

GREATEST RADIO CIRCULATION IN THE WORLD

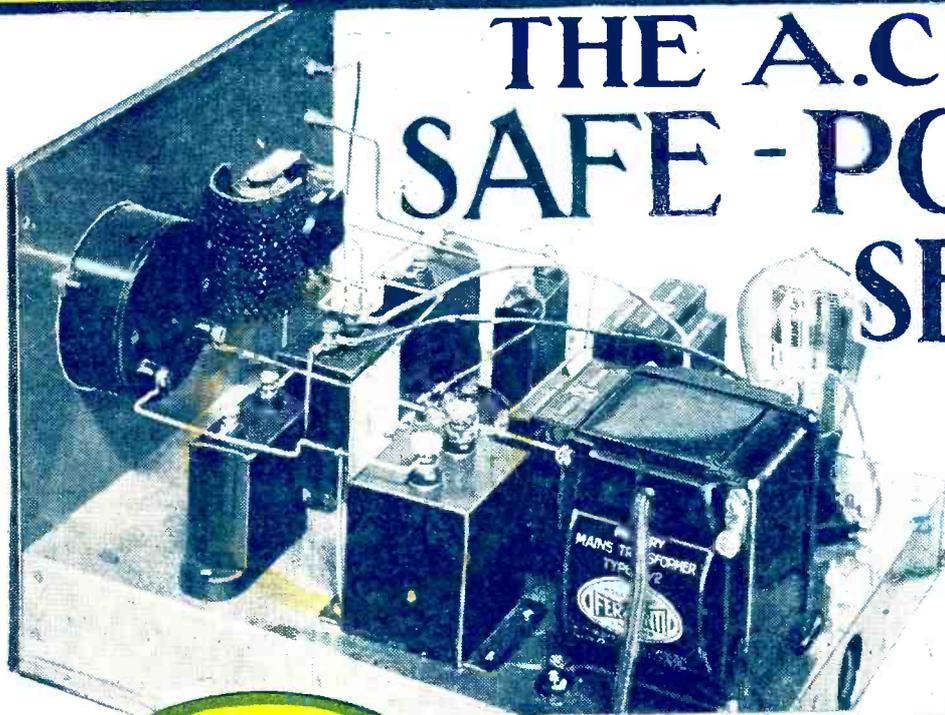
# Popular Wireless

Every Thursday  
PRICE  
3d.

No. 426. Vol. XVII.

INCORPORATING "WIRELESS"

August 2nd, 1930.



## THE A.C. SAFE-POWER SENIOR

*Full  
Details  
Inside*

### CONTENTS

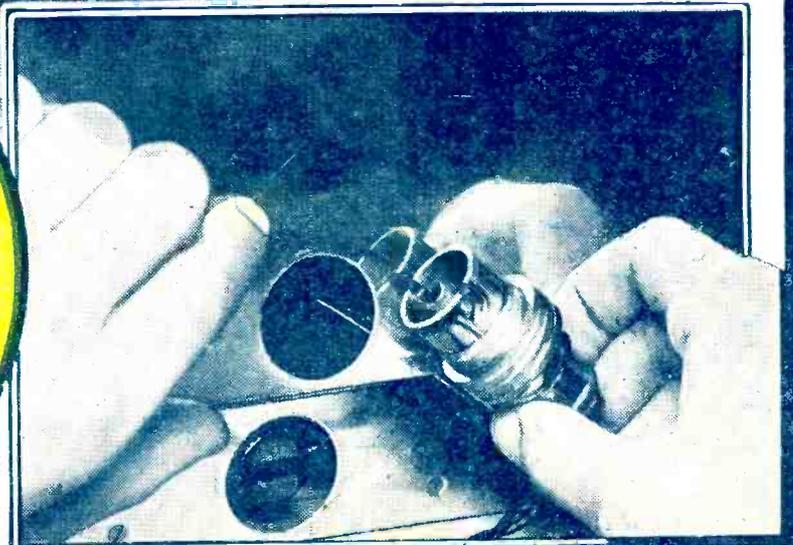
**YOUR COMPONENTS**  
By Victor King

**SIX-PIN COILS FOR THE  
MAGIC THREE**

**A SHORT-WAVER FOR 10/-  
HOW BROADCASTING  
HAS HELPED ME**

By Stiles-Allen

Etc., etc.



VIII

EVERYTHING **The G.E.C.** ELECTRICAL  
YOUR GUARANTEE

# Osram Valves

Sold by all  
Wireless Dealers

## MADE ENTIRELY IN ENGLAND. REDUCED PRICES

The following types of OSRAM VALVES are REDUCED IN PRICE as shown, the reductions becoming operative immediately.

| TYPES |          | OLD PRICES | NEW PRICES  | TYPES |             | OLD PRICES | NEW PRICES  |
|-------|----------|------------|-------------|-------|-------------|------------|-------------|
| Osram | H.L. 210 | 10/6       | <b>8/6</b>  | Osram | P. 2        | 15/-       | <b>13/6</b> |
| "     | H. 210   |            |             | "     | P. 240      |            |             |
| "     | L. 210   |            |             | "     | P. 425      |            |             |
| "     | H.L. 410 |            |             | "     | P. 625      |            |             |
| "     | H. 410   |            |             | "     | P. 625A     |            |             |
| "     | L. 410   |            |             | Osram | S. 215      | 22/6       | <b>20/-</b> |
| "     | H.L. 610 |            |             | "     | S. 410      |            |             |
| "     | H. 610   |            |             | "     | S. 610      |            |             |
| "     | L. 610   | Osram      | P.T. 240    | 25/-  | <b>22/6</b> |            |             |
| Osram | P. 215   | "          | P.T. 425    |       |             |            |             |
| "     | P. 410   | "          | P.X. 4      |       |             |            |             |
| "     | P. 610   | 12/6       | <b>10/6</b> | "     | P.T. 625    | 30/-       | <b>27/6</b> |

Prices apply only in Great Britain and Northern Ireland

# Popular Wireless



Scientific Adviser :  
 Sir OLIVER LODGE, F.R.S.  
 Chief Radio Consultant :  
 CAPT. P. P. ECKERSLEY, M.I.E.E.  
 Editor : NORMAN EDWARDS.  
 Technical Editor : G. V. DOWDING, Associate I.E.E.  
 Assistant Technical Editors : K. D. ROGERS,  
 P. R. BIRD, G. P. KENDALL, B.Sc.,  
 A. JOHNSON RANDALL.



**A TIDY MIND—  
 THE SPARE EARTH—  
 RADIO v. CAR—  
 D.F. ON SHIPS—**

**A WARNING—  
 THIS "SULPHATE"—  
 D.C. TO A.C.—  
 A NAUGHTY STATION.**

## RADIO NOTES & NEWS

### Reverie.

THE "earth" wire from my set runs down one of the upright supports of our verandah steps. Whilst dreaming in the sun over my "after lunch" smoke yesterday, and kinder staring into nothingness, I gradually realised that I was actually staring at a neatly-cut wire. The two ends were turned slightly outward, adding insult to injury; they gaped at me. I did not grasp all this at once. Too hot and sleepy!

### A Tidy Mind.

"BUT," I said, "the thing is in two bits. You don't have earth wires in two bits! Its a spark-gap in the wrong place. I'm dreaming, surely! Who of all my household (Biblical touch, that!) would steal down like a thief in the night and sever my earth lead? One does not do same, does one?" *Mais oui!*—as they say on those cheap trips to Boulogne—it was true, though. The culprit was a house-painter, who "thought the wire was in the way," and would have removed it *in toto*, as Julius Caesar said—had not the tweeney set up a scream. Heroic girl!

### The Spare Earth.

WHAT was the tweeney doing there? Keeping an eye focussed on the main chance, I suppose. The heart of a house-painter with a tidy mind is not lightly to be spurned.

Why didn't the receiver say that its jugular had been cut? Ah, a fair question, and if you can spare just a moment before you dash down to the beach I'll reveal all. Very dramatic! Hist! (Closer, come closer! Lend me your ear! (Gracious, how your neck is skinning!). The crafty old Ariel, wise from manifold afflictions, always has two distinct, separate, indiwiddle independent, self-starting earths! He has lost earths before! Now run along, children, and do a nice bit of Lido before lunch.

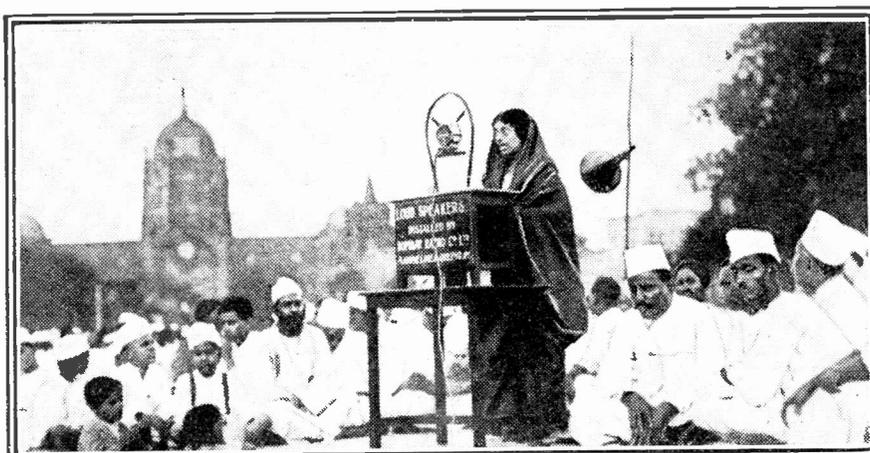
### Radio Versus Car.

DR. WALTER DAMROSCH DE NOO YORK sees in Radio and the Automobile two opposing forces fighting for the soul of youth; the Ormuzd and Ahriman of the twentieth century, so to speak. The car will disrupt family life; radio tends to build it up. B'gosh, there's much to be said for both. Though the "Kah" or "Kaw"—it depends on whether you live S.W. or S.E.—is liable to be made an outward and visible sign of snobbery, it can be a means of showing folk what a heavenly land we live in; and the radio set can be either an unmitigated evil or a key to the gates of wonder. The choice rests with the users.

### Prophecy and Reason.

ACCORDING to a notice circulated by the Australian wireless company, which runs one end of the Marconi beam, Mr. E. T. Fisk said recently that whereas talk of radio communication "left him cold" it would probably be found that radio would solve the mysteries of the future world, and of life after death. "The reason for this belief," he said, "is that radio makes use of ether waves that permeate infinite space, and it is probable that, by means of these ether waves, there would be constant and reliable communication between the future inhabitants of the earth and those who have passed over the border into another world."

## "THE UNCHANGEABLE EAST" TAKES TO THE MIKE



This up-to-the-minute view of the situation in India shows Mrs. Lilavati Munshi addressing a Bombay gathering by means of a microphone and loud speakers.

### Pigs Might Fly.

UNLESS I have missed it, Mr. A. M. Low, in his wildest flights, never went so far. I fear that Mr. Fisk, in straining after an effect has dislocated some part of his reasoning apparatus. The "reason" for his belief is that ether waves permeate space. It is no reason at all! He might as well believe that pigs will fly: the same reason would serve him. Also, in speaking of "mystery" he really ought not to make so free with the words "probably"

### D.F. on Ships.

THERE can be, however, but one view of the utility of wireless telegraphy. Once regarded by many sailors as an unnecessary and unseamanlike tool, the radio set has become a department of the ship. Interesting figures are given by the U.S. Lighthouse Service in relation to the stranding of large vessels on the U.S.A. coasts during the period Jan., 1927 to March, 1930. There were 143 strandings and of these 85 per cent. were of ships not equipped with radio compasses. An analysis of the remaining 15 per cent. shows that in only four instances the stranding took place in regions protected by wireless beacons.

and "probable." In fact, successful sensation-mongering requires much more skill than is apparent in his effort.

### "How Diagrams Help."

MANY thanks to G. M. M. (London, N.13), for his useful letter. Technical query answered and other suggestions thankfully noted by those chiefly concerned. Can't say more about them at the moment, except in reference to the suggestion that our blue-prints should be drawn to a definite scale. I can well understand that his draughtsman's soul cries out for this, but the point has not been over-

(Continued on next page.)

## RADIO NOTES AND NEWS.

(Continued from previous page.)

looked, and if he will refer to "Modern Wireless" for July, he will find our point of view in the article entitled "How Diagrams Help."

### A Warning.

THE Marconiphone people have asked us to draw attention to the fact that attempts are being made to obtain unauthorised possession of their apparatus. A man visits a house and says that he has been sent to collect the set. Up to now no one has obliged the "collector," so far as is known, but it is just as well that it should be known that all Marconiphone officials carry an identification card and that their visits are announced by letter beforehand.

### Fire!

REAL hard luck, Luton Red Cross Band, to suffer such havoc by fire amongst your music and beautiful instruments, and we are all very sympathetic. All normal music lovers feel safe when they see your name in the B.B.C.'s programme, and it is to be hoped that your having to become accustomed to strange instruments will not prove too powerful for you. I knew a kettle drummer who had a nervous breakdown because they changed the air in his drums!

### This "Sulphate."

BY a coincidence—was it?—there was published in "P.W." for July 19th an article, "The Accumulator's Enemy," by Mr. J. F. Corrigan, and in the same number I propounded a question about "topping." No doubt 1,367 readers will point this out to me; already I hear the pens creaking in Canada, Australia, India, etc. However, now that the well-known metallurgist (mentioned above) has taken a hand I shall retire from the "sulphating" business; but I think that I shall hear some more about distilled water versus tap-water. Perhaps we may be favoured with a statement of just exactly what is the poison in ordinary water from the tap?

### The Connoisseur.

J. H. M. (N. Devon) is the kind of "P.W." reader that stands in the same relation to us as a flea does to a dog; he keeps us mighty busy attending to ourselves! (This parallel, oh, J. H. M., is purely Pickwickian.) Sometimes I get a cold fit when I think of the thousands of nimble brains which are sifting my humble weekly "chat over the fence." Now, on page 487 of "P.W.," July 12th, there is a "booful picter" of an insulator under electrical test. Note how it is connected! Very good! Along comes J. H. M. and asks whether the connection is not misleading, as the wires ought to pass round the length of the "egg." In an aerial or stay the "egg" should be so connected; for an insulation test it scarcely matters how—and we can't spare the time for unnecessary frills. But 'tis a point worthy of note, and we welcome criticism of this kind.

### D.C. to A.C.

IF you use a "battery eliminator" or a charging panel for your accumulators, and then the local electricity supply is changed—it will almost certainly be from

D.C. to A.C.—your apparatus won't be much use except to put into the junk box. Will the supply people compensate you or provide you with apparatus which will work off A.C.? Even if the nature of the electricity is not altered but the voltage is changed you may be in an unhappy predicament. If some understanding cannot be arrived at between "radio" manufacturers, supply companies and the Electricity Commissioners, a test case may be initiated by the radio people in the shape of legal action.

### A Sensible Provision.

I LIKE the practical common-sense behind the decision of the German authorities to allow radio dealers to install receivers on approval in the houses of prospective customers for a period of eight

## SHORT WAVES.

It is stated that having the ears pierced is a cure for defective eyesight. A correspondent who has a wireless and gramophone enthusiast living next door to him says he has unwillingly persevered with the treatment for years.—"Humorist."

### A STARTLING DISCOVERY!

"Even standing on a wet bath mat, men have been killed just by touching a leaking electric light switch, because there was enough water on their feet to prevent the current passing through," we read in the "Evening News."

These "experts!"

This week's Optimist: The beginner who bought a crystal set—and a Maori dictionary.

"Radio shrinks the earth," we read in a provincial newspaper.

A correspondent, who had to walk five miles to have his battery recharged, states that this is not authentic.

### OUR ANTIQUES.

"Our broadcasting authorities," someone declares, "have prehistoric ideas."

The powers that be B.C.?

"This station has the call sign SPILT," we read in an article describing various foreign broadcasting centres.

Rather difficult to pick up, we should think.

"Efforts are being made to evolve a musical instrument especially suited to broadcasting." We suggest a wireless piano.—"Punch."

"When rabies attacked my Uncle Daniel, and he had fits of barking like a spaniel, The B.B.C. relayed him (from all stations) At Children's Hour in 'farmyard imitations.'—"Humorist."

days, during which no licence fee is required. It is all done through the local postmaster and thus the wheels are greased for all parties concerned. A little more helpfulness of this nature would be welcome here; it would be better than the multiplication of by-laws which hinder trade.

### Radio Criticism.

AS for Madame Muma, it would, perhaps, have been better if Joan of Arc hadn't died in French." "The Four Tromboneros played four trombones in a dark manner and I shall be very pleased to hear THEM again when we are all five descended into Heaven, and not before." "In direct contrast was the amoniated syreen of Mr. Victor Hagen, who trod the strate un na-ha-row towards mother's eyes in the best prodigwail-son traditions." "Miss Zena Moller, soprano, seems all

right in a modest way." Thus, the radio critic of the Australian "Wireless Weekly." If you venture to broadcast over there it is wise to cultivate a thick skin.

### Percentages of Pandemonium.

VERY interesting figures are given by "World Radio" as a result of the analysis by the B.B.C. of the letters received by them during 1929 complaining about electrical interference with radio reception. Expressed as percentages of the total number of such letters the causes of interference pan out as follows: Motors driving machine tools, 23.09; accumulator charging plant, 14.12; refrigerating plant, 10.01; generating plant, mains, etc., 9.5; overhead telephone and power lines, 6.29; cinemas, 6.1; flashing signs, 4.96; H.F. medical apparatus, 1.71; miscellaneous, 2.57. The snag is, "unidentified causes, 21.65.

### Luck of the Mike.

THE name of John Morel may be added to those to whom broadcasting has given a footing on the ladder of success. In October last, when he broadcast in the last promenade concert, he was not very well known, but during his performance Robert Courtneidge had marked him down, and on the night following he was engaged to sing in "The Damask Rose" at his own figure.

### A Naughty Station.

THE Federal Radio Commission, U.S.A., has cancelled the licence of the Schaeffer Radio Co.'s broadcasting station, KWBBS, Portland, Oregon, for permitting offensive language to be used at the microphone, besides being an old offender in the matter of straying from the allotted wave-length. Phew! the language must have been fairly blistering for the Commission to take so drastic a step. However, I think it must have been more Pickwickian than personal, the offending speaker being a politician engaged in "roasting" his opponent.

### Treats Given and in Store.

THE bells of St. Paul's Cathedral mixed up with noises from the river! Negro spirituals! Aesop's Fables brought up to date! A Buddhist chant over 1,000 years old! Chamber Music! "Syncopated pianisms"! A church service in Welsh! I mention these items in case any of you should be thinking that the B.B.C. has run out of ideas. The Buddhist chant ought to be mixed up with the Welsh service, like the bells and the barges! How came they to overlook that?

### A Fine Performance.

OUR correspondent in Cincinnati, U.S.A., Mr. F. Easter, describes a world-wide "hook-up" which he heard on June 30th, namely, 2 X A F (31.48 m.), 2 X A D (19.56 m.), V K 2 M E (28.5 m.), P H 1 (16.88 m.), and P L E and P L W on 15.74 and 38 metres respectively. The U.S.A. station 2 X A D broadcast music which was relayed by P H 1 to Java, which in its turn relayed it to Sydney (2 M E). After that 2 M E relayed it to W.G.Y., which re-broadcast it. 2 X A D was used for communicating with Holland in reference to the hook-up. Its a great game, sure 'nough!

ARIEL.

# YOUR COMPONENTS

By VICTOR KING

If you want the best results and maximum enjoyment from your set, see that its components are free from little blemishes such as are described by our well-known and outspoken contributor.

Do you ever examine your components critically before you actually buy them? You can take it from me that it will pay you to do so, for while there is not much real rubbish on the market these days, there is a lot of gear that, in my opinion, fails in details.

Even the products of well-known manufacturers sometimes carry little faults both in design and construction. And you don't have to be a skilled mechanic to spot them, strange though it may seem!

I don't want to cause a general mistrust of modern radio apparatus, but it is only commonsense to look your goods over carefully before paying the money. Seemingly there is an idea abroad that radio articles are very different from anything else. You will see a man buying stuff in a radio shop, straight off the hands of the shop assistant, who you know examines anything else with the keenest of eyes before he parts up with his cash.

## Knob and Dial Fixings.

I think the reason for this is that a lot of people believe that electrical apparatus cannot obey mechanical rules and regulations regarding structure and finish. That is all wrong. Let me point out a few of the weaknesses to be found in many radio components, so that you can see the sort of thing I want you to look out for, and to avoid.

One of the worst features is, in my opinion, the fixings provided for knobs and dials. Very often all you get is a small grub-screw, let into the knob or dial, which runs down on to an absurdly small "flat" on the spindle. Sometimes the grub-screw, which is frequently of soft brass, operating in a soft brass bush, easily strips its thread, while at other times the flat on the spindle wears "round."

## Mechanical Weaknesses.

In either case it becomes impossible to get the knob or dial to hold tightly on its spindle, and you have to trust to luck when you operate it.

You meet mechanical weaknesses of this kind in variable condensers, potentiometers, switches, variable resistances, and so on. There is no excuse for it at all, and I cannot see why properly "squared" spindle fittings should not be quite universal.

Then again, you meet that fiendish lock-screw knob or dial fixing every now and then. To hold the knob or dial in position you have to run it down a threaded spindle to a nut which you tighten up against it.

Such a scheme is generally quite satis-

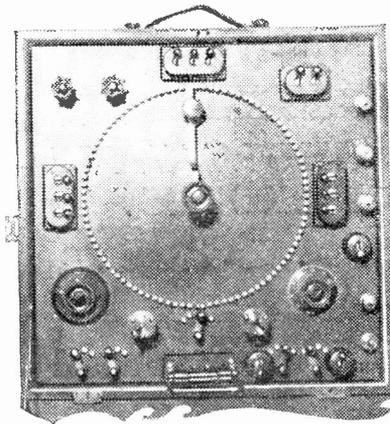
factory if you have to operate the device concerned only in a clockwise direction. But as soon as you run it in the other direction, the control loosens and you have to desist from DX for repairs!

The knobs and dials of all components that use them should fit tightly on their spindles and once fixed should never loosen accidentally. If constructors would only refuse to buy gear that was wanting in this respect manufacturers would soon mend their ways!

## Annoying Valve-holder Fault.

And what of the valve holder whose terminals are held by screws running up from the bottom, screws that have an uncanny knack of loosening after the valveholder is fitted in a set?

## STILL WORKING!



A crystal set made in the early days of radio that is still giving good service at Clapham. The big switch has some hundred studs connected to coil taps

Unfortunately, valve holders of that kind are only too common. By the way, there are far too many tiny little soft metal screws to be found in radio components. Certainly I do not advocate the use of steel, although in many instances its magnetic properties would be quite harmless; but if a non-magnetic material is insisted upon, what about using phosphor bronze, or at least screws of decent gauge and not finicky little things that are hard to handle and whose threads strip so soon as you touch them.

Talking about screws, every one of you must have noticed how loosely the screws and nuts of many radio components hang

together. A nut should run down its screw easily, but fit snugly so that there is no "play."

Mind you, I am not pretending that I am an expert mechanic, but all the things I have mentioned seem to me to be ridiculous departures from the commonsense. Sometimes, in the evening, I sit in my study gazing at some component for an hour or more, wondering how the thing passed a works-manager, as I notice all the tiny little faults that seem so obvious, even to a layman.

Let us take another example, the "one-hole panel-mounting component."

## Panel-mounted Components.

It is very nice to have to drill only one hole in an ebonite panel in order to mount something, but what if that one hole is over an inch in diameter? As I write I have before me a condenser that necessitates such an aperture. Can you make a moderately neat hole in an ebonite panel one inch or more in diameter? I confess that I find it jolly hard to do that, even with an expanding bit!

Again, you sometimes come across variable condensers that have to be held to a panel by nothing above a three eighths spindle nut. For the life of me I cannot understand why small projecting pieces are not provided, at extreme outside points of the components, which would be drawn up against the back of the panel and so prevent the whole component from tending to turn.

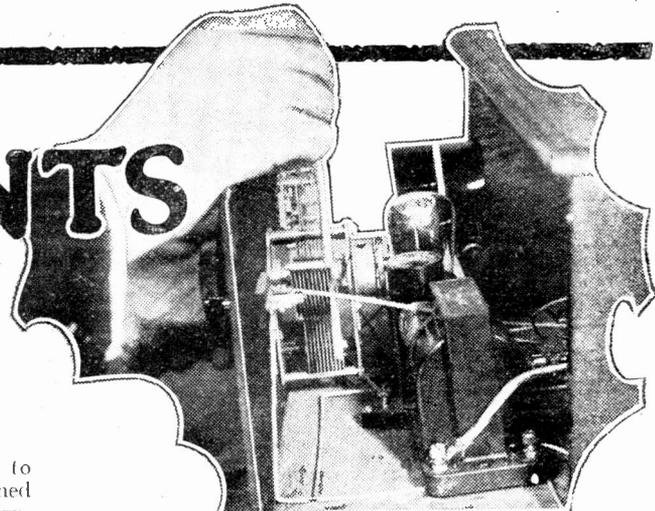
Instead of anything like this, the whole body of the article generally stands back into the set and there is nothing to hold it but that rotten little spindle nut.

## Ever Encountered This?

And what of tiny little soldering tags sitting right down on ebonite or celluloid composition insulating material? You apply the soldering iron and a wisp of smoke coils up from a bubbling, sticky black mass.

Anyway, I don't think the average home constructor does much soldering and prefers decent terminals—not fishy little things poked away in awkward corners.

You may be inclined to think that I am always grousing at something or other. It is true that I find a lot to criticise—but even my worst enemy will, I hope, admit that I attempt to make my criticisms follow a constructive line.





# THE B.B.C. TODAY

## BY THE EDITOR



**I**N order to get a clear understanding of the present position and future prospects of the Regional Scheme of broadcasting it is necessary to comprehend its background. As long ago as 1924 there was talk of the Regional Scheme, the idea of which originated in the fertile mind of Captain Peter Eckersley. It was realised then that the single programme service was inadequate, and that it should be replaced as soon as possible by a multi-programme service, distributed through several high-power twin-wave transmitters.

### The First Delay.

There was then no question of an embarrassing scarcity of ether channels. Had Captain Eckersley's early recommendations and plans been adopted and pressed forward the Regional Scheme would have been completed by the end of 1926, and British broadcasting now would have been very much more efficient. But the Regional Scheme was doomed to deplorable delay.

First of all, there was obstruction at the Post Office, which was not convinced that the plan was a good one technically. These misgivings induced the Post Office to withhold sanction on the ground that a Parliamentary Committee was about to investigate broadcasting with a view to determining its future constitution.

And so the matter was left until Lord Crawford's Committee of 1925 completed its deliberations. This meant that nothing more could be done until 1926, which, being the last year of the regime of the old Broadcasting Company, was regarded as an unsuitable time to begin. Again delay and obstruction.

### Commenced at Last.

The new Board of Governors, installed under the Corporation, at the beginning of 1927, instituted a fresh inquiry through a technical Committee presided over by Dr. Eccles. The favourable finding of this Committee was a foregone conclusion because Captain Eckersley and his colleagues had naturally sought the best technical advice before making recommendations. And so after another six months the Regional Scheme was approved, three years having elapsed since it was first outlined.

It was necessary to begin by experiments. Daventry (5 G B) was operated experiment-

\*-----\*  
\*-----\*  
\*-----\*  
\*-----\*  
\*-----\*  
\*-----\*  
\*-----\*  
\*-----\*  
\*-----\*  
\*-----\*

**This is the second of a short series of articles in which "P.W." is once more shining the spotlight on the B.B.C. In this article the difficulties of bringing the Regional Scheme to life are described, and its future discussed.**

\*-----\*  
\*-----\*

ally for eighteen months, and then towards the end of 1928 work was begun on the first of the new series of twin-wave stations—the one at Brookmans Park. This was completed a year later and has now been in operation for some months. The work

### "P.P.E.'s" SUCCESSOR



Noel Ashbridge, B.Sc. (Eng.), A.M.I.C.E., the Chief Engineer of the B.B.C.

on the North Regional transmitter at Slaithwaite, near Huddersfield, is now in progress. It is expected that service transmission in the North will begin in February or March next year.

A twin-wave transmitter for Scotland should be ready at the beginning of 1932 and, by the end of the same year, the new station for Wales and the West should be in operation, and perhaps also the new transmitter for Northern Ireland.

Although there is no avoidable delay now in the carrying through of the Regional Scheme, the consequences of the early unnecessary delays are so serious as almost to cripple the scheme from the start. In 1924 the wave-length situation was much more satisfactory; it would have been possible then to have secured twelve good channels in the broadcasting band, and to have retained the Daventry long wave. This would have made possible a uniform, geometrical, system.

### Making the Best of It.

But in the years that have passed since the plan was originated the development of broadcasting on the Continent, and the demands of other countries for facilities, have rendered it no longer possible for this number of frequencies to be secured by Great Britain. The best possible bargain has been made in existing circumstances. This provides nine frequencies in the broadcasting band, and preserves Daventry (5 X X). It also provides the B.B.C. with very serious problems in determining an equalised distribution.

Of course, London and the South-east are safeguarded, there being the two exclusive frequencies from Brookmans Park. Then the Midlands are being well looked after through 5 G B and 5 X X. There will be also two good frequencies for the North Region. That leaves Scotland, Wales and the West country, and Northern Ireland.

### A Difficult Problem.

If there were six inclusive frequencies left over all would be well, but there are not; there are only five. In order, therefore, to extend the benefits of alternative programmes to these three areas it will be necessary to arrange to duplicate one of the frequencies. That is to say, either Scotland and the West country or the West country and Northern Ireland must share a frequency. They cannot, of course, put out different programmes on the shared frequency. It follows that

*(Continued on next page.)*

## THE B.B.C. TO-DAY

(Continued from previous page.)

this must simply repeat the National programme, thereby considerably restricting the area of choice for local listeners.

In the matter of programmes, there is no doubt of the popularity of the alternative principle, which the B.B.C. is now attempting to apply by instalments. Listening with discernment and intelligent discrimination is becoming much more common than it was. This makes it all the more regrettable that the B.B.C. shows a growing tendency to increase the proportion of simultaneous broadcasts. It seems that the Governors of the B.B.C. are anxious for reasons of economy and general policy to reserve the right of withholding alternatives quite arbitrarily. This applies chiefly to religious services; but it is also true of some talks and a good deal of music.

### A Great Mistake.

It is a great mistake.

The provision of alternatives should be almost invariable, and if the Regional Scheme, belated as it is, is to have the success which it deserves there should be no compromise with the basic principle.

While alternatives should be almost invariably provided, it should not be necessary to adhere too rigidly to the wave-length arrangements. For instance, the morning religious service, which is greatly appreciated by the bedridden-sick and the poor, should be made available on the frequency which gives a stronger signal over the widest area, that is on 356 and not on 261.

I commend to the B.B.C. that there should be an early reconsideration of the allotment of items to wave-lengths. There is a danger of neglecting expediency. The objective should be to get as much as possible of the programmes into the maximum number of homes throughout the country.

Another point affecting alternatives is in connection with the new tendency to concentrate unduly on London. Centralisation threatens to go too far. The B.C.C. would be well advised to maintain strong and fairly autonomous centres at Manchester, Birmingham, Cardiff, Edinburgh, and Belfast. It is not enough to argue the same results would be obtained if the same programme builders were all in London.

### Local Atmosphere.

Each of the provincial centres has its own atmosphere and personality. There is contrast not only in material, but also in conception, attitude, and mental process. The future of the Regional Scheme on the programme side is largely bound up in the ability displayed by the B.B.C. to foster its provincial centres.

Until all the Regional stations are completed and tested it will not be possible to determine finally the future of 5 X X. The early view was that 5 X X would be used for educational and utility transmissions for the whole country.

But it was then assumed that there

would be ten or eleven channels in the broadcasting band. As things have turned out, however, 5 X X will have to be used for the National programme to fill in the gaps that exist between the service areas of the Regional stations.

As the regional plan takes shape in new stations there is a good deal of speculation as to possible modifications before it is completed. There are some who believe it would be better to use only three wave-lengths, one for instructional and the other two for alternative entertainments. The idea would be to operate the three transmitters on a power of about 200 k.w. each, reaching the whole country on simple sets.

### Highly Improbable.

This might be possible technically, if the Post Office were to approve of the use of such gigantic power; but it is a big "if." Moreover, the elimination of local interest from B.B.C. programmes would have results that would be hardly outweighed by the economic advantages. So

## THE PROGRAMME SIDE



Brother of our Chief Radio Consultant, Mr. R. R. Eckersley is Director of Programmes.

I dismiss this suggestion. But it would be a good plan to put up the power of 5 X X even in its present function. Incidentally, evidence accumulates that 5 X X is easily the most popular station throughout the Continent.

Were the Stenode Radiostat to be applied in the sense in which it is now advocated, of course, all the difficulties about wave-lengths would disappear. The B.B.C. could have as many twin-wavers and single transmitters as could be afforded. The development of this invention, or something better, might indeed make it desirable to licence in this country a competitive broadcasting service receiving its share of the listener's ten shillings. With no wave-length trouble, many things are possible.

But here again the case is hypothetical. On the whole it is probable that the Regional Scheme will be carried through on lines now contemplated.

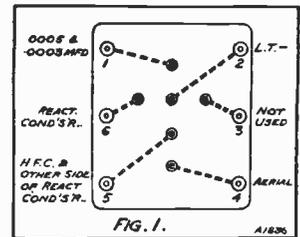
## SIX-PIN COILS FOR THE "MAGIC" THREE

By S. R. P.

MUCH experimental work has undoubtedly been carried out since the inception of the "Magic" Series, and in conjunction with its unique circuit perhaps the most popular desire has been to utilize 6-Pin Coils in place of the standard plug and socket type.

Alterations in comparison with the original circuit are extremely simple, while results on a receiver in south-west London were found to be well worth the change-over—fifty stations being received on loud speaker, including ten stations on the long wave band.

The original circuit showed two plug and socket coil-holders and one of the coils an X coil, i.e., there were five points of contact. Now in using the 6-pin coil, No. 3 terminal on coil-holder is ignored; thus again there are five points of contact.



How the box is wired.

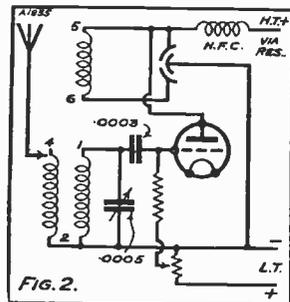
### Easily Arranged.

It is therefore only a question of disconnecting the leads, unscrewing the present coil-holders from baseboard, screwing down a 6-pin coil-holder and making connections to the five terminals in the manner shown in Fig. 1.

It will be seen that the H.T., viz.: 25,000 ohms resistance and H.F.C., now goes direct to plate of first valve, instead of through reaction coil. In operation it was found that in conjunction with a careful setting of the potentiometer (mounted on panel) a great improvement was noticeable.

The point-to-point connections are as follows:

No. 1 terminal to .0003 grid condenser; No. 2 to L.T.; No. 3 not used; No. 4 Aerial; No. 5 to H.F.C. and one side of reaction condenser; No. 6 to other side of



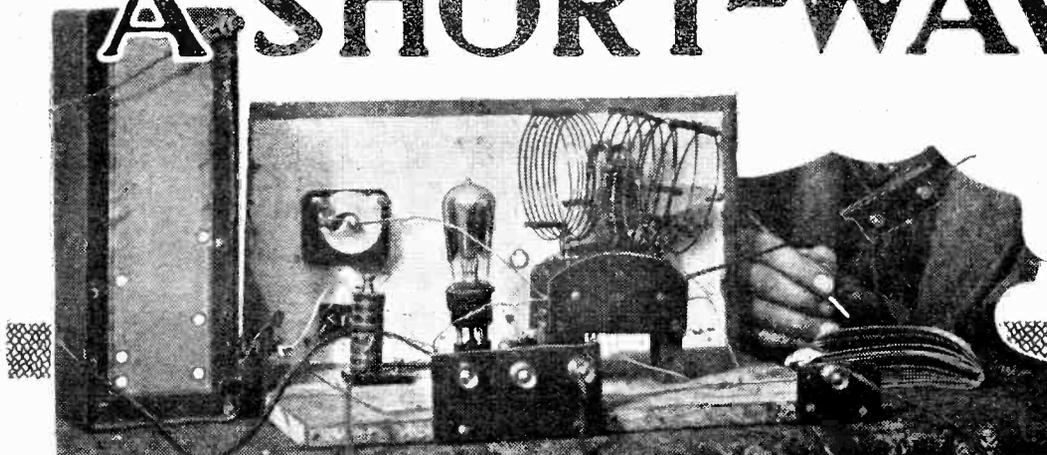
The Six-pin Magic Circuit.

reaction condenser.

The "Magic" Three has earned a world-wide reputation, and deservedly so when such excellent results are found to be obtainable. There have been disappointments, of course, but it should be remembered that a high standard cannot be realised unless careful attention is given to the following of all directions for the construction of the receiver.

# A SHORT-WAVER

for  
10/-



By H. PADMORE.

RECENTLY I rather rashly said I could build a short-waver, complete with valve and coils, capable of picking up W 2 XAD and W 2 XAF (the Schenectady relays of WGY), for a cost of 10s.

A bet immediately followed, the money was staked, and I returned home with a growing feeling that in the heat of the argument I had taken on a little more than I might be able to accomplish.

However, there was nothing for it but to have a shot or lose the stakes, so the next day I went into the neighbouring town and visited some of the wireless stores.

When I explained the nature of my requirements, I became the butt of many rude remarks, including advice to try "Woolworth's."

### Buying the Parts.

Evidently nothing doing at the dealers, I decided, and was wondering what to do next when it struck me there might be a radio merchant's stall in the market where some really cheap components could be procured.

My luck was in and, after the usual bartering, I bought the necessary parts for 6s. 8½d.

Next I called on a grocer and purchased a small wooden box made of ½ in. boards for 3d.

The following evening operations commenced, and a panel and baseboard were made out of the box. Although the set was to be only a one-valver, it was felt a fair amount of spacing should be allowed, as the highest possible efficiency would be required from this miscellaneous collection of spare parts if any results at all were to be obtained on 20 metres.

### Low Cost Coils.

Accordingly the baseboard was cut to 13 in. by 10 in., and the panel to 13 in. by 7 in., the components being mounted in the manner shown in the illustration.

The three-way coil holder, of course, originally possessed a couple of long rods for varying the coupling between the two outer coils. These were sawn off close to the holder.

Incidentally, this ability to vary the magnetic field was most useful when dealing with dead spots in the aerial and reaction circuits, and did away with any necessity to use a neut. condenser in the aerial lead.

\*-----\*  
 "Can't be done for ten bob?  
 I'll bet it can!" said our  
 contributor, and this article  
 tells how it was accomplished.  
 \*-----\*

Cutting the pieces of ebonite into suitable strips and fitting terminals was soon accomplished, after which the whole was screwed against the baseboard and wiring-up commenced.

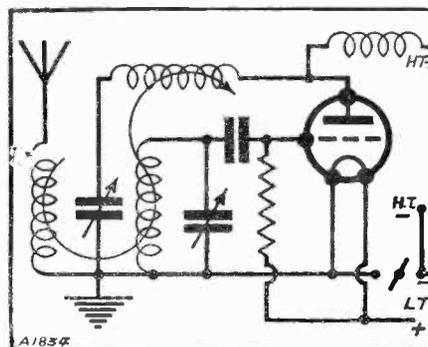
Next came the coils. I wound these on a 3 in. cardboard former (afterwards withdrawn), with turns of 3, 5, and 7, the wire being No. 18 gauge enamelled, and spaced with thin lengths of indiarubber firmly tied between each turn.

The ends of the coils were bent to fit the plug and sockets of the holders, and the enamel filed off 2 in. all round. The set was now ready for test, and consisted of a simple, straightforward circuit, as shown in the theoretical diagram.

### A Good Start.

The next item was the valve, and as I had already expended 6s. 11½d., it followed that this component must not cost more

### A SIMPLE CIRCUIT



Here is the arrangement employed, and although cheap the set proved to be a winner.

than 3s. 0½d., if I were to keep within the 10s. limit.

I found a 2-volt H.F. valve of that price, connected up, and switched on. The time being about 11.30 p.m., I thought there might be a faint chance of hearing 2 X AF, if the thing could be made to

work. A touch on the valve showed it was "alive."

I had the satisfaction of hearing a spasm of dance music from the Hotel Kenmore, Albany, via 2 XAF, on 31.4 metres. This was enough for one night, and I retired upstairs.

The following day I invited a few of the sceptics to call round about 11 p.m., when I would endeavour to win my bet.

With two sets of 'phones in series, I switched on, and one of the visitors donned the spare pair. It was now 11.15, so I decided to go for 2 XAD. I was not quite sure where he would come in, but as 2 XAF's reading was 60°, I guessed it would be somewhere among the twenties.

### Is this It?

Sure enough, on 23° a faint carrier was heard which, after resolving, proved to be dance music. Later, an announcer with a very faint American accent informed us that it was "L. J. Barnes speaking."

Shortly afterwards the station faded right out. However, although this was half the battle, the final objective was not yet gained. 2 XAF must be coaxed into audibility.

I tuned up round 32 metres, and immediately found a strong station broadcasting jazz. The power was reminiscent of 2 XAF in his palmiest days, some three or four years ago, but it seemed too good to believe that this could be him now, and it was; for shortly after an announcer spoke in a tongue that sounded like Russian—certainly not American.

### Success at Last.

It was no use spending time here, so I tuned up a shade further and came across another carrier, this time much fainter. Music was in progress here, also, but very rapid fading made it impossible for some time to tell from where it originated.

At last, however, with a rush came the words, "Our programme continues from the New York studio; this is Emerson Markham announcing."

There is not much more to add. I managed to win my bet by picking up the two American stations under rather unfavourable conditions, and thereby proving that a short-wave "fan" of even the slenderest means can enjoy the thrill of listening to programmes at great distances away.

## GOOD NEWS FOR LISTENERS!

British Valve Prices Come Down—The Home Constructor—The B.B.C. decides on a referendum.

By THE EDITOR.

OUR readers will be gratified to learn that, as we forecast a few weeks ago, signs of cheaper prices in the radio market are already evident.

The first move has been made by the British Radio Valve Manufacturers' Association, in deciding to reduce the price of valves. The 10s. 6d. valve, which is the type most commonly in demand, has now been reduced to 8s. 6d., while small power valves are now at 10s. 6d. a-piece, instead of 12s. 6d.

Power valves have been reduced from 15s. to 13s. 6d., screen-grid valves from 22s. 6d. to 20s., pentodes from 25s. to 22s. 6d., the 30s. pentodes to 27s. 6d.

### Valuable Reductions.

These reductions represent, as our readers will notice, substantial sums, and are reported to be a direct outcome of the campaign against the Ring which, it was held, kept prices at too high a standard.

It is stated to have been shown that the profit made on a 14s. valve would be 10s. 6d.—this 10s. 6d. being divided among the makers, wholesalers and retailers. There is no doubt that there was some modicum of truth in this statement about valves being too high in price but, apart from that, the effect of the old price was to induce retailers to keep large stocks of cheap Continental valves.

Incidentally, the price reductions quoted above include all the valves sold under the British Radio Valve Manufacturers' Association terms, and consequently affect the following: Marconi, Cossor, Mazda, Mulard, Osram, Six-Sixty, Lissen.

It is anticipated that other important components will probably show price reductions in the near future, and as manufacturers this year are realising there are still hundreds of thousands of keen amateur constructors in the country, it is anticipated that this year much more attention will be paid to the needs of the home constructor than was the case last year.

### The Home Constructor.

Preparations are now well in hand for a Super Radio Exhibition at Olympia, and we hope to be able to give readers more explicit details in the near future. One thing is certain, and that is that the cry last year that the amateur constructor is dying out has been fully realised to be a false alarm and that, on the contrary, instead of dying out, the constructor class is multiplying rapidly.

Incidentally, the ever-booming circulation of this journal is a clear indication of the facts of the case, and we venture to suggest to our friends in the trade that they should bear this well in mind and realise that of all the hobbies in the world radio has proved itself not only the most fascinating, but the most consistent.

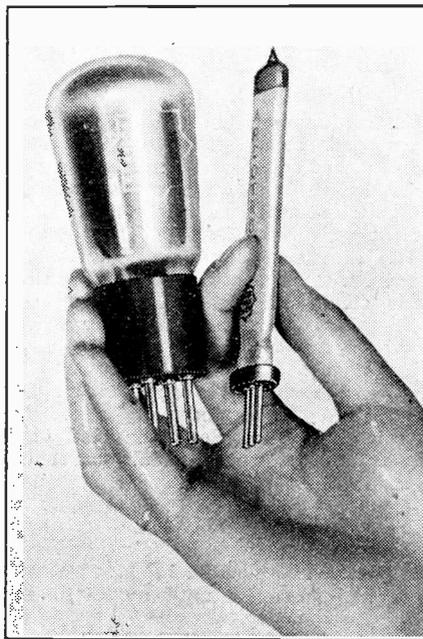
It would not be an exaggeration to say that year by year we, in this office, notice indications which convince us that the

home constructor—in fact, the amateur in general—plays a more and more predominant part in the success of the trader's year.

Balthazar saw the writing on the wall, but took no heed of it. We hope our friends in the trade will realise that this year there is more than writing on the wall pointing out the big market the home constructor offers; there is, in fact, a sky sign, which we doubt whether Balthazar himself would have ignored.

Readers of POPULAR WIRELESS will be interested to learn that the B.B.C. has

### A NEW VALVE



The thin valve is a new German product for mains units, made by Telefunken. It is called the Arcotron.

decided to find out the views of listeners by means of a Referendum on subjects connected with broadcast education. Referendums are not particularly popular—witness the fate of the recently-suggested political one!—but it will be interesting to see what sort of results the B.B.C. gains.

### Referendum in the Autumn.

To begin with, this Referendum will only apply to the educational part of the B.B.C.'s activities, which represents a very small percentage of the actual number of hours of broadcasting per week.

Mr. Siepmann, the B.B.C.'s Adult Educational Officer, stated recently before one of his Committees, that this Referendum will be taken in the autumn, when the B.B.C. will make a statistical survey for the express purpose of learning the views of listeners on the subject of broadcast educational talks.

If this Referendum proves anything like a success, it is possible that Savoy Hill will apply it to other programme departments. Ballots have been held by newspapers before, and have indicated pretty clearly that the type of broadcast which is most in favour is the variety programme, light orchestral music coming next, with talks very much at the bottom of the list.

As our readers know, there is a growing body of opinion that the B.B.C. rather overdoes its educational broadcasting, and that it does, in fact, attempt to usurp some of the functions of more established educational institutions.

### More Showmanship Required.

We have suggested before that the B.B.C.'s educational broadcasts might be much more likeable, even by those who resent the idea of being educated by wireless, if they would demonstrate a little more showmanship.

Presentation is the keyword to successful broadcasting in all its aspects, and even a highbrow talk on "Relativity," or "The Life and Times of a Flea" from the scientific point of view, could be made quite interesting and even amusing, and definitely educational, if only more care and attention were paid to method of presentation and general "layout" of the talk.

Our readers know well enough that if they have the best components in the world and the best circuit to hook up, they will not have much success unless they pay attention to layout. It is no good slinging things together and saying: "We know all this is very good, and therefore can't go wrong." That won't work, either in set-making or in any type of broadcasting.

If as much care and attention were lavished on the presentation of talks as on some of the B.B.C.'s more spectacular play productions, then the talks would improve, not only in quality, but in popularity.

Let's hope this Referendum which the B.B.C. is going to take will again emphasise this point of view.

### POINTS TO REMEMBER.

It always helps to achieve economy to experiment with grid bias voltages and H.T. supply adjustments to get the most satisfactory reception.

When putting in a potentiometer to improve sensitivity make sure its action is smooth and reliable, or else it will cause more trouble than it is worth.

Trouble with reaction overlap is often due to the wrong H.T. voltage on the detector, to an unsuitable detector valve, or to a grid leak of wrong resistance.

An H.T. battery running down, coupling troubles in H.T. mains units, H.F. currents getting through to the L.F. stages, or a badly designed choke, will all assist to cause overlap.

Thin wire as used for coil windings should not be used for H.T. leads, as it is usually insufficiently insulated.

The test voltage for a condenser for use on A.C. mains should be three times that of the supply voltage.

# HOW BROADCASTING HAS HELPED ME

by STILES-ALLEN



A well-known soprano pays some graceful compliments to the B.B.C., and suggests that broadcasting must continue to play a greater and greater part in the world of music.

IN the dear, dull days now beyond recall, before broadcasting began, being a concert singer was often not all honey. On the contrary, my profession brought harder times than I had expected when I first embarked upon it.

The top of the ladder appeared to be occupied by a favoured few who, jealous of their positions, not only sneered sometimes at the aspiring beginner, but absolutely refused to help him or her to the slightest extent. Of course, there were exceptions, but they were in a minority!

When the wireless dragon first appeared on the horizon, therefore, it was natural that a shudder should run through this section of the concert world.

It seemed that this new invention might displace the self-important singers who had voices but were not really very vital, and so the legend spread abroad that broadcasting was a menace which would not only kill the concert world, but blight all art and literature into the bargain.

### Tremendous Assistance.

The opposite view was nearer the truth. There are now more well-known artists than ever before. Many of the poor strugglers have been able to reach the peak at which they aimed. I myself have been helped by wireless to a tremendous extent.

In the first place, broadcasting has given me a wider public, and this in more senses than one. The B.B.C. is not supposed to transmit advertising matter in any shape or form, but it cannot help giving publicity to the singer.

Thus I find that the medium of the microphone has made my name better known. In singing to thousands, I have brought my name to many to whom it was previously unfamiliar. As a result, my services are more sought after.

I have also been assisted in my work in less direct ways. Some people have told me that I am one of the few sopranos on the wireless who do not "wobble" or quaver when singing, and this knowledge has put me on the *qui vive* to keep myself as near perfection as possible. I listen and, by hearing others, am enabled to remedy my own faults.

Then, again, I have acquired a more extensive repertoire, and have come to know many sweet songs which otherwise might have escaped my notice; for the wireless artist must be prepared to sing everything and anything.

### Old Favourites.

Listeners have written their ever-welcome, and often charming, letters of appreciation and criticism, and have sometimes asked for little-known melodies to be rendered. As a servant of the public, I have ferreted the tunes out and complied with the requests.

Special programmes have also brought many songs which have been delightful to sing, but which the concert-hall would never have provided. In a recent Old Folks programme, for instance, we went back to the melodies of fifty, sixty years ago.

imagine that I am joining in a little sing-song at a family party. I visualise the little group around the glowing fire.

Sometimes, too, I attempt by gesture to picture the story of the song—this solely for my own enjoyment, of course. In the concert-hall, you see, it is impossible for the average reserved English singer to gesticulate vividly.

The audience would probably think the artist mad. But in the studio, with perhaps only the announcer looking on, I can do just as I like.

### No Disadvantages.

So, save perhaps for the occasional lack of resonance in the studio, I find no disadvantages in broadcasting. The fact that my performance is sometimes alleged not to come over very well does not always worry me. My experience is that the fault generally lies not at the transmitting end, but in the receiving sets themselves.

After giving one single performance, I have known one London friend to say, "You were splendid last night!" and another to declare that I did not come through well.

So, reader, don't blame a singer for a poor performance if you are distorting her voice by using too much volume, or *vice-versa*. She is doing her best. Ask yourself if you are doing yours.

I do not agree with the old theory that wireless cannot be perfect since the artist can never put over her personality. In my opinion, she can.

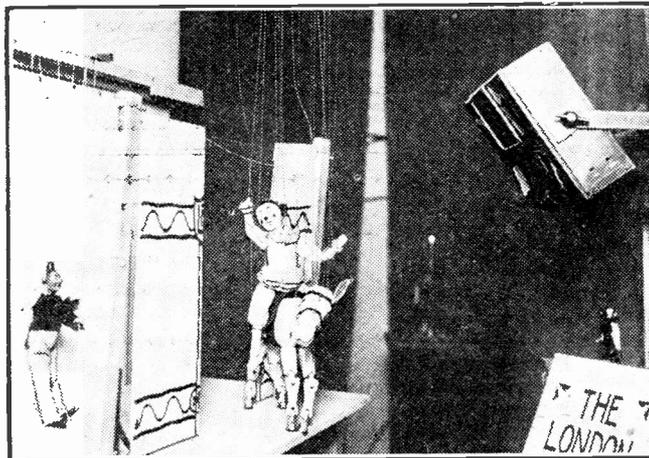
### Personality.

Of the gramophone it may be true, but the theory is certainly incorrect when applied to the radio. When a singer is heard only once, her personality may not "get over," but when one is able to sing not once, but many times, the listener soon acquires a very good idea of an artist.

Consider Tommy Handley, Jack Payne, the senior announcer! Now, don't you know the individual characters of these people? I'm sure you do.

Yes, personality really is broadcast, although appearance is not.

## TELEVISION "ACTORS"



An experimental transmission of these marionettes was recently carried out by the Baird people during one of their recent experimental transmissions.

All these brought their due reward of pleasure.

And there I have hit on the one quality which, of all others, I derive most from the wireless—pleasure. The knowledge that one is singing to millions and yet, perhaps, to one lonely person; that one is making friends, and that one can do just as one pleases sometimes makes studio work far more enjoyable to the artist than actual concert performances.

When facing the microphone, I try to

## LATEST BROADCASTING NEWS.

**BRIGHTER PROGRAMMES  
FOR AUGUST.**

**PROMENADE CONCERTS—PROGRAMME MOMENTS—SOME REGIONAL FEATURES—EISTEDDFOD IMPRESSIONS—HERE AND THERE.**

THE programmes for National and London Regional listeners will be a bit brighter during August, or, at any rate, they should be a bit brighter by the inclusion of three special shows arranged by members of the old Co-Optimists. The artists concerned are David Burnaby, Stanley Holloway, Phyllis Monkman, Betty Chester, Harry Pepper and Gilbert Charles, and their broadcast entertainments will be framed very much on the lines of their stage performances.

The first of the special programmes will be given on August 6th for National listeners, with a repetition for London Regional listeners on the following night.

**Promenade Concerts.**

Without going into full details of the programmes of the forthcoming Promenade Concert season, many listeners will be interested in the dates of broadcasting from the National and London transmitters. These for August are as follows:

National Programme: August 9th, 11th, 13th, 14th, 18th, 19th, 21st, 26th, 27th and 29th.

London Regional: August 12th, 15th, 16th, 20th, 22nd, 23rd, 25th, 28th and 30th.

The programme for the opening night will include Grieg's Pianoforte Concerto, which is to be played by that veteran pianist, Arthur de Greef, who was a personal friend of the great Norwegian composer.

**Programme Moments.**

A new revue entitled "Stop Press" by John Watt will be included in the National programme on Saturday, August 9th. It will contain several burlesques of recent broadcast performances, including a skit called "The Bloomer," recalling C. K. Munro's more serious play, "The Rumour"; a parody on A. J. Alan stories, and a satire on another recent play, "Brigade Exchange," under the title "B.B.C. Exchange."

Another sketch by Mabel Constanduros and Michael Hogan, entitled "Poor Old Snell," is to be included in the National Vaudeville programme on Friday, August 8th. Other items will be given by Fred Spencer in the famous Mrs. Arris; Nelly O'List (entertainer) and Nancy Lovatt (ballad singer).

A service from Great Yarmouth Parish Church, the largest parish church in England, will be broadcast to London Regional listeners on Sunday, August 3rd. The address will be given by the Rt. Rev. Dr. Ashton Oldham, Bishop of Albany, U.S.A.

Here are some details of the Southern Command Tattoo, excerpts from which will be broadcast from the grounds of Tidworth

House, Hampshire, on Tuesday, August 5th. As in the case of the Aldershot Tattoo, the relays will be given at three different periods, namely at 9.30, 10.55 and 11.32, each period lasting for about half-an-hour.

**Some Regional Features.**

Fifteen minutes of the North Regional programme at 7.45 on Wednesday, August 13th, will be devoted to a recital of the County Songs of Yorkshire by Mr. Harry Hopewell. Yorkshire, it seems, has a surprisingly large number of these county songs, and Mr. Hopewell's selection for this recital includes "Scarborough Fair," which is a North Riding song, "York, York for my Money," "The Yorkshire Farmer," and "The Wassail Bough," the latter being a West Riding song.

**Eisteddfod Impressions.**

Professor Ernest Hughes, one of the adjudicators in the competition for a radio play for which a special prize is offered by

this year's National Eisteddfod at Llanelly, is to give his impressions of the Festival in a talk for West Regional listeners at 7 p.m. on Tuesday, August 12th. Professor Ernest Hughes is, of course, well-known to listeners, who will look forward to hearing his views on other new features of the Eisteddfod, including, no doubt, the performance of the first musical comedy in Welsh, an innovation for which Mr. Eddie Parry, well-known to listeners for his dramatic work, is responsible.

**Here and There.**

Another Border programme arranged by Mr. Walter Barrie, of Sundhope, Yarrow, will be broadcast from Scottish stations on Friday, August 15th. Full details are not yet decided, but it is likely to include items by the Hawick Saxhorn Band.

It seems to be terribly out of place to talk about football with one Test Match still to be played, but football will soon be

here. At any rate it will soon be starting again in Scotland, where listeners are to have their first eye-witness account of the new season on Saturday evening, August 16th, when Mr. A. Y. Wilson, a well-known football authority, will describe the game between the Rangers and the Heart of Midlothian.

The Post Office Direction-Finding Van recently paid a visit to the Newcastle area. The result was that the number of licences taken out during those weeks from April to May was 4,256, whereas for the similar period of 1929 it was only 895.

**MICROPHONE MANNEQUINS**

During a recent "outside broadcast" of a German fête, one of the items dealt with was a mannequin parade, and lady listeners were greatly interested in a microphone description of "absolutely the last word."

**FOR THE LISTENER.**

By "PHILEMON"

This week our popular contributor—who is holiday-making in Italy—tells of his amusing experiences there with "Belinda" the portable set.

**Temper.**

YESTERDAY Belinda (my portable) was in a bad temper. I couldn't get a word out of her. I thought perhaps it was the heat, and that her heart was troubling her a bit. So I examined her valves, the right ventricle, the left auricula or polyanthus or whatever you call it.

"What's your idea of Italian broadcasting? I asked. "I think it's a cross between a grunting pig and a quacking duck," said Belinda. "Perhaps you are right, my dear," I said soothingly.

**James.**

Of course, I knew that this wasn't what was really troubling her. When a woman, even if she is only a Portable Set, is angry, she just picks up any stick that happens to be lying about to beat you with.

She went silent again. "What is the matter with you?" I said. "Oh, nothing," she said. Now, when a woman says "Oh, nothing," like that, you know very well that something quite terrible is on her mind. Suddenly she said, "And who is the boss in this benighted country, anyhow?"

"Belinda," I said with solemn reproof, "Italy is one of the most enlightened countries of modern times, and the boss, as you call him—well, he has another name, but in polite society, acting on the principle of Safety First, he is usually called James."

**The Wireless Heaven.**

"And is James a real boss?" said Belinda. "I have every reason to believe so," I replied. "As big as Sir John?" she said. "I believe Sir John is much taller," I said.

(Continued on page 578.)

# Tested and Found—?

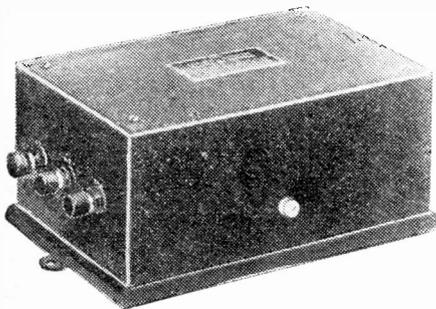


## THE NOVOTONE.

THIS is a device for use in conjunction with gramophone pick-ups. It is an invention of Dr. McLachlan, and is manufactured by Gambrell Radio, Ltd. Its purpose is to provide compensation for the low and high note loss otherwise inevitable in a gramophone record.

As you know, the amplitude, or strength of a note is determined on a gramophone record by the "depth" of the transverse wave in the groove. The low notes cannot be represented in their full strength owing to the limitations imposed on wave "depth" by the necessary closeness of the grooves. A loss in high notes is incidental to the use of pick-ups and valve amplifiers.

In addition to frequency balancing the



A terminal for earthing the metal case is provided on the side of the "Novotone."

Novotone is designed to give greater volume.

The device comprises a moderately small metal box which has five terminals on it, two for input, two for output and an extra one for a variable resistance connection. The use of this last is optional, but well worth while. A 50-ohm rheostat can be used, and it functions as a scratch filter control. No other adjustments are concerned with the Novotone.

You connect the little box between the pick-up and the amplifier, and it can be used with practically any set and with most pick-ups, although it is advisable to specify the make of pick-up when ordering a Novotone.

I regard my tests with the Novotone as some of the most interesting tests I have ever carried out. The step-up in volume that the Novotone provides is most marked, almost approximating to that given by another valve amplifier. A pick-up that requires three stages to give a respectable volume will give a practically equivalent output using only two stages when a Novotone is employed.

And no imagination is needed to appreciate the bass lift: the low notes come out with an exhilarating punch, and a marked improvement in brilliance is the result of the increased high-note amplification—so much so that with many pick-ups, the scratch filter becomes a necessary adjustment.

The Novotone certainly does its job and provides a fine compensation against the usual falling characteristics. Particularly with a Burndept or B.T.H. pick-up does the device give surprisingly good results.

As I have said, it is not a matter of psychology, for the most inexperienced ear could not fail to appreciate the real difference that results when it is used. Radio-gram enthusiasts should get their local dealers to let them hear the device demonstrated. It will probably make them most dissatisfied with their present outfits!

## PUSH-PULL AMPLIFICATION.

The latest Ferranti publication deals with Ferranti Push-Pull Transformers and contains much useful information regarding their use.

## NEW "EKCO" MAINS UNIT.

I have frequently recommended the use of mains units with portables. It is in the very nature of a portable to be "under-battered" to some extent, for batteries are heavy objects, so that if a portable is to be operated indoors it is an obvious economy to make use of the mains if they are available.

And Messrs. E. K. Cole, those enterprising mains-unit people of Leigh-on-Sea, are there ready to hand with mains units specially designed for portables.

These units are so compact that they can be fitted into the compartment originally occupied by the batteries in practically any set.

The model IV20 A.C. provides three H.T. tapplings at an aggregate maximum of 20 milliamps.

There is an S.G. tapping for the screen of S.G. valves, a variable smoothly running from 0 to 120 volts for any current between half and six milliamps, and a 120 / 150 - volt tapping giving approximately 16 milliamps.

The CT1 A.C. "Ekco" unit provides a similar H.T. supply, but it also incorporates a battery charger and this charger section will keep any ordinary accumulator, two - four-

or six-volt, up to scratch even when the set is used daily for considerable periods.

I, personally, would always have a unit with a charger included, for the charging presents no greater problems than the supply of H.T., while it is distinctly economical, and makes for pleasant, trouble-free radio.

Indeed, a combination of mains H.T. and trickle charging is, to me, the almost ideal solution to the radio power problem. Only a very small accumulator is needed, the type provided with the average portable

## When you are Buying—

### 25.—A PICK-UP.

Some gramophone pick-ups are much more sensitive than others. There are those which will work very well with two stages of L.F., while others really need three.

But remember that the detector valve in an ordinary radio set can be used as the first L.F. amplifying valve for a pick-up.

You can get simple valve pick-up adapters enabling you to connect a pick-up to the set in a few seconds.

With a very sensitive pick-up, a volume control between the pick-up and set is advisable.

Remember, a poor pick-up used in conjunction with an ordinary set and speaker may give results inferior to those given by a quite cheap gramophone.

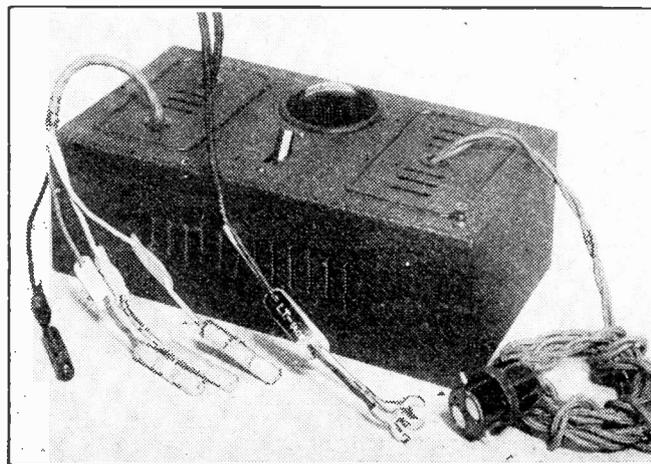
Always endeavour to hear the pick-up demonstrated on a similar set to your own before you buy it. Pick-up results can be either very good or very disappointing.

proving adequate to cope with even abnormally heavy duties. And the L.T. current is always smooth and completely controllable.

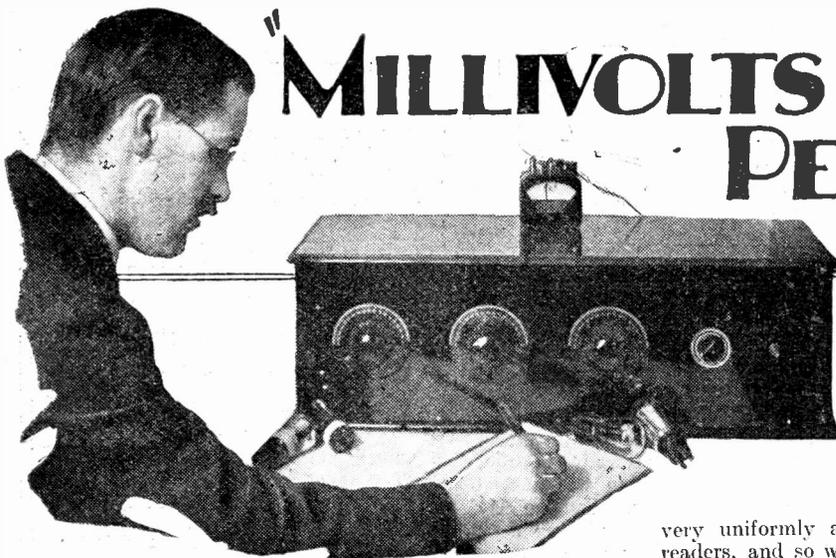
These two "Ekco" units are particularly neatly constructed, and they are certainly "Safe, Silent and Sound."

## PRICE REDUCTIONS.

The Loewe Radio Co., Ltd., announces a series of price reductions. I notice that their excellent gramophone pick-up has gone down from 18s. 6d. to 15s., and their loud-speaker unit from 13s. 6d. to 10s. 6d. A new Loewe loud speaker and two new speaker units also make their appearance.



One of the Ekco combined H.T. supply and L.T. charging mains units for portables.



# "MILLIVOLTS PER METRE"

Although the power picked up by an aerial is very tiny, being so many thousandths of a volt, it is amplified hundreds of times by the set, as shown in this explanation of a common but often puzzling term.

By T. B. SANDERS.

ANYONE who has taken the trouble to read the B.B.C.'s many attempts to explain the Regional Scheme cannot have failed to have come across the phrase "millivolts per metre," and, to many, the term has probably been devoid of meaning.

However, it is really quite simple. When a broadcast transmitter "goes on the air," it creates a disturbance in the ether which has the effect of inducing a voltage in any aerials which happen to be within its sphere of influence. The value of that voltage depends on several things; the distance between the transmitter and the receiving aerial, the wave-length, the aerial power of the transmitter and many less obvious things.

## What is Signal Strength?

It is also dependent on the height of the receiving aerial, the rule, in this case, being not "the higher the fewer," but, on the contrary, the higher we go the greater the voltage.

This voltage which we get in exchange for our annual ten-shilling licence fee is not of a very staggering magnitude. In point of fact, it is measured in thousandths of a volt, i.e. millivolts.

A very convenient way of measuring the signal strength of a transmitter at any point distant from it, then, is to erect a receiving aerial of standard height and measure the millivolts induced in it. A conventional standard height of one metre is adopted and, if a voltage of 10 millivolts is induced in such an aerial by a transmitter, we say the signal strength at the place where the receiving aerial is situated is 10 millivolts per metre.

## Field Density.

The practical reader, who feels impelled at this stage to dash forthwith into the garden with a yard-stick to measure the height of his aerial mast, should restrain his enthusiasm. It is the *effective* height of the aerial which enters into the calculation and this is not measured with any instrument so crude as a foot-rule. A good average aerial of the domestic type, about 30 ft. high, will probably have an effective height of 5 metres or so—say 15 ft.!

From enquiries put to the POPULAR WIRELESS Query Department, it would appear that a good average aerial prevails

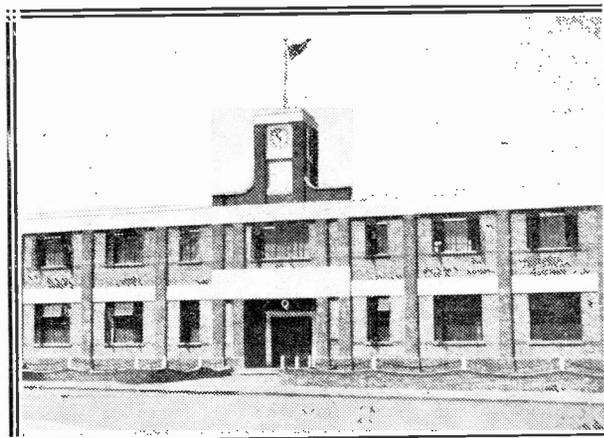
very uniformly among readers, and so we will take the case of one of them who has made the "Magic" Three, got it to work, and lives—happy man—enwrapped in a field density of 5 millivolts per metre, provided by a benevolent B.B.C.

## "Magic" and Millivolts.

Such a man has got his 5 good metres of aerial, Mr. Kendall's guarantee that his three valves are doing all that three valves can do, and his 5 millivolts per metre.

A field strength of 5 millivolts per metre means that an aerial of 1 metre *effective* height will receive an induced voltage of 5 millivolts, so a 5-metre aerial starts off with  $5 \times 5 = 25$  millivolts.

## A NEW RADIO FACTORY



Here is a view of the new factory of Messrs. Radio Instruments Ltd. It is situated near Thornton Heath, and the well-known firm has recently moved there from the heart of London.

This affects the "Magic" Three, and influences an "X" coil and a tuning condenser, the effect of which is to cause a voltage to be developed across the coil greater than the voltage which caused the current to flow.

## Amplifying the Input.

The coil and condenser, in effect, amplify the received voltage, a fair estimate of this amplification being 10, times. So this "Magic" Three, before valve amplification enters into the question, has provided an increase of the B.B.C.'s meagre gift of 5 millivolts to  $5 \times 5 \times 10 = 250$  millivolts, or a quarter of a volt.

This quarter volt which is developed across the coil is also developed between the grid and filament of the detector valve, and, as everyone knows, the valve will produce in its anode circuit a magnification of this approaching the magnification factor of the valve.

This will be probably twenty times, and there ought, therefore, now to be  $20 \times \frac{1}{4} = 5$  volts in hand, so to speak.

Unfortunately, somewhat of a set-back is encountered here. The detector valve, as its name implies, detects, which means that it separates from the H.F. voltage, with which we have so far been concerned, the low-frequency voltage of the speech and music, and this, you will have to take it from me and the B.B.C., is only about 20 per cent of the figure we have arrived at; which gives us 1 volt instead of the 5 we hoped for.

The first transformer helps to make up for this by providing roughly an amplification of three times at its secondary terminals,

## More Mains.

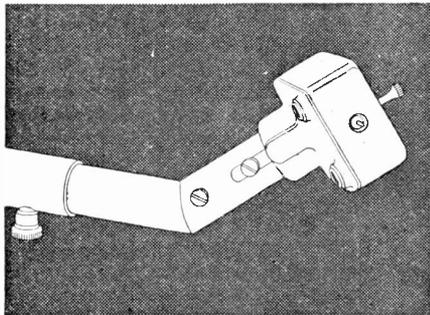
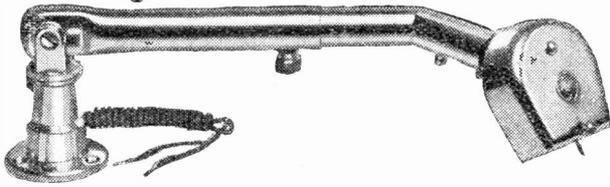
This is applied to the grid of the second valve for further amplification. This time the valve will yield about 10 and the second transformer again about 3, making 30 in all, so that the grid of the last valve has actually  $30 \times 3 = 90$  volts applied to its grid.

From which it will be seen that there is nothing much wrong with the "Magic" Three."

For a valve to handle a signal input of 90 volts, it should, theoretically, be a super-power valve with at least 300 volts H.T. and 90-100 volts grid bias!

Owners of "Magic" Threes with shallow pockets, however, need not consign their receivers to the dust-bin because of an inability to furnish themselves with such costly valves and stupendous H.T. At the worst the B.B.C. only modulates fully once or twice an evening, the general level of signal strength being much lower than the *peak* we have been assuming.

*An additional refinement*



STILL THE SAME PRICE

**45/-**

The B.T.H. pick-up holds a reputation second to none for excellence and efficiency. Now, with this latest development in the design of the B.T.H. Tone Arm, the complete accessory forms a masterpiece of ingenuity, combining perfect tracking, a feature of B.T.H. pick-ups, with the new arrangement which facilitates the changing of needles. The combination of the B.T.H. pick-up and the B.T.H. Tone Arm ensures a minimum of record wear and excellent tonal quality.



# PICK-UP & TONE ARM

From all Radio Dealers.



THE EDISON SWAN ELECTRIC CO., LTD.,  
Radio Division,  
1a Newman Street, Oxford Street, W.1.  
Showrooms in all the Principal Towns.

**EDISWAN**

W.78

## Britain's leading Valves



## -at Lower Prices!

As from July 18th the undermentioned reductions in the retail prices of certain types of Marconi Valves were brought into effect.

| Type   |        |        |       |        |     | Old Price | New Price |
|--------|--------|--------|-------|--------|-----|-----------|-----------|
| H 210  | HL 210 | L 210  | H 410 | HL 410 |     | 10/6      | 8/6       |
| L 410  | H 610  | HL 610 | L 610 |        |     | 12/6      | 10/6      |
| P 215  | P 410  | P 610  | ...   | ...    | ... | 15/-      | 13/6      |
| P 2    | P 240  | P 425  | P 625 | P 625A | ... | 22/6      | 20/-      |
| S 215  | S 410  | S 610  | ...   | ...    | ... | 25/-      | 22/6      |
| PX 4   | PT 240 | PT 425 | ...   | ...    | ... | 30/-      | 27/6      |
| PT 625 | ...    | ...    | ...   | ...    | ... |           |           |

## WHEN BUYING VALVES REMEMBER!

Marconi Valves are used by The B.B.C., Imperial Airways, Empire Communications, Metropolitan Police, Passenger Lines, etc., etc. in fact in almost every important British Service. Remember this when you buy Marconi Valves, you buy British and undoubtedly buy the best.

Buy the Valves the Experts use!

# MARCONI VALVES





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. Lill, 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.

### FITTING THE ANTIPODES ADAPTOR.

M. F. (Cheltenham).—"My brother who is an invalid and tied to his bed for weeks on end is very keen on trying the Antipodes Adaptor and getting short-wave stations on the set he has in his bedroom. So I am going to make it up from the blue print, but there is one point about which I am not clear, and that is, will it be necessary to move

### CAN WE HELP YOU WITH YOUR SET?

Perhaps some mysterious noise has appeared, and is spoiling your radio reception?—Or one of the batteries seems to run down much faster than formerly?—Or you want a Blue Print?

Whatever your radio problem may be, remember that the Technical Query Department is thoroughly equipped to assist our readers, and offers an unrivalled service.

Full details, including scale of charges, can be obtained direct from the Technical Query Dept., POPULAR WIRELESS, The Fleetway House, Farringdon Street, London, E.C.4.

A postcard will do. On receipt of this, an Application Form will be sent to you free and post free immediately. This application will place you under no obligation whatever, but having the form, you will know exactly what information we require to have before us in order to solve your problems.

**LONDON READERS PLEASE NOTE:** Inquiries should NOT be made by phone or in person at Fleetway House or Tallis House.

the ordinary wave-length coils when using the set for short-waves on the Adaptor?"

No. There is no necessity to change the coils in the ordinary set when using the Adaptor. All that is necessary is to pull the detector valve out of its socket, put the adaptor plug in its place and then plug in the detector valve into this. You can then tune in on the "adaptor" without altering anything else (except joining up aerial and earth leads as mentioned on the blue print.)

### FOREIGN STATION ON A CRYSTAL SET.

"RECTOR" (Yorkshire).—"In this quiet little community great excitement has been caused by my crystal set which on two occasions very late at night has succeeded in picking up a foreign station that closes down with the hymn tune "Austria." What station could that be?"

The national anthem of Germany is set to this tune and most of the German stations play it when closing down.

Although German broadcasts have previously been received in this country on a crystal set it does not often happen at this time of the year, so it would be interesting if you could identify the station by comparing its dia readings with that of any other station you are able to receive.

### CURING HAND CAPACITY WITH DIFFERENTIAL CONDENSER.

S. L. H. (Chatham).—"My set is one of the old-fashioned Reinartz type with reaction coil close up against the grid coil.

"One side of this reaction coil goes to the end of the grid coil, earth, etc., and the other side to reaction condenser. From the remaining plates of the reaction condenser goes the lead to the plate of the valve and H.F. choke. I have tried reversing the reaction condenser connections, but I get hand-capacity with both methods.

"I should like to ask if a differential condenser would be likely to improve matters and if so what are the connections?"

You can very easily fit a reaction condenser to this arrangement and it should certainly prove efficacious in overcoming hand-capacity troubles.

Hardly any modification of the circuit will be necessary. You will find that a differential reaction condenser has two fixed-vanes terminals and one terminal which is connected to the moving vanes. The differential condenser, therefore, has three terminals as compared to the two on your present condenser.

This means an extra lead, and all you have to do is to take out your present condenser and mount the differential in its place. The lead which formerly went from the reaction coil to one side of the reaction condenser now goes from the reaction coil to one side of the differential condenser fixed plates, the other lead (which came from H.F. choke to the reaction condenser) now goes to the moving vanes of the differential condenser.

The vacant fixed plates terminal on the differential condenser is joined to the L.T. — or earth terminal and these complete the modifications, which should completely cure your hand-capacity trouble.

### L.F. TRANSFORMER CONNECTIONS.

M. J. (St. Leonards-on-Sea).—"There are five terminals on the L.F. transformer in all, one marked E, and the others IP, OP, IS and OS. The blue print only shows four terminals namely, G, GB, A and H.T. plus.

"Will the transformer do, and if so how should it be connected?"

The transformer is quite suitable, and the connections are as follows: The point marked H.T. corresponds with IP on the transformer. The wire for A goes to OP on the transformer. That from GB on the blue print goes to IS on the transformer and the wire which is joined to G goes to OS, in your case.

This leaves one terminal, as yours has an E terminal which is not shown on the blue print. As a matter of fact, it is not necessary to use this at all, but it is provided for those who wish to earth the cores of

their transformers, as it is found to be an advantage sometimes to run a wire from this terminal to the earth or to any other point connected directly to earth.

### JUDY—THE SET WITH A PUNCH.

E. St. J. (Eton).—"When was the one-valve set called "Judy" published in "P.W.?"

Details of this famous one-valver were given in No. 382 "P.W.," September 28th, 1929.

### TAKING A SET TO THE CONTINENT.

"COOKIE" (London, W.S.).—"What are the Customs regulations about taking a set abroad?"

Different foreign countries have different methods of dealing with this, and visitors to Great Britain, for instance, bring their sets in duty free provided the set is shown to the Customs. (On new sets a deposit has to be paid, but this is refunded when the traveller leaves England if the set does not exceed six months.) Belgium, Czechoslovakia, Denmark, Finland, Germany, Italy, Norway, Sweden, and Switzerland all make it fairly easy for the visitor to take his set with him.

In France a duty of 22 per cent of the value is payable on traveller's receiving sets, and if the set is of a higher value than 700 francs or the loud speaker of greater value than 200 francs, these are subject to an additional 6 per cent ad valorem duty. Visitors to the Irish Free State not only have to pay 33 per cent ad valorem and deposit a security as well, but they must take out a receiving licence of 10s.

### HOW MANY STATIONS HAS PARIS?

A.R.F. (Winchester).—"I should have thought two long-wave stations quite enough for one city, but I have been surprised to find other Paris transmissions on ordinary wave-lengths. I also understand from a friend there is a short-wave Paris station as well. How many are there in all and what are the wave-lengths?"

In all, there are seven Paris broadcasting stations, namely: Radio-Paris, 1725 metres; Eiffel Tower, 1445.8 metres; Paris P.T.T., 447 metres; Radio L.L., 360 metres and 61 metres; Paris Post Parisien, 328.2 metres; Radio Vitus, 308 and 437.5 metres; and Paris Experimental, 300 metres, 297 metres and 40.9 metres. (Some of these wave-lengths are liable to alteration.)

### RUN-DOWN GRID BIAS BATTERY.

M.G. (Paddington).—"I am afraid I am rather inclined to neglect my grid-bias battery, and this is the second time on which reception has proved rather distorted until I remedied it by getting a new battery. Does neglect of this kind have any effect apart from distortion?"

The lack of sufficient grid bias is a sure way of taking too much current out of your H.T. battery, so if ever your H.T. battery seems to run down faster than it should you should make sure that the grid-bias voltages on the various valves are correct.

(Continued on page 576.)

## TECHNICAL TWISTERS

### No. 21. FRAME AERIALS.

#### CAN YOU FILL IN THE MISSING LETTERS?

The chief advantage of the frame aerial is that it is . . . . .

For this reason it is mounted on a swivel base so that it can be . . . . . in different . . . . .

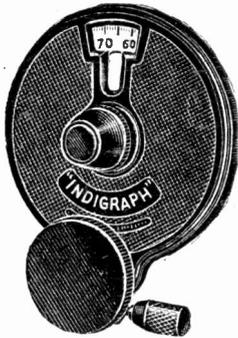
When the windings are "pointed" so that they are in line with the transmitting station the strength of reception is at a . . . . .

The frame aerial is of great assistance in cutting out . . . . .

Last week's missing words (in order) were: Evaporation; summer; Above; Acid; distilled. Electrolyte; hydrometer.

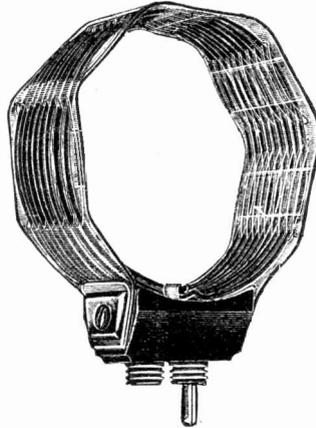
# IGRANIC QUALITY COMPONENTS

## FOR SHORT WAVE RECEPTION

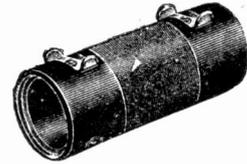


**IGRANIC INDIGRAPH VERNIER KNOB AND DIAL**  
Essential for short-wave reception. A special micrometer worm-gear drive giving an effective reduction ratio of 500-1. **Price 9/6**

May we send you a copy of our Catalogue? Address your enquiries to Dept. R 155.



**IGRANIC SHORT WAVE COILS**  
Made in four sizes, 2, 4, 6, and 9 turns  
Prices from **2/6** each.

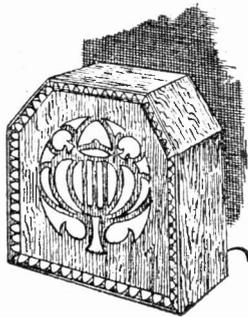


### IGRANIC SHORT WAVE H.F. CHOKE

This efficient H.F. Choke is suitable for operation on wavelengths from 10-80 metres. Excludes effectively H.F. currents from circuits where their presence would give rise to troublesome hand-capacity effects, unsatisfactory reaction control and instability.

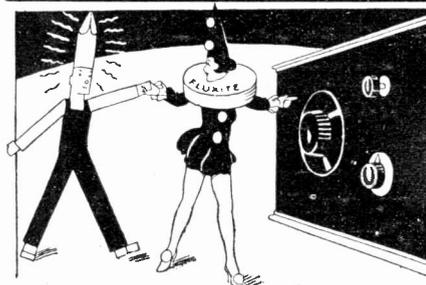
**Price 2/-**

Branches:  
Bristol, Birmingham, Leeds, Newcastle, Cardiff, Manchester.



Everybody's calling for

*Player's please*



"We're Fluxite and Solder—  
The reliable pair ;  
Famous for Soldering,  
Known everywhere!  
Wherever we go  
We're invited to stay,  
For WE make  
Soldering  
Merely child's play!"

See that Fluxite and Solder are always by you—in the house workshop, garage—anywhere where simple, speedy soldering is needed. They cost so little but will make scores of everyday articles last years longer! For Pots, Pans, Silver and Brassware; RADIO; odd jobs in the garage—there's always something useful for Fluxite and Solder to do.

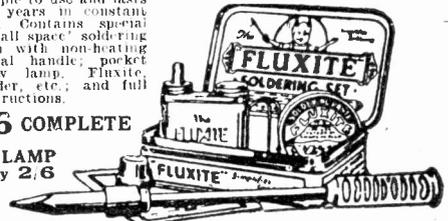
**ANOTHER USE FOR FLUXITE:**  
Hardening Tools and Case Hardening. Ask for leaflet on improved method.

### FLUXITE SOLDERING SET

Simple to use and lasts for years in constant use. Contains special "small space" soldering iron with non-heating metal handle; pocket blow lamp; Fluxite, Solder, etc.; and full instructions.

**7/6 COMPLETE**

or LAMP only 2/6



FLUXITE LTD.  
(Dept. 324),  
Rotherhithe, S.E.16

All Hardware and Ironmongery Stores sell Fluxite in tins, 8d., 1/4 and 2/8.

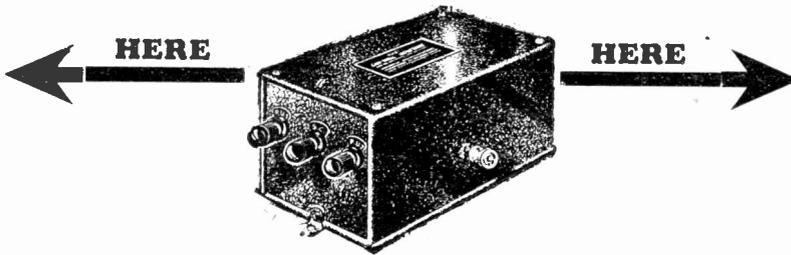
ALL MECHANICS WILL HAVE

# FLUXITE

—IT SIMPLIFIES ALL SOLDERING



ANDOVER, Hants.—H. J. Gifford  
19, Bridge Street.  
ASCOT.—Blacklock's Garage, High  
Street.  
BERKHAMSTED, Herts.—J. W.  
Wood & Son, Music Warehouse.  
BIRMINGHAM.—Malcolm and  
Stewart, 506, Alum Rock Road.  
—Cecil W. Cox, 77, Gravelly Lane,  
Erdington.  
BLACKPOOL.—Metcalfe's Radio  
Stores, 121, Whitegate Drive.  
F. X. Smith, 191a, Central Drive.  
BOURNEMOUTH.—Lawrie & Co.,  
95, Holdenhurst Road.  
—Winton.—E. P. Hall, Ltd., 321-3,  
Wimborne Road.  
BRAINTREE, Essex.—Nicholls  
Bros, 104, High Street.  
BROADSTAIRS.—C. H. Roberts  
and Co., Ltd., 77, High Street.  
BROMBOROUGH, Ches.—W. H.  
McMillan, Rake Lane.  
CAMPBELTOWN.—A. P. Mac-  
Groary, 16-18, Main Street.  
CARDIFF.—Thompson & Shac-  
kell, Ltd., 14, St. John Square.  
—Tudor Electrical Supplies, 14,  
Tudor Road.  
—Duck & Son, St. John's Square.  
CATERHAM VALLEY, Surrey.—  
The Caterham Motor Co., Ltd.  
CHARD.—The Chard Motor Sup-  
ply Co., Ltd., Fore Street.  
CHEPSTOW.—Coles & Shirley,  
St. Mary's Garage.  
CHESTER.—W. A. Guy, 75, Fore-  
gate Street.  
EDINBURGH.—Brierley & Howie,  
23, Barclay Place.  
EPSOM.—H. Pengilly, Station  
Road.  
FRINTON-ON-SEA, Essex.—  
Priest Bros., 16, Connaught Ave.  
GILLINGHAM, Dorset.—H. W.  
Haines, Queen Street.  
GRAVESEND.—Bennet & Brown,  
96a Old Road West.  
GRIMETHORPE, Nr. Barnslev.—  
George Green, 1, High Street.



# Hear the Wonderful NOVOTONE

reproducing records with  
"AMAZING REALISM"

(Vide "Music Trade Review")

You ought to know

what you are missing and how to get perfect compensation for the serious losses which are present when gramophone records are reproduced through the medium of a pick-up, amplifier and loud-speaker. Read all about it in the

FREE 16 PAGE BOOK  
"Realism from Records"

IF YOUR DEALER CANNOT DEMONSTRATE LET US KNOW  
GAMBRELL RADIO LTD., 6 BUCKINGHAM STREET, LONDON, W.C.2

HUDDERSFIELD.—Kenne-  
h Levell, King's Head Arcade  
Cloth Hall Street.  
IPSWICH.—E. A. Mould, 223,  
Woodbridge Road.  
LIMERICK.—Thomas Hassett,  
Ltd., 9, O'Connell Street.  
LONDON, E.9.—Electric Special-  
ists, 20, St. John's Church Road,  
Hackney; S.E.11.—Photo En-  
larging Co., 329, Kennington  
Road; S.E. 25.—C. H. P.  
Nutter, 245, Selhurst Road.  
W.11.—J. C. Perry, 64, Tavistock  
Crescent, Westbourne Park;  
W.11.—Westbourne Lighting  
Stores, 105-7, Talbot Road,  
Bayswater; N.11.—Sports &  
Radio Stores, 21 Queen's Parade,  
Friern Barnet.  
LOWESTOFT, Suffolk.—Duray,  
4, Suffolk Road.  
MAIDENHEAD.—Maidenhead  
Radio Co., 40, Queen Street.  
MANCHESTER.—Hime & Addi-  
son, 195, Deansgate.  
PAIGNTON.—W. Sagar, Preston.  
PORTSLADE.—F. W. & C. A.  
Hart, Victoria House, Victoria  
Road.  
RAMSGATE.—J. Carman, 65, King  
Street.  
RYE.—Edward J. Parlett, 40, The  
Mint.  
SHEPTON MALLET.—W. H.  
Feltham, Long Bridge.  
ST. HELENS, Sutton.—Leonard  
Davies, 47, Junction Lane.  
SWINDON, Wilts.—W. H. Winch-  
combe, 160, County Road.  
TAVISTOCK.—A. E. Graves, The  
Radio Stores, 74, West Street.  
WATERLOOVILLE, Hants.—  
C. R. Miller, London Road.  
WEST HARTLEPOOL.—Ed-  
Taylors, 49, Thornton Street.  
WOLVERHAMPTON, Compton.  
—Ernest A. G. Jones, "The  
Leasowes."

# WEARITE COMPONENTS

SOMETHING REALLY NEW FOR YOUR SET—

Write for special leaflet:

AN ENTIRELY NEW

## L.F. COUPLING UNIT

which will make a remarkable  
difference to your reproduction.

COMPLETE WITH SWITCH  
FOR TONE CONTROL.

PRICE

20/-

Have you our  
Illustrated List?

WRIGHT & WEAIRE LTD.,  
740, HIGH RD., TOTTENHAM, N.17

Telephone: Tottenham 3847/8.

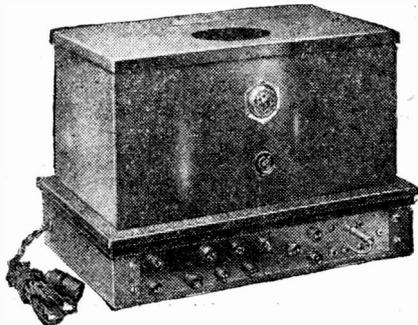
LOOK OUT FOR OUR OTHER NEW LINES

for all  
**CONDENSERS**

**CERTAINLY!**

|                                |                                   |  |
|--------------------------------|-----------------------------------|--|
| <p>3/-</p> <p>VERNIER DIAL</p> | <p>15/6</p> <p>0005 DUAL GANG</p> | <p>FORMO CONDENSOR</p> <p>MAX.<br/>F 0001 2/-<br/>J 0003 2/-<br/>G 001 2/-<br/>H 002 3/-</p> |
| <p>4/6</p> <p>MID LOG LINE</p> | <p>3/9</p> <p>DIFFERENTIAL</p>    | <p>2/9</p> <p>GOLDEN SQUARE<br/>PICCADILLY CIRCUS<br/>LONDON</p>                             |
|                                |                                   | <p>CHS</p> <p>MIDGET REACTION</p> <p>GERRARO 1863</p>  |

## Save Money in Battery Consumption



### Use the Lotus All Mains Unit

Dispense with both H.T. and L.T. batteries, and enjoy a strong, steady supply of power direct from the A.C. Mains electric light current, at a nominal cost. Save the expense, time and trouble of continually having to re-charge your batteries, and ensure a regular supply of power whenever you want it.

Price £7:7:0, or 14/6 down and 11 equal monthly instalments.

Ask your dealer for details of the Lotus All Mains Unit for converting the Osram "Music Magnet" to All Electric. Same price as above.

Write for full particulars.

# LOTUS

## ALL MAINS UNIT

Garnett, Whiteley & Co., Ltd.  
Lotus Works, Mill Lane, Liverpool.

Causton

## FOR THE LISTENER.

(Continued from page 566.)

This annoyed her. She made a noise like atmospherics. "Taller!" she snapped. "What do I care about taller? Is James as powerful a god as Sir John?"

It then occurred to me for the first time that Wireless Sets must be a race of rather wonderful beings with an invisible world, a heaven of their own which watches over them and arranges things for them and supplies them with power and makes them good.

And that they worship gods like we do. They worship by their tribes and families, the Marconis, the Burndeps, the Pyes, the Magic Fours and the rest of them. Brookmans Park is their heaven, towards which they pray every morning and every evening. Savoy Hill is their Olympus where the greater and the lesser gods abide. The Announcer is the archangel. And Sir John (it is a solemn thought!) is the deity himself!

### Italian Programmes.

So that was the secret of James and John! What Belinda wanted to know was whether James was a strong radio god like Sir John, or whether he was simply a tuppenny-ha'penny sort of Baal who was responsible for Wireless in Italy.

"I do not know," I replied to her question, being myself a worshipper at the Savoy shrine, but not wishing to offend the deities of a land in which I sojourn for a season, "Sir John is great above all the radio gods, but, so far as I know, James——" "I don't think much of him," said Belinda. "And why," said I, "don't you think much of James?"

"Well," she said, "look at the rotten programmes he sends out." "But Belinda, my dear," I said, terrified lest anyone should overhear us, "rotten is a traitorous word. I admit that perhaps they are a little—limited, shall we say?"

### Complaints.

"Besides," she changed her ground, "they don't begin their programmes till half-past six. Have they nobody to tell them how to keep poultry or to make puddings in the mornings? How do you think I like being silent the best part of the day?"

"You seem to manage very well," I said slyly.

### Opera.

It was eight-thirty, and, desiring this conversation to cease, I switched on without looking at the programme. It was another Opera!

There was the weirdest noise inside Belinda, out of which, like a clear star through wild, broken storm clouds, the voice of Wish Wynne, "I shall now give, by request, the story of Jack and the Beanstalk as told by a slum child."

"Did you do that on your own?" I said to Belinda when it was over. "Why not?" she said. "You don't know me yet, my man," she said, "not half!"

She is a wonderful creature! And now that I have discovered she has a memory in addition to her valves, she will be (as Jack Hulbert delightfully sings) "such a comfort to me!"

## TECHNICAL NOTES.

By Dr. J. H. T. ROBERTS, F. Inst. P.

### The Super-Het.

THE super-heterodyne receiver, which was so popular with the more ambitious experimenter two or three years ago, suffered something of a setback in view of the great advances made in screening and in the development of the screen-grid and pentode valves. However, owing to the increasing need for super-selectivity, it looks as though the super-heterodyne may well come back into its own again.

Many amateurs who have never operated a super-heterodyne receiver are apt to be a bit frightened of it, thinking that its control may perhaps be a little bit beyond them. As a matter of fact, the super-het is an extremely simple set to operate, inasmuch as it has only two tuned controls, its only drawbacks are the comparatively large number of valves necessary for its proper operation (say seven to nine) and the fact that consequently the amount of filament current and H.T. current required is correspondingly greater.

If, however, you have means for re-charging your own batteries the question of running costs need not be seriously considered.

### Will it Come Back?

On the other hand, the super-het has many very important advantages. It is very simple to work and, of course, its selectivity is perfectly amazing to anyone to whom this type of circuit is new. An ordinary straight circuit would need to have at least three tuned circuits in order to gain a selectivity comparable with that of the super-het.

No outside aerial is used with the super-het, but notwithstanding this it will bring in all kinds of foreign stations, even during conditions which, for an ordinary set, would be regarded as adverse.

### On the Continent.

The super-heterodyne is more popular on the Continent than it is here, possibly for the reason that most European countries have not such a selection of powerful local stations within a comparatively small area as we have in this country. Consequently, long-distance reception is more the order of the day and selectivity is still more important.

It is no doubt for reasons such as this that the super-heterodyne enjoys a considerable popularity in different European countries as well, of course, as in the United States, the land of its birth.

### Running Costs.

I should add that the running costs of the present super-het are considerably lower than of the older type, and also the operation is actually simpler, since the advantages of screening has now been applied to this type of receiver. This means that instead of using a potentiometer for applying a positive damping in order to obtain stability, the stability is obtained by screening and consequently the extra high-tension current consumption which was

(Continued on next page.)

# DEAF AIDS

(INEXPENSIVE)

Highest Efficiency Guaranteed.  
Better than other Aids costing Five times as much.



£1-2-6  
as illustrated, including a light headband for the earpiece.

£1-10-0  
fitted with MIDGETPHONE (fits into ear) instead of earpiece with headband.

THIS Aid comprises the latest sensitive SUPER-MICROPHONE (to be attached to Coat or Dress, conveniently concealed), a SMALL BATTERY (for the pocket), and a SMALL EARPIECE which can be held to the deaf ear by hand or by a light headband supplied with the Aid. All speech and sound reaching the Super-Microphone is loudly heard in the earpiece. The battery can be switched off when the Aid is not in use. ANY small 3-volt battery can be used with these Aids.

Either of the above Aids can be made SPECIALLY POWERFUL by fitting a DOUBLE Microphone in place of the single, at an extra cost of 10/-.

FREDK. ADOLPH, Actual Maker,  
27, Fitzroy St., London, W.1. Phone: Mueum 8329.

## TECHNICAL NOTES

(Continued from previous page.)

involved in the positive damping method is avoided.

The screening naturally, by its stabilising effect, makes the operation of the receiver much simpler.

### Question of Quality.

It has sometimes been objected that although a super-heterodyne receiver will pick out almost innumerable distant stations and bring them in at loud-speaker strength, the quality is in some way inferior. I think this is an unjust criticism of the super-heterodyne and, certainly, if the circuit is properly adjusted, the quality is remarkably good—some of its supporters will, in fact, assert that the quality of its reproduction is equal to that of anything on the market.

### Distortion by the Detector.

I am often asked whether the grid leak method of rectification can be relied upon to give really distortionless reproduction. This is putting it rather high as, of course, no receiver will give absolute distortionless reproduction. At the same time, it is important to reduce the distortion to the absolute minimum at every stage in the circuit.

The grid will carry a certain current (in the grid leak method of rectification) and this is often a cause of some distortion, the grid current arising owing to the joint effects of the positive bias applied to the grid and the positive parts of the signal current. The positive bias applied to the grid is apt, to a slight extent, to make the valve act as an amplifier as well as a detector and this method of rectification is useful where sensitivity is an important consideration.

### No Grid Current.

The grid is generally given a negative potential relative to the filament, when the anode-bend method of rectification is being used, and with signals of ordinary strength it follows that the grid will not become positive with respect to the filament and therefore grid current will, in these circumstances, be eliminated.

In-so-far as grid current is a cause of distortion, this means that the anode-bend method has the advantage over the grid-leak method. On the other hand, the advantage of the better rectification which is obtained is, to some extent, off-set by the absence of the slight amplifying effect which is obtained with the grid-leak method.

In other words, the anode-bend method of rectification is probably preferable if absolute purity of reproduction is the only or the main desideratum, but for all-round purposes, and especially where sensitivity is particularly desirable, the grid-leak method should be found quite satisfactory.

### Importance of Proper Values.

Of course, I should add that grid-leak rectification comes in for a good deal of unfair criticism, owing to the values of the grid leak and condenser being unsuitably chosen, especially that of the grid leak. If the value of the grid leak is too high the valve tends to become choked, whilst if the leak is too low the valve does not operate in the proper manner.

(Continued on next page.)

## "POPULAR WIRELESS" says:

"There is everything in favour of buying a complete kit of parts and nothing against it. You get all the little items, such as screws, etc., and your panel is neatly drilled for you. Moreover, you are certain that every component is suitable for the set—that is, if you purchase an approved kit such as is sold by Ready Radio."

### KITS OF PARTS AND LOUDSPEAKERS

1930 MAGIC THREE  
THE "EUROPEAN" 3  
THE A.C. SAFE-POWER SENIOR  
ETC., ETC.

Cash or Easy Terms  
Lists on Application

# Ready Radio

159, BOROUGH HIGH STREET,  
LONDON BRIDGE, LONDON, S.E.1.  
Telephone: HOP 5555 (Private Exchange)

## 10 PAGE SPECIAL BARGAIN LIST

### RADIO AND SCIENTIFIC INSTRUMENTS

Readers of "Popular Wireless" should apply now. Send 1½d stamp.

ELECTRADIX RADIO,  
218 Upper Thames Street, E.C.4.  
City 0191, Electradix, Cent, London.

### WET H.T. BATTERIES

Solve all H.T. Troubles.  
SELF-CHARGING, SILENT, ECONOMICAL  
JARS (waxed), 2 1/2" x 1 1/2" sq. 1 3 doz.  
ZINCS, new type 10d. doz. Sacs 1 2 doz.  
Sample doz. (18 volts), complete with bands and electrolyte, 4 1. post 9d.  
Sample unit, 6d. illus. booklet free  
Bargain list free.  
AMPLIFIERS, 30/- 2-VALVE SET, 25  
P. TAYLOR, 57, Studley Road,  
STOCKWELL, LONDON.

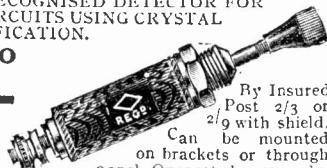


## "RED DIAMOND"

THE RECOGNISED DETECTOR FOR ALL CIRCUITS USING CRYSTAL RECTIFICATION.

RD 40

2/-



By Insured Post 2/3 or 2/9 with shield. Can be mounted on brackets or through panel. Once set always ready.

Not affected by vibration. Each one is tested on broadcast before despatch, and is perfect.



## "RED DIAMOND" WALL PLUG

RD 29

2/-

Solid Ebonite, Highly Finished, Perfect Insulation. Two size plugs and sockets, so that it is impossible to insert plugs in reverse.

Or by insured post, 2/3.  
Of all high class Radio Dealers, or Sole Makers: TRADE MARK

## JEWEL PEN Co., Ltd.

(Radio Dept. 46), 21-22, Great Sutton St., LONDON, E.C.1.



## HEADPHONES REPAIRED 4/-

Transformers 5/- Loudspeakers 4/- All Repairs re-magnetised free. Tested, guaranteed and ready for delivery in 24 hours.  
Discount for Trade. Clerkenwell 9069.  
MASON, 44, East Road, City Road, N.1.

## CELLS THAT SATISFY. SPECIAL BATTERY OFFER.

120 volt H.T. Batteries 12/- each  
100 volt H.T. Batteries 10/- each  
60 volt H.T. Batteries 6/6 each  
60 volt Porous Pot Wet Batteries from 14/-  
The Best and Cheapest yet offered. Also send 1½d. stamp for the "Leyton" Booklet to:—  
THE LEYTON BATTERY CO.,  
305, CHURCH ROAD, LEYTON, E.10.

## EXACT TUNERS

—250 to 2,000 metres.  
Thousands of these tuners are in use, and we can strongly recommend them. No further coils are required. Send P.C. for particulars and circuits—FREE.  
THE EXACT MANUFACTURING CO.,  
Croft Works, Priory Place, Coventry

Have you got this Catalogue

56 PAGES. 2/- POST FREE

# BULGIN RADIO PRODUCTS

A. F. BULGIN & Co., Ltd  
9/11, Currier St., Chancery Lane, London, E.C.4.

# ENGINEERS!

Can't we get together?



WRITE FOR THIS  
BOOK TO-DAY  
IT'S FREE!

All we ask is the chance to prove that you can earn £300, £400, £500 per year or more. Other men are doing it and you can do the same.

We have an unrivalled and world-wide organisation waiting to help you whether you be novice or expert. If you wish for something more than a "bread and butter" job you owe it to yourself to investigate our Service. Our handbook, "Engineering Opportunities," has pointed the way to better things to over 20,000 of your fellows. It contains details of A.M.I.Mech E., A.M.I.E.E., A.M.I.C.E., A.M.I.A.E., A.M.I. Struct.E., London Matric., C. & G., G.P.O., etc., Exams., outlines home study courses in all branches of Electrical, Mechanical, Motor and Wireless Engineering, and explains our unique guarantee of

### NO PASS—NO FEES

In a brilliant foreword Prof. A. M. Low shows clearly the chances you are missing. "Engineering Opportunities" and our advice are quite FREE. Don't neglect this offer—give vent to that "upward urge" and send a postcard NOW, stating Branch, Post or Exam. which interests you. British Institute of Engineering Technology, 101 Shakespeare House, 29/31, Oxford Street, W.1

### KITS OF PARTS FOR ALL CIRCUITS

**1930 MAGIC 3 KIT**, including cabinet, panel, valves, coils, including S.W., carriage paid, **87/6**.  
**STRAIGHT 3 KIT**, including Dual coil, 2 transformers, valves, cabinet, panel, carriage paid, **60/-**.  
**SPEAKER KIT**, Ormonde type cabinet, 12 x 12, B.A. Unit, cone and baffle, carriage paid, **15/-**.  
Specification of above kits and lists of components free. You will be surprised at my prices. Money back if not satisfied. Any part supplied separately. Carriage extra.

The **SERVIS 3-Valve Set**, in polished cabinet with handle, enclosed speaker, two transformer-coupled, assembled and ready to use, complete with 3 valves, 100-v. H.T., 2-v. accumulator and G.B. Carriage paid, **£4.18.6**.

**PORTABLES**, 5-valve suitcase type in blue morocco, complete with valves, 100-v. H.T., G.B., and unspillable accumulator. Guaranteed by makers. Carriage paid, **£8.15.0**.

Also 3-valve A.C. mains sets, complete, **£11.10.0**. All mains radio gramophones, **£22.10.0**.

All goods new and perfect. Let me quote for any set or kit of parts. Cash or C.O.D. only.  
**E. BUTLIN, 143B, Preston Rd., Brighton.**

### REPAIRS

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

Terms to Trade.

**TRANSFORMER REPAIR CO.,**

"Repairs" Dept.

953, GARBATT LANE, TOOTING, S.W.17.

PLEASE be sure to mention  
"POPULAR WIRELESS"  
when communicating with  
Advertisers. THANKS!

**DX** THE  
**STANDARD  
PLUG-IN COIL**  
Sold everywhere from 1/-  
DX COILS LTD., LONDON, E.8

## TECHNICAL NOTES.

(Continued from previous page.)

You want always to remember that the conditions obtaining in the grid-leak represent a compromise between a grid completely insulated and one completely earthed, and upon the grid-leak conditions being exactly adjusted for the particular conditions, the strength of signals, and so on, depends the entire functioning of the valve as a detector.

### Valve Improvements.

Beginners in radio often want to know whether it is not possible to make a valve without a filament; or, rather, a valve in which the electrode taking the place of the filament is unheated. In other-words, a "cold valve." They argue, not without reason, that the temperature necessary for the release of the electron current from the filament has, by successive improvements in valve manufacture, been reduced to a mere fraction of what it was in the earlier types.

There is all the difference between a valve which requires a filament-heating battery and circuit, however small the filament current may be, and one which requires no current, and therefore no battery and circuit at all.

Many attempts have been made to design a valve based upon the electronic emissivity of photo-electric substances (such as potassium and sodium) or radio-active substances, of which there are many. Valves have also been designed in which a high value of H.T. voltage is used (the valve being of very "soft" type), so that something akin to a high-tension "discharge" takes place, through the gas within the valve, this discharge constituting the anode current.

In all these cases, although it is a comparatively simple matter to obtain an anode current, it is quite another thing to modify and control that current in the way which is necessary if the valve is to be applied to ordinary radio purposes.

### Radio-Active.

The emission current from a small quantity of radio-active substance, for example, is in ordinary circumstances far too small to be of any use; and, furthermore, it is quite impracticable to control the amount of the emission or the velocity with which the electrons leave the electrode. In the case of photo-electric substances the trouble here is the extremely small amount of emission which is obtained.

Incidentally, a photo-electric substance will only emit when under the influence of a suitable type of radiation (of which ordinary visible light is an example), and therefore it cannot be regarded as an entirely automatic emitter, since energy has to be supplied from without.

### "Soft" Valves.

The high-tension discharge method is open to the objection that the current cannot be controlled, and, moreover, the discharge is very erratic and altogether unsuitable for use in a radio valve.

I should say, however, that it is by no means impossible—in fact, I should think a distinct probability—that some practical

type of cold valve will be evolved in the near future.

### Aerial Length.

In the early days of broadcasting it was the ambition of every amateur and experimenter to provide himself with a high aerial of as nearly as possible the maximum 100-ft. length.

In these days of valve developments, however, it has been found that the old "P.M.G. aerial" is generally far too long, and much better results are obtained with a shorter aerial.

Many listeners actually prefer an indoor aerial, and of those who use an outdoor aerial a considerable percentage have quite short antennae, not more than perhaps 10 to 20 feet in length.

### Selectivity.

One of the great advantages of the shorter aerial is, of course, the increase in selectivity which is generally obtained thereby. With high-frequency amplification so very easy to obtain, by means of screen-grid valves, the possible reduction in incoming signal strength is quite unimportant, whereas the question of selectivity with increasing stations becomes increasingly important.

If you are in doubt about the length of your aerial, it is a good plan to try using shorter aerials. A simple way to do this is to disconnect the regular aerial from the set and to rig up (a little distance away from the regular aerial) a temporary aerial consisting of a length of ordinary copper wire, suspended on insulators, of course, in the usual way. It is better, if you want to make the test in the most satisfactory way, to take down the regular aerial and substitute the temporary one for it as, of course, the presence of the regular aerial interferes to a slight extent with the results which you get with the temporary one.

However, if it is too much trouble to take down the regular aerial, fix up the temporary one as far away from it as you can and then proceed with your tests.

### Some Simple Tests.

The temporary aerial may be made a few feet shorter than the regular one to start with and the results on the receiver carefully noted. Then try cutting off a few more feet from the temporary aerial and again note results, both as regards signal strength and particularly selectivity.

In reducing the length of the aerial, of course, you cut off at the end remote from the down lead and re-attach to the insulator at that end in each case. It is a good plan to have the insulator attached to a rope so that the reductions in length of the aerial are compensated for by increases in the length of the rope.

By a few trials in this way, and also trying different heights, you will soon find out whether there is going to be any great advantage in making a change in the length of your aerial.

If the aerial was already comparatively short, probably you will not find a great deal of difference, but if it was the old-fashioned long aerial it is almost certain that you will find a great improvement, especially in selectivity, by shortening it.

Having discovered more or less the best dimensions you can then set to work to alter your regular aerial to correspond, finally re-erecting it in its new form.



**GENERAL-PURPOSE VALVES**

| 2v.        | 4v.        | 6v.     | OLD PRICE | NEW PRICE |
|------------|------------|---------|-----------|-----------|
| P.M.1 A.   | P.M.3 A.   | P.M.5 B | 10/6      | 8/6       |
| P.M.1 H.F. | P.M.3      | P.M.5 D |           |           |
| P.M.1 L.F. | P.M.4 D.X. | P.M.5 X |           |           |
| P.M.2 D.X. |            | P.M.6 D |           |           |
|            |            |         |           |           |

**POWER VALVES**

| 2v.   | 4v.   | 6v.   | OLD PRICE | NEW PRICE |
|-------|-------|-------|-----------|-----------|
| P.M.2 | P.M.4 | P.M.6 | 12/6      | 10/6      |

**SUPER-POWER VALVES**

| 2v.     | 4v.     | 6v.                  | OLD PRICE | NEW PRICE |
|---------|---------|----------------------|-----------|-----------|
| P.M.252 | P.M.254 | P.M.256<br>P.M.256A. | 15/-      | 13/6      |

**SCREENED-GRID VALVES**

| 2v.    | 4v.    | 6v.    | OLD PRICE | NEW PRICE |
|--------|--------|--------|-----------|-----------|
| P.M.12 | P.M.14 | P.M.16 | 22/6      | 20/-      |

**PENTONES**

| 2v.    | 4v.       | 6v.    | OLD PRICE | NEW PRICE |
|--------|-----------|--------|-----------|-----------|
| P.M.22 | P.M.24    | P.M.26 | 25/-      | 22/6      |
|        | P.M.24 A. |        | 30/-      | 27/6      |
|        | P.M.24 B. |        | 35/-      | 30/-      |

**A.C. DIRECTLY-HEATED VALVES**

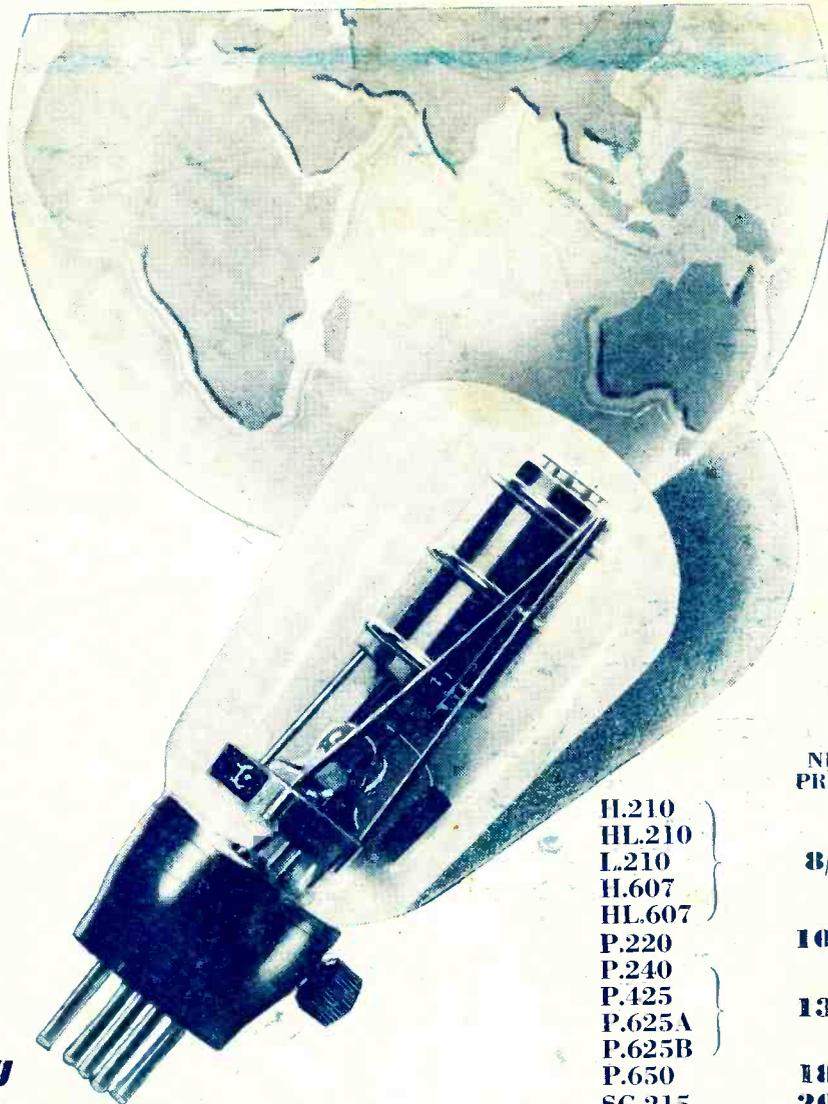
| 2v.     | 4v.     | 6v. | OLD PRICE | NEW PRICE |
|---------|---------|-----|-----------|-----------|
| A.C.104 | A.C.064 |     | 17/6      | 16/-      |

**SPECIAL VALVES**

| 2v.    | 4v.    | 6v.     | OLD PRICE | NEW PRICE |
|--------|--------|---------|-----------|-----------|
| P.M.13 | P.M.25 | A.C.c84 | 25/-      | 22/6      |

**Mullard**  
**MASTER · RADIO**

# THE WORLD'S FINEST VALVES REDUCED IN PRICE



The  
amazing

# MAZDA

## RADIO VALVES

V.65

|         | NEW PRICE | OLD PRICE |
|---------|-----------|-----------|
| H.210   | 8/6       | 10/6      |
| HL.210  |           |           |
| L.210   |           |           |
| H.607   | 10/6      | 12/6      |
| HL.607  |           |           |
| P.220   |           |           |
| P.240   | 13/6      | 15/-      |
| P.425   |           |           |
| P.625A  |           |           |
| P.625B  | 14/-      | 20/-      |
| P.650   |           |           |
| SG.215  |           |           |
| PEN.230 | 22/6      | 25/-      |
| PEN.425 |           |           |
| AC/PEN. | 27/6      | 30/-      |



THE EDISON SWAN ELECTRIC CO., LTD.  
Incorporating the Wiring Supplies, Lighting Engineering, Refrigeration and Radio Business of The British Thomson-Houston Co., Ltd.

Radio Division:  
1a Newman Street, Oxford Street, W.1  
Showrooms in all the Principal Towns

# EDISWAN