReadiRad ·0002 fixed condenser | | | 10 |
| 1 | ReadiRad 2-meg. grid leak | | | 10 |
| 1 | Lissen R.C.C. unit with ½- and 1- or 2-meg. leak | | 4 | 0 |
| 1 | ReadiRad "Hilo" H.F. choke | | 4 | 6 |
| 1 | ReadiRad fuse and holder | | 1 | 3 |
| 1 | Igranic type J L.F. transformer | | 17 | 6 |
| 1 | Terminal strip, 18 × 2 in. | | 1 | 8 |
| 10 | Belling Lee engraved terminals | | 2 | 6 |
| 1 | Lewcos coil, No. 60X | | 4 | 9 |
| 1 | Lewcos coil, No. 250X | | 6 | 6 |
| 1 | Lewcos coil, 100 | | 4 | 6 |
| 3 | Valves as specified | 1 | 7 | 6 |
| 1 | Set ReadiRad Jiffilinx | | 2 | 6 |
| 1 | ReadiRad duograph dial | | 6 | 6 |
| | Screws, plugs, etc. | | 1 | 8 |
| | TOTAL (including valves and cabinet) | £7 | 2 | 0 |

## "MAXI-POWER" FOUR

| | | £ | s. | d. |
|---|---|---|---|---|
| 1 | Drilled ebonite panel, 21 × 7 in. | | 8 | 0 |
| 1 | Hand-polished oak cabinet with 10-in. baseboard | 1 | 10 | 0 |
| 2 | ReadiRad 3-point on-off switches | | 3 | 0 |
| 2 | ReadiRad variable condensers, ·0005 | | 9 | 0 |
| 2 | ReadiRad duograph slow-motion dials | | 13 | 0 |
| 1 | ReadiRad differential reaction condenser, ·00015 | | 5 | 0 |
| 1 | Wearite filament rheostat, 15 ohms | | 1 | 6 |
| 1 | ReadiRad on-off switch | | 0 | 10 |
| 6 | ReadiRad single coil holders | | 5 | 0 |
| 4 | Benjamin vibrolders | | 6 | 0 |
| 1 | ReadiRad ·0002 fixed condenser | | | 10 |
| 1 | ReadiRad ·0001 fixed condenser | | | 10 |
| 2 | T.C.C. ·01 fixed condensers | | 6 | 0 |
| 1 | ReadiRad ·001 fixed condenser | | | 10 |
| 1 | ReadiRad ·0003 fixed condenser | | | 10 |
| 2 | T.C.C. 1 mfd. | | 5 | 8 |
| 2 | ReadiRad 2-meg. grid leaks and holders | | 2 | 8 |
| 1 | R.I. H.F. choke | | 7 | 6 |
| 1 | ReadiRad "Hilo" H.F. choke | | 4 | 6 |
| 1 | Varley 100,000 ohms resistance and holder | | 7 | 0 |
| 1 | Ferranti A.F.3 L.F. transformer | 1 | 5 | 0 |
| 1 | ReadiRad H.T. fuse and holder | | 1 | 3 |
| 11 | Belling Lee engraved terminals | | 2 | 9 |
| 1 | ReadiRad Standard screen, 10 × 6 in. | | 2 | 0 |
| 1 | ReadiRad G.B. clip | | | 6 |
| 1 | Terminal strip, 21 × 2 in. | | 2 | 6 |
| 2 | Lewcos coils, No. 35 | | 7 | 0 |
| 2 | Lewcos coils, No. 60 | | 7 | 0 |
| 1 | Lewcos coil, No. 250X | | 6 | 6 |
| 4 | Valves, as specified | 2 | 7 | 6 |
| 1 | Set ReadiRad Jiffilinx | | 4 | 0 |
| | Screws, flex, plugs, etc. | | 1 | 6 |
| | TOTAL (including valves and cabinet) | £11 | 5 | 6 |

ANY OF THE ABOVE COMPONENTS CAN BE SUPPLIED SEPARATELY IF DESIRED.

**KIT A** less valves and cabinet .. .. **£4: 4:6**
or 12 equal monthly payments of 7/9

**KIT B** with valves less cabinet .. .. **£5:12:0**
or 12 equal monthly payments of 10/3

**KIT C** with valves and cabinet .. .. **£7: 2:0**
or 12 equal monthly payments of 13/-

**KIT A** less valves and cabinet .. .. **£7: 8:0**
or 12 equal monthly payments of 13/6.

**KIT B** with valves less cabinet .. .. **£9:15:6**
or 12 equal monthly payments of 18/-

**KIT C** with valves and cabinet .. .. **£11: 5:6**
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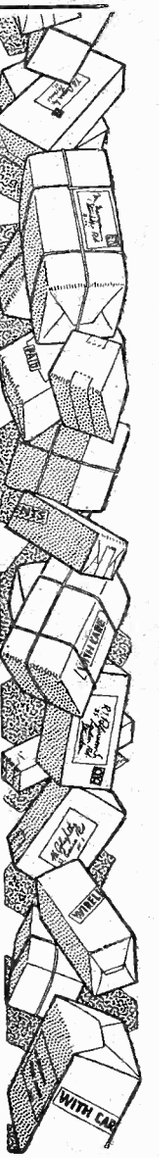
**OFFICIAL BLUE PRINT SUPPLIED FREE WITH ALL KITS**



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# FROM THE TECHNICAL EDITOR'S NOTE BOOK.

## Tested and Found—?

The "Sylphone" is available for either A.C. or D.C. mains, or battery operation, in unit form, and it is designed so that it can be fitted to any type of baffle-board or cabinet. The Squire model 21 is sensitive and it has a particularly even response.

### NEW SIX-SIXTY ACTIVITY.

AN interesting development is announced by the Six-Sixty Radio Co., Ltd., of 17-18, Rathbone Place, London, W.1.

The many users of their valves will be interested to hear that Six-Sixty are marketing a complete range of grid leaks this season. They are available in 14 different resistances from ·01 to 20 megohms and sell at 1s. 6d. each. A neat bakelite holder for use with them retails at 1s.

These new Six-Sixty grid leaks are said to be remarkably silent in operation and extremely accurate, and constructors should make a point of seeing them.

### FOR RADIO-GRAM ENTHUSIASTS.

I recently received a selection of Goodson gramophone records, and I have been trying these out on a radio-gram outfit. I find them quite good, and the following seem to be particularly suitable for electrical reproduction: List No. 240, "On the Sunny Side of the Street" (University Syncopators), "Waiting For You" (Dixie Rag Pickers), and List No. 245, "I'm Needing You" (White Way Serenaders), "Climb Through the Clouds" (University Syncopators).

The Goodsons are, of course, those flexible, unbreakable records. Seven of them weigh no more than one ordinary record. They seem to be well recorded, and there is a brightness and a healthy bass that are associated usually only with the expensive recordings.

I had heard that Goodson's were "scratchy," and tended to "pull up" ordinary motors, but I don't find that the case on my instruments. Perhaps they were earlier faults that are now eliminated.

### NEW SQUIRE LOUD SPEAKER.

We recently received a Model 21 "Sylphone" loud speaker from Fredk. Squire & Co., Ltd. Squires were early in the field with moving-coil loud speakers, and we have watched their progress with great interest.

The model 21, their latest, shows in concrete form what concentrated specialism can do. Its special features include a new form of diaphragm support, a diaphragm centring scheme that is almost completely independent of the diaphragm's lateral movements, a coil of patented design which has no former and is remarkably light, and a scheme for the reduction of air resistance in the vicinity of the moving coil.

### A VOLUME CONTROL.

A volume-control potentiometer, above all other types of variable resistances, needs to have an absolutely efficient action. A faulty contact may mean loud crackles and scrapings while, if the resistance is not evenly spread out, a satisfactory adjustment of volume may be hard to obtain.

One of the most satisfactory potentiometer-volume controls that I have tested for some time is the Super Rotorohm volume control, due to the Rotor Electric, Ltd. It retails at 7s. 6d., and the type H has a resistance of 25,000 ohms.

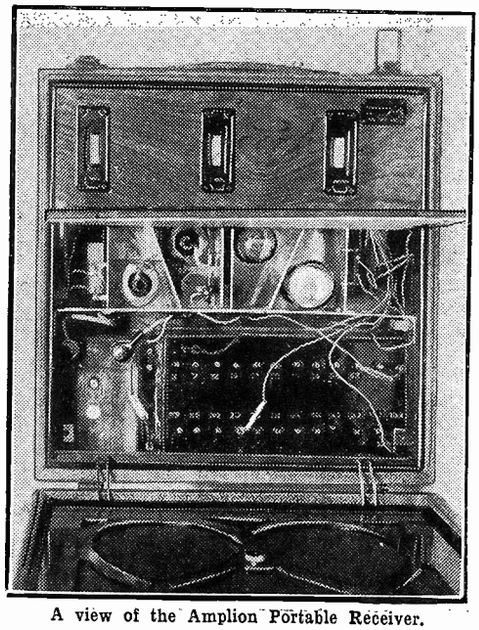
A disc-rocker contact provides an exceptionally smooth adjustment. The component is most robust in character and the finish is high class. A large milled knob with an engraved indicating arrow is provided, and the device can be mounted on a panel by means of one hole.

### NEW BATTERY CONNECTOR.

When coupling up Exide H.T. 10-volt units two different sizes of connectors are required. A 60-volt assembly, for instance, necessitates three large connectors and two small ones.

But in future the Chloride Electrical Storage Company, Ltd., are going to supply one large connector with each 10-volt unit, together with an instruction card showing how a small connector can easily be cut from the large one.

The connector takes the form of a flat lead strap with four holes cut in it. The marking is very plain and the material easily cut.



A view of the Amplion Portable Receiver.

### EBONITE COMPONENTS.

The British Ebonite Co., Ltd., recently sent me a selection of their new productions. These include 6-contact coil formers and bases and choke formers of various sizes.

The new Becol multi-contact formers are greatly improved and are superior to the original patterns—good though those were.

Also the price is now only 7s. 6d. for the former and base instead of 10s. 6d. You can obtain either part separately for 3s. 9d.

Both four and six-contact Becol formers and bases are available.

All these British Ebonite lines seem to me to be particularly robust mouldings, and the ebonite is of a high grade and much superior to some that is on the market.

**Manufacturers and traders are invited to submit radio apparatus of any kind for review purposes. All examinations and tests are carried out in the "P.W." Technical Department, with the strictest of impartiality, under the personal supervision of the Technical Editor.**

**We should like to point out that we prefer to receive production samples picked from stock, and that we cannot guarantee their safe return undamaged, as it is our practice thoroughly to dissect much of the gear in the course of our investigations!**

**And readers should note that the subsequent reports appearing on this page are intended as guides to buyers, and are therefore framed up in a readily readable manner free from technicalities unnecessary for that immediate purpose.**

### THE AMPLION PORTABLE.

The Amplion Portable set is built into a real-hide case and is of the suitcase type.

It employs two screened-grid H.F. stages, a detector, and one L.F.

The loud speaker is contained in the lid and you can see the disposition of the valves and batteries from the accompanying photo, which shows the set with the neat cover removed.

I have recently had an opportunity of testing one of these Amplion portables and I must say I find its performance impressive.

It is very selective and it is sufficiently powerful easily to bring in a number of Continentals in daylight.

Also, its quality is unusually good for a portable.

The controls are easy to handle and altogether it is an achievement.

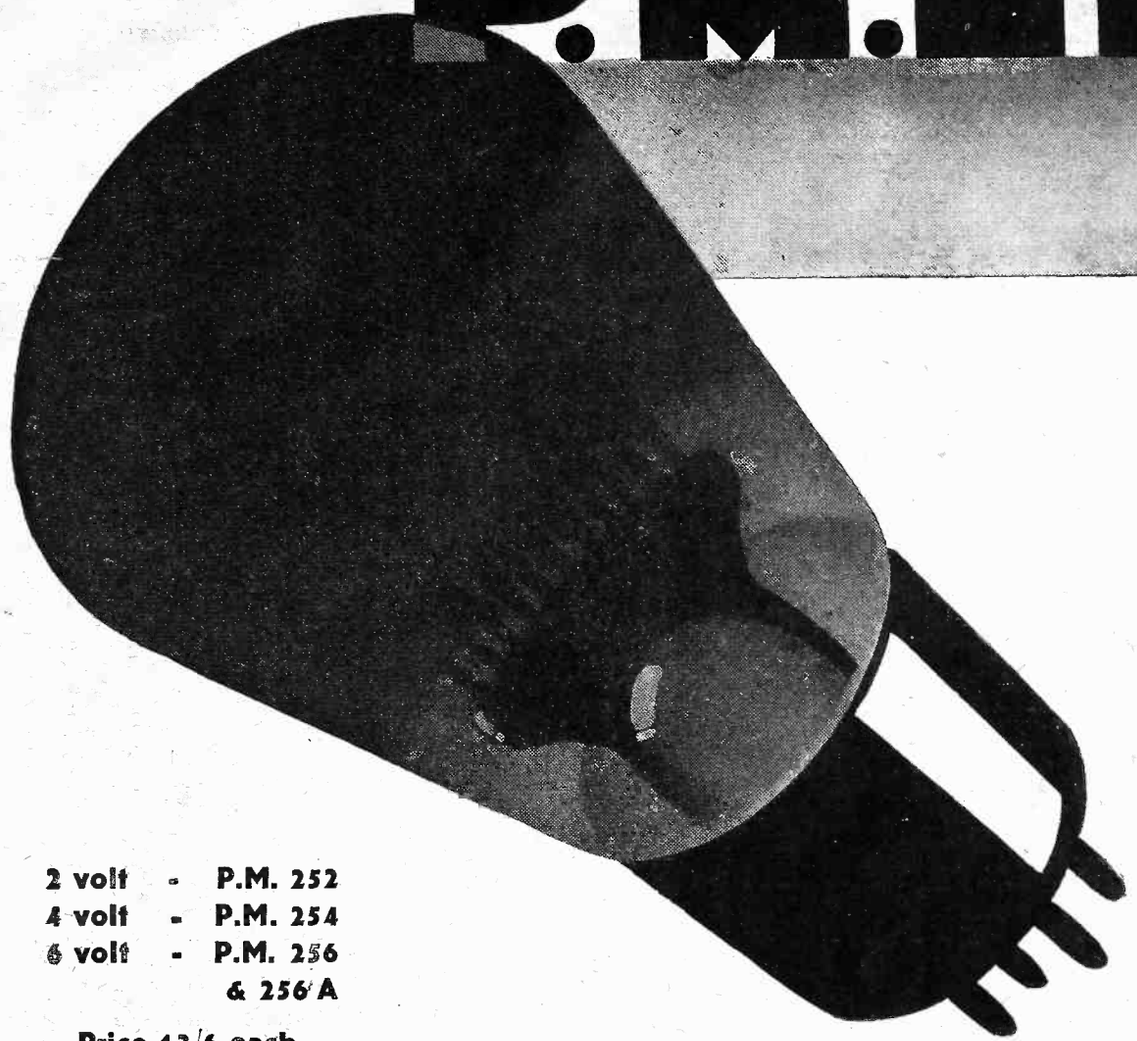
### CONCERNING MOVING COILS.

Messrs. Rotor Electric Ltd. recently issued the Grassman Moving-Coil Booklet which contains interesting notes on moving-coil speakers in general and the Grassman Dynamic in particular.

### RADIO CABINETS.

The Carrington Mfg. Co. Ltd. are now distributing a 24-page catalogue describing their "Camco" cabinets.

# P.M.252



**2 volt - P.M. 252**
**4 volt - P.M. 254**
**6 volt - P.M. 256 & 256A**

**Price 13/6 each.**

A low impedance valve for use as the output valve in battery-operated receivers, type P M. 252 is the " super-power " valve of the Mullard 2-volt range. The large permissible grid swing permits the valve to handle big signal voltages while as a result of its low impedance (2,600 ohms) and excellent mutual conductance (2.1 milliamps per volt) it will give a large undistorted output sufficient for operating the average domestic speaker or radio gramophone.

The P.M. 252 is very economical in operation, the filament consumption being only 0.3 amp at 2-volts. It can therefore be employed in portable receivers without imposing too great a load upon the low tension accumulator.

# Mullard

## THE · MASTER · VALVE

# GREATEST RADIO SENSATION

## NEW 3-VALVE SET OBTAINS OVER 50 STATIONS ON LOUD SPEAKER WITH DAVENTRY 5GB WORKING

This is the new Northampton Plating Co. Super Selective 3-Valve Loud Speaker set, which is now offered to the public. After months of careful research a circuit has been designed superior in selectivity to a screen grid set, and yet remarkably simple. It can be used, not only for cutting out the local station, but for other disturbances such as Morse. It is the simplest, cheapest, and most selective in the world. No soldering required or coil changing. Experts have declared it absolutely unique. Over fifty stations have been obtained on loud speaker with aerial 20 feet high, using cheap valves, including Cardiff, Paris, Madrid, Manchester, Stuttgart, Toulouse, Hamburg, Glasgow, Frankfurt, Rome, Langenberg, Berlin, Brussels, Hilversum, Kalundborg, Konigswusterhausen, Radio Paris. These were obtained 3 miles from Daventry while 5 G B was working. Thousands of novices with no knowledge of wireless have built the old Northampton Plating Co. Super 2 and 3 in all parts of the world, and have been astounded by the results even with cheap components, but the new Super Selective 3 makes other sets old fashioned, and marks the greatest improvement in valve sets for years. Orders have poured in from all parts of the world, including America, Turkey, Gold Coast, and Nigeria. In order to give everyone the opportunity of testing out the new circuit, two 6d. Blue Prints, one for new Super Selective 2 and one for Super Selective 3 Valve, will be supplied for 3d. each.

## NEW SUPER 4-VALVE PORTABLE SEPARATES TWO BROOKMANS PARK STATIONS UNDER THE AERIALS

**This is the latest model circuit by the Northampton Plating Co. offered to the public for the first time. It has been specially designed to satisfy the requirements of the new regional stations. Owing to its wonderful selectivity, it requires no wave trap and obtains under favourable conditions a large number of Continental Stations at loud speaker strength, including Toulouse, Hilversum, Eiffel Tower, Konigswusterhausen, and Radio Paris. At less than half the price of a high-class portable set, it is acknowledged under severe technical tests to be far superior. In order to show what marvellous results can be obtained the set was placed between two aerials at the entrance to Brookmans Park, and the two programmes were easily separated. The set was also taken on 1,000-mile motor-tour over England and Wales. On the South coast and East coast many stations were easily obtained on loud speaker at good strength. Even in Wales, where reception is difficult, excellent results were also obtained. In order that everyone may be able to construct this unique portable set, a full size shilling Blue Print, with full details and instructions, can be obtained from Northampton Plating Co. for 6d. Letters must be fully stamped. NAME AND ADDRESS IN BLOCK LETTERS.**

**TRADE SERVICE AGENTS WANTED.**

READ THE LATEST REPORTS BY THE LEADING RADIO EXPERTS OF THE DAY :—

I refer to the receiver marketed by the Northampton Plating Co. as a kit set at a price that is more than reasonable. I had a pleasant surprise when I first operated it. I found there were 12 or 13 Stations easily brought in at loud speaker strength on the medium wave in addition to 5 G B. The set has remarkable qualities of selectivity and sensitivity, two characteristics rarely coupled in any one receiver. It must be set down as a definite advance.

("NOTTINGHAM JOURNAL," December 21st, 1929.)

Those who are too far from a station to use a crystal and are deterred from wireless by the present high cost of valves, will find it best to make a set from the Northampton Co.'s blue prints for two or three valves, price 3d. each. If they cannot afford a Mullard, the same company supply excellent valves at 4s. 11d. which give admirable reception, though so cheap. A thoroughly good two valve set ought not to cost more than £2 10s., including everything, and a three valve about 11s. more. ("REYNOLDS' NEWS," January 12th, 1930.)

READ THESE TESTIMONIALS.

I have had your Super 3 since Sept., 1929, and have had wonderful results, about 50 stations at full loud-speaker strength, and can get most of these any night of the week, chief among them being: Paris, Eiffel Tower, Budapest, Prague, Belgrade, Stockholm, Madrid, Toulouse, Stuttgart, Barcelona, Turin, Maravstra-Ostrava, Rome, Algiers, Langenberg, Oslo, Lahti and Kaunsas. Wishing you every success.— W. T. Emsworth, Hants, 17/1/30.

I must write and tell you I am more than pleased with your three valve set I have just made.

It is the most wonderful bargain I have ever known in wireless, and it is all that you claim of it. I wish to recommend it to my friend who is a keen wireless enthusiast. W. P. T., Derby, 16/1/30.

I have now built up your Super Three Valve set, and, independent of price, I have never heard or seen a set to beat it. We are still getting fresh stations, and up to the present have logged 20 at full loud speaker strength. As I am writing we are hearing an Aria from Rome. My last set cost me about £25. Your Super Three has cost me less than £5, including accumulators. W. A. P., Norwich, 3/2/30.

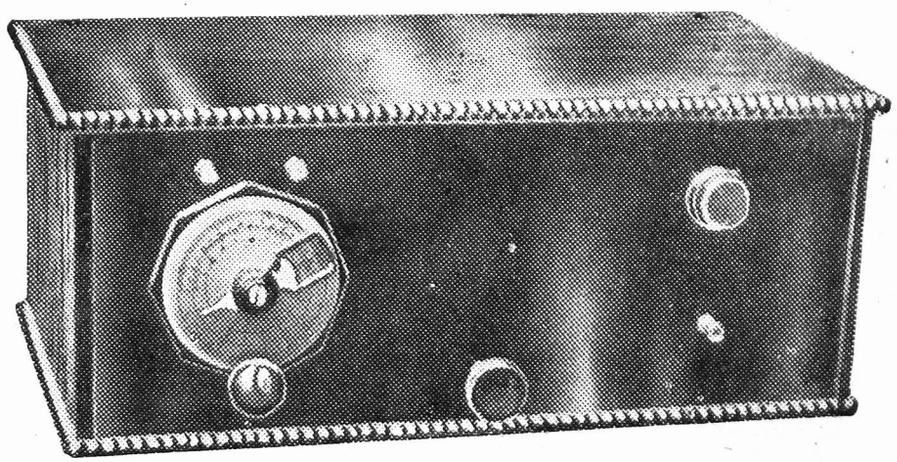
Referring to the 3-valve set recently supplied, I have pleasure in informing you how satisfied I am with it. I recently put up an expensive 4-valver, and had such bad results. I may say I have had many circuits in use up to 5 valves with very good results—that means quality of reception, volume and distance. I purchased your Super 3 really for local use. As you will see, I am on top of the Brookmans Park Transmitter. The results I am getting are equal to my best with 4 and 5 valves. I can still have my Continentals on the loud speaker, and with perfect quality. Wishing you every success.—Yours faithfully, V. M., Cheshunt, Herts.

I feel I must write and congratulate you on a wonderful circuit. I have now had your "Northampton 3" only two nights, but in those two nights it has fully justified itself. I have the poorest of poor indoor aerials, and I have in 10 minutes logged 16 stations on the Loud Speaker. I have had to insert a volume control because of the power of the local station (Bournemouth, 70 miles away) and 5GB. I have just received Oslo, Paris (2), Hamburg, Berlin, Budapest and many others. Your "3" gives 90 per cent better results than you specify. Wishing your sets the best of luck in the future.—Yours very satisfied, C. D. N.

**I have examined the above testimonials, and am satisfied that these are genuine communications.—Advertisement Manager, "News-Chronicle."**

## ARE YOU TROUBLED

**with Brookmans Park? Test Report on New Brookmans Park Station, from Palmer's Green, about four miles from Station, by our own radio engineers. Using the Northampton Plating Co. Super Selective Set, with the addition of a Type F Formodenser (Price 1/6) in earth lead, it was found that by careful adjustment of set the local station was absolutely cut out. Many British and foreign stations were easily obtained at loud speaker strength, including 5 G B, Radio Toulouse, Radio Paris, 5 X X, Konigswusterhausen. This is a marvellous achievement since the set used is the cheapest in the world.**



**SPECIAL WIRELESS AND CYCLE BARGAINS.**

| Usual Price. | | Sale Price |
|---|---|---|
| 10/- | Latest Type Cabinet 12 × 8 .. .. .. | 4/11 |
| 5/- | Ebonite for same, 12 × 8 | 3/- |
| 5/11 | Transformer .. .. | 3/6 |
| 4/6 | ·0005 Variable Condenser | 2/11 |
| 2/- | ·002 Condenser .. .. | 1/3 |
| 1/6 | ·0003 ,, .. | 10d. |
| 1/- | Grid leak 2 meg. .. .. | 10d. |
| 1/- | Anti-Mic. Valve Holder .. | 9d. |
| 2/3 | Rheostat .. .. .. | 9d. |
| 2/- | Indoor Aerial .. .. | 9d. |
| 5/- | Earth Tube .. .. | 1/6 |
| 10/- | Guaranteed Phones .. | 4/11 |
| 3/6 | S.M. Dial .. .. .. | 1/11 |

| Usual Price. | | Sale Price. |
|---|---|---|
| 17/6 | New Cossor Type Long Wave Coils, pair .. | 9/6 |
| 7/6 | Volume Control .. .. | 3/11 |
| 7/6 | H.F. Choke .. .. | 3/11 |
| 2/6 | Daventry 5 G B Coil .. | 1/3 |
| 10/6 | 6 Volt Amplion Valve .. | 3/11 |
| 12/6 | Cone Unit .. .. | 6/11 |
| 12/6 | Cone Speaker Cabinets .. | 7/11 |
| 2/- | 12in. Cone Speaker Frets | 11d. |
| 3/- | 15in. Cone Speaker Frets | 1/11 |
| 7/6 | Old Cossor Type Coils .. | 3/11 |
| 15/- | Old Cossor Type Cabinets, 21 × 7 .. .. .. | 7/11 |
| | Ebonite for same .. | 3/11 |

| Usual Price. | | Sale Price. |
|---|---|---|
| 12/6 | Mullard Type Cabinet, 18 × 7 .. .. .. | 6/11 |
| 7/6 | Aluminium Panel 18 × 7 | 3/11 |
| 17/6 | Dual Coil for M.M3 .. | 12/6 |
| | Triotron Dull Emitter Valve .. .. .. | 4/11 |
| 5/- | Cycle Tyre .. .. | 2/6 |
| 2/6 | Cycle Tube .. .. | 1/3 |
| 6d. | Panel Transfer .. .. | 3d. |
| 6/6 | Double Reading Voltmeter | 3/11 |
| | Triotron Super Power Valve .. .. .. | 6/6 |
| 15/- | Titan Coil .. .. | 9/11 |
| 9/- | 60 Volt H.T. Battery .. | 4/11 |

| Usual Price. | | Sale Price. |
|---|---|---|
| 12/6 | 100 Volt H.T. Battery | 8/11 |
| 5/6 | 2 Volt Accumulator .. | 3 6 |
| 2/- | Accumulator Carr. .. | 11d. |
| 4/6 | Neutralising Condenser .. | 2/11 |
| 4/- | Reaction Condenser .. | 2 6 |
| 5/- | Diff. Reaction .. .. | 2/11 |
| 2/- | Loud Speaker Cord .. | 11d. |
| 2/- | 'Phone Cord .. .. | 11d. |
| 6/- | S.L.F. Condenser .. .. | 3/11 |
| £2 | Loud Speaker .. .. | 15/- |
| £3 | Super Telefunken Type Loud Speaker .. .. | 29/11 |
| 30/- | Cone Speaker .. .. | 9/11 |
| | 'Phones Repaired .. .. | 2/6 |

New Cycles, Guaranteed, **59/11**; with 3-speed, **79/11**; with Dunlop Tyres, **10/-** extra.

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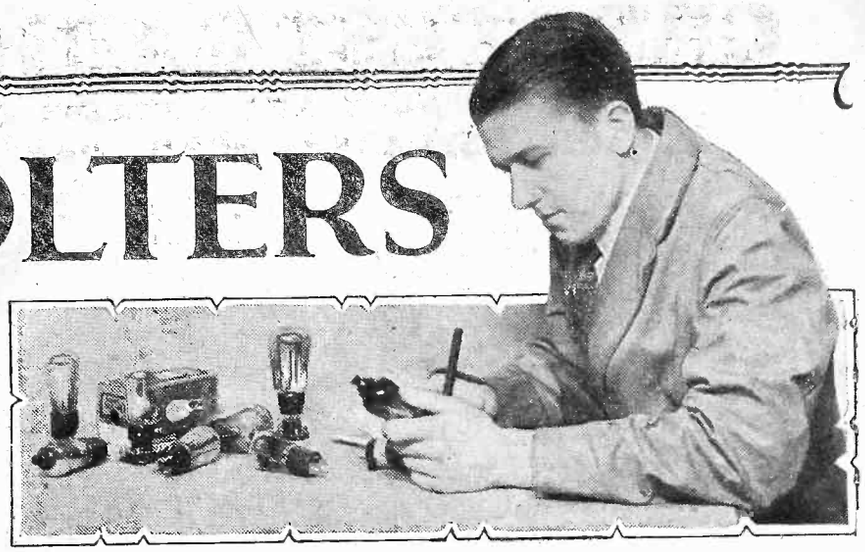
**NORTHAMPTON PLATING CO.** (RADIO and Cycle Manufacturers), **NORTHAMPTON**

# TWO-VOLTERS of To-day



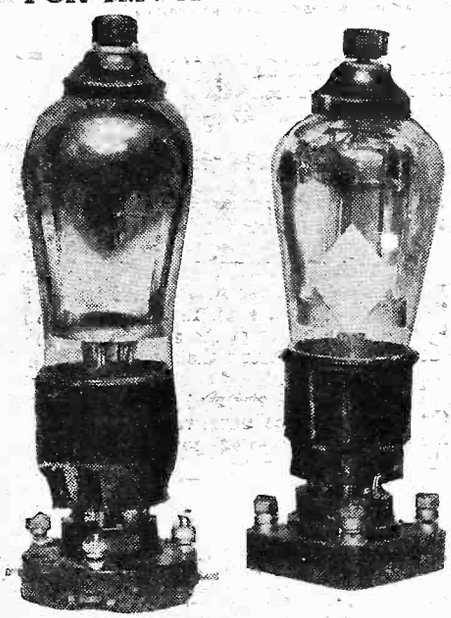
**One of the most interesting developments in modern radio has been the growth of the valve—especially the two-volter. It has been an extremely rapid advance and valve-set owners will be interested in this brief description of the present happy state of affairs.**

**By K. D. ROGERS.**

THOSE of us who can look back to radio experiences in the days before broadcasting began in this country—not so very long ago when you come to think of it—are able to appreciate to the full the tremendous advances which have been made in all phases, not excluding the design of valves.

In those "early days," as we are wont to call them, the only valves available for radio reception were the ordinary bright emitters of the R. type, and valves of the V.24 and Q.X. class for high frequency and special detectors. Not so very long after

## FOR H.F. AMPLIFICATION



**The Marconi and Cossor S.G. two-volt valves—both excellent amplifiers.**

others appeared, but at the beginning of broadcasting the chief valve of British manufacture was the ordinary R. type costing about 17s. 6d. and consuming ·75 amp. of L.T. current.

### The Old-Timers.

Shortly afterwards the Mullard Ora came out, and prices dropped to somewhere round 15s., and then experiments were made with the D.E.R. type, the first "dull" emitter. This took a good quarter of an amp., and was not a particularly great success when viewed in the light of present-day achievements, though in those days it was hailed as a great wonder.

After that valves rapidly appeared. Dull emitters became more general, and we got to the ·06 current valve. This was not really a particularly good valve, and it was not very long before it was superseded, and now it is right off the market with the exception, perhaps, of some old stock which I believe is being disposed of at extremely low prices.

But all this time, although detectors were coming along very well and H.F. valves were not too bad, we had little choice in the way of a power valve, and unless one used the D.E.5 or the L.S.5 types of valve, L.F. amplification and loud-speaker reception was rather a precarious business. Quality was not particularly worried about, and, indeed, it would have been little use to worry.

### Dull Emitter Brightens Up!

The dull emitter then found its feet properly, and the design of valves was gone into more closely than ever. At that time also, 2-volt dull emitters began to show that they were going to be the most popular valves among the British public. The valve makers had found a filament which would give a reasonably good emission at 2 volts without a high current (·1 amp. being the general rule), and the results were equal to those obtainable with 6-volt valves, except on the low-frequency power side.

So we got dull-emitter valves which needed only ·2 filament wattage and held their own against the 6-volters. But we still were up against it from the point of view of quality, for unless we used 6-volt power valves we were unable to get really good power amplification for loud-speaker reproduction. At that time the moving-coil speaker was coming into prominence, and from the 2-volt user's point of view in many cases things began to be rather awkward. But once again the valve designer rallied, and the result has been very marked during the last eighteen months.

The old days when we used to say that if we used 2-volt valves for H.F. and detector we should still require a 6-volter for power work have gone, and unless we want *super* super power the 2-volt valve will give all we need. Whereas a few years ago nothing in the way of a power valve of the 2-volt variety having an impedance less than about 6,000 ohms was available, now we have valves having impedances well below 2,000 and incidentally—which is much more to the point—having magnification factors which give a mutual conductance of 2 or more.

### 2-Volters Throughout.

The result of all this is that for all ordinary purposes and even loud-speaker work, there is no reason why 2-volters should not be used throughout a set. Two-volt screened-grid valves of to-day are rarely surpassed except by the mains types, and the H.F.'s, detectors, and L.F.'s of the 2-volt class can hold their own among any competition.

Power valves are also excellent and super-power valves such as the P.220A., the P.240, the P.M.252, the Marconi and Osram P.2., and so on, are valves capable

(*Continued on next page.*)

## TWO OF THE LATEST


**On the left we have the newest Osram valve—the H2, a 2-volt valve having an impedance of about 35,000 ohms. On the right is the famous Mazda P.220A.**

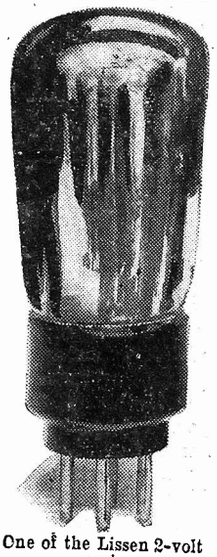
# TWO-VOLTERS OF TO-DAY.

(*Continued from previous page.*)

of giving really superb results. It is only when you come to the P.X.4 class and the L.S.6A. that one really notices any difference between 2-volt valves and their 4- or 6-volt brothers.

The 2-volters of to-day are nothing like the 2-volters of two years ago in performance. The majority of them have mutual conductances of well over one and in the power valves usually over two, so that whenever we use a low impedance power valve in the last stage of a fairly large set we can be sure of getting good magnification out of it, a thing which was impossible with the 2-volter of two years ago.

## CHEAP & GOOD



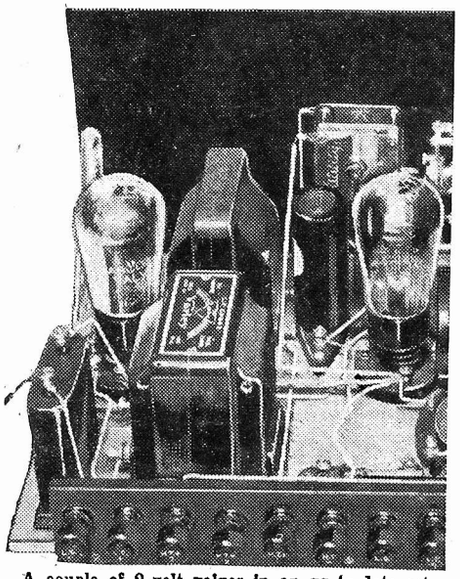
One of the Lissen 2-volt series.

Mazda's have done a great deal to popularise 2-volt power valves, and their P.220A., which has recently been placed on the market, is an example of the extensive research and untiring efforts they have displayed.

### High Output for Small Input.

Marconi's and Osram have the P.2, a really remarkable power valve on the market, while Mullards at the same time paid attention to the Pentone valves. These

## THE OUTPUT END



A couple of 2-volt valves in an up-to-date set. The last valve is a P.2.

5-electrode valves (commonly called pentodes) have done a great deal for the man with the small set, and the P.M.22, which has an amplification factor of 82 and an impedance of 62,500 ohms, is the result of the Mullard efforts to bring out a really good pentode valve.

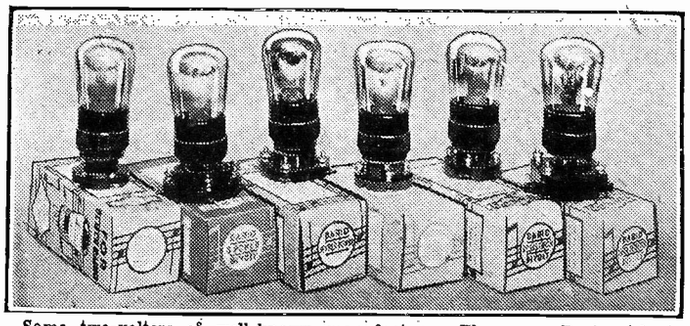
Other valve firms followed suit so that not only in the screened grid and the power, but in the pentode as well have we reached a high degree of excellence.

It is true that pentode valves will not carry the same input as the super-power valves, but it will give an extraordinarily high output for the small input.

### Really Remarkable Figures.

A comparatively short time ago every valve user became enthusiastic about the A.C. power valves brought out by Metro-Vick, and which had an amplification factor of something like 10 with an impedance of 2,500, thus giving a mutual conductance of 4. But since then Mazda's have been at work with the 240 super-power 2-volter, which is a battery-operated valve, and they have now developed it until it is comparable with that A.C. valve which we welcomed so gladly. The P.240 has an amplification factor of 7 and an impedance of 1,900 ohms, giving a mutual conductance of 3·7, really remarkable

## MEMBERS OF A POPULAR FAMILY



Some two-volters of well-known manufacture. These are Dario valves of various types.

figures for a battery valve, let alone a 2-volter having a filament wattage of only ·8.

And when we mention these valves we must not forget the fact that quite recently super-power valves have been reduced in price, the P.240 is now 13s. 6d., while the "ordinary" valves are only 8s. 6d. Excellent 2-volters are also obtainable in the Six-Sixty, Dario, and P.R. types, while Messrs. Lissen, Tungsram and Triotron have several valves well worth consideration.

### "P.W." Sets.

The position of the user of the 2-volt valve of to-day is an extremely happy one. He is thoroughly well catered for, and in my opinion there is nothing in battery valves for ordinary purposes to beat the 2-volters.

There is no reason for supposing that the 4- or 6-volt valve—except, of course, in very exceptional cases, is any better than the 2-volter of to-day. That is the reason why "P.W." sets are invariably tested with 2-volt valves as well as with those of other voltages, and you will see in the photographs of our sets that they often have 2-volters placed in their valve holders.

Set tests with this type of valve are made because the Research Department feel that not only is it a most popular valve, but it is rightly popular. It is efficient and economic, the two main factors which all set designers and all valve designers try and combine in their products.

# RADIO REMINDERS

**Round the Stations—Reception Hints—For the Constructor**

The German station at Breslau (325 metres) sometimes uses a metronome, time interval signal, ticking 60 times per minute.

* * *

A fast-ticking metronome (160 beats to the minute) is the sign that you are listening to Bucharest, Rumania, on 394 metres.

* * *

Budapest, Hungary, has an opening signal of four musical notes, repeated and followed by the inital note, G sharp, B A B G sharp B A B G sharp).

* * *

A chime of five bells from the Cologne studio is the interval signal used by that station on 227 metres.

* * *

### A SLEIGH-BELL SIGN

Crakow, Poland (on 244 metres), has both men and woman announcers, and frequently uses sleigh bells or a gong as the interval signal.

* * *

If you are using a screened set which has copper foil covering the baseboard, be sure to avoid creases and inequalities in its surface, as these are a fruitful cause of shorts.

* * *

The pentode valve used instead of an ordinary output valve will often give a pleasing "brilliance" to moving-coil loud-speaker reproduction.

* * *

There is no need to use a flashlamp bulb of uncertain rating for a fuse in an H.T. circuit, as proper fuses guaranteed to blow at the required limit can be obtained quite cheaply.

* * *

Although the B.B.C. stations are now shown with increased power rating (London 45 kw. instead of 30 kw., etc.), the alteration is not in the actual power of the stations, but in the methods of computing their outputs.

* * *

Leaving the set switched on while you alter the position of the negative grid bias plug of the power valve from one socket to another is a sure way of shortening the life of the valve.

* * *

Poor selectivity on a set using an X-coil for aerial coupling is often due to the coil holder being connected up the wrong way round.

* * *

### X-COIL CONNECTIONS

Normally the pin of the aerial coil-holder containing an X-coil should be connected to the earth terminal of the receiver.

* * *

Power valves normally have rather low amplification factors, but that for the new A.C. indirectly-heated pentode valve comes out at about 100.

* * *

Although the earlier pick-ups used to have in many cases an adjustment for volume control, most of the modern instruments are "set" before being sold, and this adjustment should not be altered.

* * *

Failure in soldering is often due to a dirty iron, to an iron which is too cool, or to dirty wires or terminals.


All Editorial communications should be addressed to the Editor, POPULAR WIRELESS, Tallis House, Tallis Street, London, E.C.4.

*The Editor will be pleased to consider articles and photographs dealing with all subjects appertaining to wireless work. The Editor cannot accept responsibility for manuscripts or photos. Every care will be taken to return MSS. not accepted for publication. A stamped and addressed envelope must be sent with every article. All inquiries concerning advertising rates, etc., to be addressed to the Sole Agents, Messrs. John H. Lile, Ltd., 4, Ludgate Circus, London, E.C.4.*

*The constructional articles which appear from time to time in this journal are the outcome of research and experimental work carried out with a view to improving the technique of wireless reception. As much of the information given in the columns of this paper concerns the most recent developments in the radio world, some of the arrangements and specialities described may be the subject of Letters Patent, and the amateur and the trader would be well advised to obtain permission of the patentees to use the patents before doing so.*

## QUESTIONS AND ANSWERS.

### TESTING FOR A BREAK.

F. L. J. (Gillingham, Kent).—"How do you test a coil or a transformer for a break with a pair of 'phones?"

Faults of this kind, as well as defects in the wiring of a receiver, may be detected by a very simple series of tests with a pair of 'phones and a dry cell.

One tag of the 'phones should be connected to one terminal of the dry cell, and two flex leads should be connected, one to the remaining 'phone tag and the other to the remaining terminal of the dry cell (a flash-lamp battery is quite satisfactory, or an old G.B. battery).

If these two flex leads are now touched lightly together, they will produce a strong double click in the 'phones—one click when they make contact with each other, and another when they separate again. They may thus be used for testing for continuity in leads, etc., since the loud double click is ample evidence that everything is satisfactory.

Any break is quickly shown up. A fault in a coil holder, for instance, such as a break between the terminal and the plug or socket to which it is connected, may now easily be detected, since, if one flex lead is connected to the terminal and the other to the side of the holder to which the terminal should make connection absence of the double click is positive evidence that the component is faulty.

You can test for shorts as well. If one of the flex leads is connected to the *socket* of the coil holder and the other to the *plug* and a double click *is* then heard there is obviously a short-circuit across the holder.

Similar tests may be made with valve holders, both for testing for a connection between each terminal and its socket and for testing for direct short-circuits between the sockets.

Variable condensers may also be tested by this method, a short-circuit between the plates giving rise to the usual double click, which should *not* be present in the usual way.

It is, of course, essential to see that all leads are removed from the components under test, and also that no coils are in position in the coil sockets when these are tested.

The wiring of complete circuits may be tested in this manner. For example, if the A.T.C. is in parallel with the A.T.I., in a simple tuned aerial circuit, one

(*Continued on page* 302.)

# RADIOTORIAL QUESTIONS AND ANSWERS.

(*Continued from page 300.*)

flex lead placed on the aerial terminal and the other on the earth terminal will give a certain test for continuity between these points.

It will be seen from the foregoing that this method may be extended to tests for almost any component or circuit.

### THE SILENT AMPLIFIER.

P. M. A. (Kent).—"Being perfectly satisfied with results, I thought I would put the set and the extra valve into one big cabinet to smarten it up a bit. So I made up the set inside, just as it was, and added the extra wiring for the amplifier alongside it, the whole being out of sight when the cabinet was closed. It looks fine, but now the amplifier will not work.

"All the parts and connections are as before, except a new valve holder for the amplifier to replace the old one, which I broke in removing. When using the set only it works like it used to, but on joining up the amplifier I cannot get anything at all from the loud speaker, not even the clicks as the H.T. is plugged in and out. The valve lights up all right.

"Do you think it is the new valve holder?

Yes, probably the valve holder is causing the trouble. It looks as though it had a disconnection inside. Possibly the socket for the plate of the leg of the valve is not making proper contact with its soldering tag or with the terminal to which it should be internally connected. You can easily check this by examination, or by a 'phones and dry cell test.

See the answer to F.L.J. (Gillingham).

### A SUDDEN FAILURE.

C. M. M. (Brighton).—"The set cost over £3, and has been perfect until this week, but when I switched on yesterday it was silent. And since then not a sound has come from it. What shall I do?"

In such a case, the first thing to do is to look over the set carefully and make sure that no lead has come off. If they all appear to be in order make sure that the telephones themselves are working, either by comparison on another set or by testing with one of the methods described in "Radiotorial" from time to time.

If the telephones themselves prove to be O.K., and the set itself has not been tampered with and appears to be normal in every way, the next thing to do is to examine the aerial and earth connections outside. If the aerial wire is touching on a roof or waterpipe, or if the aerial or earth leads have become disconnected or broken you will hear no broadcasting.

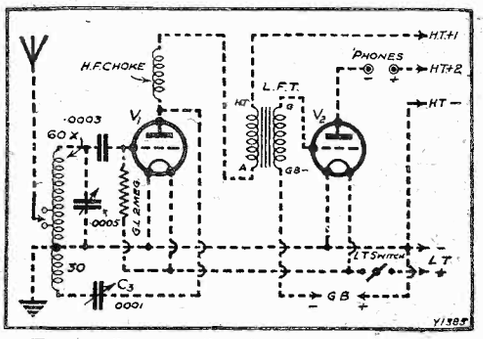
Remember, also, that the earth lead may be broken right underground, out of sight, so this test should be a very thorough one; if you cannot find any trace of a broken wire the only likely cause is a break in the wiring inside the set, or faulty contacts, if it is a crystal set.

Incorrect connections of the batteries would be sufficient to cause silence, and of course a similar result would accrue from a broken battery lead. Generally speaking, any broken contact will disclose itself if gently investigated with the finger by the noises it sets up in the telephones or speaker, but remember if a valve set is being used very great care must be taken not to allow the high-tension wiring (which includes everything connected to H.T. positive) to come into contact with the low tension (which includes everything connected to the filaments of the valves).

Unless great care is taken the batteries may be shorted or, worse still, the valves may be burnt out. If you carefully go over the set on the lines indicated we think it is certain you will come across a fault, but in the unlikely event of your not doing so we are afraid it means you will have to have expert advice to determine the cause of the failure.

By "expert advice" we do not necessarily mean a highly-paid or highly skilled technician, for, as a matter of fact, it is practically certain that anyone who has used a valve set for a few months, and who is interested in it, will be able to suggest where your fault lies after an inspection of the receiver and of the aerial and earth, etc.

## POPULAR "WIRELETS" No. 21




**Here are the connections for the simple two-valver, the "parts" for which were given in last week's "P.W."**

### WON'T OSCILLATE.

C. H. (Amersham Common).—"Why do you think I can never get a short-wave set to oscillate? I've tried three different components, but never get reaction effects."

We should suspect you have been up against the old fault of coupling the aerial too tightly.

For successful short-wave work it is essential that the coupling between the aerial and the grid circuit should be really loose, and we do not doubt that if you remember this in your next short-waver you will have no difficulty in getting oscillation on very low wave-lengths.

If your set has to employ a separate aerial coil, remember that if you place a coil of too many turns in this coil holder you will be coupling the aerial too tightly to the grid coil, and this is quite sufficient to prevent reaction effects. Consequently you must use a *few*-turn (say two-turn) coil in the aerial and do not put up with unsatisfactory reaction effects without trying alterations in the size of the coil, or a much shorter aerial.

If the set has an aerial lead terminating in a clip, for putting on to one of the turns of the grid coil, remember that loose coupling is obtained if this clip is adjusted near to the earth end, and not to the grid end of the coil. By varying the position of the clip, you will soon learn to obtain just the right

(*Continued on page 304.*)

# RADIOTORIAL QUESTIONS AND ANSWERS.

*(Continued from page 302.)*

degree of coupling to give satisfactory reaction effects over the whole tuning range.

Finally, if this set should be used with a small variable condenser between the aerial lead and the aerial terminal, to vary the coupling, this condenser must be set towards its minimum in order to give loose-coupling effects, as if a fairly long aerial is employed and the aerial coupling condenser is set "all in" the set may refuse to oscillate, even though everything else is in perfect order.

Remember also that the H.T. applied to the detector valve has an important effect upon the oscillation control, which is to some extent also dependent upon the value of the grid leak, and upon the position of the slider of the detector's potentiometer, if the set incorporates one of these.

### WHAT WAS WRONG?

*Last week's was a rather difficult question, because there are several possible causes of such trouble. Among the common ones are wrong relationship of connections to primary windings (reversal will often cure a hum), a not very efficient output filter, a de-coupling or by-passing circuit that is not functioning properly, or an imperfect earth.*

*In this case the earth wire was broken underground, and gave no trouble with batteries, but caused a hum with a mains unit.*

### INTERFERENCE BETWEEN INDOOR AERIALS.

T. M. (Earls Court).—"I still have in use the "P.W." blueprint set Det.-L.F. No. 11, and although it has been satisfactory for many years, I am now in difficulty with it.

"The point is that I persuaded my neighbour who lives in the next flat to build one, because he had heard mine and was greatly impressed with it. He did not think that he could do without an outdoor aerial, so I showed him mine, which is eight wires along the ceiling of the long hall which runs right from the front to the back of the flat.

"With my help, he made up the set very similar to mine, and put up the same kind of aerial. Now either set alone goes splendidly, but they refuse to work properly together.

"If I switch on and tune in, it takes his programme right out, and the same sometimes, when I am listening, if he switches in, it blots out mine. What can we do about it?"

When interaction of this kind takes place the great thing is to try and remove one aerial as far as possible from the other, and especially to avoid running them parallel, as this is the position for maximum interference.

Your best plan would be for one of you to try a totally different kind of aerial, such as, for instance, a wire zig-zagged across the ceiling of one room as far away from the neighbour's aerial as possible. Another tip which is worth trying, if the flat has a metal window, is to endeavour to use this as an "aerial," for very often there is quite sufficient pick-up on a window of this kind, which, if experiments indicate it is likely to prove satisfactory, can easily be drilled for a terminal shank.

You might also try one of the indoor type "sausage" aerials, arranged so that it lies at right-angles to the neighbour's aerial; in which case it would not matter so much if it had one end running close to it, with only the wall dividing them.

Failing all this, you may have to take the other aerial down, and both of you try different aerials, one running, say, from front to back of the house and the other from side to side, or diagonally across the largest room. The probability is that if you experiment in this way (with a quarter of a pound or so of D.C.C. wire, before putting up the aerial permanently) you can both find positions where the sets will not interfere noticeably with one another, unless too much reaction is applied to one of them.

This latter, of course, would be fatal, for it is impossible to overcome the ill effects of strong reaction. We are afraid it may take a little time and patience, but we think if you tackle the job along the lines indicated you should be able to find a satisfactory solution which will enable either of you to listen to the desired programme without interfering with the other.

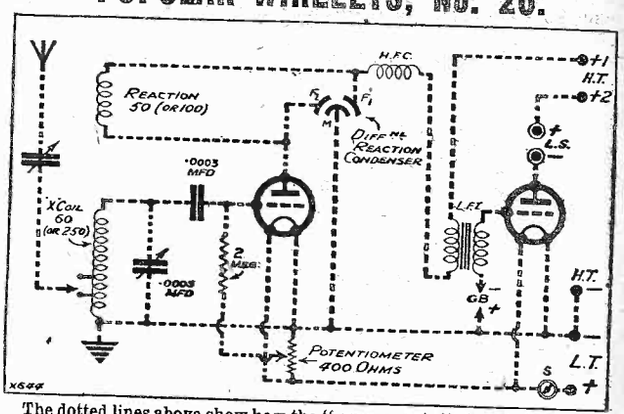
### FITTING A DIFFERENTIAL REACTION CONDENSER.

H. L. P. (Didsbury).—"Being interested in the reports of improved reception with a differential reaction condenser as compared with the old two-vane type, I thought I would alter my set, which has reaction not on the aerial, but from the detector plate to the grid circuit (following a stage of S.G. amplification).

"I worked out the connections carefully, but am very disappointed with results. I find

*(Continued on next page.)*

## POPULAR WIRELETS, No. 20.




**The dotted lines above show how the "components" given in "P.W." No. 435 should be connected to give a straight Det. and L.F. circuit. The potentiometer return for the grid-leak ensures good reaction control and greatly assists in long distance reception.**

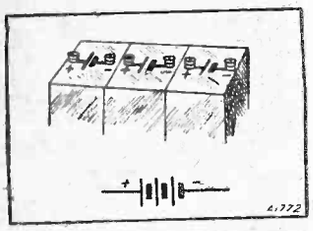
## RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from previous page.)

t not only is reaction not half so good as formerly, but I have completely altered the S. tuning, which is now extremely flat and altogether unsatisfactory. In fact, I might just as well work without an S.G. stage at all. Unfortunately, I spoiled the old condenser in taking it out, and before getting another one of the same kind I should like to know whether it is possible I have done wrong in trying to apply a differential reaction condenser to a detector following a S.G. valve, or whether it makes an improvement only where the detector is the first valve."

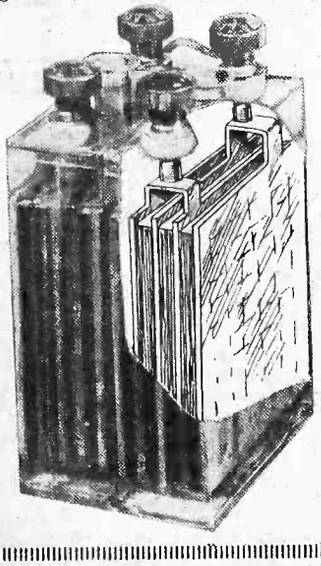
The advantages of the differential scheme of reaction, as compared with the older type, are just

### "INSIDE" INFORMATION



Above you see the theoretical sign for an L.T. Battery (consisting of alternate plates), and above that a sketch of a 6-volt battery, showing that each cell contains one negative and one positive group of plates.

Below, part of the contents of a 4-volt battery have been sketched in, from which it will be seen how the theoretical diagram does really convey the essential idea underlying battery construction.



applicable when it is used following an S.G. stage when the detector is the first valve.

Evidently, in your case, you have failed to connect up properly, and we think that there is no doubt, if you overhaul the connections and get them correct, you will find that your differential reaction condenser gives far better results than the older method. The usual plan is to have the moving vanes of the differential condenser joined to the plate circuit of the valve between H.F. choke and plate, with one set of the fixed vanes going to the non-earthed end of the reaction coil. The other fixed vane goes to earth.

Or you could use the method of correction shown in "*Popular Wireless*, No. 20.

Perhaps you have taken one of your sets of fixed vanes to the H.F. choke and plate?

### READERS' ADDRESSES.

P. F. (Salisbury), C. C. S. (Belfast), AND "SAMBO."—Sorry, but we regret that it is quite impossible to accede to your requests. It would not be fair to other readers.

# BRISTOL'S WIRELESS WEEK.

NOWHERE is there closer co-operation between civic authorities, the B.B.C., and the wireless trade than at Bristol, where, for the fourth successive year, one of the finest radio weeks of the whole country is due to take place between October 26th and November 1st.

Every day throughout the week the Cardiff programmes will include something emanating from or relating to Bristol, beginning with a concert by the Bristol City Police Band, an oratorio programme in which May Middleton, a Bristol soprano, will take part with the National Orchestra, and a service relayed from St. Mary Redcliffe Church, Bristol, on Sunday, October 26th.

### The Flying Fox

On the same evening the Lord Mayor of Bristol, Councillor Walter Bryant, will appeal to listeners on behalf of his Wireless for Hospitals Fund, which has, up to date, brought in more than £2,500 and over £500 worth of material. All hospital sets in the city have been reconditioned and brought up to date during the past year at a cost of £500 raised by a house-to-house collection, and no expenses have ever been charged to the fund.

On Monday, October 27th, a feature programme will be relayed from the R.N.V.R. training ship, "Flying Fox," which is moored in the Bristol Channel, when life aboard will be portrayed by a description of a gun-loading competition, and band music, songs and choruses contributed by men of the R.N.V.R.

### Famous Men of Bristol.

The commanding officer of the vessel will also speak about the work of the R.N.V.R.

Dennis Noble (baritone), a native of Bristol, is taking part in the National Orchestra of Wales concert at Swansea on Tuesday, October 28th, and on the following day the programmes contain a concert organised by the Bristol Children's Concert Society, which is to take place at the Central

(Continued on next page.)

## "EKCO" POWER SUPPLY UNITS

**Messrs. E. K. Cole, Ltd., ask us to announce that an error appeared in their advertisement in POPULAR WIRELESS, September 27th, 1930.**

**In this the price of the H.T. Unit A.C. Model 1V.30 was given as "£2 19s. 6d." (which is the price of the D.C. Model) instead of as £5 15s. (which is the correct price of the A.C. 1V.30).**

**Messrs. E. K. Cole Ltd., offer their apologies for any inconvenience which may have been caused, especially as hundreds of enquiries have been received in answer to the advertisement—a tribute to the pulling-power of "P.W." as an advertising medium.**

## BRISTOL'S WIRELESS WEEK

*(Continued from previous page.)*

Hall, Bristol, under the chairmanship of Dr. Ludford Freeman, Director of Education for the city.

Thursday brings an organ recital by Mr. Rowland Shiles at St. Nicholas Church, Bristol, when vocal items will be contributed by George Winstone, a boy (soprano, and the Rev. J. M. D. Stancomb (baritone) who was formerly Precentor of Bristol Cathedral. That evening a variety programme will also be relayed from the Bristol Musical Club.

There are talks by Mr. Ben Tillett, M.P., a native of Bristol and a well-known trade unionist among dock workers, who, on Saturday, November 1st, will describe a day in dockland, and by Dr. F. W. Rixon, who, the same evening, will attempt to prophesy what Bristol will be like in A.D. 2000.

**To Which County?**

On Friday evening there is a debate between Mr. W. Irving Gass and Mr. Fred A. Wilshire entitled Somerset versus Gloucestershire which will revive the age-old problem of whether Bristol belongs to one or other county. Actually, the River Avon, which flows through the city, is the geographical dividing line, but the town was constituted a county of itself by a Charter of Edward III granted in 1373.

Special programmes for the children will also be broadcast throughout the week, one of which will be relayed from the Zoological Gardens, Clifton. There are, too, plays by West Country writers and a feature programme arranged by Mr. Froom Tyler entitled "A Trip Round Bristol."

Finally, there is dance music on Saturday, November 1st, relayed from the Grand Spa Hotel, Clifton.

## IS MAINS HUMMING INEVITABLE?

*(Continued from page 291.)*

"unacclimatised" ears when there is no speech or music to drown it is, I suppose, passable in the case of the smaller, cheaper apparatus.

When the "humming" can be picked out by critical ears during a transmission, then that is a sign that the smoothing is very inadequate.

The cost of "smoothing" rapidly increases as with increases in the size and complexity of a set. There is some excuse for the presence of a small hum in a five-valver using two screened-grid valves that derives both its H.T. and L.T. from the mains and perhaps even the field current for a moving-coil loud speaker.

**Use a Tested Condenser.**

With such gear the suppression of hum does, in fact, become a very difficult affair indeed. Nevertheless, it is possible, although in cases special measures have to be taken.

When it is a question of deriving only H.T. from the mains and that for a more or less straightforward two-, three-, or four-valve set, there are no real problems encountered. An absolutely silent background with complete freedom from humming is not at all difficult to get, and the

*(Continued on next page.)*

# IS MAINS HUMMING INEVITABLE?

(*Continued from previous page.*)

gear required is relatively extremely simple and inexpensive.

But even here there is a limit below which it is not wise to go in lowering the quality of the smoothing chokes and the number of "microfarads" or hum will surely creep in.

If you happen to have one of those not-too-good units that does contribute hum, I would advise you to add a little extra smoothing. One good smoothing choke designed especially for mains units such as are sold by the R.I., Wearite, Varley, and other such people, and one 4-mfd. fixed condenser, marked as tested at a voltage about twice that of your mains, will be necessary.

The choke needs to have a low resistance and a hefty inductance at moderate currents. It is in such details that so many chokes fail. Of course, such an item costs a pound or so.

### Watch the Detector

You should first try connecting the choke in series with the H.T. lead that feeds the detector valve connecting the fixed condenser between the valve side of the choke and H.T. minus. The detector is naturally very susceptible to "hum" in that all its energy, complete with all its mush, is amplified further by the succeeding L.F. stages.

Alternatively, the choke can be connected in series with one or other of the mains input leads and the condenser joined across these leads at the unit side.

But I am not going into this extra smoothing business any further, otherwise I shall spoil the moral of this article, which is, any good H.T. unit or for that matter any good mains set should not need extra smoothing, for it should not evince the slightest degree of hum, as humming is far from being inevitable!

# SIMPLE PICK-UP SWITCHING.

THERE are several ways in which a gramophone pick-up may be connected into the circuit of a radio receiver, but there is one simple way which is applicable to any ordinary set.

Just one extra component is required, and that is a single-pole two-way switch. This switch may be of either the ordinary throw-over type, or may be a push-pull one.

It should be mounted on the panel as near as possible to the grid of the detector valve holder. The connections and alterations to make are then as follows:

Remove the wire which goes to the grid of the detector valve holder and join it to one of the outside contacts of the switch.

Join the now free grid terminal to the common or centre switch contact.

Connect the remaining switch contact to one side of the pick-up, the other side of which has to be connected to a negative tap on the ordinary G.B. battery. Usually 1½ volts will be suitable, but sometimes 3 will prove better.

When the switch is in one direction the set will work just as before, and when in the other direction the pick-up will be brought into play and the radio will be cut right out of circuit.

## TECHNICAL NOTES.

*(Continued from page 276.)*

rent circuit has to be rewired throughout set.

Rewiring is not a difficult matter, and en the job is satisfactorily accomplished r are free of all low-tension battery ubles once and for all.

As a rule the heating current for each ve is somewhere about 1 ampere, and s is generally obtained by means of a table filament transformer.

**Straightforward Job.**

The H.T. current is obtained in the usual y. I should add, however, that the mere ostitution of the A.C. valves for the tery-operated valves and the rewiring the receiver will not in general ensure t, the moment you switch on your eiver, it will work precisely as before. You will almost invariably find that cial precautions will have to be taken so

## TECHNICAL TWISTERS

### No. 31.—H.T. MAINS UNITS.

CAN YOU FILL IN THE MISSING LETTERS?

There are two chief classes of mains unit—those for use with . . . . . current mains, and those for use with . . . . . current.

In the case of D.C. H.T. Unit the output must be . . . . . to eliminate hum, and some form of . . . . . regulation is required to provide variations for different valves.

The maximum . . . . . available is limited by that of the D.C. supply mains.

In the case of A.C. supply there must be a . . . . . as well as smoothing and voltage regulation apparatus.

By choosing a suitable . . . . . the voltage of A.C. mains can be altered as required.

LOOK OUT FOR THE MISSING WORDS NEXT WEEK.

Last week's missing words (in order) were: Recharging; Two; Use; Charge. Current; Capacity. Ampere; Filament. Ten.

to prevent the set from becoming unstable d so as to keep down as much as possible y A.C. hum.

There is no need for any reader, however, feel in the least afraid of tackling the job converting his battery set into an all-ains one.

The rewiring is quite a straightforward atter and the slight adjustments necessary get the set working efficiently should ally give very little trouble.

**odern Receiver Design.**

Talking about A.C. sets, it goes without ying—as was very evident at the last adio Show at Olympia—that many of ie new radio receivers are designed for l-electric working.

*(Continued on next page.)*

## TECHNICAL NOTES

*(Continued from previous page.)*

There are some cases in which batteries are necessary, and will perhaps always be necessary, but there is no doubt that wherever direct operation from the electric light supply is possible, it certainly is very much more convenient and is making a rapidly increasing appeal to the public.

**Background Noise.**

Generally with an A.C. all-electric receiver you will find that when no reception is coming in there will be a slight A.C. "background" which will be heard with varying degrees of loudness.

In a really good and well-smoothed receiver this should scarcely be perceptible. In any case, it is not fair to judge the receiver when it is tuned to a silent position between two stations or when no station can be received, as this gives an altogether wrong impression of the importance of any slight background which may exist.

**Permissible Amount of Hum.**

The proper way is to observe the interfering effect, if any, of the background when a fairly weak or distant station is being received. If you find that there is no perceptible interference in these circumstances you can be well satisfied with the set.

I have sometimes heard criticisms made of receivers which were really excellent in every other way simply because at a *silent* point between stations a faint A.C. background was audible.

To eliminate this last trace of background would have increased the cost of the set very considerably, and the extra cost would have been out of all proportion to the advantage gained. In fact, the advantage would have been negligible.

**Dual-Purpose Amplifiers.**

Most receivers nowadays are provided with arrangements for using the L.F. amplifier for the purpose of playing gramophone records, and I think any of you who may be contemplating the purchase of a new receiver would be well advised to make this a definite stipulation.

The electric reproduction of gramophone records is now so popular that it seems to me a commercially made receiver can hardly be called "up-to-date" unless it can be used also for both purposes.

**Variable Selectivity.**

Another useful feature of a reciever is the provision of different aerial tappings so that the selectivity can be varied.

For example, when the local station, or any station likely to interfere, is working, the most selective tapping can be used, whilst in other circumstances when there is no danger of interference—or when the local station has closed down—the least selective tapping can be used, which often means much greater signal strength on distant stations.

# FOR THE LISTENER

**By "PHILEMON"**

**Our popular contributor—on his return from abroad—reviews the recent programmes.**

### Home Again.

IT is good to be home again. Coming up from Dover on the boat train it was good to see the innumerable aerials—yours, gentle reader, perhaps among them!—stretching across back gardens and back yards in every village and town.

It is the rarest thing to see an aerial in Italy. I saw more eagles than aerials! There they are so thick that, if I were a bat, I shouldn't flitter round about houses at dusk any more!

### The Last Prom.

For the most part I have given music a miss since my return. Except for the last Promenade Concert. One wouldn't willingly miss that.

It is more of a thrill than a performance. The crowd went wild that night. I love crowds which go wild.

The Rachmaninoff Prelude went a bit wild, too; and was, I thought, the better for it. The Concert ended with the usual Pot Pourri of National Airs. The audience combined with the orchestra to raise the roof with "Rule Britannia."

And then, on a pandemonium of cheering, and in a chariot of handkerchief waving, Sir Henry Wood was for the umpteenth time translated into heaven. To judge by the sound, there was no standing-room in the Queen's Hall; and critics who prophesy that wireless will empty the concert halls were once more confounded.

### Listening at Ease.

Most of my notes this week are on Talks. You can't imagine how pleasant it is to listen to a talk, sure that you will not be suddenly interrupted by a brass band from Vienna or an opera chorus from Milan.

*(Continued on next page.)*

# FOR THE LISTENER

*(Continued from previous page.)*

I listened to Mr. S. K. Ratcliffe trying to discover from Mr. Reginald Swing what America thinks of us. The danger of all such conversations is that they should become too complimentary.

Mr. Swing said quite a lot of very nice things about us. No doubt he meant them. He gave no hard knocks. The worst he was willing to say about us was that we are "reticent." Even that was a compliment.

### Words.

I also listened to Mr. J. C. Squire talking about the Meaning of Words. Very entertaining. It is a fascinating subject, and Mr. Squire, with his clear, agreeable voice and his dry humour, approaches the ideal talker.

He gives me the impression that he thoroughly enjoys his own talk; but he cannot have enjoyed it more than I did. And you also, if you were wise or lucky enough to be listening at the moment.

### Science and Religion.

I also heard Sir Arthur Thompson on Sunday evening. (I was just too late for Julian Huxley on the same subject the previous week.)

I love Sir Arthur's books, on birds and beasts and biology. I could probably love him himself quite easily; but I bar his voice on the air. To me it was almost intolerable.

I hung on until he had declared that there was no real conflict between science and religion, since the one was descriptive and the other interpretative—and then I switched off. I couldn't stand it any more. Happily, I could guess what he was going to say.

### Stainless.

Talking of voices, I was lucky to find Stainless Stephen at the microphone on my first vaudeville night after my return. There is a voice if you like!

There is the old story of a sculptor who, having ruined a piece of work by a horrible slip of the chisel, proceeded to make use of his mistake by making a masterpiece out of it. The voice of Stainless is a mistake.

It is a blot on the vocal universe. It is a moth-eaten thing. But such is the fellow's art and craft that his voice is a living partner with him in his triumphs. There's more than a bit of genius about a man who can turn a limitation into an ally.

### White Skins.

Harold Nicolson for once in a way disappointed me in his eulogy of Lord Birkenhead and Lord Curzon. He did not sound quite at his ease. He was laboured.

Probably he felt that he had given himself the hopeless job of getting the ocean into a bucket. I thought that the parallel which he drew between the two men was far-fetched.

But I liked his story of how Lord Curzon, watching some Tommies having a bath after coming back from the trenches into billets, said, "Dear me, I never realised that the lower classes had such white skins!"

**Next Week**
**"CONTRADYNE JUNIOR"**

# I Like that Margin of Safety

All electric's all right for radio, but I like to be careful about anything that's worked by electricity in the home. There's the missus and the youngsters *and* the maid who will monkey about with the set at *any time.* She does like radio—that's why my H.T. Batteries always get spent out when I want a special programme, so I've got fed up with batteries and I've bought an

## RI ALL-INSULATED H·T·UNIT

**With the neat All-Insulated Bakelite Case and Recessed Sockets**

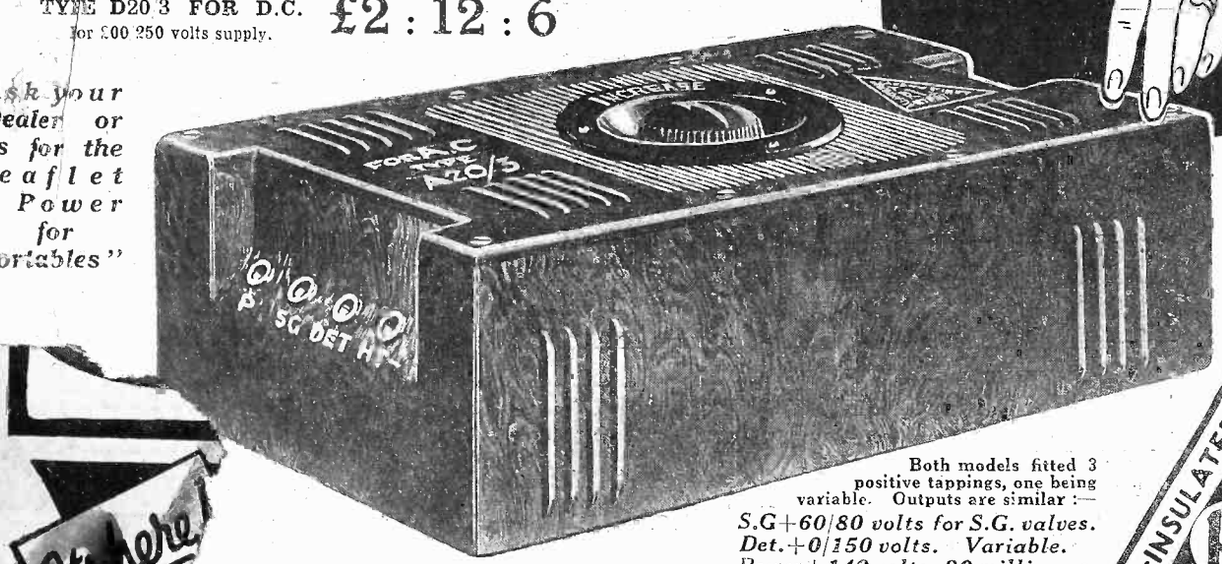
It's impossible to get a shock and the Unit is the most advanced and efficient you can get. NIKALLOY the amazing new metal is used in it, and although the unit is the same size as a battery it gives results quite unattainable in such a small space without Nikalloy. It fits portables, of course, and works any set up to five valves.

**TYPE A20 3 FOR A.C.** **£4 : 15 : 0**
For 200 250v. 40/100 cycle supply.
For 25 cycles £5 : 5 : 0. Suitable for 50 cycles if change over occurs.

**TYPE D20 3 FOR D.C.** **£2 : 12 : 6**
For 200 250 volts supply.

*Although D.C. type is normally rated at 20 m.a. actually 30 m.a. are available.*

*Ask your Dealer or us for the leaflet "Power for Portables"*




Both models fitted 3 positive tappings, one being variable. Outputs are similar :—
*S.G+60/80 volts for S.G. valves.*
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*Power+140 volts. 20 milliamps.*

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ALL-INSULATED SAFETY FIRST
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H·T·UNIT

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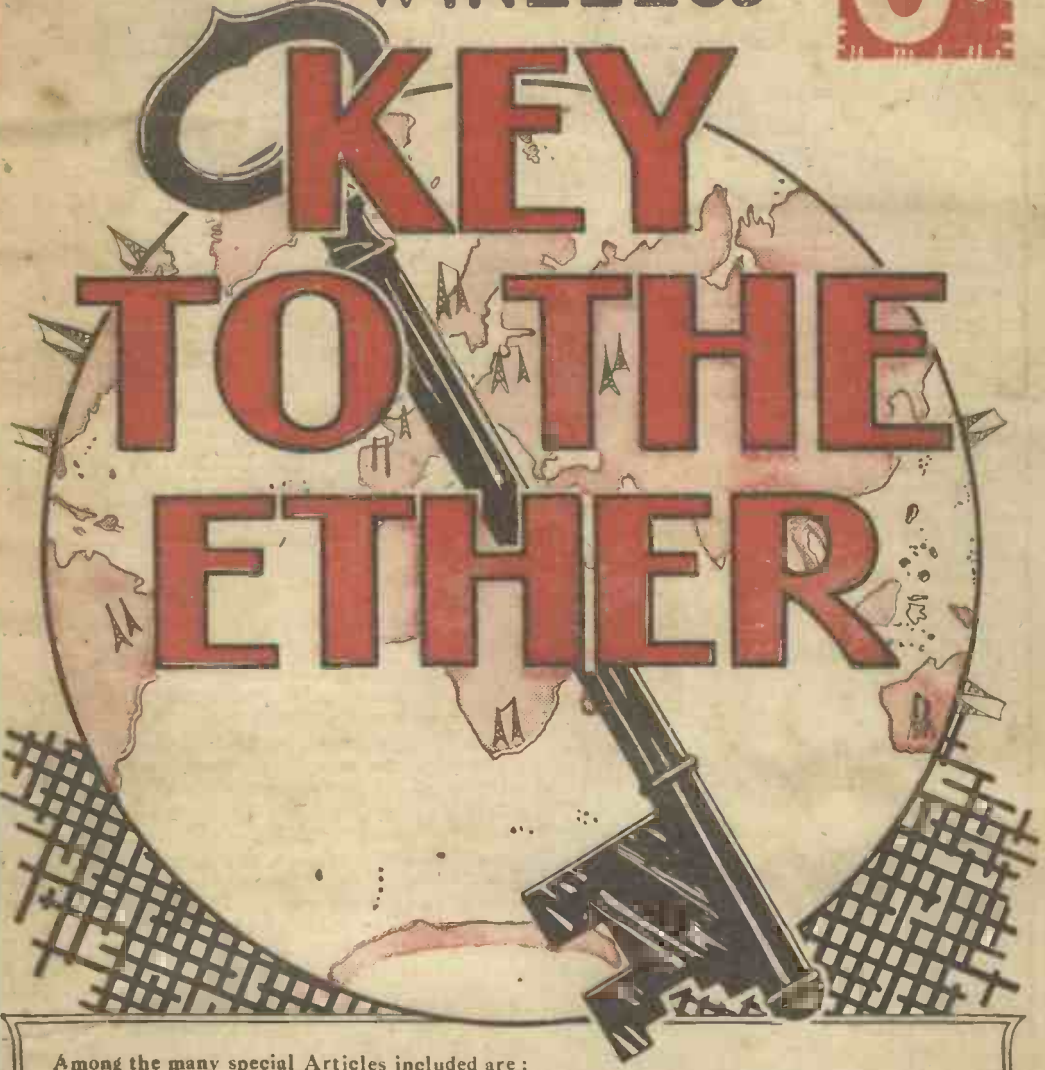
*Presented Free with "Popular Wireless," Oct. 18th, 1930.*

# THE "POPULAR WIRELESS"

6d

# KEY TO THE ETHER



Among the many special Articles included are:

- FINDING FOREIGNERS
- YOUR AERIAL AND EARTH
- TIPS FOR TUNING
- DROPPING THE "LOCAL"
- BOOSTING WHISPERS
- FROM LEEDS TO NIJNI NOVGOROD
- CIRCUITS TO TRY
- TWO-HAND TUNING
- "PLACING" THE STATIONS
- SELECTING CIRCUITS
- IMPROVING YOUR SET
- DIVING DOWN TO SHORT WAVES
- LONG-WAVE FAVOURITES
- WHAT WAVE-LENGTH WAS THAT?

AND HOW-TO-MAKE DETAILS OF TWO FINE SETS

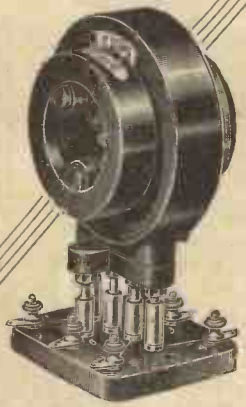
ii

# SUCCESSFUL ALLIES OF SUCCESSFUL RECEIVERS


LEWCOS C.T. COIL

THE LEWCOS SUPER COIL IS SPECIFIED FOR THE "D X" ONE RECEIVER DESCRIBED IN THIS ISSUE.

THE CENTRE-TAPPED COIL IS SPECIFIED FOR THE "ECONOMY" THREE RECEIVER AND THE "'P.W.' BROOKMANS REJECTOR" DESCRIBED IN THIS ISSUE.



LEWCOS SUPER COIL.


LEWCOS "X" COIL.

Lewcos engineers are occupied year in and year out on problems connected with the improvement of radio reception.

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To improve your Receiver follow the advice of the experts—use Lewcos Radio products.

Fully descriptive leaflets of the Centre Tapped and "X" Coils (Ref. R34) and the Super Coil (Ref. R43) will be sent on request, together with a free sheet of blue prints of four suggested circuits utilising Lewcos components (Ref. R70). Please quote reference numbers.

THE "X" COIL IS SPECIFIED FOR THE "ECONOMY" THREE RECEIVER AND THE "'P.W.' BROOKMANS REJECTOR" DESCRIBED IN THIS ISSUE.

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RADIO PRODUCTS FOR BETTER RECEPTION

THE "POPULAR WIRELESS"

# KEY TO THE ETHER

**A practical guide to the reception of distant broadcasting programmes, with full details of how to adjust and handle your set for best long-distance results.**

SPECIALLY COMPILED BY
THE TECHNICAL STAFF
OF "POPULAR WIRELESS."

## CONTENTS

# FINDING FOREIGNERS

**It's a great game—and you're going to be good at it!**

FINDING foreigners is the greatest game on earth. And it is a game that YOU can play.

Plenty of people can pick up foreign stations on crystal sets. And if you have got a valve set you are "on velvet," for the valve set—even a one-valver—is *certain* to pick up foreign stations if properly handled.

Notice that word "certain." There is no doubt about it, no qualification, no query, no "ifs" or "buts," but a plain statement that with a one-valve set *you* can get foreign stations.

Note, too, that the word "you" is emphasised. We are coming back to YOU in a minute. First we must say just a few words about crystal sets.

## HANDLING THE SET.

Crystal sets are far more sensitive than they are generally given credit for. If you give a crystal set a good aerial and good earth, it will give you a surprise.

But a valve set is so superior that even if you do *not* give it a particularly good aerial and earth, it can reach out and grab foreigners galore.

The reason that so many valve sets fail to pick up foreigners properly is that they are badly handled. We said a few lines back that we were coming back to YOU again. We have now come back to you, and the question is, "Do you handle your set properly?"

It is not the set, but the man behind the set that matters.

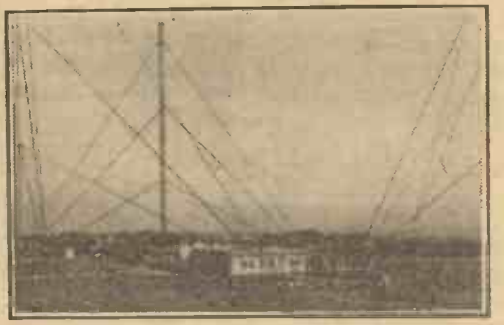
Scores and scores of simple receivers are missing programmes that they could pick up quite easily if controls were handled properly. The foreign programmes are in the aerial, but they never come out of the telephone or loud speaker because they never have a chance.

The reaction dial is turned too far round or the tuning dial is in the wrong place, or there is a fatal lack of that fine tuning which would do the trick.

Do not blame the set. Probably the set is all right.

If you will read this book through carefully, paying attention to the hints and trying to give your set a fair deal, you will find that those slippery and elusive foreigners are really the homeliest fellows in the world. There is endless entertainment to be had from them.

## VIENNA CALLING!



This is Vienna—767 miles from London, but only "just across the road" from a radio set's point of view.

## KNOWING THE CONTROLS.

But they want coaxing. In order to bring in foreign stations on a simple set you must know *how to handle the set.* You must use its controls knowingly and skilfully and, above all, smoothly.

The following chapters of this book will have to be practical ones, full of hints and tips and "how-to-do-its." But in this chapter the thing we want to say about finding foreigners is that *you can do it!*

Your set may be a little one, but it has big possibilities. Your pocket may be limited, but the whole wide world is open to you. The great thing is to get the right attitude of mind. Get to know your set.

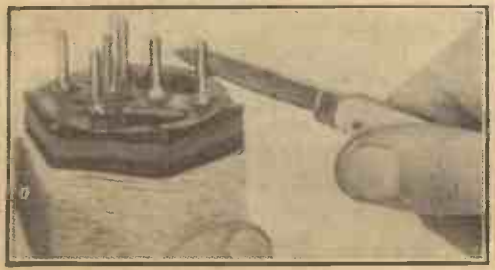
You may not be very skilful at the moment, but you can be. If you read this book, and digest what is told you, you *will* be.

There are plenty of foreign stations to be had.

Get them!

In Europe alone there are hundreds of broadcasters on the air this very hour, flinging out wireless waves all over the country. Why not tune in your share of them?

## A USEFUL TIP



**Cleaning and opening contacts doesn't take long, but it puts miles and miles on your range.**

## IMPROVING SELECTIVITY

**An extra coil of 15 turns or so, tied to your "aerial" coil with cotton, will sharpen tuning. One end of it goes to earth and the other to your aerial lead.**

# TIPS FOR TUNING

Some practical hints on handling the dials.

THE tuning dials on a set simply *alter the wave-length* to which the set is adjusted for reception. If you have a dial which is marked "reaction" or "increase" or "strengthen," that is *not* a tuning control. Do not confuse your reaction and your tuning dials; they are quite different.

The idea behind tuning is this. Every station that sends out a programme sends it out on an aerial, and that aerial has a coil and condenser associated with it. *The wave-length on which that transmission goes on depends upon how that coil and condenser are adjusted.*

If a station is instructed that it must send out on 500 metres, it adjusts its coil and condenser until the wave-lengths on which it is sending out is 500 metres, and then it fixes these adjustments permanently and always sends out on that wave.

If you want to pick up that transmission, you must adjust *your* circuit to 500 metres also. For when you are "in tune" with that station, even the weakest signals from it will affect your receiver; but if you are out of tune, its programmes will pass you by.

## FIX THE DIAL ON TIGHT.

It is only when your set is "in sympathy" with the distant set that a weak transmission from it can be picked up loud enough to hear what is going on.

Just a few words about the tuning dial itself. Obviously, if the markings upon this are to be of any use at all in long-distance reception, the dial must be affixed *tightly* to the spindle which carries it.

Usually a tuning dial is held on its spindle by a little grub-screw, countersunk into the dial. Sometimes you can get at it easily, sometimes you can't, but wherever the screw is *it must be tight.*

## VERY SIMPLE!

Don't grip a dial like this. You get finer adjustment by holding its outer edge.

Do not put up with a loose screw or a loose tuning dial, or you will never be successful with foreign stations.

If the little screw which holds your dial on to the spindle seems loose, and it is too small for your screwdriver to reach and tighten up, get a small-headed screwdriver for it, or else improvise a screwdriver by filing a small bradawl. Be sure and do it somehow, for you cannot possibly set your tuning to a given point unless the dial is *tight*

To tune-in distant stations on an ordinary receiver you must, first of all, have a reasonably clear dial.

If the local station monopolises one-third or more of the dial, a Brookman's Rejector—or, failing that, a really good wave-trap—is essential, and, when correctly set, should reduce the local station's programme to two or three degrees. Assuming that the dial is fairly clear, what is the best way of receiving foreign stations?

## MIND YOUR HANDS!

When adjusting a wave-trap condenser you get better results by keeping your hand well away from the trap. A long screwdriver with a wooden handle is very useful in this connection.

Frankly, the whole secret of success lies in the handling of the reaction control. If you have too little reaction, then your set is not sufficiently sensitive, and you will not hear the weaker stations.

If, on the other hand, you have too much reaction, you will still fail to receive the foreign programmes, and, in addition, your set will be giving out squeals and squeaks, and will be upsetting the reception of all your neighbours. What, then, is the fair amount of reaction to give, and how can this be assured for any particular station?

The answer to the first part of the query is: use as little reaction as possible to get the necessary strength, and always keep below the "oscillation point." What is meant by the "oscillation point" is explained elsewhere in this book.

## STATION UPON STATION.

The method of tuning recommended really does not cause interference with the neighbours, and yet, if practised properly, will enable any intelligent listener with a valve set and decent aerial to pick up more foreign stations than he knows what to do with.

The kernel and heart of the whole matter is to be able to adjust the tuning dial to cover various wave-lengths and, at the same time, keep the set *nearly, but not quite*, oscillating.

# YOUR AERIAL AND EARTH

**Long-distance efficiency is like charity—it should begin at home. If you want foreigners it will pay you to read this article and ponder over the practical hints given below.**

A good aerial will make an enormous difference to the number of foreigners you can pick up, so you ought to pay particular attention to making it as nearly perfect as possible, and maintain it in good condition.

The best scheme is to have a good high mast, 30 ft. or more, erected in such a position that not only is a long aerial possible, but this is lifted above any roof, building, tree, or similar obstruction, which would "screen" the aerial and impair the results.

## DIMENSIONS FOR THE AERIAL.

The total length from lead-in to the far end must not exceed 100 ft., and generally a very much-shorter aerial is perfectly satisfactory. If you can raise it, say, 25 ft. or 30 ft. at the house end and run it to a mast which is about 40 ft. away, you should get excellent and satisfactory reception.

Use a single and not double wire, of stranded copper, or similar high conductive material avoiding any breaks or joins, so that the aerial runs from the farthest insulator right down to the lead-in without a break, if possible.

Take care not to kink the aerial when putting it up, and use an adequate number of insulators of the type that will remain dry (even under severe weather conditions) over parts of their surfaces.

## TAKE CARE OVER THE LEAD-IN.

If you are going to use an aerial lead-in switch (and it is advisable to do so) make sure that the contacts of this are really firm and sound, and arrange that the whole switch is covered with some protective device, such as a box, to protect it from the effects of the weather. Be particularly careful not to take the lead-in through the window close to any metal, bearing in mind that the wire itself should not be within a foot of any wall, etc., except at the point where it enters the house, and here it should be well spaced away from conductive surfaces.

From a high-frequency point of view, which is that point of view with which the aerial is concerned, an aerial is *not insulated properly unless it is spaced well away from adjacent conductors.* If you lay an insulated aerial wire along a metal gutter-pipe, you have, in effect, a condenser, one plate of which is the wire *inside* the insulation, and the other plate is the gutter-pipe!

## THE SERIES CONDENSER.

Now, oscillating or high-frequency currents have no difficulty whatever in "flowing through" condensers. (You can see for yourself that the aerial currents are very often led through a condenser and the other side of this is connected to the set, so that all currents in the aerial are forced to "cross" this condenser before they reach the set.)

## EARTH JUST AS IMPORTANT.

The earth is just as important as the aerial. Generally you can make a good "earth" by joining up to a water-pipe, employing one of the usual earth-clips to make the connection to it and making sure that the pipe is thoroughly cleaned with a file or emery cloth before the clip is placed in position.

If you make a thoroughly good, clean job of the electrical connections, and then coat the whole of the clip with petroleum jelly, to protect the joint from the effects of the atmosphere, you can be sure that the water-pipe connection will give you an excellent earth. It is sometimes thought that an outside earth is always better than a water-pipe, but this is not true, and very often the water-pipe is far more satisfactory.

## WHERE MASTS SPRING UP LIKE MUSHROOMS

A typical scene in a London suburb, where everyone tries to out-top his neighbour, because extra height means extra range.

## DO NOT SHARE YOUR EARTH.

It not infrequently happens that the sharing of an earth wire with a neighbour means that the operation of one set will interfere with the other to some extent, so that, for instance, every time he adjusted his crystal you would hear the scratching in your 'phones, or possibly you would be able to hear speech or any loud noise which affected his telephones and caused interaction with your own receiver.

Interaction of this kind is always undesirable. The best plan is to employ a separate earth, because aerials are often necessarily placed somewhat close to one another, which exposes them to risk of interference with one another, unless all precautions are taken to avoid this.

The photograph on this page shows how closely placed aerials have to be in many suburbs of large towns.

# TWO-HAND TUNING

**Some practical information for the heavy-handed dial-twister.**

It is hopeless to attempt to handle a two or three dialed receiver without working to a definite plan. Haphazard dial twisting will produce but poor results. It would be as futile as trying to open a combination lock without knowing the combination word or figures.

If your set has two or three dials it has considerable power or sensitivity, and usually that means H.F. stages. If you have these H.F. stages properly neutralised, or if screened-grid valves are used, there is practically no danger of re-radiation from the set. So you will be able to operate the set in an oscillating condition, without causing interference to other listeners.

## FEELING YOUR WAY.

If you have two tuning dials and a reaction control, this is how you should proceed with your station searching. First of all get the feel of the dials, that is to say, twiddle each one round and note how many degrees you pass through for each certain movement of the control knob.

Get the idea thoroughly into your head that the clockwise movement of the tuning variable increases its capacity and, therefore, the wave-length to which the circuit in which it figures will tune. Likewise, the higher the reading on the dial the higher the wave-length.

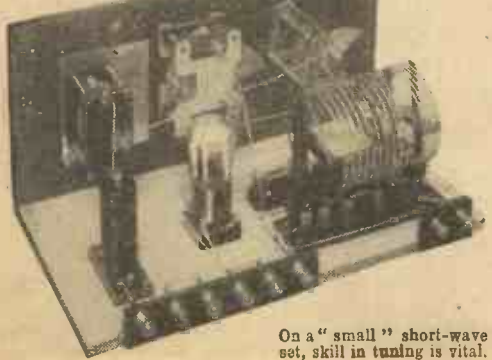
If it is normal, the reaction condenser should function in a similar way, that is, the farther you turn it to the right the greater the reaction effects. Also note whether or not the reaction condenser needs a greater adjustment to produce oscillation towards the upper readings of the condenser dial.

This is the more common condition, and it is generally found that very little capacity is needed from the reaction condenser to make the set oscillate on the lower wave-lengths, while it has to be nearly full in to do this on the higher wave-lengths.

The next thing you want to do is to "line up" the tuning condenser dials so that their readings are approximately the same for each wave-length. You can do this by tuning-in the local station to start with. Put the reaction at zero, and then twist the tuning variables until you find that local station. You should have no difficulty in doing this. You will probably be able to locate the broadcasting by means of the one dial only.

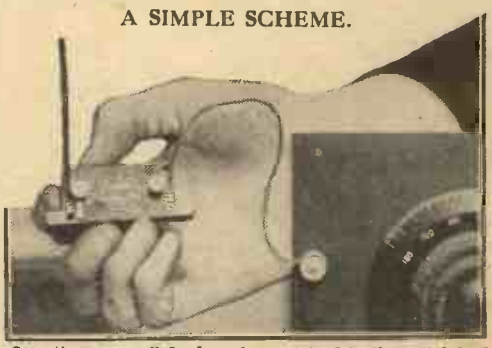
When you have secured the station, tune it in to its loudest on the one dial, then, leaving that, tune in to the sharpest point on the other dial. If the two dial readings are widely different it would be advisable to alter the dial of one variable so that the readings more or less correspond.

## FOR SHORT WAVES.



On a "small" short-wave set, skill in tuning is vital.

## A SIMPLE SCHEME.



Sometimes a small fixed condenser joined in the aerial lead will help to sharpen tuning.

You will probably be able to do this easily enough by loosening a little grub screw that holds the dial to the spindle of the variable, gently twisting the dial without altering the moving vanes of the variable until the readings coincide, and then screwing up the grub screw again.

You will probably discover that the tuning is much flatter on the one scale than on the other. You may be able to lose your local station by means of a very small readjustment of one dial, the second dial acting more like a volume control, a big movement of it being needed before the station vanishes.

## YOU NEED NOT OSCILLATE.

In this case, take the sharp-tuning dial as your lead. Adjust this one very closely while you follow up on the other dial with the other hand, perhaps oscillating backwards and forwards over the approximate reading until the coincidence of the two adjustments brings in the distant broadcaster you require.

It is not advisable, nor is it necessary, to have the set in an oscillating condition and so locate stations by their squeals. In the circumstances, a little squealing would not do any harm, as there will be no re-radiation, but the method is not adopted by experienced station searchers.

It is much better to have the set in that very sensitive condition just off oscillation. You then tune in music or speech and do not get lost in a maze of C.W. stations and "carrier" harmonics.

# A "DX" ONE-VALVER

**"DX" means "long-distance," and that is just exactly what you get with this wonderful little set.**

THE great merit of this circuit arises from the special form of differential reaction which was developed by the "P.W." Research Department for the "P.W." "Magic" sets. This special scheme is really a combination of the ordinary differential circuit and the "throttle control" type and its special advantage is that it does not upset the tuning when it is operated.

Moreover, the full sensitivity of the detector is maintained at all times, and, in addition to this effect, which is normal to all "differential" circuits, there is a special one obtained only in this particular form, in that the moving vanes of the reaction condenser are wired to the filament circuit, and so risks of hand-capacity effects are eliminated.

## COMPARING WIRING & THEORETICAL DIAGRAMS

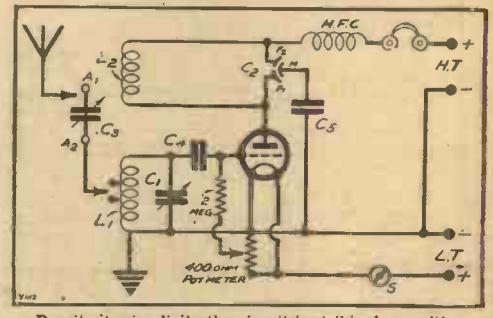
The theoretical circuit is shown in one diagram, with the parts labelled $C_1$, $L_2$, etc. These symbols are used on the practical wiring diagram also; so, even if you don't understand the ordinary theoretical diagram, you can trace this one without difficulty by comparing the two together.

Panel dimensions are given in another diagram. There is a special list of the components that are required, and it will be seen that they are all of conventional types.

After you have prepared the panel and mounted the two condensers and switch on it, you will fix it to the baseboard in the usual way by means of a row of screws along its lower edge; you hardly need panel brackets for so small a set. You must also cut your terminal strip, drill it and fit the terminals, and fix the strip to the near edge of the baseboard with a row of screws.

The next step is to mount the parts on the baseboard, and here you should turn to the wiring diagram and copy the layout as closely as you can, particularly with the placing of the coil holders. This is important if you want the best results.

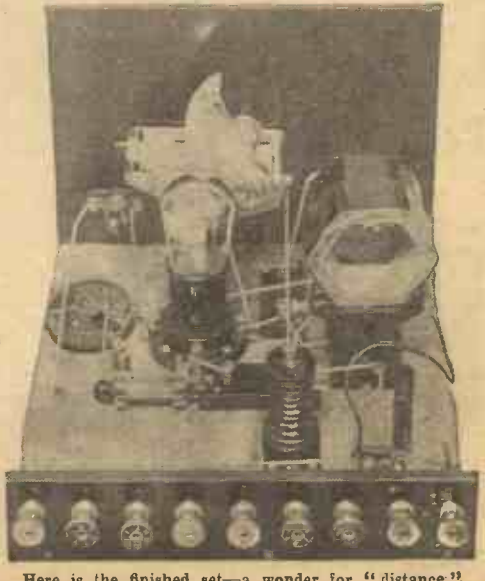
## A SURPRISING CIRCUIT




**Despite its simplicity the circuit is strikingly sensitive.**

### YOUR SHOPPING LIST FOR THE "DX" ONE-VALVER.

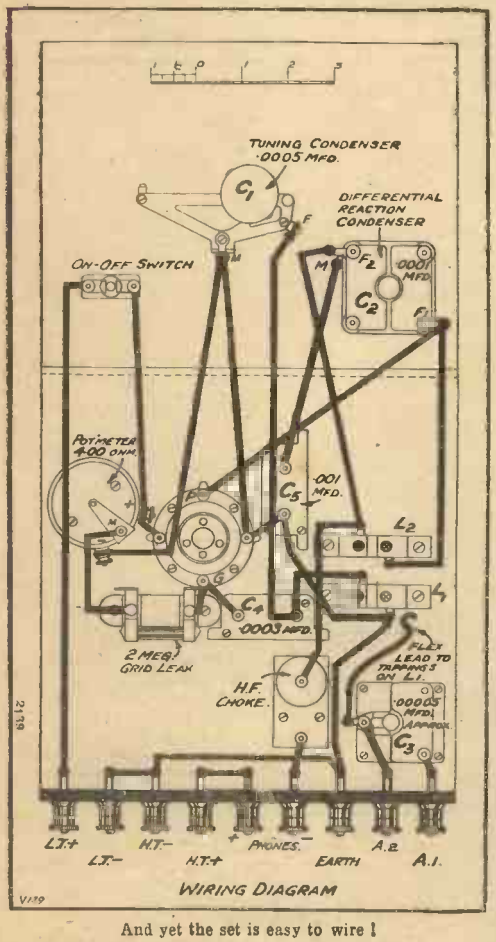
1 Panel, 9 in. × 7 in. (Lissen, Paxolin, Goltone, Ripault, Resiston, etc.).
1 Cabinet, with baseboard 9 in. or 10 in. deep (Camco, Pickett, Lock, Osborn, Gilbert, etc.).
1 ·0005-mfd. variable condenser, slow-motion type, or plain with vernier dial (J.B., Dubilier, Igranic, Lissen, Lotus, Keystone, Formo, Burton, etc.).
1 ·0001-, ·00013- or ·00015-mfd. differential reaction condenser (Utility, Lissen, Lotus, Ready Radio, J.B., Magnum, etc.).
1 L.T. on-off switch (Burton, Benjamin, Lissen, Igranic, Bulgin, Wearite, Magnum, Ormond, Red Diamond, etc.).
1 Sprung valve holder (W.B., Benjamin, Igranic, Lotus, Telsen, Precision, Lissen, Dario, Wearite, Formo, etc.).
2 Single-coil sockets (Wearite, Lotus, Lissen, Ready Radio, Igranic, Bulgin, Magnum, etc.).
1 Baseboard-mounting neutralising condenser (Bulgin, J.B., Lissen, etc.).
1 H.F. choke (Ready Radio, Lewcos, Lissen, Varley, Igranic, R.I., Dubilier, Telsen, Climax, Magnum, etc.).
1 200- or 400-ohm baseboard-mounting potentiometer (Lissen, Igranic, Ready Radio, etc.).
1 ·0003-mfd. fixed condenser (Lissen, Dubilier, T.C.C., Ediswan, Ferranti, Atlas, Goltone, Igranic, etc.).
1 ·001-mfd. fixed condenser (Lissen, etc.).
1 2-meg. grid leak and holder (Lissen, Dubilier, Ediswan, Igranic, Ferranti, etc.).
1 Terminal strip, 9 in. × 2 in.
9 Terminals (Eelex, Clix, Igranic, Belling & Lee, etc.).



**Here is the finished set—a wonder for "distance."**

Next comes the wiring-up process, and here you can use either bare wire, or one of the covered materials like Glazite. You will find that the layout makes wiring very easy, and you will soon have it done if you go at it methodically and cross off each wire on the diagram as you put it into the set. Perhaps you are wondering why two aerial terminals are used? In addition to $A_2$ we have provided an alternative aerial terminal ($A_1$) which brings in a very small series condenser for short-wave working.

## DOZENS OF DISTANT STATIONS

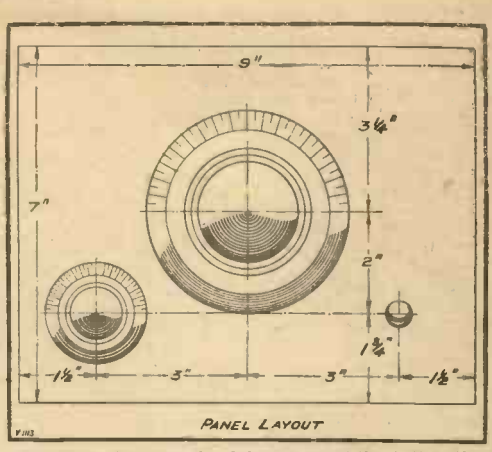



**And yet the set is easy to wire!**

The object of this condenser ($C_3$) is to permit proper reaction control without "flat spots" to be obtained if the set is used on the short waves.

The condenser is actually one of the neutralising type, with a capacity of somewhere round about ·00005 mfd., and the usual procedure is to connect the aerial lead to $A_1$ when working on short waves, and try $C_3$ at various settings. As a rule you will find you can leave it set to maximum, and only try other capacities if you experience difficulty in getting sufficient reaction at some point on the dial.

By the way, it is often not necessary to use $C_3$ at all if the aerial is small or of only moderate size.




**Apart from those for the fixing screws at the bottom there are only three holes to drill.**

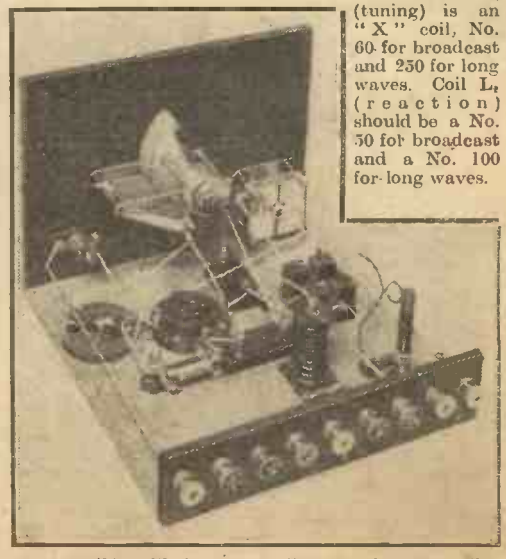
In such cases just leave the aerial on $A_2$, exactly as for broadcast reception, and all will be well.

Little need be said about the actual construction because it is so extremely simple, and no one who has ever built a set before will have the slightest difficulty in putting it together successfully.

Let us go on, then, to the practical details you will need for working it to the best advantage. The valve should be of the H.F. type (impedance about 20,000 to 30,000 ohms), and the H.T. voltage something of the order of 60 volts or perhaps a little less.

This voltage really requires adjustment for the best results: Try 60 volts, adjust the potentiometer so that the arm is as far round towards the *positive* end as possible without making reaction ploppy, and note results. Then try 50 volts, readjust potentiometer, and compare results. You will soon find a good combination, and once found it will not need further attention.

Coil sizes: $L_1$ (tuning) is an "X" coil, No. 60 for broadcast and 250 for long waves. Coil $L_2$ (reaction) should be a No. 50 for broadcast and a No. 100 for long waves.



**Compare this with the wiring diagram when doing the soldering.**

# HOW TO GET THEM!

**A helpful talk about pulling foreign programmes out of the ether.**

SOME people pick up foreign stations like pebbles on the beach. Others, even with similar sets, seem to have no luck at all.

Why? Well, it's largely knack. A matter of "knowing how."

If the aerial and earth are as good as you can get them, and all the etceteras are O.K., you might think the set is ready. So it is—*ready to begin*. But it may want a lot of tittivating before you get far with it.

How's reaction, for instance? So much depends on that. To get foreigners you should be able to bring up reaction smoothly and sweetly until the set begins gently to oscillate. No sudden "plops," no "overlaps."

## WHAT "OVERLAP" IS.

You know the latter trouble, which is shown by the fact that the reaction condenser doesn't stop oscillation at the adjustment which started it, but has to be taken back about five degrees farther?

This is known as "overlap," because instead of the reaction condenser dial reading remaining the same for both advancing and retarding reaction, the latter is different from the former, and the critical positions for reaction "overlap" several degrees of the dial.

Common causes are H.T. or L.T. batteries running down, insufficient bypassing or H.F. choking, a high-resistance H.T. supply causing coupling, wrong size of reaction coil, unsuitable detector valve, unsuitable grid leak, and incorrect H.T. on the detector.

That last-named (incorrect H.T.) is very injurious. The detector's wander-plug really must be made to "wander" until the best voltage for good reaction, etc., is found.

Elsewhere on this page, under the heading "Potentiometer Adjustment for Smooth Reaction Control," you will find hints about that important subject. If your set has a potentiometer for the detector's grid leak be sure to read those hints, which tell you how adjustments should be made.

And always remember that the most important point in long-distance tuning is that the set is in its most sensitive condition when it is nearly, *but not quite*, oscillating.

## THE MOST SENSITIVE POSITION.

You can consider it this way if you like. If you have a set with no reaction (a simple set with no high-frequency amplification), you can increase its sensitivity by giving it a little reaction. But everything depends upon this reaction being applied in moderation and to the right degree.

A little reaction means a little increase in sensitivity, a little more reaction means a little greater increased sensitivity. Still more reaction means still more sensitivity, etc., *but there is a limit* to this process. That limit is reached when the set has so much reaction that it oscillates.

If it oscillates it easily becomes useless for long-distance reception and is a nuisance to all surrounding listeners. The whole point is to get it near the oscillation point, but *not over*.

## "RESOLVING" THE CARRIER.

When trying to tune with the set on the edge of oscillation you often first hear a sort of "chirp" as your tuning passes through the foreign carrier-wave. Tune back to that chirp, and *slack off reaction slowly*, and the "chirp" becomes a programme!

That is what they call "resolving" the carrier-wave. You heard it first as a "chirp" because you had too much reaction. Keep the set just below oscillation point and instead of chirps you get the music and the "Allos" and the "Achtungs" from abroad.

DON'T MISS THEM.

Dirty contacts in the set, leads, or batteries, will lose many a fine foreign programme, so go all-out for cleanliness.

## POTENTIOMETER ADJUSTMENT FOR SMOOTH REACTION CONTROL.

In the preliminary tests you should first put the potentiometer slider about half-way round and then ignore it until the other circuit conditions are satisfactorily adjusted. Get your coil couplings right, adjust H.T., etc., and when the set seems O.K. proceed with the final touches to the potentiometer as follows:

Set the tuning condenser somewhere near the middle of its scale and move the potentiometer slider round to the *positive* end of its travel.

If you now test the reaction control you will probably find it rather "ploppy," so gently move the slider round slowly towards the negative end, adjusting the reaction control as you do so.

## THE FINAL SETTING.

You will find that it gets smoother and smoother as the slider is advanced farther towards negative, but the disadvantage of proceeding in this way is that signals will probably be weakened the farther round you go.

The detector anode voltage should be readjusted with the object of finding a setting which enables you to bring the potentiometer slider round as far as possible towards the positive end, without spoiling the smooth slipping in and out of oscillation.

Remember that you should not be tempted to carry it round too far towards the positive lead, and thus make reaction go in or out with a plop, for it is hopeless to attempt to tune-in distant stations unless the reaction control is perfectly smooth.

# LONG DISTANCE ON SHORT AERIALS

**Don't despair if you can't put up a big outdoor aerial—there are plenty of stations to be had on the indoor types.**

"If you are going to pick up plenty of foreigners you *must* have a good aerial." How often that has been said! How true it is! And yet how often we find exceptions!

But some people imagine that the term "a good aerial" means "a good *outdoor* aerial." And that is wrong. It must not necessarily be assumed that the man with an outside aerial is better off than the one who only has an indoor pick-up system.

## DECIDED DRAWBACK.

With modern sets and especially when working on really short waves a long aerial can be a decided drawback. Working on ordinary wave-lengths, it is often amazing how good reception can be on a short or a "shut-in aerial."

If you are able to fit the aerial in a loft, you are "well away." Should the set be on the ground floor it may be better not to bring the lead-in down inside the house, where it will have to be run along the walls.

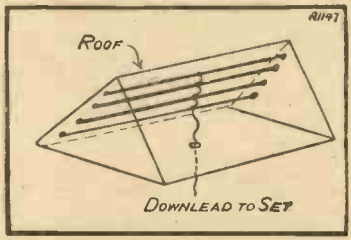
You should have no difficulty in finding a small hole or crack through which a wire can be passed under the eaves and *outside* the house to a window. Use "stand off" insulators to keep the wire away from the walls.

Remember, too, that a good earth connection will sometimes make all the difference. A rather poor indoor aerial with a bad earth may be hopeless, but the same aerial with a good earth will give quite passable results.

Constructors sometimes think that since they have no access to a loft in which to erect their aerial, that they will have to use a frame aerial. In practically all cases a small aerial consisting of a wire round the room will give results far superior to a frame aerial.

There are many ideas which may be tried for an indoor aerial, and the main points to be borne in mind are to keep it as high as possible, and to get a fair length of wire in it. Do not, however, have more than about 60 ft. in all. If the aerial is too long it is almost sure to have a fairly high capacity, which is detrimental to good results, apart from making it difficult to get reaction effects.

**UNDER THE TILES!**




**Take the lead-in from the centre, as shown, or from one end of the wires, but be sure to well space it.**

## OFTEN BETTER.

Very often the height of a loft aerial is greater than that of an outdoor aerial, since it is not usually possible to get a mast as high as the roof of the house. For aerials in a room it is best to use ordinary, medium-size rubber-covered flexible wire. It is not necessary that it should be supported on insulators.

In some cases the best indoor arrangement would prove more efficient and therefore give louder results than the best possible outdoor aerial. But just one warning as conclusion: do not run the aerial parallel or near to any pipes in the wall, or along by bell wires or electric cables, otherwise you will lose much of the power.

## HOW MANY MILES?

| FOREIGN STATIONS— | |
|---|---|
| BARCELONA | 720 |
| BERLIN | 579 |
| BUDAPEST | 900 |
| COLOGNE | 306 |
| DUBLIN | 286 |
| HILVERSUM | 232 |
| KALUNDBORG | 542 |
| LANGENBERG | 311 |
| MADRID | 786 |


| | | | | —YOU HAVE HEARD | |
|---|---|---|---|---|---|
| MOTALA | 886 | MUNICH | 570 | 715 | OSLO |
| | | | | 214 | PARIS |
| | | | | 640 | PRAGUE |
| | | | | 890 | ROME |
| | | | | 886 | STOCKHOLM |
| | | | | 453 | STUTTGART |
| | | | | 552 | TOULOUSE |
| | | | | 767 | VIENNA |
| | | | | 899 | WARSAW |

# ADJUSTING YOUR H.F.

**You will get twice the number of stations if your H.F. stage is properly "neuted," etc., as explained below.**

HAVE you an H.F. stage in your set? If so, *is* it an H.F. stage, or is it a graveyard for foreign programmes?

So much depends upon operating it correctly. A perfectly good H.F. stage can be a snare and a delusion if it isn't adjusted as it was meant to be adjusted.

S.G. stages, for instance. In order to get the best possible results and to obtain the full advantages of the screened-grid valve's extraordinary sensitivity it is important to take every care that the specified H.T. voltages are used.

## H.T. VOLTAGES.

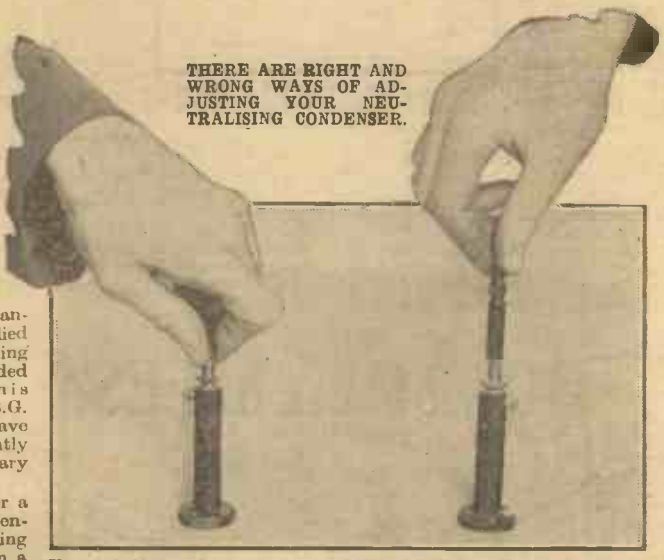
All adjustments should be *carefully* attended to. That doesn't mean, of course, that it is necessary to purchase a potentiometer, as the ordinary "steps" of an H.T. battery or mains unit give quite enough variation of screen voltage, especially with the variations in voltage allowed to the valve's anode.

Where H.T. batteries are used there is sometimes a danger of the applied H.T. voltage falling short of the intended rating. When this happens with an S.G. valve it may behave quite differently from an ordinary valve.

With the latter a voltage fall-off generally means nothing more serious than a gradual diminution in the volume of the reproduction accompanied by a falling off in quality. With the screened-grid valve, if the proper voltages are not used, or if they are allowed to fall away from their proper values, the valve begins to misbehave itself in various peculiar ways.

## ERRATIC RESULTS.

Often the effect is to send the valve into oscillation and to cause generally unsatisfactory and erratic results. Nevertheless, in practice it is quite easy to prevent this by taking care that the applied voltages are correctly applied. Usually the anode of an S.G. valve wants all the H.T. you can give it, up to the maximum laid down by the valve maker. But sometimes *reducing* the anode voltage a little will favourably affect results, so an occasional experiment on these lines will do no harm.



THERE ARE RIGHT AND WRONG WAYS OF ADJUSTING YOUR NEUTRALISING CONDENSER.

If you hold low down—as on the left—you get capacity effects. These are not encountered if you adjust as shown to the right.

If your H.F. valve is not an S.G., but a "neutralised" valve, you must have it properly neutralised to get good results. *How can you be sure of that?* you ask. Try this method.

## HOW TO NEUTRALISE.

Set the reaction control at minimum and likewise the neutralising condenser. Now, on setting the tuning condensers so that the two tuned circuits are "in step" with each other it will probably be found that the set is oscillating.

The best way to test for oscillation is to touch one or other of the sets of plates of the tuning condensers (this may be either the fixed or moving, according to the particular set). When the set oscillates you get a loud double click.

You will probably find that the set will only oscillate under the above conditions when the two circuits are in tune with each other and this can be used as an indication. (It is convenient to perform the operation at some point near the middle of the tuning range.)

Now increase the capacity of the neutralising condenser. (In the case of most condensers this means screwing downwards).

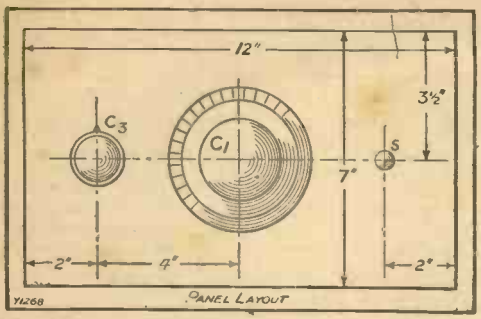
## KEEP TESTING.

Test at intervals for oscillation as this is done and you will presently find that the set has ceased to oscillate, and will not re-commence even when the tuning dials are slightly readjusted.

Now increase the reaction a *little*, until the set once more oscillates, and again increase the neutralising condenser setting until oscillation ceases. Slightly readjust the tuning condensers again to make sure that the set is completely stable once more.

Proceed in this way until it is found that the correct adjustment of the neutrodyne condenser has been "over-shot." Once this point has been passed, it will be observed that further increases of the neutrodyne condenser setting no longer stop oscillation, but cause it to become stronger.

The object is to find such an adjustment of the neutralising condenser as will permit the greatest setting of the reaction condenser to be used without producing oscillation.




# THE 'ECONOMY' THREE

**A set that proves how low cost and long-distance results can be combined with easy operation and construction.**

THE total cost of this receiver is only just about the same as the average two-valver, and it should make a very strong appeal not merely to the enthusiastic constructor, but to any set-builder who may be looking for the best possible set for a very moderate expenditure.

You can construct it either from all ready-made components, or from some ready-made and others made at home. (Naturally this works out a little cheaper.)

## USING A WOODEN PANEL.

Let us explain what this extra constructional work really is before we go any farther. Well, first of all we are suggesting that instead of the conventional ebonite panel the set should be provided with a wooden one, a very pleasing appearance being obtained in this way if you use some suitable plywood, especially if you finish off the edge with a little beading all round, and stain and polish the surface of the wood. (A suitable varnish stain is an effective method of obtaining a good finish.) Those who want to cut out all extra work of this nature can, of course, adopt the obvious expedient of using just the ordinary ebonite panel.

## MAKING THE GRID CONDENSER.

Next there is the grid condenser. This is a particularly easy component to make for yourself. If you do not wish to make it you can just purchase the usual fixed condenser of ·0003 m'd.

If you feel inclined to try your hand at making it, however, you will require two small pieces of ebonite, one measuring 1½ in. square, and, to fit over the top of this, one 1½ in. × 1½ in.

These pieces of ebonite simply form clamps, so you arrange for them to be screwed together tightly by means of four small brass screws passing from the smaller one into the larger one. By the way, if you do not possess means of tapping the holes in the lower piece of ebonite, you can at a pinch use round-headed wood screws, if you drill suitable holes in the lower piece of ebonite.

## THE NECESSARY DIMENSIONS.

This little condenser has only two plates, each measuring 4 × 1 centimetres. These plates overlap for a length of 3 centimetres, the outer end of each plate being left projecting outside the unit.

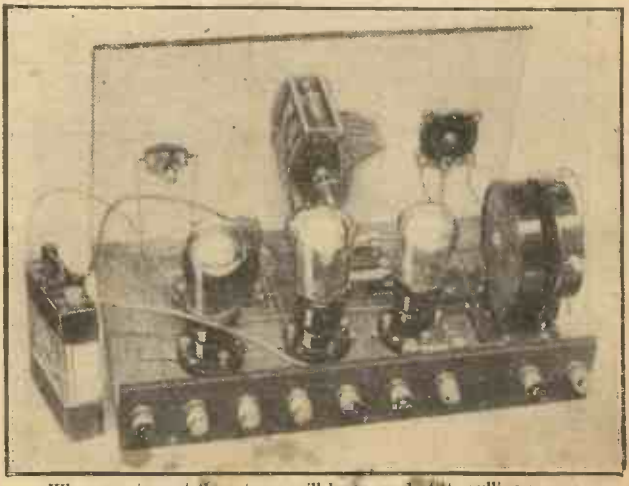
The plates are, of course, clamped between the two pieces of ebonite, with a sheet of thin mica between them, the correct thickness for this mica being about ·002 in. Connections are made to the condenser by soldering direct to the projecting ends of the plates, which should be of fairly thin copper foil, so that they can easily be cut to size with scissors.

### IF YOU HAVEN'T THE PARTS IN HAND, YOU WILL NEED—

- 1 Panel, 12 in. × 7 in. (wood or ebonite). See text.
- 1 Cabinet with baseboard 7 in. deep (a home-made cabinet is well within the powers of the constructor who is fond of woodwork).
- 1 ·0005-mfd. variable condenser (Lissen, or Lotus, Igranic, J.B., Ormond, Ready Radio, Polar, Dubilier, etc.).
- 1 ·0001- to ·0002-mfd. differential reaction condenser (Ready Radio, or Formo, Lissen, Lotus, J.B., Burton, Dubilier, Ormond, etc.).
- 1 On-off switch (Junit, or Lissen, Igranic, Benjamin, Lotus, Wearite, Ready Radio, etc.).
- 3 Plain valve holders (the sprung type are not strictly necessary for the modern improved valves). (W.B., or Burton, etc.)
- 1 ·0003-mfd. fixed condenser (home-made or commercial). See text.
- 1 Baseboard-mounting two-coil holder (home-made or commercial. See text.
- 1 Resistance-capacity coupling unit (Lissen, or Varley, Dubilier, R.I., Mullard, etc.).
- 1 Low-ratio L.F. transformer (R.I. Hypermite, or Igranic type J, Varley Nicore No. 2, Lissen, Telsen, Ferranti, Mullard, Lotus, Lewcos, etc.).
- 1 2-megohm grid leak and holder (Dubilier, or Lissen, Igranic, Mullard, Loewe, Ediswan, etc.).
- 1 Terminal strip 12 in × 2 in.
- 9 Terminals (Belling & Lee, or Igranic, Eelex, Burton, Clix, etc.).

Wire, screws, flex, G.B. plugs, etc.

## READY FOR THE TEST

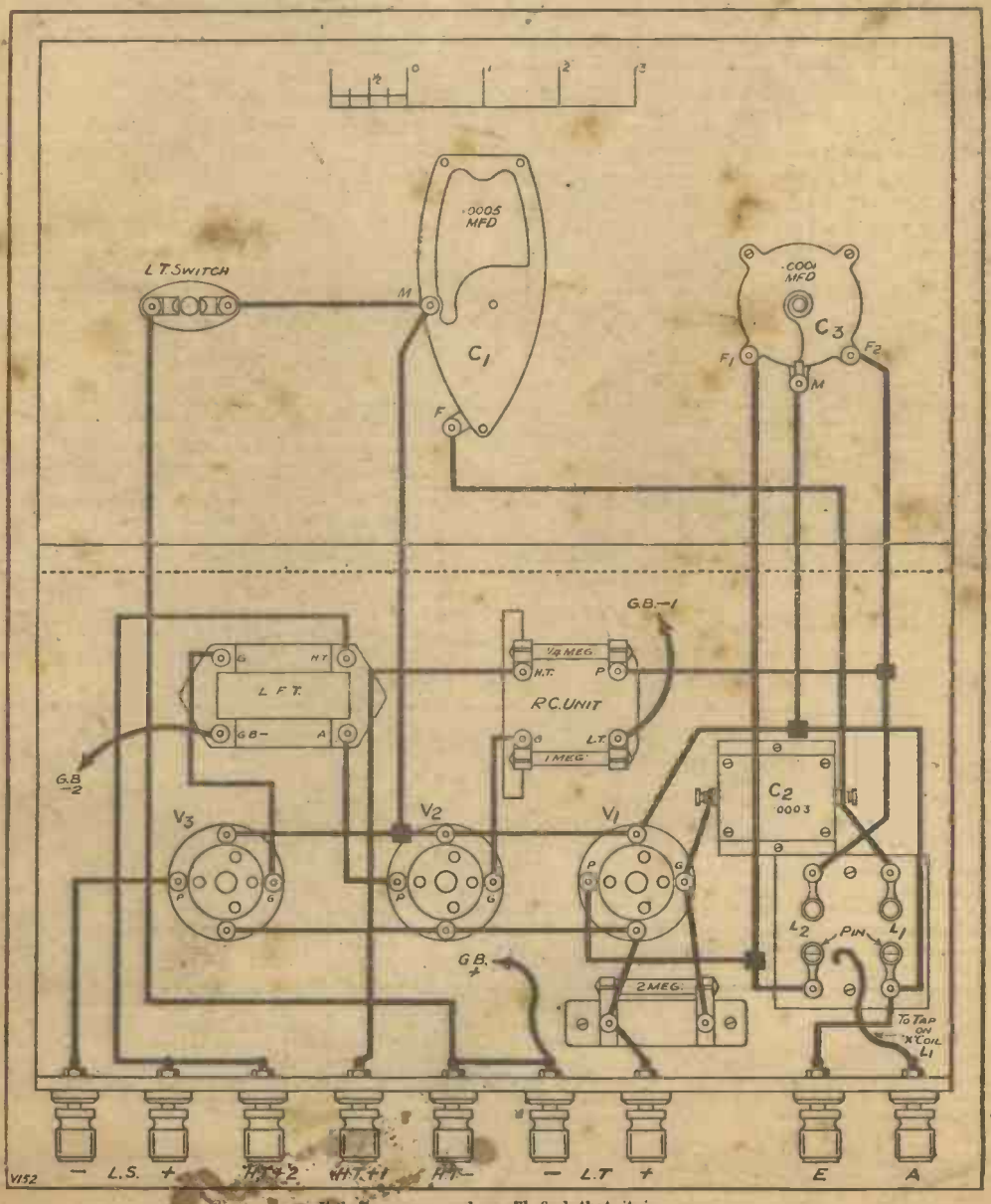


When you try out the set you will be amazed at its pulling powers.

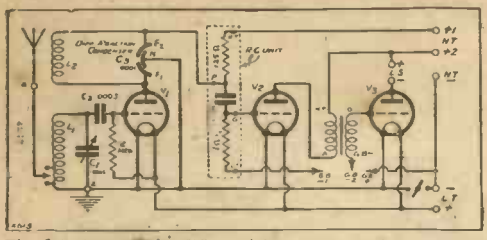
The other home-made component is a baseboard-mounting two-coil holder to replace the usual pair of single-coil sockets which would be screwed down upon the baseboard. (Of course, if you like you can use just the ordinary two separate sockets of the ready-made variety.)

The idea is that you should obtain a small piece of ¼-in. ebonite measuring about 2 in. square, and mount upon this the metal parts obtained from a couple of the cheap single-coil holders you can get from many dealers. Between the pin and socket of each holder there should be a space, measuring from centre to centre, of $\frac{5}{16}$ of an inch. Between the two holders a suitable spacing is 1⅛ in., again measured from centre to centre. (This latter is the space from the centre of one coil to the centre of the next, when placed in the holders.) If preferred, you can obtain the whole thing ready-made. (Wright and Weaire.)

The rest of the work is a perfectly straightforward job of laying out the components and wiring them up and in doing it we think you cannot fail to




It looks easy—and you'll find that it is.



**The detector employs differential reaction, and is followed by one R.C. stage with an L.F. transformer to back it up.**

appreciate the exceedingly simple and straightforward arrangement we have adopted. On the baseboard you will find there are actually only eight components to be mounted, which must be something of a record for a three-valve set.

## VALVES TO USE.

It was possible in this design to dispense with the usual H.F. choke, the necessary plate circuit impedance to enable reaction to be obtained being found in the anode resistance of the resistance-capacity coupling unit which transfers the signals from the detector to the first low-frequency valve.

The second L.F. stage is transformer-coupled, and you will note that there is space upon the baseboard at this end of the set for the usual 9-volt grid-bias battery, for which you could provide a pair of clips if you desire.

The remainder of the constructional work you will find is so simple that just a glance at the photographs and then at the wiring diagram will be all the assistance you need. We would just point out, however, that the wiring is so simple and well spaced that you can quite well use ordinary bare wire for the connections if you wish.

Now for the necessary operating details. The valves should be two of the "H.F." type with an impedance of perhaps 20,000 to 30,000 ohms for $V_1$ and $V_2$, and a small power or else super-power for $V_3$. There are only two H.T. positive terminals, so the connections here are very simple.

## H.T. AND G.B.

Terminal H.T. + 1 supplies the detector, and here you will want a voltage of perhaps 60 to 70, with a little adjustment to secure the smoothest possible control of reaction. Terminal H.T. + 2 supplies both the low-frequency valves, and here you want some 100 to 120 volts. The set will work with considerably less, of course, but in the interests of good quality it is not advisable to go much below 100 volts.

Grid bias is very much a matter of the particular valves you employ, although on G.B. — 1 you will almost certainly want 1½ volts negative, while G.B. — 2 will usually want from 6 to 9 volts negative for the ordinary power valve. Super-power types vary considerably in the grid bias they require, and so you should be guided by the makers' data slip.

There is just one point about the anode resistance which is worth mentioning. You may have an anode resistance on hand which you wish to use. But it is worth noting that you will probably find that it is not possible to deviate with safety far from the value specified (·25 megohm) or otherwise you may find your reaction results are adversely affected.

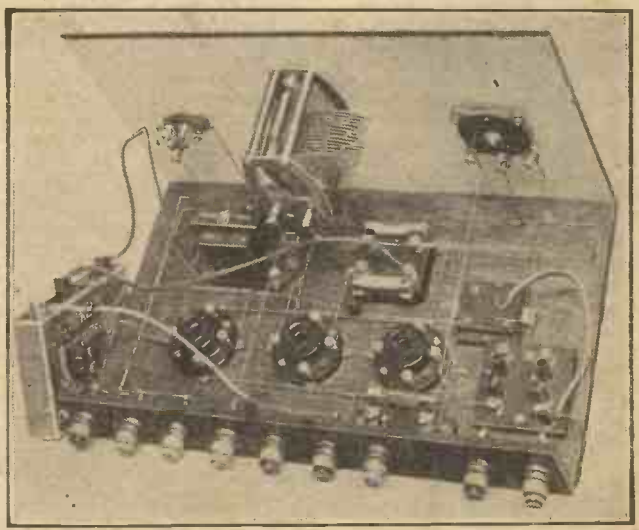
## THE COIL SIZES.

The sizes are as follow:

$L_2$ will usually be somewhere about a No. 35 or 40 for the lower wave-band, and $L_1$ should be a No. 60 of the "X" type. The long waves will need for $L_2$ a 75 or 100, and for $L_1$ a 250X. The flex lead from the inner side of the aerial terminal, by the way, should be tried first on one and then on the other tapping on the "X" coil to see which gives you the best results with your particular aerial.

There, now, you are ready to put the set into operation, and we do not think there is much doubt about your verdict. The receiver put up a really excellent performance on test, and when you bear in mind its extraordinarily low cost we do not think that any constructor can fail to be thoroughly pleased with it.

## HOW THE PARTS ARE PLACED IN POSITION



**The coil-holder in the foreground was home-made, but you can buy one if you prefer.**


LISTENING on the long waves is not as popular as it ought to be, for some of the best of Europe's stations are "up there" above 600 metres. And, moreover, long-wave listening has certain advantages over and above the alternative programmes which are available there. These advantages apply either in country or town districts.

In the town, for instance, a change over to long waves will generally enable the listener to escape from a local oscillator, the most annoying blot on the fair face of broadcasting. In some populous districts a good set may prove disappointing because near at hand there is an inexperienced listener who, switching on a set with too much reaction, spoils the quality or strength of his neighbour's reception.

Such a spoil-sport is rarely to be found upon long waves, so if you are unfortunate enough to suffer from this form of interference, a set of long-wave coils is the gateway through which you may escape from it.

## ALTERNATIVE PROGRAMMES IN DAYLIGHT.

In country districts the silent-point oscillator is generally unknown, but as the listener is not usually cramped for space he can erect a really long aerial. This often gives—even with a simple set—the advantage of being able to hear long-wave broadcasting from abroad *in daylight*.

Wave-lengths above 1,000 metres are not so adversely affected by sunlight as the shorter waves, so no listener to the daylight programmes should fail to investigate the advantages of the long-wave stations.

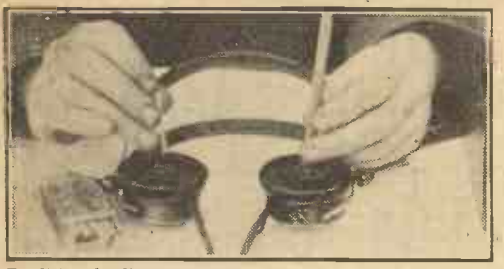
The wide choice of programmes available on the long waves will be apparent from the accompanying list of stations, including as it does the most popular European stations. Daventry 5 X X is a host in itself (especially for those listeners who do not in the ordinary way tune in to 2 L O), the strength and efficiency of this station being now traditional. Paris has two powerful long-wave stations, whilst Germany's high power station at Zeesen is famous for its orchestral items.

## BIGGEST STATION IN THE WORLD!

All the other transmissions are of interest on the long waves, but the programmes from Hilversum, Kalundborg, and Motala deserve special mention on account of their strength and reliability. In certain districts, Lahti (Finland), Warsaw (Poland), or Stamboul (Turkey) take pride of place after the French and German stations, so it is very rare that a set of long-wave coils on a good receiver fail to produce an enjoyable alternative programme.

The future, too, is full of promise, for several new stations are being planned, including the world's super-station at Warsaw. This is due to open on Christmas Day, on 1,411 metres, with the colossal power of 160 kw.

| Wave-length in metres | Name of Station |
|---|---|
| 1961 | Ankara (Turkey), 7 kw. |
| 1935 | Kaunas (Lithuania), 7 kw. |
| 1875 | Huizen (Holland), 8·5 kw. Sometimes gives Hilversum programme and announcements. |
| 1796 | Lahti (Finland) (relays Helsinki), 54 kw. |
| 1725 | Radio Paris (CFR), 17 kw. |
| 1635 | Königswusterhausen (Zeesen) (Germany), 35 kw. Relays Berlin. |
| 1554 | Daventry National Station (Gt. Britain), 35 kw. |
| 1481 | Moscow (Old Komintern) (R A 1) (Russia), 40 kw. |
| 1445·7 | Eiffel Tower (F L), 15 kw. |
| 1411 | Warsaw (Poland, 14 kw. |
| 1350 | Kasbah (Tunis), 0·5 kw. |
| 1348 | Motala (Sweden) (relays Stockholm), 40 kw. |
| 1304 | Moscow (Trades Unions), 75 kw. |
| 1200 | Kharkov (Russia), 25 kw.; Istanbul (Turkey), 5 kw.; Boden (Sweden), 0·75 kw. |
| 1153 | Kalundborg (Denmark), relays Copenhagen, 10 kw. |
| 1116 | Novosibirsk (Russia) R.A., 4 kw. |
| 1103 | Moscow, Popoff (Russia), 40 kw. |
| 1073 | Rostov-Don (Russia), 4 kw. |
| 1071 | Hilversum (Holland), 8·5 kw. Sometimes gives Huizen programme and announcements. |
| 1010 | Basle (Switzerland), 0·25 kw. |
| 1000 | Leningrad (Russia), 20 kw. |
| 870 | Tiflis (Russia), 4 kw. |
| 840 | Nijni Novgorod (Russia), 1·8 kw. |
| 800 | Kiev (Russia), 20 kw. |
| 778 | Petrozavodsk (Russia), 2 kw. |
| 770 | Ostersund (Sweden), 0·75 kw. (relays Sundsvall) |
| 760 | Geneva (Switzerland), 1·5 kw. |
| 720 | Moscow (Experimental), 20 kw. |
| 700 | Minsk (Russia), 4 kw. |
| 680 | Lausanne (Switzerland,) H B 2, 0·6 kw. |



Don't tap the diaphragm with a pencil to see if it is "free"—a match is infinitely better!

# WHEN USING TELEPHONES

**Here are some eminently practical hints about using 'phones that will enable you to get full service and long life from these too-often-neglected instruments.**

IF you are really keen on picking up foreign stations you will find a pair of 'phones a great help. Scores of stations are missed on the loud speaker because they didn't sound worth listening to, but they would have been clear enough with 'phones.

'Phones are not only very sensitive, but they shut out unwanted sounds in the room—they lessen the rustling of papers, voices, creaking of footsteps. This is a double gain. With 'phones on you can concentrate on "distance."

You can arrange a switch to use 'phones, and cut out the speaker and amplifying valves. Or, if you like, you can just "tap-in" on 'phones by connecting these in place of the R.C. unit or L.F. transformer, inside your set.

## HOW TO TEST THEM

### A SIMPLE TEST.

One 'phone tag goes to the unit's (or transformer's) terminal marked H.T.+ (or B.+; or I.P.). The other 'phone tag goes to the terminal that is marked P. (or A.; or O.P.).

First of all, you must be sure that the 'phones are working well. This is the correct way to test them.

Place the earpieces over the ears in the ordinary manner, and then put one of the tags at the end of the cord into the mouth, holding it firmly between the lips. Now, in one hand take the other tag of the telephones, and in the other hand take a key, a nail, or a similar piece of metal, and rub this gently on the second tag. If the telephones are in good order you will hear noises corresponding with this rubbing in the telephones.

Don't test your 'phones with a dry-cell—a far more sensitive method is shown here and described on this page.

The noises, of course, will not be very loud, for in the absence of an external battery you are working the telephones by a kind of human electricity, generated in your own body. But so sensitive are a good pair of telephones that if they are O.K. the noise will be absolutely distinct and unmistakable.

### HOW TO COMPARE EARPIECES.

If you wish to test each earpiece separately, you can do so by removing one of the earpieces from the ear and listening only with the other. Or, alternatively, you can place a pad between the ear itself and the adjacent earpiece, so as to cut off the sound from the latter. In this way you can compare the loudness of the two sounds, but do not forget that most people hear better with one ear than the other, so before definitely pronouncing one earpiece less sensitive than the other, turn the telephones round and try both earpieces on one ear.

When used with a valve set, some telephones must be connected in circuit the right way round. Many earpieces are marked with a red cord or with a +, to denote which side of them should be connected towards the H.T. +. If these are connected so that the current goes in the *wrong* direction, in the course of time they become insensitive.

Most valve sets have one red (or +) L.S. terminal, and it is this one to which the red 'phone tag (or the one marked +) must be joined if the 'phones are to be given a fair chance in life.

### DON'T DROP THEM.

On no account drop the telephones on the floor or knock them off the table, but treat them as you would any other sensitive electrical instrument. The diaphragms should not be removed, or the inside of the instrument interfered with by an inexperienced person, as it is very easy to bend the diaphragms, which will result in insensitivity.

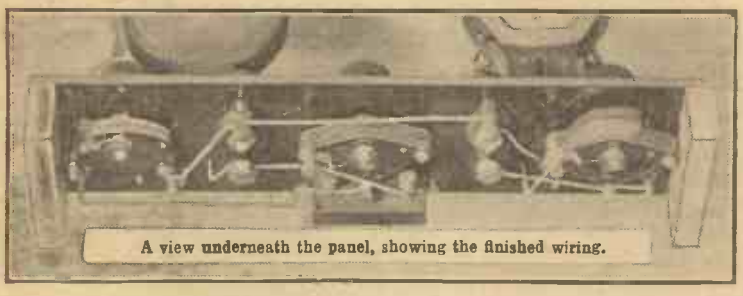
If 'phones are worn for long periods, they should be gently wiped over with a soft cloth, to remove all traces of perspiration, etc., and should the diaphragm become rusty through long use the experienced listener can prevent a repetition of this trouble by carefully removing the cap, *sliding* off the diaphragm, and cleaning it, and then lightly smearing it with petroleum jelly, the greatest care being taken not to bend the diaphragm during the operation.

### REMOVING THE DIAPHRAGM.

So easy is it to bend the diaphragm, and thus to decrease the sensitivity of the 'phones, that it is not good practice when removing it to pull it straight off from the magnet, as the magnetic pull alone is quite sufficient to cause harm in some cases. A better plan is to *slide* it sideways off the ear-cap so that there is no direct magnetic pull at the centre. Remember that the little flat disc has to speak to you, sing to you, and play every instrument in the band for you, and that the least you can do for it is to treat it with respect.

# DROPPING THE LOCAL

**Here is a simply-made device that connects in front of your set and enables you to cut out your local programmes easily and at will. There are two switches, each of which removes an interfering programme, so even near a twin-wave Regional station you can be freed from interference.**



A view underneath the panel, showing the finished wiring.

So far as local work is concerned that is enough, no doubt, and will enable you to get either transmission without interference from the other, but what about the foreign stations? Obviously, it won't do, because if you can only eliminate one of the waves the other may still spread over the dial and cause trouble. The device to be described below gets over that trouble in all ordinary circumstances.

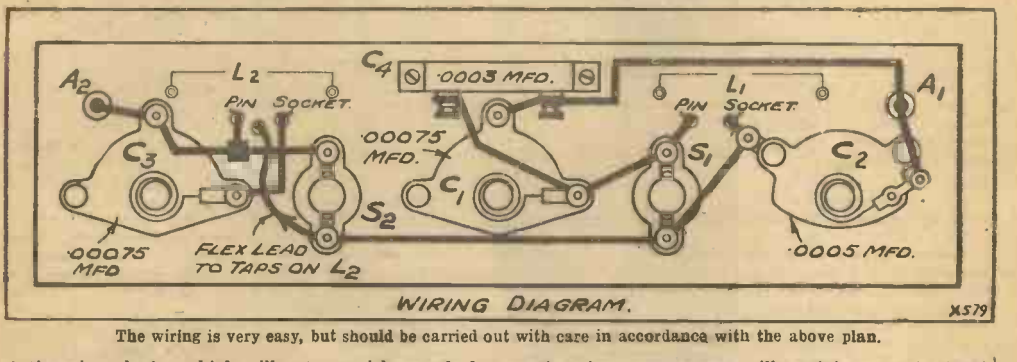
To get plenty of alternatives you must be able to reach out through the local station's programmes. Of all the ways of doing this the most satisfactory method is to fit a "P.W." Brookmans Rejector.

The one to be described here is a special twin-wave rejector, for what is wanted in the difficult areas fairly near one of the B.B.C.'s Regional stations is a device which will cut out either or *both* of the two transmissions.

To cut out merely one programme is easy; the ordinary Brookmans Rejector will do it with remarkable completeness on any receiver employing ordinary aerial coupling arrangements.

It consists of a Brookmans Rejector circuit to remove the more powerful local wave and an ordinary auto-coupled trap to deal with the other local programme. (Most listeners find one "Twin" station comes in better than the other from the same Regional station.) Each is provided with a switch to put it out of action when it is desired to hear that particular station, in a manner we will explain more in detail later on.

## HOW THE PARTS ARE PLACED AND CONNECTED




The wiring is very easy, but should be carried out with care in accordance with the above plan.

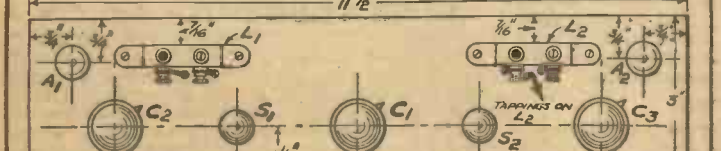
## GENERAL CONSTRUCTIONAL DETAILS.

Now for some practical details of its make-up and actual use. Since it will stand against the left-hand end of the set, a convenient form for the unit is a long, narrow strip.

Accordingly we have assembled all the parts on a narrow piece of ebonite, which can form the lid of a shallow box if you like. We did not make up a box for our own model, and merely fitted a piece of wood at each end to act as a support, a detail you will be able to follow from the photos.

Mounted in the usual way on the ebonite are the two

## HERE ARE THE DIMENSIONS FOR THE PANEL




Mark your panel positions carefully, as correct spacing helps efficiency.

terminals, two on-off type switches, and the three "Ready Radio" variable condensers. Attached to the underside of the panel is a ·0003-mfd. fixed condenser, and to the upper surface two ordinary coil sockets. These parts are best fixed with some small brass nuts and bolts.

The coil $L_1$ and condensers $C_1$, $C_3$ and $C_4$ form the Brookmans Rejector circuit which deals with the more powerful transmission, and the switch $S_1$ puts it out of action when it is desired to hear this programme.

## CONNECTING UP THE UNIT.

Coil $L_2$ and condenser $C_2$ makes up the auto-coupled rejector circuit which is intended to cut out interference from the other wave. Switch $S_2$ "outs" this part of the unit when you want to hear the lower-wave transmission.

The photographs and diagrams show how the unit is constructed. To connect it to your set proceed as follows:

Remove the aerial lead from its usual terminal on the receiver and place it instead on $A_1$ on the unit. Connect $A_2$ on the unit to the aerial terminal on your set (keep this lead short) and the job is complete.

Now for the preliminary adjustments. This is how, for instance, a London listener would proceed with the setting of each rejector to deal with the appropriate station.

### THE PARTS YOU WILL NEED.

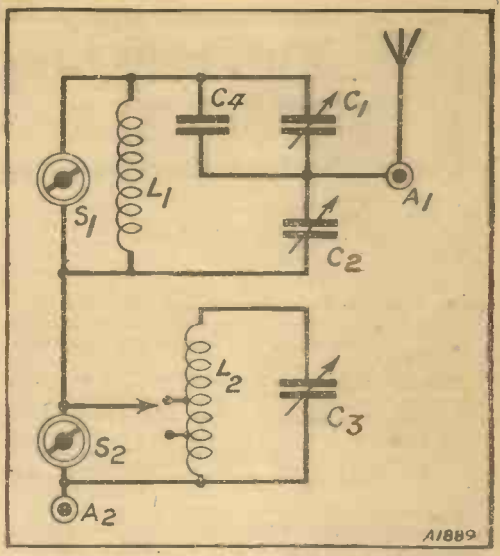
1 Piece of ebonite, 11½ in. × 3 in. or 12 in. × 3 in.
2 Pieces of wood, 3 in. × 1 in., or shallow wooden box to take panel (see text).
2 Terminals (Eelex, Igranic, Belling & Lee, etc.).
1 Fixed condenser of ·0003 mfd. (Lissen, Dubilier, T.C.C., Clarke, Mullard, Igranic, Ferranti, Ediswan, etc.).
2 Single-coil sockets (Lotus, Igranic, Lissen, Magnum, Wearite, etc.).
2 On-off type switches (Lissen, Lotus, Wearite, Benjamin, Bulgin, etc.).
1 Set of "Twin-Wave Rejector" condensers (Ready Radio), consisting of one ·0005 mfd. and two of ·00075 mfd.
Wire, screws, etc.

The first step is to set the Brookmans Rejector circuit to eliminate, say, 356-metre transmission, and it is best to perform this operation when the 261-metre station is not working.

Place $S_2$ to its "outing" position, i.e. knob pulled upwards, and push the $S_1$ knob downwards. Put a No. 50-plug-in coil of good make in the $L_1$ socket, set $C_1$ to minimum (moving vanes all out), and $C_3$ to about a half-way position.

Now tune in the station, then turn to $C_1$ and adjust it until you find a setting which causes the signals to go down suddenly, practically to nothing (on many sets they will vanish completely unless a good bit of reaction is being used), and on either side of which they reappear.

You will find that you can put $C_3$ at various positions, then reset $C_1$ to find the rejection point. In general, those combinations in which $C_3$ is fairly small and $C_1$ large (vanes well engaged) give the most complete rejection.



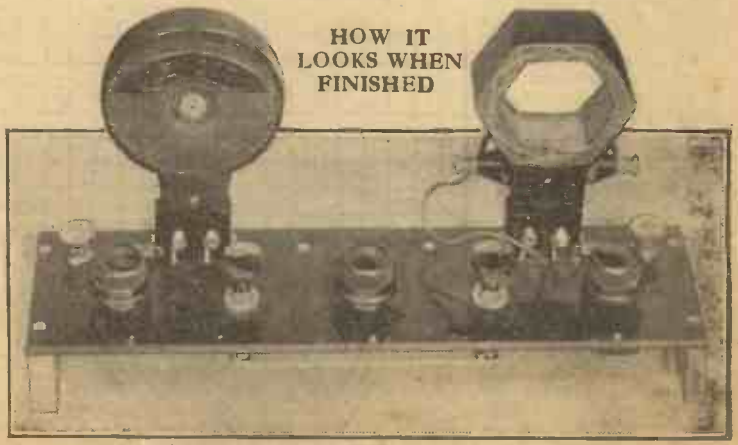

Here's the circuit, with component references.

So much for that. Now for the setting of the auto-coupled rejector to cut out the 261-metre wave. To do this, push $S_1$ downwards and pull $S_2$ upwards, and tune in the station.

## THE FINAL ADJUSTMENTS.

Next, place a No. 60 "X" coil in the $L_2$ socket and attach the flex lead to one of the tapping points on the coil. (Try each, re-setting the circuit each time, and see which is best.) Now de-tune your set so that the station is heard at rather reduced volume.

Next, push $S_2$ downwards and turn to $C_3$, and adjust it until you find the rejection point where signals go down almost to nothing. They will not disappear completely, because this type of rejector is less drastic than the other; but they should go down so much that they will only be heard when fully tuned in, and so will cease to trouble you.




One coil is of the ordinary plug-in type and the other an "X" coil.

# "PLACING" THE STATIONS

**How to make a chart that tells you who the "stranger" is, or where to tune for a wanted foreigner.**

IF the dial-readings were all *wave-lengths* tuning would be a very simple matter. You would set your dial to the wave-length wanted and that would be that!

Although dials are not usually marked in wave-lengths, it is a simple matter to make a chart showing the relationship between wave-length and dial-reading. All you want is a list of European stations and wave-lengths, a pencil, a rule, and a sheet or two of squared graph paper. You can get the latter from any stationer's for about twopence or threepence, and for this modest sum and with this simple equipment you can make those elusive foreigners "toe the line."

## VERY EASY TO DO.

The first job is to prepare your graph paper. Look at the sketch on this page. It shows a partly finished calibration chart, and along the bottom of it you will see the numbers from 0 to 180 corresponding with the numbers on the tuning dial.

With this nicely squared paper you can make a scale (as long as you like or as short as you like). Every fifth and tenth line on the paper is usually printed a little heavier than the others so that marking out is simplicity itself. When you have got the 10, 20, 30, and so on in their correct relative positions to correspond with the dial, you leave the bottom of the chart alone and turn to the side.

On one side of the chart you have to put the wave-lengths ranging from the lowest station you can receive to the highest.

## DIAL DEGREES.

Thus the calibration chart illustrated on this page shows wave-lengths starting from 240 and going right up to 600. You need not do exactly the same figures, of course, but this is a very useful range, with 2LO "National" coming in near the bottom of the dial.

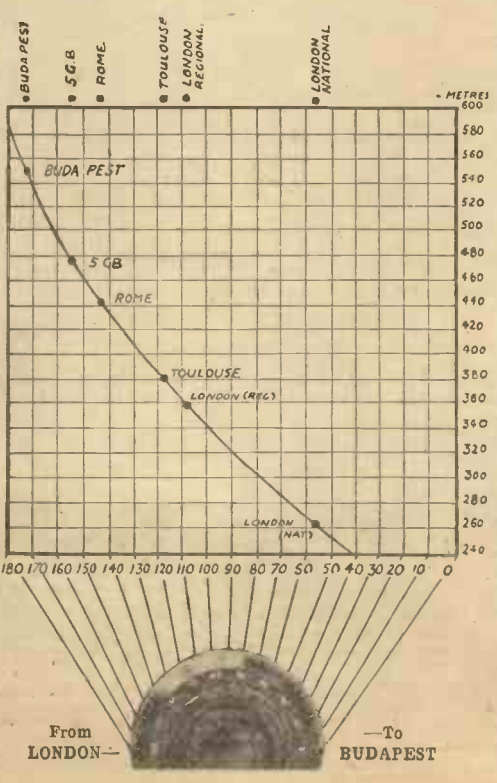
Just as every square along the bottom line represents a certain number of degrees on the dial, so every square on the side line represents a certain number of metres, or "wave-lengths."

Having got the degrees along the bottom and the wave-lengths up the side, you have formed the framework of your chart, and all that now remains is to fill in the curve by the aid of some of the regularly-received and well-known stations. On your first rough chart (you will draw a nicer one later on) it is a good plan to first "dot" your stations' dial-readings at the top of the chart, as shown.

Probably you already know most of their positions so there is not much difficulty in this, and we are now getting to the exciting part. For once you have them fixed on your new chart the unknown others will simply fall into place like ninepins. (While you are about it, try and get one station dial-reading as near the top of the dial and another as near the bottom of the dial as possible.)

Now the next thing to do is to get your wave-length table out and to look for those stations on it. In the chart shown, Budapest was one station, and Budapest's wave-length is 550 metres.

Halfway between 540 and 560 metres is the thin line running right across the chart and corresponding with 550 metres. Put your rule along this line and then "bring the Budapest dot down" by making a dot on the chart where the 550-metre line crosses the line corresponding with 173 on the dial. (Your own reading may not be 173, but you see the idea?)




## THE FINAL LINE.

Next you must "double-cross" 5GB, and pass on merrily to Rome, Toulouse, etc. Fill in all your stations like that, and then *lightly pencil a line across the chart connecting all these points together*. It will not be a perfectly *straight* line, but it will be a perfectly *wonderful* line for foreign stations. If an unknown station comes in at, say, 163 on your dial and starts "chirping," who is he? You find that 163 on the curve you have drawn corresponds with 501 metres, and on your wave-length chart 501 is shown to be Milan!—And so you can "place" all your stations!

# EVERY COMPONENT FOR *THE "ECONOMY" THREE* BY RETURN OF POST

## KIT OF PARTS

| | | £ | s. | d. |
|---|---|---|---|---|
| 1 | Hand-polished oak cabinet, 12 x 7 x 7 .. .. | 1 | 0 | 0 |
| 1 | Ebonite panel, 12 x 7 .. .. .. .. | | 4 | 0 |
| 1 | ReadiRad ·0005 variable condenser .. .. | | 4 | 6 |
| 1 | ReadiRad Duograph dial .. .. .. .. | | 6 | 6 |
| 1 | ReadiRad differential condenser .. .. .. | | 5 | 0 |
| 1 | ReadiRad on/off switch .. .. .. .. | | | 10 |
| 3 | W.B. valve holders .. .. .. .. | | 3 | 9 |
| 1 | ReadiRad ·0003 fixed condenser .. .. .. | | | 10 |
| 2 | ReadiRad single coil holders .. .. .. | | 1 | 8 |
| 1 | Lissen R.C. Unit .. .. .. .. | | 4 | 0 |
| 1 | R.I. Hypermite .. .. .. .. | | 12 | 6 |
| 1 | ReadiRad 2-meg. grid leak .. .. .. | | | 10 |
| 1 | ReadiRad grid-leak holder .. .. .. | | | 6 |
| 1 | Terminal strip, 12 x 2 .. .. .. .. | | 1 | 6 |
| 9 | Belling Lee engraved terminals .. .. .. | | 2 | 3 |
| 3 | Valves as specified .. .. .. .. | 1 | 7 | 6 |
| 1 | Lewcos 60x coil .. .. .. .. | | 4 | 9 |
| 1 | Lewcos 40 ,, .. .. .. .. | | 3 | 6 |
| 1 | Lewcos 250x ,, .. .. .. .. | | 6 | 6 |
| 1 | Lewcos 100 ,, .. .. .. .. | | 4 | 6 |
| | Wire, screws, plugs, etc. .. .. .. .. | | 1 | 5 |
| | TOTAL (including Valves and Cabinet)..... | £5 | 16 | 10 |

**EASY PAYMENTS**

12 Equal monthly payments of **10/9d.**

## READI-RAD BROOKMAN'S CONDENSER

***Specially recommended in this booklet***

**FOR USE IN "THE BROOKMAN'S REJECTOR"**

**This amazingly popular range of condensers now includes all capacities suitable for tuning and reaction. Heavy gauge brass vanes are of true logarithmic design, with bakelite dielectric. Phosphor bronze spring pigtail provides thorough noiseless contact with moving vanes. One-hole fixing. Particularly small dimensions and light weight. Prices, complete with bakelite pointer-knob. Capacities '00075, '0005 and '0003, 3/6 each; '0001 mfd., 2/6.**

**Ready Radio**

159, BOROUGH HIGH STREET,
LONDON BRIDGE, S.E.1.

*Telephone: Hop 5555 (Private Exchange) Telegrams: READIRAD, SEDIST.*

*Ready Radio (R.R. Ltd.), 159, Borough High Street, S.E.1.*

# BOOSTING "WHISPERS"

**All about that very important subject—the handling of reaction.**

AFTER you have juggled and jiggled about with the dials, and you find you have a foreign station whispering something to you, how can you *make it louder?*

If you had tons and tons of money and could afford to buy the finest set in the land—a regular ten-valve "super-cum-hyper-cum-listen-to-this"—you would get foreign stations as easily and as clearly as the local. But on a small set *skill* is nearly everything.

## THE ALL-IMPORTANT REACTION.

With on ordinary simple one- or two-valve set there is only one way to pick up weak foreign stations with any degree of regularity, and that is by learning how to handle reaction and tuning. When you alter a tuning dial you alter wave-length. That's easy. Anybody can turn a tuning dial.

(If your set has *two tuning* dials you have to keep them "in step," so that they are covering the *same wave-length*. And that would be very easy if it meant exactly the same dial readings, but generally the dials differ a little, so skill is required.)

Generally it is that *reaction* dial that causes all the trouble. And yet it's easy enough, if you think about it like this:

*Too-little-reaction* means that the set is not as sensitive as it might be.

*Too-much-reaction* means oscillation. It means that you make your set (and your neighbours' sets) howl and whistle, you get poor quality, and poor long-distance results.

*Just-right-reaction* means foreign stations, and plenty of them.

If you listen-in *when there is no local broadcasting station working*, you can, in a few minutes, give yourself a thoroughly sound object lesson in the use of "just-right-reaction." Set the tuning dial half-way round for a start, and place the reaction control at zero, making sure that all batteries, etc., are connected up as usual, and that the set is in working condition.

## PRACTISE IT FOR YOURSELF.

Now bring up the reaction control *slowly*. Just a few degrees at the time.

Listen carefully to the loud speaker, or preferably to the 'phones, and notice exactly what is happening as the result of moving the reaction dial. Do not touch the tuning—just the reaction—listening carefully all the while.

The probability is that at first you will notice no difference. As you advance another 3 or 4 degrees listen very carefully and presently you will hear in the 'phones a very faint hissing, breathing noise.

The reason that you are hearing these noises is that the increase in reaction is making the set more sensitive. The farther you go the more sensitive it becomes, *up to the oscillation point.*

If you continue to advance you will come to a point where there is a more or less distinct "plop" followed by a rather louder *continuous* breathing or hissing noise. *This is oscillation*, and you have gone too far. For good reception you must be *below* the oscillation point, so turn back the reaction dial immediately.

What you have got to remember is this. With the reaction all-out the set is comparatively insensitive. As you increase reaction the set gets more and more sensitive. But the moment your set starts oscillating you must "come back a bit" in order to get just below the oscillation point.

BEFORE MOUNTING A SWITCH—

**It's often advantageous to tighten the spring—especially if it is for wave-change purposes.**

## KEEPING IN STEP.

If this were all, handling reaction would be a very easy matter—but we have not yet considered the effect of tuning.

Unfortunately, the tuning and reaction dials are not independent of one another. Every time you alter one the other needs a little re-adjustment, too. And as you keep altering the tuning to find different stations you *must* keep altering reaction, too, to keep "in step."

A little further experiment will demonstrate this. First set your tuning dial mid-way, and then bring up reaction carefully until the set is very, very nearly—but not quite—oscillating. Now leave reaction alone, and see what tuning does.

You will find that when set thus the effect of "tuning *down*" to *lower* wave-lengths is to send the set over the oscillation point; whilst if you "tune up" to *higher* wave-lengths you draw away from the oscillation-point. Consequently, to keep the set just below oscillation when tuning you must work both dials at once. You must not leave reaction alone, but gently increase it as tuning goes up, or gently decrease the reaction as the tuning goes down! And when you can do that successfully without making the set oscillate you will find that boosting whispers is easy, and that foreign stations fairly fall in.

# "HEARD THIS ONE—"?

**Some practical information that tells you where the programme that you heard came from.**

FOREIGN broadcasting stations are just like people—they have their own little peculiarities that help you to recognise them.

Spanish stations, for instance, can be heard singing and dancing away at 2.30 a.m. very often, when the rest of Europe has gone to bed. Just what you would expect of them!

The German stations, on the other hand, get up early and keep hard at it all day.

Some of the stations broadcast distinctive call or interval signs. Here are some noteworthy ones:

**Sleigh Bells,** softly striking, are the sign that you are listening to Cracow.

* * *

**The Cuckoo's Call** has been chosen by two widely separated stations, and is probably the most easily recognised of all musical calls. The stations in question are Leningrad (Russia), 1,000 metres, and Ljubljana (Yugo-Slavia), 575 metres.

Some stations give a clue from the fact that they employ women announcers. Amongst these are:

Bratislava, Czecho-Slovakia, 279 metres.
Bucarest, Rumania, 394 metres.
Genoa, Italy, 381 metres.
Milan, Italy, 501 metres.
Rome, Italy, 441 metres.
Wilno, Poland, 312 metres.

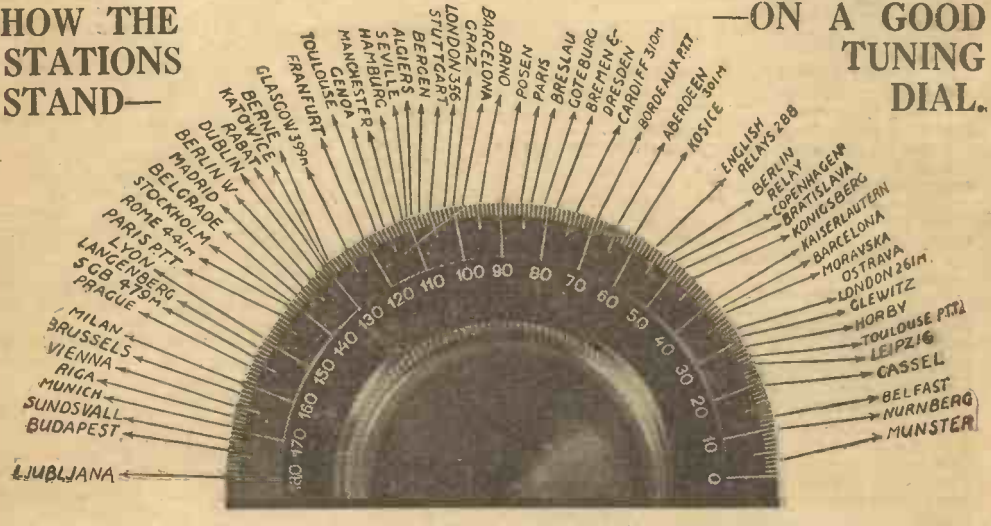
* * *

**The Nightingale's Song** has been chosen as a musical interlude sign by Turin, Italy. It is played on a gramophone with electrical pick-up, and is a very effective station-marker at most seasons of the year. But this very pleasing call has the disadvantage that in the summer it may be confused with stations which relay the actual nightingale's song as a "stunt" broadcast.

* * *

**Hammer Strokes on an Anvil** is the pleasing and distinctive sign of Katowice, Poland. The sounds indicate the industrial nature of the neighbourhood.

## HOW THE STATIONS STAND—




## —ON A GOOD TUNING DIAL.

## EUROPE'S STATIONS, AND HOW TO KNOW THEM

**BARCELONA.** 349 metres.
Between intervals says "Radio Barcelona" and closes down with Spanish National Anthem and the words "Buenas noches, Señores; hasta manana si Dios quiere."

**BARCELONA** (Radio Catalana). 268 metres.
Says "Union Radio Catalana," and closes down with "Buenas noches, Señoras y Caballeros."

**BASLE** (Switzerland). 319 metres.
Man announcer. "Hallo, Radio-Basel."

**BELGRADE** (Yugo-Slavia). 432 metres.
"Radio Beograd." Metronome ticks sixty beats a minute during intervals.

**BERGEN** (Norway), 364 metres.
Announces "Bergen her."

**BERLIN** (Witzleben), Germany. 418 metres.
"Achtung. Berlin." Metronome ticks thirty-six beats in ten seconds.

**BERNE** (Switzerland), 403 metres.
Opens with tune on musical-box. Man and woman announcers.

**BRATISLAVA** (Czecho-Slovakia), 279 metres.
"Halo, Bratislava." Plays the four musical notes C, E, G, G as interval signal.

**BRESLAU** (Germany), 325 metres.
Sometimes uses a metronome, ticking 60 times a minute.

**BRNO** (Czecho-Slovakia), 342 metres.
"Hallo, Radio-journal Brr-no." Man announcer.

**BRUSSELS** (Radio Belgique), 509 metres.
"Ici Radio Belgique." Opens with a high-pitched whistle.

**BUCAREST** (Rumania), 394 metres.
"Radio Bucaresti." Opens with metronome ticking 160 to a minute, for five minutes.

**BUDAPEST** (Hungary), 550 metres.
"Hallo! Itt Budapest" and/or "Hier Budapest."

**COLOGNE** (Germany), 227 metres.
Chime of five bells from the Cologne studio, during intervals.

**COPENHAGEN** (Denmark), 281 metres.
"Kalundborg-Kobenhavn." Opens with three strokes on a gong.

**CORK** (Irish F.S.), 224 metres.
Usually man announcer, speaking Irish and English.

**CRACOW** (Poland), 313 metres.
"Hallo! Hallo! Polskie Raadjo Krakoov"! Man and woman announcers. Clock gong or sleigh bells in intervals.

**DUBLIN** (Irish F.S.), 413 metres.
Announces in English and Irish. Opens with tuning note.

**FRANKFURT** (Germany), 390 metres.
"Frankfurt-am-main und Kassel." Man and woman announcers.

**GENEVA** (Switzerland), 760 metres.
"Allo Ici Radio-Geneve." Man announcer, speaks French.

**GENOA** (Italy), 381 metres.
"Eh-yar Radio Genova." Closes down with the words "Buona notte a tutti."

**GOTEBORG** (Sweden), 322 metres.
Closes down with the words "God Natt, God Natt."

**A CONTACT—OR A SNAG?**

**Fit your leads with nice spade terminals and you can get a good tight contact. Stray and straggling wires are simply snags.**

**GRAZ** (Austria), 352 metres.
Opens with V's in Morse (. . . -, . . . -, etc.). Announces "Hallo! Hallo! Hier Radio Graz auf Welle!"

**HAMBURG** (Germany), 372 metres.
Strokes on a gong indicate the number of minutes interval; and one stroke of gong before each item. Also sends the letters H.A. in Morse (. . . . . -).

**HANOVER** (Germany), 560 metres.
Usually relays Hamburg. Sends Morse letters H R in intervals (. . . . . - . ).

**HILVERSUM** (Holland), 298 metres or 1,071 metres.
No interval signals. Man announcer.

**HUIZEN** (Holland).
Usually man announcer. Closes down with "Goeden avond, Dames en Heeren. Wel te rusten." (Good-night, ladies and gentlemen. Sleep well.)

**KALUNDBORG** (Denmark), 1,153 metres.
"Kalundborg Kobenhavn." Opens and ends with three strokes on a gong.

**KAUNAS** (Kovno, Lithuania), 1,935 metres.
"Allo, allo, Lietuvos Radio Kaunas."

**DON'T FORGET TO COUNT THE**

# TELL TALE TICK TOCKS

**Loud-ticking clocks, or metronomes, are employed by many Continental stations, and usually the number of ticks per minute will enable the station to be identified.**

**KONIGSBERG** (Germany), 276 metres.
"Achtung! Konigsberg und Danzig." Closes down with "Gute Nacht" (good-night).

**KONIGSWUSTERHAUSEN** (Zeesen, Germany). 1,635 metres.
"Achtung! Konigswusterhausen." Metronome beats 40 beats in 10 seconds.

**KOSICE** (Czecho-Slovakia), 293 metres.
"Hallo Kosice." Closes down with "Dobrous Noc" (good-night).

**LANGENBERG** (Germany), 473 metres.
Relays Cologne—see notes under that heading.

**LAUSANNE** (Switzerland), 680 metres.
"Allo! Ici Radio-Lausanne." Usually announces in French, but sometimes German. Short tune for interval signal.

**LEIPZIG** (Germany), 253 metres.
Calls "Achtung! Achtung! Hier sind die mittelsdeutschen sender Leipzig und Dresden . . ."

**LILLE** (France), 265 metres.
"Allo! Allo! Ici Radio Lille." Closes with an air played on musical box.

**LYON** (P.T.T., France), 466 metres.
"Allo! Allo! Ici le poste radio-diffusion de Lyon La Doua." Closes down with a few bars of the Marseillaise.

**MADRID** (Spain), 424 metres.
Opens with Seigfried's bugle-call theme, usually given on piano. Closes with "Buenos noches, Señores; hasta manana."

**MARSEILLES** (France), 316 metres.
"Allo! Allo! Ici le poste radio-telephonique de Marseilles."

**MILAN** (Italy), 501 metres.
"Stazione de Milano." Closes down with "Buona notte a tutti" (Good-night, everybody).

**MORASKA-OSTRAVA** (Czecho-Slovakia), 263 metres.
Closes with "Radiojournal Moravska-Ostrava. . . . Dobrou noc" (Good-night).

**MOTALA** (Sweden), 1,348 metres).
Relays Stockholm and other stations. Closes down with "God-Natt. God-Natt."

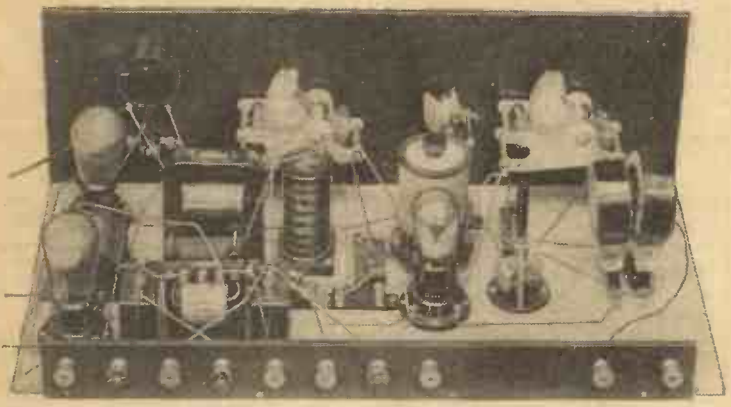
**MUNICH** (Germany), 533 metres.
Musical-box for interval signal Relays (and announces) Augsburg and Nurnberg.

**NAPLES** (Italy), 332 metres.
"Stazione di Napoli." Closes with Buona notte a tutti" (Good-night, everybody).

**OSLO** (Norway).
"Hallo, Oslo her." Closes down with "God-natte. God-natte."

**PARIS, EIFFEL TOWER** (France), 1,445 metres.
"Allo! Allo! Ici le poste radio-telephonique de la Tour Eiffel." Closes down with a few bars of the Marseillaise.

**PARIS, ECOLE SUPERIEURE** (France), 447 metres.
Relayed by many other French stations, and seldom announces station's name. Usually begins "Allo! Ici le poste radio-diffusione del'Ecole Supérieure des Postes et Telegraphes de Paris."



**With all the European stations going "all out," high selectivity is an essential requirement of the modern set. This is one of the earlier band-pass designs.**

**PARIS, PETIT PARISIEN** (France), 329 metres.
Announces frequently in both French and English.

**PARIS, RADIO PARIS** (France), 1,725 metres.
"Ici Radio Paris" (sometimes announces under old title of "Radiola"). Usually studio clock chimes the hour.

**PRAGUE** (Czecho-Slovakia), 487 metres.
"Hallo, Radio Praha," or "Hallo! Praha." Man and woman announcers. Closes with "Dobrou noc" (Good-night).

**ROME** (Italy), 441 metres.
"Eh-yar Radio Roma." Usually woman announcer. Closes with "Buona notte a tutti" (Good-night, everybody).

**SAN SEBASTIAN** (Spain), 459 metres.
"Union Radio San Sebastian."

**SEVILLE** (Spain), 368 metres.
"Union Radio Sevilya." Closes with "Buenas noches, Señores: Hasta mañana."

**STOCKHOLM** (Sweden), 436 metres.
"Stockholm Rundradio," or "Stockholm-Motala." Closes down with "God-natte. God-natte."

**STAMBOUL** (Turkey), 1,200 metres.
Announces in French and Turkish. Gong strikes 77 times a minute in intervals.

**STUTTGART** (Germany), 360 metres.
Uses the three musical notes C, D, and G as interval signal (played on oscillating valves).

**TOULOUSE** (P.T.T., France), 255 metres.
"Ici Toulouse-Pyrenees."

**TOULOUSE** (Radio du Midi, France), 385 metres.
"Allo! Ici Radio-Toulouse." Strokes on a gong at one-second intervals, during programme pauses.

**TURIN** (Italy), 273 metres.
"Eh-yar Radio Torino." Song of the nightingale (on gramophone) during intervals.

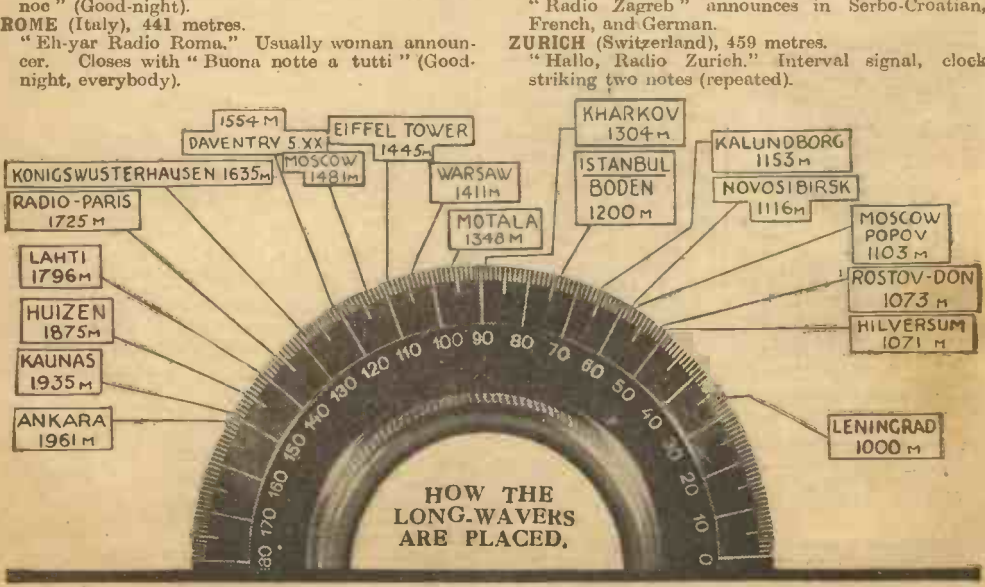
**VIENNA** (Austria), 517 metres.
Sends V's in Morse (...-) for tuning signal. "Hallo! Hallo! Hier RadioWien." Closes with "Gute nacht, meine Damen; Gute nacht; meine Herren; Gute nacht."

**WARSAW** (Poland), 1,411 metres.
"Hallo! Hallo! Polskie Raadjo Varshava," Man and woman announcers.

**WILNO** (Poland), 313 metres.
Cuckoo's call, or huntsman's horn, as interval signal. "Oovagha Polskie Raadjo Wilno."

**ZAGREB** (Yugoslavia), 308 metres.
"Radio Zagreb" announces in Serbo-Croatian, French, and German.

**ZURICH** (Switzerland), 459 metres.
"Hallo, Radio Zurich." Interval signal, clock striking two notes (repeated).



# FROM LEEDS TO NIJNI NOVGOROD

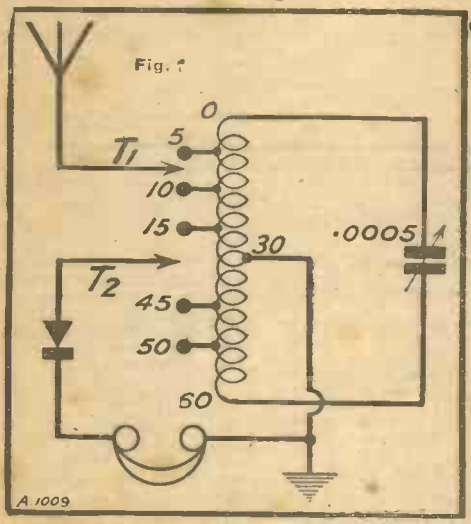
Some Stations to Choose From.

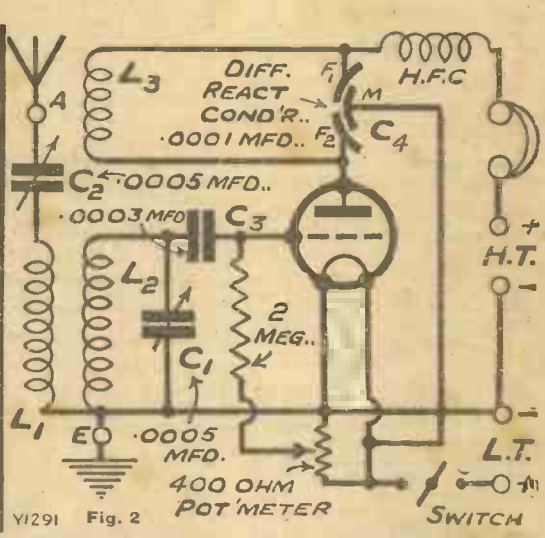
| Wavelength in Metres | Name of Station |
|---|---|
| 840 | Nijni Novgorod (Russia) |
| 800 | Kiev (Russia) |
| 778 | Petrozavodsk (Russia) |
| 770 | Ostersund (Sweden) |
| 760 | Geneva (Switzerland) |
| 720 | Moscow (Experimental) |
| 700 | Minsk (Russia) |
| 680 | Lausanne (Switzerland) |
| 574·7 | Ljubljana (Yugoslavia) |
| 570 | Freiburg-Im-Breisgau (Germany) / Hamar (Norway) |
| 565 | Smolensk (Russia) |
| 560 | Hanover (Germany) / Augsburg (Germany) |
| 550 | Budapest (Hungary) |
| 542 | Sundsvall (Sweden) |
| 533 | Munich (Germany) |
| 525 | Riga (Latvia) |
| 517 | Vienna (Rosenhügel) (Austria) |
| 511 | Archangel (Russia) |
| 509 | Brussels No. 1 (Belgium) |
| 501 | Milan (Italy) |
| 497 | Moscow (Russia) |
| 487 | Prague (Czechoslovakia) |
| 479 | Midland Regional Station (Gt. Britain) |
| **BELOW 5GB.** | |
| 476 | Simferopol (Russia) |
| 473 | Langenberg (Germany) |
| 466 | Lyons (La Doua). (France) |
| 459 | San Sebastian (Spain) / Zürich (Switzerland) |
| 453·2 | Porsgrund (Norway) / Aalesund (Norway) / Salamanca (Spain) / Bolzano (Italy) / Danzig (Free City) / Klagenfurt (Austria) |
| 450 | Moscow (Russia) |
| 447 | Paris (P T T) (Ecole Supérieure) (France) |
| 445 | Notodden (Norway) / Rjukan (Norway) |
| 441 | Rome (Italy) |
| 436 | Stockholm (Sweden) / Malmberget (Sweden) |
| 432·3 | Belgrade (Yugoslavia) |
| 424 | Madrid (Union Radio), (Spain) |
| 418 | Berlin (Witzleben) (Germany) |
| 416 | Rabat (Morocco) |
| 413 | Dublin (Ireland) |
| 408 | Katowice (Poland) |
| 406 | Kharkov (Russia) |
| 403 | Berne (Switzerland) |
| 401 | Tallinn (Estonia) |
| 398·9 | Glasgow (5 S C) (Gt. Britain) |
| 394 | Bucharest (Rumania) |
| 390 | Frankfurt (Germany) |
| 385 | Toulouse (Radio) (France) |
| 381 | Lwów (Poland) / Genoa (Italy) |
| 376·4 | Manchester (2 Z Y) (Gt. Britain) |
| **'TWIXT 2 ZY & 2 LO.** | |
| 372 | Hamburg (Germany) |
| 370·4 | Radio L L (France) |
| 368 | Fredriksstad (Norway) / Seville (UnionRadio) (Spain) |
| 364 | Bergen (Norway) |
| 363·4 | Algiers (N. Africa) |
| 360 | Stuttgart (Germany) |
| 356·3 | London Regional Stn. |
| 352 | Graz (Austria) |
| 351 | Leningrad (Russia) |
| 349 | Barcelona (Radio Barcelona) (Spain) |
| 342 | Brno (Czechoslovakia) |
| 338·2 | Brussels No. 2 (Belgium) |
| 335 | Cadiz (Spain) / Poznan (Poland) |
| 332 | Naples (Italy) |
| 328·2 | Grenoble (PTT) (France) / Paris — Poste Parisien—(France) |
| 325 | Breslau (Germany) |
| 322 | Göteborg (Sweden) |
| 319 | Dresden (Germany) / Basle (Switzerland) |
| 316 | Bremen (Germany) / Marseilles (P T T) (France) |
| 314 | Oviedo (Spain) |
| 312·8 | Wilno (Poland) |
| 311 | Agen (France) |
| 309·9 | Cardiff (5 W A) (Gt. Britain) |
| 308 | Radio-Vitus (France) / Zagreb (Yugoslavia) |
| 304 | Bordeaux - Lafayette (P T T) (France) |
| 301 | Aberdeen (2 B D) (Gt. Britain) |
| 298·8 | Falun (Sweden) / Hilversum (Holland) Daily until 5.40 p.m. |
| 293 | Kosice (Czechoslovakia) / Limoges (P T T) (France) |
| 291 | Viipuri (Viborg) (Finland) |
| 288.5 | Bournemouth (6 B M) / Bradford (2 L S) |
| 288·5 | Dundee (2 D E) / Edinburgh (2 E H) / Hull (6 K H) / Liverpool (6 L V) / Newcastle (5 N O) / Plymouth (5 P Y) / Sheffield (6 F L) / Stoke-on-Trent (6 S T) / Swansea (5 S X) |
| 287·2 | Lyons (Radio) (France) |
| 286 | Montpellier (France) |
| 283 | Berlin Relay (Germany) / Magdeburg (Germany) / Stettin (Germany) / Innsbruck (Austria) / Uddevala (Sweden) / Varberg (Sweden) |
| 281 | Copenhagen (Denmark) |
| 280 | Radio Liége (Belgium) |
| 279 | Bratislava (Czechoslovakia) |
| 276 | Königsberg (Germany) |
| 273·2 | Turin (Italy) |
| 272 | Rennes (France) |
| 270 | Hudiksvall (relays Sundsvall) / Norrköping(Sweden) / Kaiserslautern (Germany) |
| 269 | Barcelona Radio Catalana (Spain) |
| 265·4 | Lille (P T T) (France) |
| 263 | Moravská - Ostrava (Czechoslovakia) |
| 261·3 | London National Stn. |
| 259 | Gleiwitz (Germany) |
| 257 | Hörby (Sweden) |
| 255 | Toulouse (P T T) (France) |
| 253 | Leipzig (Germany) |
| 251 | Almeria (Spain) |
| 249 | Juan-les-Pins (France) |
| 247·7 | Kalmar (relays Stockholm) |
| 246·2 | Schaerbeek (Brussels) (Belgium) |
| **BEYOND BRUSSELS.** | |
| 246 | Turku (Åbo) (Finland) / Säffle (Sweden) / Eskilstuna (Sweden) / Linz (Austria) / Cassel (Germany) / Kiruna (Sweden) / Cartagena (Spain) |
| 244 | Cracow (Poland) |
| 242 | Belfast (2 B E) (Ireland) |
| 239 | Nimes (France) / Nürnberg (Germany) |
| 238 | Bordeaux - Sud - Ouest (France) |
| 237 | Orebro (Sweden) |
| 235·5 | Charlerol (Belgium) |
| 234 | Lodz (Poland) |
| 232·2 | Kiel (Germany) |
| 231 | Boras (Sweden) / Umea (Sweden) / Malmö (Sweden) / Hälsingborg(Sweden) |
| 228·4 | Biarritz (Côte d'Argent, France) |
| 227 | Aachen (Germany) / Cologne (Germany) / Münster (Germany) |
| 224·4 | Cork (6 C K) (Ireland) |
| 222·9 | Radio Luxembourg |
| 221 | Helsinki (Finland) |
| 219 | Radio-Beziers (France) |
| 218 | Karlstadt (Sweden) / Flensburg (Germany) / Björneborg (Finland) |
| 216 | Halmstad (Sweden) |
| 214·2 | Warsaw |
| 214 | Fécamp (France) |
| 204 | Gävle (Sweden) |
| 203 | Kristinehamn(Sweden) |
| 202 | Jönköping (Sweden) |
| 200 | Leeds (2 L S) (Gt. Britain) |

## FAVOURITE SHORT WAVERS.

| | |
|---|---|
| 80 | Rome (Italy), 3 R O |
| 61 | Radio L L (France) |
| 54·02 | New York City (W 2 X B H) |
| 50 | Barcelona Radio Club |
| 49·22 | Toronto (Canada) |
| 49·18 | Bound Brook (N.J.), W 3 X A L, 15 kw |
| 48.86 | Pittsburgh East (W 8 X K). |
| 48·8 | Manila (Philippine Islands), K Z R M |
| 41 | Radio Vitus. (Testing). |
| 34·68 | Long Island (N.Y.), W 2 X V. |
| 32·5 | Sydney (2 B L) |
| 32·5 | Paris, Eiffel Tower(FL) |
| 31·48 | Schenectady, N.Y. (W 2 X A F). 10 kw. |
| 31·38 | Zeesen(Germany) 8kw. Relays Königswusterhausen. |
| 31·28 | Eindhoven (Holland) |
| 31·1 | Nairobi (Kenya), 7 L O Daily, 5—8 p.m. |
| 25·6 | Winnipeg (Canada). |
| 25·53 | Chelmsford (G 5 S W). |
| 25·4 | Rome (Italy), 3 R O. |
| 25·25 | Pittsburgh East (W 8 X K). 5 p.m.—3 a.m. |
| 19·72 | Pittsburgh East (W 8 X K). Wed. and Sat., 1—5 p.m. |
| 19·56 | Schenectady (W 2 X A D). Daily from 10.10 p.m. to 1 a.m. |
| 16·8 | Bandoeng (Java), P L F. 30 kw. |
| 16.3 | Kootwyk (Holland). P C K. From 7 a.m, |
| 15·94 | Bandoeng (P L E). |

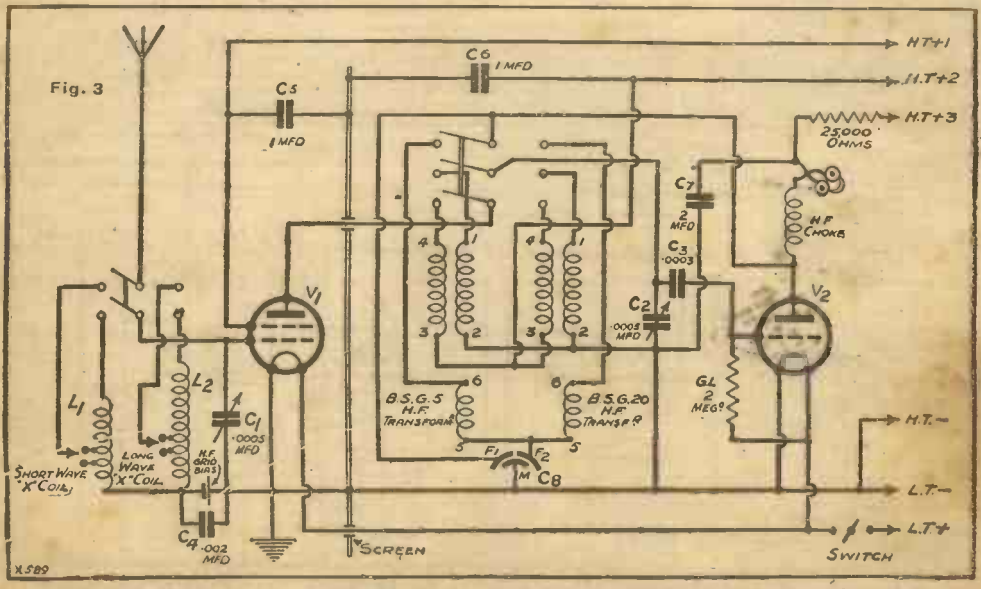
# SOME GOOD CIRCUITS TO TRY



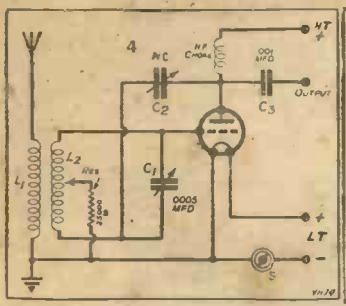



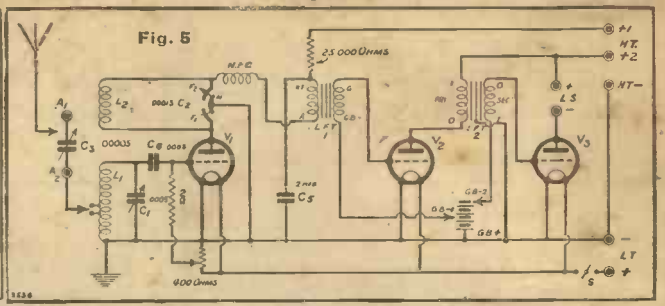

A crystal set based on Fig. 1 gives unusually good long-distance results because the crystal and the aerial connections are tapped (by means of crocodile clips) on to the main coil. This consists of 60 turns of 24 or 26 D.C.C. wire wound on a 3-inch tube, and tapped at the turn numbers shown.

The one-valver (Fig. 2) is a good DX (long-distance) receiver using ordinary plug-in coils. The coil sizes are: $L_1$, 35 or 50; $L_2$, 60; and $L_3$, 50 (or 75). For long waves, $L_1$, 100 or 150; $L_2$, 250; and $L_3$, 100 or 150. $C_3$ is chiefly useful for improving selectivity with long aerials, and may often be omitted without detriment.



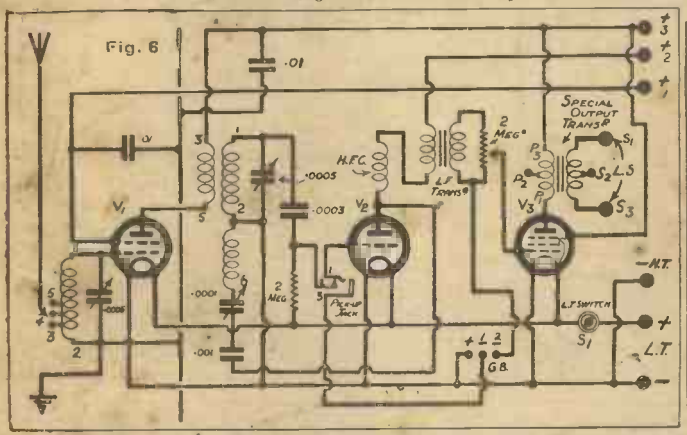

Excellent long-distance results are obtainable with this set (Fig. 3), which is not intended to work a loud speaker, though an L.F. amplifier can be added for this purpose if desired. The differential reaction condenser is marked $C_8$. $L_1$ is a 60 X-coil, and $L_2$ a 250 X-coil, the two switches being of the low-capacity type (1 D.P.D.T. and 1 three-pole double-throw). A tapped G.B. battery is generally employed for the H.F. ($1\frac{1}{2}$, 3 or $4\frac{1}{2}$ volts) and this assists in keeping down the H.T. current. Station-getting is simplicity itself with this kind of circuit.




The H.F. Unit (Fig. 4) employs plug-in coils, $L_1$ being a 25 or 35, or for long waves a 75 or 100. $L_2$ is a centre-tapped coil, 60 for ordinary and 250 for long waves.

The "Magic" Three is shown in Fig. 5, the neutralising condenser, $C_2$, being for use when the set is taken down on the very short waves. $L_1$ is a 60 X-coil, or 250X for long waves. $L_2$ is an ordinary plug-in, 35 or 50, and for long waves 100 or 150. $C_2$ is the differential reaction condenser.



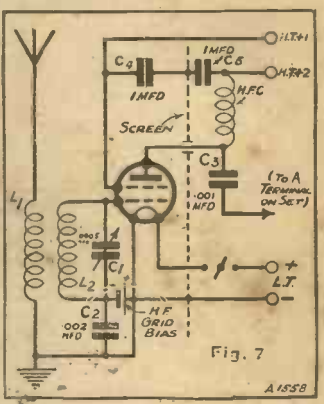
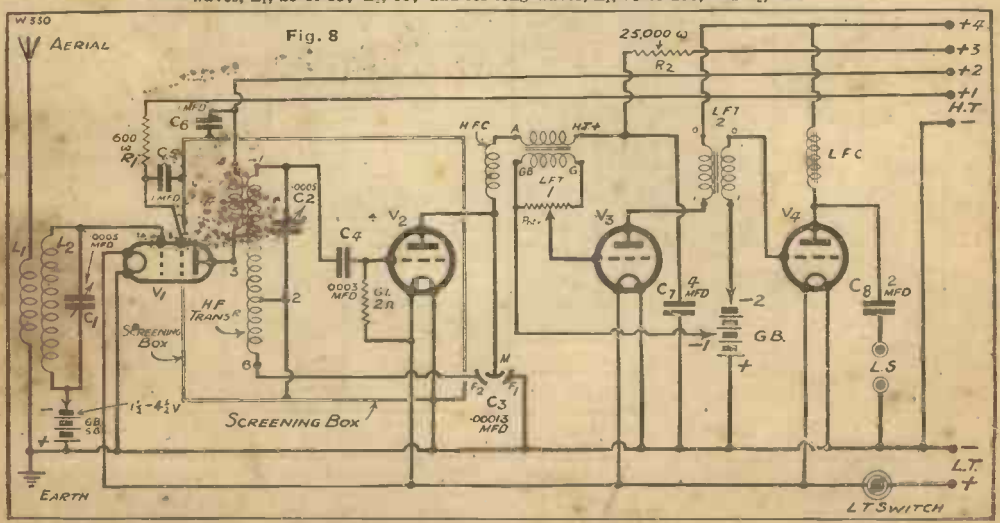




Fig. 6 shows an S.G. Det. and Pentode arrangement, with a jack for a pick-up plug for gramophone reproduction. A Lewcos C.A.C.5 or C.A.C.20 coil is used for the aerial (medium or long waves respectively), and the corresponding H.F. transformers are the Lewcos C.S.P.5 and the C.S.P.20, with P.8 and P.16 primaries respectively. The H.F. unit (Fig. 7) uses plug-in coils of the usual sizes for aerial and grid circuits, namely, for medium waves, $L_1$, 25 or 35; $L_2$, 60; and for long waves, $L_1$, 75 or 100, and $L_2$, 250.




Ordinary plug-in coils are used for $L_1$ and $L_2$ in this fine 4-valver (ordinary 25/35 and 60, long waves 75/100 and 250). The H.F. S.P. transformer is of the standard or interchangeable-primary type, and a volume control is provided as well as output filter and decoupling device.

# IMPROVING YOUR SET

How many of you have asked yourselves whether it was worth while altering your ordinary receiver to include a screened-grid stage, or building a new set incorporating a screened-grid valve? How many of you have queried whether it was worth while using a super-power in the last stage, whether an ordinary power would not be just as good or even better, or whether a pentode would meet your purpose?

Have you ever queried whether anode-bend or grid-leak rectification is the better? And the old query as to whether transformer or resistance coupling on the L.F. side is preferable is still being asked, while a hundred and one other little points crop up every day in the life of the home constructor.

## THE FIRST IMPORTANT QUESTION.

In the first place let us discuss the screened-grid valve question, to which the answer depends upon two main features which can be expressed as questions themselves. The first is: "Do you want selectivity or sensitivity?" Which of the two is more important? And the second is: "Can you supply the valve with sufficient H.T.?"

The answer to the first question depends somewhat on your distance from the local station. There are means of getting both sensitivity and selectivity from a screened-grid valve circuit, but if you want *ultra selectivity* and you only want to use one H.F. stage, then the ordinary neutralised valve is more likely to give it to you than the screened grid.

If, on the other hand, you prefer to use a wave-trap, or a rejector, or a special circuit for your screened-grid valve, in order to cut out the local station, which is rather too near to you, and you want at the same time *sensitivity* to give you distance, then the screened-grid valve will give you what you want.

## THE S.G. VALVE.

There is no doubt that the screened-grid valve has much more "punch" than the neutralised valve, but it has the drawback that it consumes far more H.T. current, and, as a rule, unless the circuit is carefully designed the selectivity will not approach that obtained by the neutralised stage.

The screened-grid valve is certainly worth it if you are prepared to use a proper circuit, and not merely to adapt the present set and hope that a screened-grid valve will give better results, even though its anode circuit may not be suited to it; and also if you are prepared to supply, say, four milliamps or so of H.T. current instead of the usual one milliamp which is needed for the neutralised valve.

## BIASSING H.F. VALVES.

You must also be prepared to bias your H.F. valve. To work properly an S.G. valve nearly always needs biassing, and many valves of the screened-grid type are exceedingly uneconomical in their anode current consumption unless they are biassed. The bias varies from 1½ volts up to about 4½, which is the maximum we have ever found a screened-grid valve to require. The usual bias required is about 1½ volts.

Thus assuming you are prepared to provide a bit more H.T. and some grid bias and to use a circuit really suited to the valve, go ahead and you will certainly find the screened-grid valve worth while; but if, on the other hand, you are going to make a makeshift circuit of it, not worrying about getting the proper anode circuit impedance, not worrying about the grid bias, and probably attempting to run the screened-grid valve with a number of other valves in your set from only small-size H.T. batteries, then stick to the neutralised stage, for it will give you far better service and greater satisfaction.

The super-power, power, and pentode problem is rather more difficult to unravel. Perhaps it will help us if we have a look at the valves themselves and see what types of things they are.

## THE SUPER-POWER TYPES.

What is usually known as the power valve generally has a magnification factor of anything from 4 to 10 or so, and an impedance of 4,000 ohms upwards. It will not carry any very great grid swing. That is, you cannot put a tremendous signal into it without causing overloading; but if, on the other hand, you put a moderately strong signal on to the grid, then it will give you good amplification in return.

The super-power valve is not nearly so generous in its amplification. Many people imagine that the super-power valve is a valve which will give more power; in other words, a far greater punch for unit input, i.e. more amplification. But that is quite an erroneous translation of the term "super-power."

**TESTING YOUR SET**

With a pair of telephone receivers connected in series with a small dry battery, you can test components for both continuity of windings and for short-circuits.

This valve is one which will *handle* more power, not necessarily give you more amplification. As a matter of fact, a super-power valve rarely has an amplification factor greater than 6, unless it be of the special A.C. mains type.

But it has a much lower impedance than the power valve, and will carry a far greater input without overloading. Therefore, if you get a bigger input on the valve you should expect a bigger output, provided the amplification factor is reasonably good. That is exactly what happens with a super-power valve, you have a greater input which can be put into it without overloading, and it will give you a bigger power output, operating the loud speaker louder than is the case with the ordinary power valve.

## CONCERNING THE "PENTODE."

Naturally, in wireless, as in everything else, we do not get something for nothing, so that if you use a valve which will enable you to handle more power you have got to give it more electrical energy, and as a rule the super-power valve takes a little more L.T. current, for you must be prepared to give it anything up to 20 milliamps or so of H.T. if you are going to work it at its best.

The pentode valve is rather in a class by itself. It is an output valve which has a very high magnification factor and at the same time a very high impedance.

It will not carry a very large grid swing, no larger as a rule than the ordinary power valve will, but it will give a tremendous magnification, much greater than the power valve, and input for input the output is several times louder than that obtained with either the power or super-power assuming that none of these valves is being overloaded. But the characteristics of the pentode are such that it is often not worth while using a pentode in place of a power or super-power.

## FOR MOVING-COIL LOUD SPEAKERS.

With the ordinary loud speaker the pentode valve is hardly suitable unless an output transformer is employed, unless you want the maximum magnification, say, for short-wave working, or on a two-valve set, when you are using a loud speaker which is not very high-pitched.

If your loud speaker is inclined to be very high-pitched or lacking in bass, then the pentode valve without the special output transformer, is liable to make it very "hard" in quality. For moving-coil work the pentode valve is perhaps more useful, because it imparts a brilliancy to moving-coil reproduction which it is sometimes difficult to get with the ordinary super-power or power valve without a specially-designed loud speaker.

Some of the modern pentodes (such as the P.M.24A) will provide quite sufficient power to work a moving coil really well.

## IS IT WORTH IT?

If we were asked "Is it worth it?" when discussing the pentode, we would say, "In the average case, no. Use a power or super-power valve." If you are using a moving-coil speaker, however, we should advise you to try the pentode unless *your loud speaker is "peaky" in the high register*. Where you want maximum volume with the minimum number of valves the pentode valve is very useful, but you want to know what you are doing, or to work on advice from the set designer himself, before you rush to place a pentode in the output stage of any ordinary receiver. You always know where you are with a power or super-power valve, but with a pentode, unless you are certain of what you are doing, you may be disappointed.

And that brings us to the question of rectification. Which is the better? Anode bend or leaky grid. This is purely a personal question for the constructor himself to answer. It is often stated that with anode-bend rectification a great deal of sensitivity is lost, but it has been the experience of many that anode-bend rectification is very nearly, if not quite, as sensitive as the ordinary grid-leak rectification.

## ANODE-BEND RECTIFICATION.

With transformer-coupling after the detector-valve anode bend is not as a rule satisfactory, but with resistance coupling then anode bend will often give a "clean up" to the signals which is very beneficial.

Smooth control of reaction with anode bend is usually more difficult to obtain than is the case with the grid-leak rectifier, and the type of valve certainly does make a difference. You want a valve which has a fairly steep slope and a fairly sharp bend at the bottom end of the slope in order that really good anode-bend rectification may be obtained.

## STATEMENTS NEEDING QUALIFICATION.

We could go on for a long time discussing various points in wireless receivers and whether they were worth while, for there are nearly always two sides to each question. It is difficult to lay down any rule, and in wireless one certainly cannot be dogmatic, for so much depends upon the requirements and the tastes of the owner of the set.

We have those who say that the moving-coil speaker is the best. Well, it may be the best on the best set, but if you put a moving-coil speaker on a poor set it will sound about the worst thing on earth. Every statement in radio has to be qualified, and that makes it very difficult when one queries the worth of any particular component or type of circuit, or even set.

It all depends upon circumstances.

# CONNECTING LEADS

**The wires running from batteries to set are often completely neglected, but here are several points of importance connected with them**

THE external leads to a set are often straggling, sorry things, with kinks in their middles and whiskers frayed on their ends. That is all wrong. They should be stout, tidy cables, frequently renewed.

Non-corrodable terminals can be bought for a few pence for the accumulator leads.

These external leads are of very great importance, more particularly those which join the batteries to the set. Faulty insulation, a loose end wriggling about, a "whisker" shorting across a pair of terminals, and damage to the batteries or even valve burn-outs might result.

## KEEP THE WIRES SEPARATED

Having put in some nice new cables of ample gauge and well insulated, do not proceed to bunch them together indiscriminately. You may achieve neatness at the cost of good results.

The aerial, earth and loud-speaker leads must be well separated, each taking their quickest routes—more particularly the aerial lead. You can group the L.T., grid bias, H.T. negative and earth leads, but it is as well to keep the H.T. positive out of the way of this bunch.

If you are using a mains unit of any kind very special attention indeed should be paid to all the wiring to and in the set.

# DIVING DOWN TO SHORT WAVES

There is a great fascination about short-wave work, and here you read how easy it is to "dive down."

IT used to be difficult. In fact it used to be considered impossible. But nowadays if you want short-wave stations you simply dive down for them.

There was a time, and that not so very long ago, when short-wave reception was regarded as a quite isolated branch of radio reception. Those were the days of "supers," "ultras," and "low-losers," when in order to join the "ham" throng one had to construct a skeleton-looking arrangement with something akin to a broom handle on the condenser in order to keep the hands away from the tuning control!

But those days are over.

## THE TYPE OF SET.

Now almost any set of the straightforward type can be used equally successfully for the 'phone reception of "Pittsburg, Pa." as for the L.S. reception of Brookmans Park—conditions permitting, and with certain reservations. You might think there is a snag hidden in those "reservations." Not a bit of it, for this is all that is meant:

(*a*) The first valve must be the detector. It matters not whether it is followed by one or more L.F. stages so long as it is not *preceded* by H.F. stages.

(*b*) The set must employ plug-in coils. Preferably, but not absolutely essentially, with reaction on the Reinartz or other capacitative control system.

## WHAT COILS TO USE.

(*c*) A slow-motion dial or other means whereby the tuning condenser can be rotated very slowly is indispensable.

There are hundreds of sets which fall into this grading, and the following hints should therefore be of fairly general interest.

You will need a set of short-wave coils to replace those ordinarily in use. Place a four-turn plug-in short-wave coil in the holder which normally takes the grid coil (the one which is connected to one side of the grid condenser), and a three- or four-turn plug-in coil of the same type in the reaction coil socket.

If on the ordinary broadcast band your set uses a separate coil for aerial coupling, the socket with the coil removed can now be ignored, thereby doing away with the necessity for three plug-in coils.

Alternatively, you can plug-in a 2-turn coil there. If not, fix a new terminal (which we will refer to as $A_1$) to the panel or terminal strip, and join the shank of this terminal to one side of a *small* variable condenser. It must be small—a neutralising condenser of ·00001 will do—and can be fixed at any convenient point on the baseboard.

## TRY DIFFERENT TAPPINGS.

To the other side of this condenser attach a short length of flex fitted at the remote end with some form of clip. This clip has to be clipped to one of the turns on the short-wave grid coil. (The best point to start at is the middle turn.)

The set is now quite ready for use, and it can be switched on and operated in exactly the same manner as previously, only this time it should be remembered that tuning will be exceedingly sharp, and very careful manipulation of the controls will therefore be necessary.

If you experience any difficulty in obtaining reaction, try first using the tap on the grid coil at a position nearer to the earth end of the winding, and if this should not do the trick the distance separating the plates of the series aerial condenser should be increased. For best results, however, these plates should be used as close to one another as possible, providing the set can still be made to oscillate satisfactorily.

By the way, if you find it consistently impossible to obtain reaction, it may be due to the H.F. choke not being suitable for short-wave work. In this connection it is only fair to mention that this fact does not necessarily cast reflections upon the choke in use.

## MAKING YOUR OWN CHOKE.

A choke which may function perfectly on the broadcast waves may not be suitable for short-wave work, and if you come up against this difficulty wind 80 turns of No. 30 D.C.C. or D.S.C. wire single-layer fashion upon a former of roughly 1 in. in diameter, and use it in place of the normal H.F. choke for short-wave work.

**Short-wave tuning is so sharp that a ·0005 tuning condenser often seems too big. But if you connect another ·0005 (fixed) in series with it, across the coil, you bring your tuning capacity down to about ·00025 mfd.**

## ON HIS ORDINARY SET!

He is using a converter unit that brings in short-wave stations on an ordinary set.

**DEAD SPOTS**

**Sometimes a perfectly good short-wave set refuses to oscillate in one place on the dial, though it is O.K. above and below this.**

**Such a "dead spot" is nearly always due to a tuning effect, and can be overcome by altering the aerial circuit's tuning, by means of a small condenser in series.**

# MAKING CERTAIN OF SUCCESS

**If you haven't had any luck on the short waves, read this article and try again!**

ONE of the most remarkable things that occurs when "diving down" to the short waves is the alteration in the tuning. Even if your set is fitted with slow-motion dials, the probability is that if you are a novice on the short waves you will at first turn the dials much too quickly for success under the new conditions.

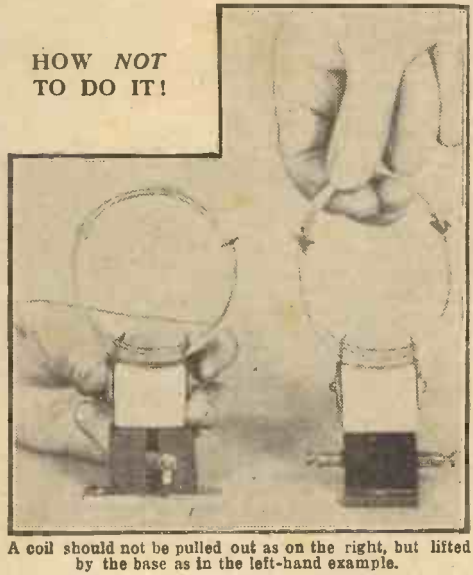
## ROTATE VERY SLOWLY.

The tuning dial must be rotated not merely slowly, but absolutely "dead slow," or otherwise you will miss the short-wave carriers altogether. So easily can a transmission—even a powerful one—be passed over that short-wave enthusiasts practically always wear 'phones instead of using the loud speaker, so as to make sure that nothing escapes notice when tuning. At the faintest sign of a chirp or whistle the tuning should be very, very carefully adjusted, the reaction being slackened off so as to keep the set only on the very verge of oscillation.

So sharp are the tuning effects that very often it will be found that when condenser-controlled reaction on the Reinartz principle is being applied, even a slight alteration of the *reaction* condenser will throw the tuning so far out that all trace of the faint whistle disappears!

## KEEP IN STEP.

Therefore, both hands must be used, one on the tuning control, and one on the reaction, and the two must work together in perfect accord, the tuning dial following up or down the carrier or whistle which is being investigated, whilst the reaction is being varied to the necessary degree.




**A coil should not be pulled out as on the right, but lifted by the base as in the left-hand example.**

Only the lightest possible touch is required, and the co-ordination between the two dials must be close and complete if the various signals which are received are to be fully investigated.

Apart from the very fine degree of tuning and of reaction control that is required, there are other simple things which make or mar short-wave reception. One of the most important is aerial coupling, which in nearly all cases of operation by a novice is made far too tight.

There is no doubt that a very large proportion of short-wave failures are due to this fact, and to this alone—that the aerial has been wrongly connected to the set. What, then, is the correct aerial connection?

## LOOSE COUPLING BEST.

First and foremost, it must be a "loose" connection, not from the mechanical standpoint, of course, but from the view of electrical coupling. Practically all the important work in a short-wave set takes place in and around the grid-circuit coil, and if the aerial is too closely linked with this the whole set is "held down," and is inefficient.

One method of coupling the aerial to the grid is to have a separate aerial coil holder in which one of the set of short-wave coils is placed. If you place a coil of too many turns in this aerial coil holder you will be coupling the aerial too tightly to the grid coil, and this is quite sufficient to prevent the set from oscillating. Consequently, you should use a few-turns coil in the aerial, and do not put up with unsatisfactory reaction effects without trying the effect of altering the size of the aerial coil (or the position of the clip attached to this).

## ANOTHER METHOD.

Sometimes there is no separate coil employed in a short-wave set, so that the aerial lead terminates in a clip, which can be clipped on to one of the turns of the grid coil. This arrangement gives tight coupling if the clip is adjusted near the grid end, and loose coupling if it is adjusted near to the earth end (minimum or no coupling is obtained when the clip is attached to the earth end of the coil).

When working with an arrangement of this type, do not forget to alter the position of the clip not only from one turn to another on the grid coil, but from one part of the turn to another part, until just the right degree of coupling has been obtained and reaction effects are satisfactory over the whole tuning range.

## FINAL ARRANGEMENT.

There is yet another method of coupling which is in pretty common use in short-wave receivers, namely, the method employing a small variable condenser in series between the aerial lead and aerial terminal. Provided a really small variable condenser, such as a "neutrodyne," is employed, this is a very satisfactory method, but here, again, it is advisable to shift the coupling until the exact degree has been found to be best for the particular operating conditions.

## DON'T FORGET THE H.T.

It will thus be seen that although the aerial itself is not very important in short-wave work, the method of connecting it and the adjustment of the aerial clip are two of the most important movements of successful station getting.

Remember, too, that readjustment of the H.T. voltage is of great importance, and should never be neglected.

# WHAT WAVE-LENGTH WAS THAT?

**All about an easily-made instrument that tells you just where the short-wavers are.**

It is often said that in short-wave working it is difficult to know what wave-length you are on. That is wrong.

There is no reason to flounder in a sea of unknown wave-lengths, because anyone who knows the business end of a screwdriver from its handle can make up a satisfactory short-wave meter with very little trouble, and probably from components already in stock.

It is called an absorption short-wave meter, and the only snag is in the name! "Absorption" sounds complicated, but, as a matter of fact, it is extremely easy to make.

## MOVE THAT CLIP

If your short-waver won't oscillate properly, move the clip that controls aerial coupling.

All you need is a coil and coil holder, and a condenser, apart, of course, from the baseboard and panel, and a box to put it in. As the panel may be of wood, and the box ditto, and as there is not even a terminal to add, no one can complain of the complexity of it.

The "wiring" is done by joining the condenser across the coil holder. That's all! But it should be mentioned that the condenser must *be* a condenser and not merely a piece of casual contact, and that the short-wave plug-in coils must be soundly and solidly made.

A slow-motion condenser is essential, and the dial must be of the non-slipping, non-skidding type, for unless it will always return to the same setting accurately it is a waste of time to put it into a wave-meter.

### BUILDING THE UNIT.

To make the unit, then, all you have to do is to mount a coil holder close to the variable condenser and join them in parallel, enclosing the whole gadget in a box, which preferably should be large enough to take the plug-in coils and so keep them out of harm's way. The coils, of course, will cover the same tuning range as your tuning coils. Having done that you have made your absorption wave-meter, and all that remains is to use it.

Unlike some wave-meters this one does not have to be sent to the National Physical Laboratory to be calibrated! Many experimenters have found to their cost that it is one thing to make a short-wave meter and another to calibrate it. The beauty of the type which we are now describing is that it can be calibrated in a few minutes by the experimenter himself.

You require the usual squared paper for showing dial readings at one side and wave-lengths in metres at the bottom, and all that is necessary is to draw a curve for each coil, showing how the condenser setting alters the wave-length. As everybody knows nowadays the best way to do that is to ascertain the condenser setting for as many known wave-lengths as possible so that a line on the paper drawn to connect these points together will indicate intermediate settings also.

### CALIBRATING THE WAVE-METER.

In practice, all you do is to tune in a station (on your set), the wave-length of which is known exactly. Suppose, for instance, it is Schenectady, New York, W 2 X A F, working on a wave-length of 31·48 metres.

Tune this in in the ordinary way with your set right on the verge of oscillation. The tuning condenser must be carefully adjusted and left alone at exactly W 2 X A F's setting.

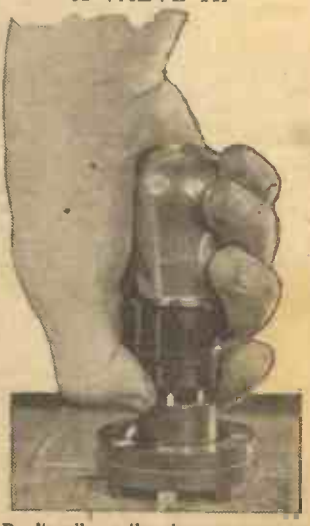
Now bring out your absorption wave-meter, plug in a coil similar to the one in the grid circuit of the short-wave set (approximately the same number of turns, and experience will soon prove which is the best form of coil to use), and place the wave-meter about 8 in. away from the short-wave set's grid coil. As stated, the short-wave set is tuned-in to W 2 X A F's wave-length, and if the wave-meter is suitably placed and then *slowly* tuned, you will find at one condenser setting reception on the set ceases.

### MAKING THE READING SHARP.

Why? Because energy that was helping to make the short-wave set sensitive has suddenly been absorbed by the wave-meter. The point is, that this will only happen when the instruments are exactly in tune, and the reading on the wave-meter can be rendered very sharp if this is placed as far as possible from the short-wave set whilst still allowing the absorption effect to take place.

So all you have to do is first of all to transfer to the calibration chart as many wave-lengths from the set as possible. Once you know the exact wave-length covered by the wave-meter readings you can transfer these to any set simply by placing the meter in the required position near the set, with its condenser tuned to the required wave-length. Then, keeping the set gently oscillating, turn the tuning dial until suddenly oscillation ceases.

## A VALVE TIP



Don't pull on the glass or you may loosen it. Get a grip on the base as well before pulling out a valve.

# Selecting Circuits

In these days, especially when screened-grid, pentode, old "point-o-sixe," and "R" type valves almost rub shoulders, as it were, the powers of a set can no longer be judged by the illumination it provides.

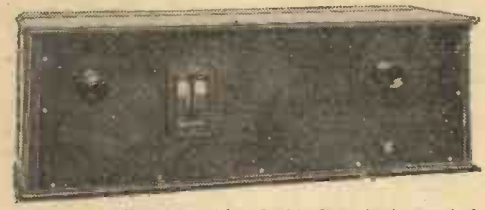
Indeed, radio has become a very complex business, and the choosing of a circuit or set is as difficult as can be.

No doubt many take the advice of expert friends, while others probably ignore technical aspects and confine their choices to particular patterns of sets, thinking (with some justification) that all radio sets nowadays are good, so let's go for the one with the prettiest panel.

### A MULTITUDE OF DIFFERENT HOOK-UPS.

You might accuse "P.W." and all the rest of the radio press of making confusion more confounded by emitting a steady stream of new designs. But we can't hold back new designs; that way lies stagnation, retrogression, decay, and whatnot.

At this very moment of writing we could compile a list of 500 different sorts of sets, each one having some distinctive feature. And out of that 500 you could not possibly pick out one set which would satisfy everybody.



A modern multi-valver with a double-drum tuning control.

You see, we don't manufacture little differences merely for the sake of producing a large number of designs. There is a lot of variation to be seen in the following list of three-valvers. A det., 2 L.F., resis. trans.; an H.F., det., L.F., split-primary neut., L.F. trans.; an S.G., det., L.F.; S.G., det., pentode; det., 2 L.F., trans.

You can double this list by making wave-change an alternative in each case. With four valves the list is three or four times as long. And all these are broad types of circuits. There is still the variations of choke-capacity outputs, layout designs, coil designs, the inclusion or exclusion of refinements, such as volume controls or pick-up schemes, mains smoothing circuit, etc.

### ALL WITH ADVANTAGES.

In the three-valve class alone you already have some 40 distinct arrangements indicated, and each one of these may be variable to some extent. Bring in circuit variations, such as methods of detection, reaction control (Reinartz, throttle, swinging coil, Schnell, etc.), and your list grows to enormous dimensions.

You will not need us to point out that all these variations have their individual advantages and disadvantages, and that it is for the individual set buyer or builder to make up his mind as to the compromises he must make.

# Watch Your Grid Bias

You build or buy a new set. You plug-in the valves, tie up the batteries, adjust the H.T. and G.B., and that is that. Every now and then you have the L.T. accumulator charged and every more-widely-spaced "now and then" you renew the H.T. In the interim you do a lot of knob twisting, get many stations and enjoy hundreds of programmes.

Meanwhile, that little G.B. battery sits on the baseboard as modestly as a fixed condenser. In a way, it is a pity that the G.B. battery does not have to deliver a current, and thereby run down fairly quickly. As it is, the G.B. battery merely deteriorates.

We expect, if a voltmeter census of grid-bias batteries were taken, you'd find that over fifty per cent. of those in use were hopelessly exhausted. Now this is all wrong, not merely from the point of view of the quality of reproduction, which must suffer when the G.B. battery runs down below the figure needed for proper biassing, but because the H.T. may be wasting away.

### EFFECT ON H.T. CONSUMPTION.

In the case of a power valve—and it is here that G.B. is always used—the amount of G.B. (in volts) determines the H.T. current that shall flow, given a certain definite H.T. voltage.

A power valve connected to 120 or more volts H.T. may need 10 volts grid bias according "to the book." Perhaps at this there will be 10 milliamperes current drain on the H.T. battery. But generally you can, with no ill-effect, give a valve more grid bias than the makers specify, so that if you are a careful amateur that valve will perhaps have 12 volts bias, and be "using" only 8 or less milliamps H.T.

Should the G.B. battery have depreciated so much that the 12-volt tapping is providing a potential difference of only 2 or 3 volts, then the H.T. consumption may have risen to 20 or more milliamps. Enough to run down a large dry battery very quickly indeed.

### GRADUAL DETERIORATION UNNOTICED.

Large batteries are expensive; they cost many more tens of shillings than the wee battery that supplies that regulating G.B.

Don't jump in here and say that quality will have gone "phut" and plainly indicate that things are not as they should be. Only a milliammeter will clearly show this.

You see, that G.B. battery will have run down very gradually, and you may have become slowly acclimatised to the distortion. And this, at its worst, might be by no means as bad as the valve curve, etc., will make out. It is surprising what fairly good results you can get under such conditions.

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# PILOT RADIO KITS

## SPECIALLY PREPARED FOR THE SPLENDID SETS IN THIS HANDBOOK

## PILOT RADIO KITS INCLUDE

1. Every specified Component. 2. "Red Triangle" guaranteed ebonite panel, highly polished and drilled to specification. 3. Handsome cabinet, made in our own Factory and beautifully french polished by hand. 4. The specified valves. 5. All nuts, screws, plugs, connecting wire and flexible leads contained in neat partitioned carton. 6. A written guarantee of service. 7. THE PILOT TWO-RANGE TEST METER.

## ● IMMEDIATE DELIVERY TO APPROVED ORDERS ●

### SHARP TUNE TWO ("P.W." 18/10/30)

| | | | |
|---|---|---|---|
| Kit A. | Cash £3 18 0 | or 12 monthly payments of | 7/2 |
| Kit B. | ,, £4 17 0 | ,, ,, ,, | 8/11 |
| Kit C. | ,, £5 13 0 | ,, ,, ,, | 10/4 |

### EASY CHANGE THREE ("P.W." 11/10/30)

| | | | |
|---|---|---|---|
| Kit A. | Cash £3 18 3 | or 12 monthly payments of | 7/2 |
| Kit B. | ,, £5 5 9 | ,, ,, ,, | 9/8 |
| Kit C. | ,, £6 10 9 | ,, ,, ,, | 12/- |

### ECONOMY THREE (See Page 11)

| | | | |
|---|---|---|---|
| Kit A. | Cash £3 4 7 | or 12 monthly payments of | 5/11 |
| Kit B. | ,, £4 12 1 | ,, ,, ,, | 8/6 |
| Kit C. | ,, £5 5 10 | ,, ,, ,, | 9/8 |

### THREE COIL THREE ("P.W." 18/10/30)

| | | | |
|---|---|---|---|
| Kit A. | Cash £5 4 6 | or 12 monthly payments of | 9/7 |
| Kit B. | ,, £7 3 6 | ,, ,, ,, | 13/2 |
| Kit C. | ,, £8 8 6 | ,, ,, ,, | 15/5 |

### MAXI POWER FOUR ("P.W." 11/10/30)

| | | | |
|---|---|---|---|
| Kit A. | Cash £6 10 7 | or 12 monthly payments of | 12/- |
| Kit B. | ,, £8 18 1 | ,, ,, ,, | 16/4 |
| Kit C. | ,, £10 15 7 | ,, ,, ,, | 19/9 |

### D.X. ONE-VALVER (See Page 6)

| | | | |
|---|---|---|---|
| Kit A. | Cash £2 18 1 | or 12 monthly payments of | 5/4 |
| Kit B. | ,, £3 6 7 | ,, ,, ,, | 6/1 |
| Kit C. | ,, £4 1 1 | ,, ,, ,, | 7/6 |

IMPORTANT NOTE: Kit "A" is less valves and cabinet. Kit "B" is with valves less cabinet. Kit "C" is with valves and cabinet.

## ● ACCESSORIES, MANUFACTURERS' KIT, Etc. ●

Send **10/9** Only — **Regentone W.5 Combined H.T. Eliminator and Trickle Charger.** 1 S.G., 1 variable and one fixed tappings for H.T.; L.T. charging for 2, 4 and 6 volts. For A.C. Mains. Cash price £5 17 6 — Balance in 11 monthly payments of **10/9**

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