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Popular Wireless

Every Thursday
PRICE
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No. 438. Vol. XVIII.

INCORPORATING "WIRELESS"

October 25th, 1930.

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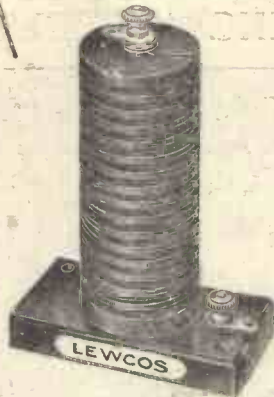
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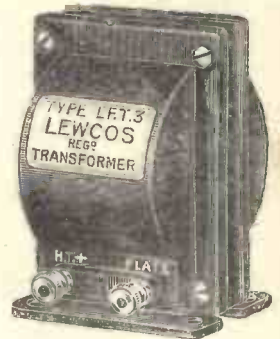


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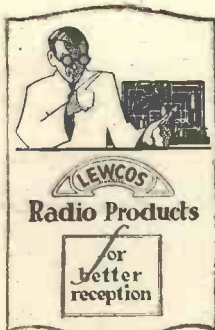


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Any one or all of the LEWCOS components illustrated above would improve your receiver to an astonishing degree. "Perfection in every detail" is the keynote of the Lewcos Factory where these components are constructed.



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The Chassis is constructed of aluminium 11½ in. in diameter, ribbed to ensure absolute rigidity and provided with two brass pillars to ensure easy assembly of the unit. The whole may be secured to a baffle board or cabinet, screw holes being provided in the outer ring for this purpose.

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FOR all-electric radio of the highest efficiency, for unfailing reception and a background of perfect silence—the improved series of “Marconi” indirectly heated A.C. Mains Valves stands supreme. Every feature desirable in modern receivers is included in this range—high conductivity, rigid construction, mesh anode to prevent overheating and grid emission and exceptional vacuum—each will contribute towards better reception in your own set. There are types for every receiver.

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M.L. 4	Power ...	9	3,000	17/6

Remember!

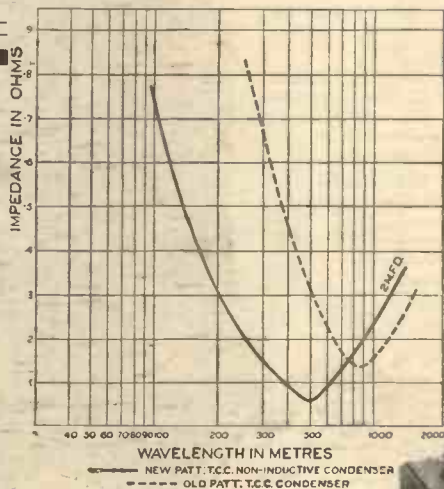
Marconi Valves are used by The B.B.C., Imperial Airways, Croydon Control Tower, Metropolitan Police, Trinity House Beacon Stations and Lightships, Empire Wireless Communications, large Passenger Liners, &c., &c., because of their longer life, clearer tone, greater range and volume.

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Here's the latest T.C.C. development—a Non-Inductive Condenser at no extra cost. The advent of the Screened Grid Valve has emphasized the need for a condenser having the minimum of impedance in order that small high frequency currents may be readily passed. How the new T.C.C. Non-Inductive Condenser achieves this result is shown on the curve above. The ordinary 1 mfd. condenser has a resonant point at about 900 metres whereas in the new T.C.C. Non-Inductive Condenser this has been reduced to nearly 500 metres. Be wise: always use

Available in all capacities from .005 mfd. to 2 mfd. from all wireless shops.

The above illustration shows the T.C.C. 2 mfd. Non-Inductive Condenser in moulded case 3/10.

Telegraph Condenser Co., Ltd., N. Acton, W.3



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GREATER PERFORMANCE SMARTER APPEARANCE NO CHANGE IN PRICE

Ask your dealer to show you the new range of Telsen Components, each one embodies many new and exclusive features making for better and cheaper radio.

The already famous Telsen Transformers have been entirely re-designed, each model now embodies new windings and core, in addition to which they are fitted with earth terminals, a very desirable feature in these days of high-efficiency, two-transformer-coupled sets, finally they are shrouded in Genuine Bakelite Mouldings.

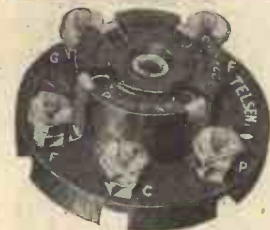
The complete range of Telsen Components include Valve Holders, four and five pin types, H.F. Chokes, Fixed (Mica) Condensers, etc. They are so scientifically designed that no real radio enthusiast will ignore their claim as "Radio's Choice" for "Better Radio Reception."



TELSEN "RADIOGRAND" TRANSFORMER, new model, shrouded in Genuine Bakelite, with new windings and core, fitted with earth terminal. Made in ratios 3-1 and 5-1. Price 12/6 each.

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TELSEN VALVE HOLDERS. Low capacity, self-locating, supplied with patent soldering tags and hexagon terminal nuts. Price 1/-



TELSEN FIVE-PIN VALVE HOLDER. Pro. Pat. No. 20286/30. Genuine Bakelite Mouldings fitted with Nickel Silver shock-absorbing spring contacts. Price 1/3 each.



TELSEN H.F. CHOKES, designed to cover the whole wave-band range from 18 to 4,000 metres, extremely low self-capacity, shrouded in Genuine Bakelite. Induction 150,000 microhenries, resistance 400 ohms. Price 2/6 each.

Perfected in every detail, Telsen Transformers now represent the embodiment of the very latest practical principles of Radio transformer construction. Built to give long and satisfactory service—the highest quality reproduction . . . in fact . . . built as well as it is possible to build a transformer . . . and yet the prices still remain the same . . . one of their attractive features.



TELSEN FIXED (MICA) CONDENSERS, shrouded in Genuine Bakelite, made in capacities up to .002 mfd. Pro. Pat. No. 20287/30. .003 supplied complete with Patent Grid Leak Clips to facilitate series or parallel connection. Can be mounted upright or flat. Tested on 500 volts. Price 1/- each.

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Advt. of Telsen Electric Co., Ltd., Birmingham.

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The November
**WIRELESS
CONSTRUCTOR**

Contains a particularly fine selection of articles by leading radio authorities, and covering all phases of radio reception.

Among the contents are full constructional descriptions of

THE "PARATUNE" THREE

A set of exceptional powers;

THE STANDARD A.C. UNIT

A mains H.T. supply that will give you ample power free from all trouble; and

THE "MAX-AMP" LIMITER

Of incalculable value to valve-set owners.

Don't forget YOUR Copy of

THE WIRELESS CONSTRUCTOR

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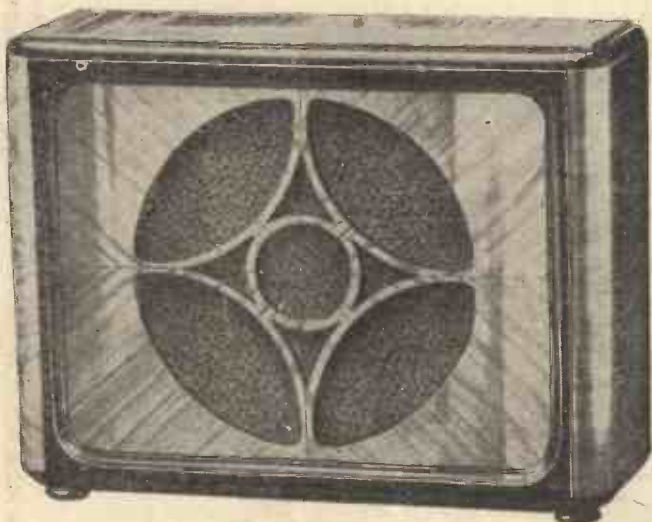
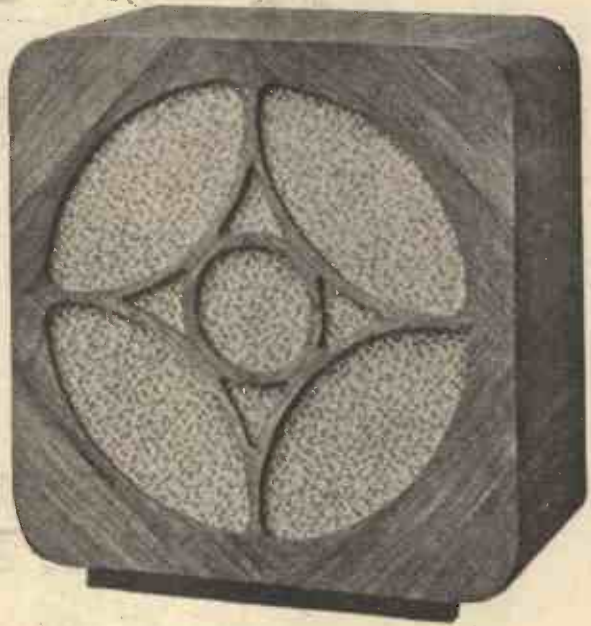
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Two wonderful Speakers!



41 K This speaker's arrival on the market is a great event in wireless history—accurate reproduction at a popular price. Almost every home in England can now have its Blue Spot Speaker. Housed in a beautiful walnut case, this fine speaker costs

50/-



71 R This new and splendid speaker represents all that is highest in loud-speaker reproduction. The walnut case is a perfect piece of the cabinet maker's art, and the driving unit is 66R, the finest unit in the world. Price

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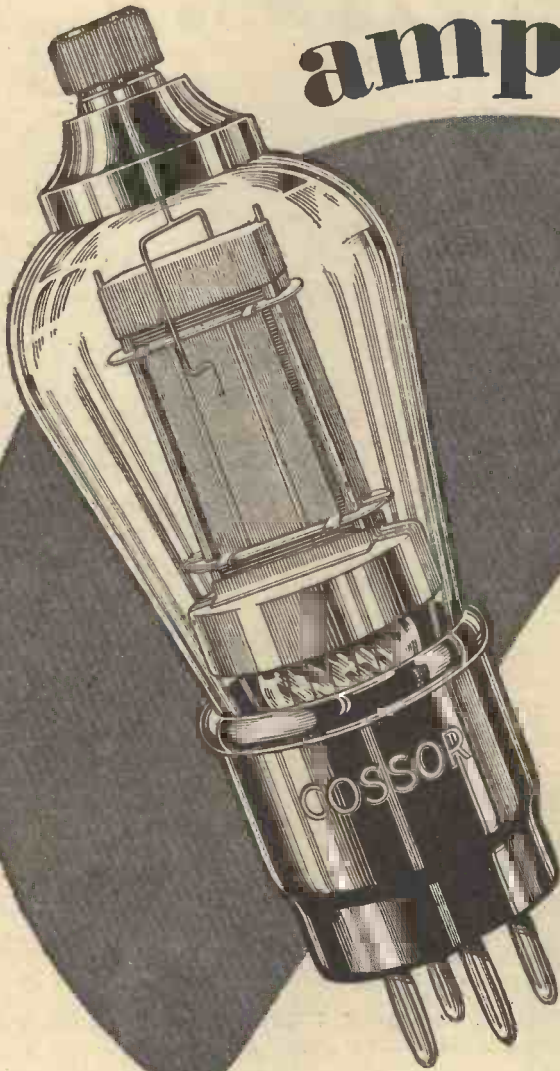
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Greater effective amplification is definitely ensured by the New Cossor Screened Grid Valve. This is due to its minute inter-electrode capacity which has been reduced to the order of .001 micro microfarads—lower than that of any other Screened Grid Valve on the market. Because of this and because grid current has been eliminated, the use of this New Cossor Valve will considerably increase the efficiency of your Receiver.

Write for free fully descriptive Folder on "How to increase the range of your Receiver," mention No. L35P.W.

Cossor 215 S.G. 2 volts, .15 amp. Impedance 300,000. Amplification Factor 330. Mutual Conductance 1.1 m.a./v. Normal working Anode Volts 120. Positive Voltage on Screen 60-80. Price **20/-**

THE NEW
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215 S.G.

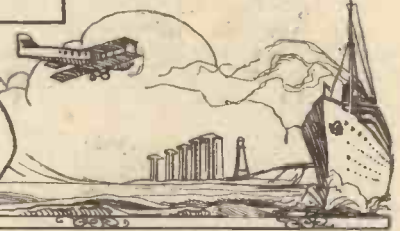
Popular Wireless

LARGEST NET SALES



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THE WORLD'S MOST POWERFUL STATION.

**HAPPY XMAS IN ADVANCE.
A HANDSOME COMPLIMENT.**

RADIO NOTES & NEWS

**THE FARTHEST NORTH.
A LONG, LONG WAY.
SHOOTING LISTENERS!
"DIAGONALIZATION."
A RUM GO.**

The World's Most Powerful Station.

NOT long ago I referred to the fact that it was not easy to say which was the most powerful broadcasting station in the world. There seems to be no doubt, however, that the distinction will belong to Poland as soon as the new Warsaw station is erected.

It has just been despatched from the Marconi Works at Chelmsford, and is due to begin operating on Christmas Day. The power in the aerial is 160 kw. as against Daventry 5 X X's tiffing little 35 k.w., so if all the rest of Europe does not sit up and take notice of Poland it will not be Poland's fault!

5 S W's Aerials.

SHORT-WAVE enthusiasts in other lands whose chief link with home is 5 S W—the Empire short-wave station at Chelmsford—will be interested to know that this station has two different aerials.

Experiments are continually proceeding to find out which is the best method of radiation, and at the moment two very queer constructions are in use at different periods, one known as "aerial A" and the other as "aerial B."

Some day all the cream will be skimmed off the different experiments, and we shall have a really sumptuous short-waver at Chelmsford to fling out the Empire programme.

Happy Xmas in Advance.

TALKING of that reminds me of my quaint habit of sending out advance Christmas greetings. I know it seems unnecessarily early to talk about Christmas, but the point is that "P.W." gets all over the world, and some of the copies of this week's issue will just about be reaching the backwoods of Burma, the Leeward Islands lagoons, or the Tibetan tableland by next Christmas Day!

So if when these words reach your eye you are sitting somewhere on the Outside Edge of the Empire, and according to your reckoning

it is Christmas Day or thereabouts, consider yourself seasonally slapped on the back by "Ariel" of "P.W."

Amateurs and the Army.

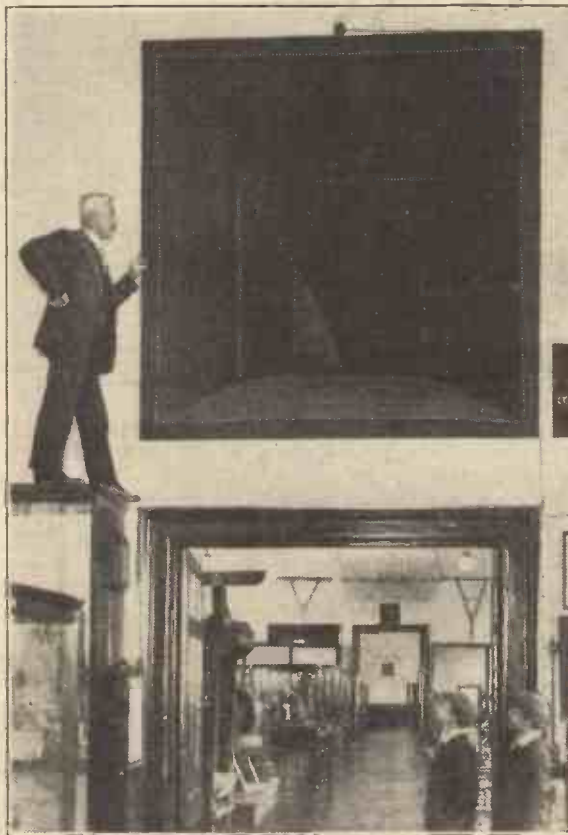
WE are so used to the cold, dead hand of the Post Office pressing heavily upon British amateur radio that one can hardly credit the length to which America goes to encourage short-wave transmitters. Not long ago the "boys" were

asked to co-operate with the Army Air Corps in manoeuvres, the idea being to keep in touch with long-distance army 'planes flying right off the beaten track.

The amateurs, self-trained and efficient, absolutely amazed the army operators by their keenness, their accuracy, and their immediate adaptability to act as an army adjunct.

In America the radio amateur is not only recognised—he is encouraged. But what a difference on this side of the Atlantic!

SURE SOME SPEAKER!



The 7 ft. square orifice into which the attendant is looking is the mouth of the giant logarithmic horn loud speaker installed at the Science Museum, South Kensington, London, S.W. The instrument is twenty-seven feet in length, and has been specially constructed to demonstrate the perfection of quality attainable in present-day broadcast reproduction. It is worked by a receiver built in accordance with B.B.C. suggestions, but only two programmes are available—the London Regional and National.

A Handsome Compliment.

JUST to show you the difference between the amateurs of America and our own so far as official recognition goes, here is a typical message received by the U.S.A. amateurs this year: "Thank you and your organisation for the splendid support you gave the first Pursuit Group Manoeuvres in connection with short-wave communication. I am perfectly amazed at the results produced by your extremely active and able members. (Signed)

"F. TRUBEE DAVIDSON,

"Assistant Secretary of War, in charge of Army Aviation."

Can you imagine our Assistant Secretary of War writing to the R.S.G.B. in that way?

The Farthest North.

IF it seems a bit nippy in the mornings now when you "show a leg," pause a moment and thank your lucky stars that you are not the wireless operator in Hooker Island. Setting out from Archangel, some enthusiastic scientists have managed to set up an observatory and wireless station on Hooker Island, where they say the best long-distance reception in the world is obtainable.

This may be, but although I am as enthusiastic over radio as anyone, they certainly won't catch me on the wrong side of the Arctic Circle, trying to test reception conditions. I like the mercury in my thermometer to be visible, not down a well!

(Continued on next page.)

RADIO NOTES AND NEWS

(Continued from previous page.)

A Long, Long Way.

THE Marchese Marconi has been addressing the Italian Society for Advancement of Science, and if the report is correct this is one of the things he said: "The waves were reflected by bands of ions outside the magnetic field of the earth, sometimes at a distance from the earth of 25,000,000 miles. The observations of Hals indicated distances up to 48,000,000 miles."

If any of your waves seem a bit late in arriving don't be too hard on them—the probability is they have strayed along the 48,000,000-mile route instead of the mere short-cut of 25,000,000 miles.

Those Old Telephones.

EVERYBODY knows you should not drop your 'phones on the floor, but the Bradford Royal Infirmary is even more afraid that you will drop them in the dustbin.

They need old 'phones to keep the patients entertained, and listeners who, proud of their new loud speakers, swear they will never listen on 'phones again, should remember that one pair of 'phones in the Bradford Royal Infirmary is worth half-a-dozen pairs rusting their diaphragms away on a top shelf.

Ireland's Super-Station.

BEDAD; it's good news from Dublin I'm tellin' ye—the contract's signed! "What contrahct, ses ye?" Why, the contract for the new Irish High-Power Station, av coorse.

Marconi's—who have just polished off a Polish super-station—are to build this Irish wonder-worker, which is to be erected out Athlone way, and will provide the whole of the Free State with powerful programmes.

Rumour says 413 metres will be the wave-length—but the site hasn't been fixed definitely, so it seems early to talk of the wave-length with any degree of certainty.

St. Dunstan's.

THAT concert by the blind two weeks ago, from London, reminded me of a very significant statement in the Fifteenth Annual Report of St. Dunstan's. Referring to sport and recreation for war-blinded men, it says:

"As is only natural, wireless forms probably the keenest source of amusement for St. Dunstan's men. All have been provided with a set."

Well done, St. Dunstan's!

Shooting Listeners!

COLOGNE hit upon a very ingenious idea when broadcasting a commentary from a rifle-range meeting some little time ago. Listeners heard the usual description, bullets whanging about, and so on, and then an old microphone was connected up and put up as a target!

The first three or four shots put the wind

up the loud speakers, and then suddenly there was a terrible "plonk!"—somebody had "shot" all listeners!

A Radio Presentation.

I WONDER if any of "P.W.'s" readers I picked up the broadcast from the Radio World Fair, New York, when a presentation was made to Mr. Frank Davidson, the wireless operator of the British liner "Tahiti"?

A gold medal was presented to him for his conduct in the emergency, and for the cool and capable way in which he handled all the messages from the ill-fated vessel. (It will be remembered that no sooner was the S.O.S. and business safely disposed of than he asked a final query: "How goes the Test Match?" which was being played and was at an exciting stage at that time!)

Foolishness!

POSSIBLY some of you saw the foolishness which was circulated recently in connection with that incident. The unpleasant suggestion was made that the

HE STOPPED, HE LOOKED, HE LISTENED.



This is Mr. Douglas Walters, of Chiswick, London, W., who picked up a television broadcast direct from New York. He saw on his screen the figure of a man, thus making transatlantic television history.

query about cricket, coming from a sinking vessel in that way, was a bit of "theatrical bravado."

It was nothing of the kind. Mr. Davidson was not going in for any "heroics," false or otherwise, but was simply doing the job of work he had to do, like the good fellow he is.

And when the danger was all over he simply took advantage of his chance to ask how the Test Match was going on. Perfectly natural, probably you or I would have done just the same.

Back to "Spanspace."

I SUPPOSE it is the effect of the darker evenings, but—whatever the cause—the last few weeks have seen a very big increase in my postbag. So much so that I can only refer briefly to a few of the letters.

In a missive from Kirkcaldy, G.Y. says he is getting A1 results from the "Spanspace 4," but he has a feeling that he isn't handling it as it should be handled. So

G.Y. wants me to dig up the old "P.W.'s" describing this set (May 28th, 1927, and June 5th, 1927). I'm trying, but these archaeological researches aren't too easy in these busy times.

"Magic" Again.

IT'S a thrill to hear dance music from New York and Chicago, 3,000 miles away. The magic is great on S.W., says "E. Kay" (Peckham). And he goes on to ask in what numbers of "P.W." wave-change switching for the "Magic" was described, and the method of cutting out the first valve.

As many other readers are interested in these adaptations I am giving herewith the dates in which the letters, etc., appeared: Mr. Currie's Wave-change Magic IV—"P.W." No. 428.

Instructions for Cutting Out the H.F. Valve—"This Year's Magic Four"—Radiotorial, "P.W." No. 436.

"Diagonalization."

FROM Coventry comes a very nice letter in praise of the B.B.C.'s "Diagonalization" policy—and A.M.H., the writer, makes out a good case, I admit. But although this policy of repeating a programme from another B.B.C. station the next evening does give a chance to listeners who missed it the first time, nobody will ever make me like the word "Diagonalization," by which the B.B.C. describe the process.

"Diagonalization" is a verbomaniacal extravaganza!

KDKA's Aerial.

LISTENERS living near East Pittsburg, U.S.A., aren't half so fond of the famous KDKA station as listeners abroad. To the latter class it is a fine station—"strong," "clear," "reliable," etc. But to those listeners living on its doorstep it is a confounded nuisance.

The high power used shuts out other stations by a "blanketing" effect (so called because when KDKA is going "all out," its neighbours can't get another blankety blank thing!). So a new vertical aerial has been developed by the KDKA engineers, consisting of eight linked aerials in a ring.

The idea is that signals from any one aerial are stopped from spreading round too much by the other seven, and the combined effect of the eight aerials is shot skyward, far from the maddened crowd, for the benefit of the distant listeners.

A Rum Go.

RUM-RUNNING is not all honey, especially now that the preventive men have called in the infra-red rays to help them. They say that a pair of these invisible "rays" keep a kind of wireless watch over New York harbour, and every ship that passes through them breaks the rays, and so warns the shore stations of its presence.

The order in which the rays are broken tells whether the ship is going out or into the harbour, and the device works equally well by night, in fog, or during storms. Good wheeze, what? **ARIEL.**



L. F. HOWLING.

by VICTOR KING

Some practical pointers about one of the commonest troubles encountered in modern radio sets. Reference is made to the "popping" and general instability that often follows the substitution of a mains unit for H.T. batteries.

howling or that insidious instability where the set squeaks, moans or pops when you touch certain of its external parts.

A loud howl clearly shows that something is wrong, but conditions of instability, where there is no audible evidence of anything serious happening, should be guarded against. The set may be howling at a frequency above

audibility and that will play havoc with the harmonics and, indirectly, with the general quality of results.

When Using a Unit.

It frequently happens that a set will work perfectly with ordinary H.T. batteries, but that as soon as an H.T. eliminator is coupled to it, an L.F. howling occurs.

This may show that there is not an adequate separation between the H.T.appings on the mains units. The back-coupling results for the simple reason that

are not tempted to be particularly liberal with your voltages; 120 may be the sort of maximum at which you work.

When you go over to the mains, you think nothing of 150 volts, for such a value is obtainable cheaply and comparatively easily.

But when the volts go up like that it often happens that the efficiency of the set is increased, and its valves are able to amplify to better effect, so that a similar feed-back to that which caused no ill-effects when the set was not working from the mains now assumes "ogreish" proportions.

An Easily-Fitted Cure.

In such circumstances, a cure may be found in the introduction of an anti-motor-boating arrangement. This can even be applied externally to the receiver. It can comprise a resistance of about 25,000 ohms in series with an H.T. + terminal of

IN the earlier days of broadcasting there were many attempts to obtain an L.F. reaction to supplement ordinary H.F. regeneration.

You all know this last, for you find it in practically every modern set. It is obtained by passing back to the grid of the detector valve a little of the energy from its anode circuit for re-amplification. And the control is such that you can adjust the feed-back to a nicety. If it is applied too liberally the set goes into self-oscillation.

The Cause of It.

For some time it was thought that considerable further amplification could be achieved by taking some of the L.F. current from an anode circuit and feeding it back to its associated grid circuit. Some enthusiasts went so far as to endeavour to feed back from the final L.F. valve to the detector. They generally obtained the reaction all right, but could not control it.

Their reward was L.F. howling. Nowadays, we know that good quality reproduction results only when every effort is made to prevent any such L.F. feed-back effects. Our modern components are so efficient that a set is liable to become unstable if there is the slightest degree of L.F. reaction.

Inaudible "Howling."

Apart from the H.F. reaction properly applied, our endeavour is to make the energy keep to a definite route through the set.

The main purpose of the screened-grid valve is to prevent any coupling occurring between its anode and grid circuits via an internal capacity of the valve. That, too, is the object of neutralisation.

The anode circuit of the first valve is linked to the grid circuit of the second valve, and the anode circuit of this valve to the grid circuit of the following valve, and so on up to the loud-speaker end of the set.

Any back-coupling between the anode circuit of one of the later valves and the anode or grid circuits of any of the preceding valves must be prevented at all costs.

If it is not prevented, you get L.F.



A photograph of Victor King in his radio laboratory. The loud speakers are gathered together for an investigation into diaphragm characteristics, the results of which will no doubt appear in "P.W." in due course.

the unit is feeding the anode circuit of various valves and is providing a coupling between them.

That Extra Voltage.

There are some who say that every set should, in itself, provide sufficient decoupling between its various circuits to render such happenings impossible. But in view of the fact that it is likely that over fifty per cent of the valve sets in use are not in themselves sufficiently decoupled, it is obvious that mains units should be so designed that they do not introduce any more coupling than H.T. dry batteries.

Indeed, they should provide much less. You see, when you use H.T. batteries, you

the set and the H.T. + terminal of the mains unit.

A 2- or 4- mfd. condenser is then joined from the set side of the resistance to H.T.—. A receiver embodying two stages of low-frequency amplification, transformer coupled, is generally more prone to instability and L.F. howling than a similar set employing resistance-capacity coupling, owing to the fact that it constitutes a more powerful amplifier.

A choke-capacity output will help to remedy matters, and a decoupling arrangement of the nature above mentioned inserted in the detector anode circuit will generally bring back the set to its original stability.

SIR JOHN REITH AND THE B.B.C. CRITICS.

By virtue of his very position the Director-General of the B.B.C. is rarely free from criticism of some kind or another. Much has been said about the B.B.C.'s attitude to the R 101 disaster, and, as is pointed out below, Sir John certainly seems to have missed an opportunity here.—

THE Director-General of the B.B.C. had some interesting things to say the other day when he opened the Radio Exhibition at Manchester.

Sir John Reith speaks all too rarely in public; and much too rarely in front of the microphone.

Some of the persuasive gentlemen on the "staff" of G.H.Q. at Savoy Hill should get busy, and endeavour, by hook or by crook, to get Sir John to speak in public more frequently. His candour is always

HEAD OF THE B.B.C.



The Rt. Hon. J. H. Whitley, the recently appointed Chairman of the B.B.C.

refreshing—and sometimes the sting in the tail of his speech a much more effective rejoinder to the carping critics.

As Sir John said, "serious and intense consideration is given to the problems which confront the B.B.C. . . . the critics we shall always have with us." There is a note of philosophical resignation in those last few words which would touch a heart of stone—let alone a critic's. 'Tis too true: we shall always have the critics with us—because we are *all* critics. If there were no critics there'd be no listening public and no B.B.C.

"Ferocity and Absurdity."

Continued Sir John: "There are some critics who—and this is a common phenomenon in all lines of activity—themselves unable to do anything, are always ready to teach.

"There are other critics the ferocity and absurdity of whose criticism pro-

claims an ulterior motive in that criticism, or else incapacity in their judgments.

"But others there are, still critics, who bring to the consideration of the multifarious and vexed problems of broadcasting a sympathetic mind, with an appreciation of the likes and dislikes of other people, even, perhaps, with some measure of goodwill towards the B.B.C., and, as a result, they come to the B.B.C. with criticism which is reasonable and constructive.

Constructive Criticism Sought.

"Such criticism, unlike the rest, is heard and needed. Such criticism is welcome, and, more than that, it is sought."

Well—if it is sought—we will step in, right away, and offer some criticism.

What was the B.B.C. doing on that fatal day when R 101 crashed?

Special editions of all the leading newspapers were published—but the B.B.C. was last in the field with the news. In fact, it was not until 3 o'clock in the afternoon that the news was broadcast—together with the text of the King's message. A few further details—very meagre—were broadcast at 4.15, and again at 8.50.

But compared with the press broadcasting was nowhere, and the day, being Sunday, offered the B.B.C. a unique chance of proving its indispensability as a national medium for announcing information of supreme interest and importance.

Was there no one on duty to step into the breach and handle the emergency? Whatever the explanation, we feel justified in criticising the B.B.C. for badly failing to give its enormous public the *first* news of the disaster.

We want some sort of a Sunday morning news broadcast, but we shall have something further to say about this at a later date.

Curiously enough, the first news of the tragedy reached this country via South America!

A radio station there picked up the news of the disaster from the French air station at Le Bourget; it was then *cabled* to London.

What About Croydon?

Why didn't Croydon hear that message—or if it did, why was the news held up? And what about our other air force stations. And what about Tatsfield—and British amateurs and dozens and dozens of others in this country. Why was it left for a South American sta-

tion to be the one to get the first news? Incredible!

If Tatsfield had been listening—or any B.B.C. official! What a tremendous chance for the B.B.C. to demonstrate its national importance!

Anyway, we congratulate the alert operator at Buenos Aires who was first to receive the fateful news.

EXTRA CAPACITY.

How to Add Microfarads.

THERE are two vital factors where the smoothing of audio-frequency variations is concerned. They are capacity and impedance.

It often happens, due to one of several possible reasons, that a hum is experienced when working a set from a mains unit, and extra smoothing is desirable. Unless the hum is very bad, this smoothing can conveniently take the form of extra capacity.

No alterations have to be made to the unit. All you need do is to connect externally 2-mfd. fixed condensers across the H.T. positive output terminals and the H.T. negative output terminal.

Another place where extra capacity sometimes helps is across the by-pass condenser of decoupling resistance.

CLASSICAL AND JAZZ



Mr. Jack Payne and Mr. John Ireland, the famous composer, discussing a musical programme recently broadcast from London.

THE "CRYSTATUBE"

At a cost of only a few shillings you can easily make this highly-efficient crystal set. Its design represents a triumph of simplification on the part of the "P.W." RESEARCH AND CONSTRUCTION DEPARTMENT



THIS little set gave us somewhat of a shock when it was first tested, for it did something we never expected; on a large and high aerial it separated the two Brookmans Park transmissions quite easily, at a distance of only 14 miles!

This is really a feat which we only expect from crystal sets which have been very specially designed for exceptionally high selectivity, and the present one wasn't. It was intended solely as a simple type for the man who likes to make everything himself at a very moderate outlay.

Neat and Easily Made.

Its particular virtues were to be an unusually neat and interesting method of assembly, very low cost and extreme simplicity, both in circuit and construction. The circuit used, while probably the best of all the simple types, is not expected to be super-selective.

It gives somewhere about the best selectivity which can be got from a simple circuit, but when tested under the drastic conditions we have mentioned there is normally a little overlap between the Brookmans Park transmissions. As a

matter of fact, it is only very special crystal circuits which do *not* give this overlap under these conditions unless a "Brookmans Re-jector" is used.

Why, then, the behaviour of the "Crystatube"? It seems to have been due to three things. First, one of the tappings happened to suit the particular aerial very accurately. In other words, it gave a degree of coupling exactly weak enough to give maximum selectivity without undue loss of strength.

Secondly, the coil was of unusual efficiency. Note its large diameter and rather robust gauge of wire. The third factor was the crystal detector, which seemed to be a rather unusual specimen. On replacing it with another (of the same type) signal strength improved a trifle, but the selectivity went down perceptibly, and very slight overlap occurred between the two Brookmans Park transmissions.

Where to Use It.

We are really telling you about this peculiar affair because most people are interested in such happenings, especially when a circuit as ridiculously simple as the "Crystatube" is concerned. We do not think we should be justified in claiming on the strength of it that the set is suitable for use in the "agony area" in a radius of some 12 to 15 miles round Brookmans Park.

The little receiver was certainly not meant for this difficult locality unless a rejector is used. It was intended to be an interesting, easy and economical job to construct, and to give excellent strength with just the amount of selectivity needed in the outer areas, and, of course, in those places where there is only one local transmission to be considered.

So far as results are concerned you must take our word for it that it does its work really well, but its other claims you can judge for yourself when you have had a look at the photos and diagrams. Pretty simple and neat, isn't it?

It is built on an interesting plan, too, for there is no panel

or baseboard and no ordinary tuning condenser. Instead, one of the very inexpensive compression-type condensers is used for tuning, and the whole receiver is assembled on the piece of tube on which the coil is wound. (Hence its name.)

All terminals are mounted in the wall of the tube, and so is the crystal detector, while the condenser is carried on a little wooden strut fixed across the upper end of the tube. It is a wonderfully easy set to

THE FEW PARTS REQUIRED.

- 1 Piece of insulating tube, 4 in. diameter and 3 in. long (Pirtoid, or other good material).
- 1 Semi-permanent crystal detector (R.I., or Red Diamond, Brownie, etc.).
- 1 Compression-type adjustable condenser, .0003 mfd. (max.) if local station works on wave-length below 400 metres; .001 mfd. (max.) if it works on wave-length above 400 metres (Formo, or R.I., Lissen, Leweos, Polar, etc.).
- 6 Small terminals, 2 oz. No. 24 D.C.C. wire, piece of wood, two screws, a little wire for connections.

HERE IT IS—COMPLETE!



The only adjustments necessary are those of the little compression condenser and the crystal detector, and yet the set is wonderfully effective.

make (you can finish it easily in an evening and have time to test it thoroughly as well) and when it is done you will have something very novel-looking to show your friends.

A run over the little circuit will tell you how it works before we begin on the constructional side. Note first that there is a single coil winding, of which the bottom end is earthed.

How the Aerial is Coupled.

There are three tapping points on this to which the aerial can be connected, so giving what is called "auto-coupling." The choice of three different degrees of coupling enables you to suit your particular conditions nicely, and you should try each alternative aerial point (A₁, A₂, and A₃) in turn, noting which gives the best results. Remember, though, to re-tune on the condenser each time.

The tuning condenser is connected across the whole coil in the usual way, but the crystal and 'phones are tapped across only half of it, to obtain both better selectivity and better volume. Observe that the crystal is wired to the third aerial tapping point,

(Continued on next page.)

THE "CRYSTATUBE"

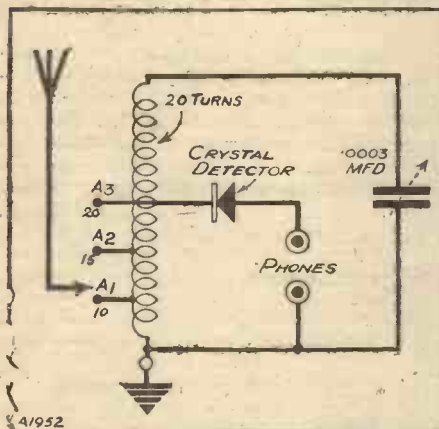
(Continued from previous page.)

which happens to be the centre of the coil. (This particular aerial tap is likely to suit small aerials best.)

Now to make a start. You want first of all a piece of coil former 4 inches in diameter and about 3 inches long. Round the upper edge of this mount six terminals in the positions shown in the wiring diagram. The set will look neater if these are rather small ones, although the pair for the 'phones must be big enough to grip the tags properly.

Next fit the wooden strut to carry the compression condenser. This goes cross-

A CIRCUIT SUCCESS



By "tapping" the crystal down the coil at a certain definite point selectivity with added power results.

wise in the upper end of the tube, and is secured by two small screws which pass into its ends through the wall of the "former."

The last step in the fitting-up is to drill the hole for the crystal detector and see that it fits comfortably therein. The correct location for this hole is one inch down from the upper edge, in a position you can get sufficiently accurately from the wiring diagram.

Do not at first fit the detector, however, because it would be in your way while winding the coil. Just see that it fits properly, and then put it by for attachment later on.

Now the winding of the coil. This is a very easy job, so don't be alarmed by the idea. You want a little No. 24 gauge double cotton covered wire, and a 2-oz. reel will be ample.

Winding the Coil.

First prick two small holes in the tube about $\frac{1}{4}$ in. from the lower edge, and about $\frac{1}{4}$ in. apart. They should be located immediately beneath the "E" terminal, which, of course, is on the upper edge of the tube.

Now take the wire and push the end in through one hole and back out through the other one. Then push it in through hole number one again and leave it sticking out inside to a length of about 3 in.

You are now ready to begin winding, and this you do in a single close layer, i.e. with the turns touching and close side by side. Even if you have never wound a coil

before you will find it quite easy with so thick a gauge of wire.

When you have put on 10 turns you have to make the first tapping, and this is very simple, too. Stab a hole in the tube under the 10th turn with a bradawl or other pointed tool, make a loop in the wire and push it in through the hole.

Draw the loop up inside the tube and clamp it under the back nut of terminal A_1 , scraping off the cotton before doing so, in order that a proper connection may be obtained. Before clamping, too, pull the loop up tight so as to hold the 10th turn firmly.

Now carry on winding for another five turns, and make another tapping exactly as before, taking the loop to terminal A_2 this time. Proceed again for another five turns, and tap again, to terminal A_3 .

This is the last tapping, and when that is done you have just to wind on a further 20 turns without taps and the coil is done. Secure the finishing end just as you did the beginning, leaving 3 in. of wire sticking through inside the tube.

As a check, here are the actual turn numbers of the various points on the coil. First tap at 10 turns, second at 15, third at 20, total number of turns 40.

Quick and Easy Wiring.

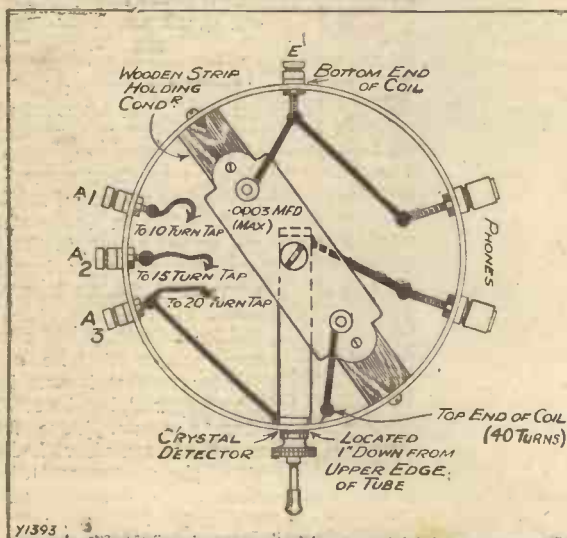
Now fit the crystal detector in place, and you are ready for the wiring process. This will only take you a few minutes, and the wiring diagram makes it all pretty clear.

It may be helpful to have the work described in words as well, however, so here you are. First join the beginning (lower end) of the coil to the E terminal, then wire this terminal also to one 'phone terminal and one side of the condenser.

Join the upper end of the coil to the remaining side of the condenser, then wire one side of the crystal detector to the remaining 'phone terminal. This connection is not too easy to get at, but you will be able to manage it if you turn the set upside down.

Finally, connect the remaining side of the crystal detector to the A_3 terminal and the job is done. That didn't take you long, did it?

ALL ON THE FORMER



The coil former carries the components as well as the special tapped coil winding.

Now we really ought to give you some "operating instructions," but the set is so simple there is really mighty little to say. Just hitch up the 'phones and the earth lead, put the aerial on A_2 , and tune on the condenser. Having got your signals, try re-adjusting the crystal; draw the knob outwards, give it a quarter of a turn and let it go back gently, and repeat if necessary. Always draw the knob out before rotating it.

Now try the aerial on A_1 and A_3 in turn, re-tuning each time, and so find which gives the best results. That's really all, and it just remains to enjoy the fine reception you are bound to get so long as you have anything like a decent aerial.

POWER DETECTORS.

JUST recently quite a lot has been heard about power detection, and a certain mystery seems to surround what is often considered an entirely new method of rectifying H.F. Actually there is nothing particularly unique about the scheme.

Strictly speaking, any detector valve which will handle a very large radio-frequency input, and is capable of giving a considerable power output, is a power detector. The valve may work on either of the two common forms of rectification—namely, leaky-grid condenser or anode bend.

In order to get a high magnification in a power detector, and also to obtain a large grid-volts base, a high value of H.T. is employed. It is also usual to employ a low impedance valve so as to be sure that a large grid-swing can be handled without distortion.

What it Means.

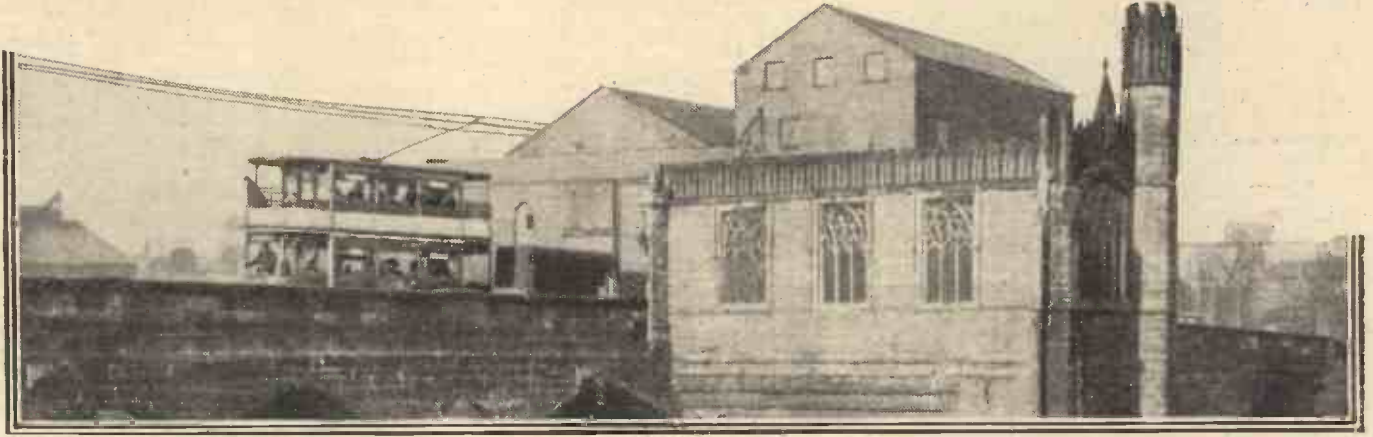
It is sometimes assumed that it is from the latter fact that the name of "power detection" is obtained. In reality the term originated in an altogether different way.

This type of detection was first used in loud-speaker sets with only one L.F. stage, and because there was only one audio amplifier (the output power valve) it was necessary for the detector valve to have a large output. Otherwise the power valve would not have been properly loaded up.

The expression "power detection" was thus applied to a detector valve with sufficient output to load up the power valve.

Power detection is most useful when powerful H.F. stages are used and great volume is desired. Particularly does this apply where local station working is concerned. One of its chief drawbacks is a difficulty of obtaining a smooth reaction control with it.

PARASITES of the ETHER



THE reach of a modern multi-valve set, using screened-grid amplification, is now limited solely by the electrical "unrest" of the atmosphere. The wider the range, the greater becomes the intake of atmospherics, until the general level of "noise" drowns out the more distant signals.

Luckily such disturbances are not so prevalent here as in the tropics, where a continual succession of crashes, bangs, and rattles often renders ordinary reception quite impossible for hours at a time. In any locality, however, atmospherics are usually more troublesome on the long waves than on the short. They prefer the summer time to winter, and are subject to peculiar variations at sunrise and sunset.

How the Name "X's" Arose

Here is how Dr. Eccles describes a typical experience:

"Starting to listen about half an hour before sunrise, the strays are loud and numerous—much as they have been all night. About fifteen minutes before sunrise they get weaker and fewer, rather suddenly, until a lull sets in, which lasts for perhaps a minute. They reappear in force, and within ten minutes they have settled down to a steady roar. Usually the day disturbances are fewer and weaker at night, except on rare occasions."

In the early days of wireless, when signals were recorded on a Morse inker actuated by a coherer, atmospherics were responsible for irregular and quite unintelligible markings on the tape, which, because of their mysterious and unknown origin, were called X's. Subsequently they were variously known as "static," "strays," and "sturbs," whilst other and much less polite names have been applied to them from time to time by harassed wireless operators struggling to keep touch with some distant signals through the prevailing din.

Clicks and Grinders

On a somewhat more systematic basis they can be classified as grinders, clicks, and hisses. "Clicks" are due to definite atmospheric discharges, more or less distant; whilst "hisses" are caused by an intermittent flow of current through the aerial, when it taps a point of high atmospheric potential. The term "grinders" covers all the other miscellaneous noises.

Ever since the birth of radio investigators have been trying to discover the secret of atmospherics, and the extraneous noises which often interrupt reception. "Man-made" static, too, has come in for a great deal of attention, and the results of recent researches are given in this interesting article

By J. C. JEVONS.

To understand the origin of atmospheric disturbances one must regard the earth as being surrounded by a sea of so-called "static" electricity. If it were really "static" in the sense of being "quiescent," all would be well. Actually, there are continual dynamic discharges taking place in the atmosphere, and these cause all the trouble.

NATURE'S BIG NOISES



Crash! Crash! Radio reception is drowned as the great lightning flashes send out their unwelcome broadcasts. This photo shows two of Nature's "big guns" in action.

The potential gradient in the sea of static, moving upwards from ground level, is approximately 100 volts per metre. This, of course, implies a corresponding charge of electricity on the surface of the earth. Interchanges take place between the earth charge and the surrounding sea of "static" whenever any change occurs in the prevailing meteorological conditions.

The Effect of Snow

During fine weather there is usually a downward positive current, tending to neutralise a positive charge on the surface of the earth, whilst during bad weather, currents may flow in both directions.

When rain moisture, for instance, is first precipitated in tiny drops, the latter acquire the potential of the atmosphere at that particular spot. As they form into a cloud the tiny drops coalesce into slightly larger drops, and the capacity of each diminishes. However, since the original charge is retained, the potential increases, and is communicated to the cloud, which, in this way, accumulates an excessive charge.

Similarly, a fall of snow will cause a redistribution of atmospheric electricity. Or a current of warm or cold air may have the same effect. Sometimes the resultant potential differences between the surface of the earth and a charged cloud (or between one cloud and another) becomes so intense that the voltage breaks down the insulation, and a lightning discharge takes place.

Nature's High Power

Broadly speaking, however, every factor which tends to upset the static equilibrium is quickly followed by corresponding electrical movements tending to restore equilibrium. All such movements are liable to affect a sensitive wireless receiver and create "noise" in the set.

It has been calculated that an average flash of lightning, two kilometres long, discharges a current of 20 coulombs in about the one five-hundredth part of a second—representing an average current of 10,000 amps. By comparison a modern high-powered transmitter will feed, say, 500 amps. into an aerial 800 ft. long, and has an effective range of some 20,000 miles or more.

The lightning flash, whilst it lasts, is 200 times more powerful than the transmitter, so that there is little wonder that

(Continued on page 352.)

THE WORLD'S BIGGEST BROADCASTER.

An Account of a Visit to Europe's Super-Station.

By P. R. BIRD.

SOMEWHERE on the high seas, pitching and tossing and rolling, is the most powerful broadcasting station in the world. It is going to Poland!

It does not look much like a broadcasting station at the moment, for all the outward and visible signs of it are about three hundred cases, snugly stowed away in a hold of a cargo steamer. But on that ship are half a dozen wireless engineers, going out with the gear, and as soon as they arrive with those boxes in Warsaw things are going to hum!

"Poland's Super Poles."

For Poland is to possess the premier broadcasting station in the world. No longer will the Poles have to strain their ears to pick up programmes from the weak little Warsaw station, or stretch their ears to get crackles from Cracow. And no longer will the powerful Russian station across the border fling out their propaganda programmes and jam the local items.

Twelve miles from Warsaw, on a little plateau near the town of Rasin, stand the two highest broadcasting masts in the world. They tower up to the sky for 600 ft.—Poland's Super Poles. Beneath them lie the station buildings waiting for the consignment of crates and cases which contain the new station, made in England at the Chelmsford Works of the Marconi Company.

This new super-station is to be ready by Christmas, and will work on 1,411 metres. Some idea of the station's importance can be gained from the fact that whereas Daventry 5 X X—our own high-power station—radiates 35 kw. in the aerial, the new Warsaw station is to have an aerial power of 160 kw.

The only other broadcasting station in the world planned to provide power anywhere near this figure was at Bound Brook, New Jersey, but the Americans admit that this station is a failure. Poland, however, is going to be a success.

Before it was packed up for the voyage I ran down to Chelmsford to see the station undergo its final tests. It was an impressive sight.

An Electrical Triumph.

As we passed through the works where this triumph of British engineering ingenuity was born I caught glimpses of aeri-als of every conceivable sort, leading from all sorts of inconceivable places, and heard the subdued hum emanating from 5 S W, the British Empire short-wave station, which is situated there.

And then I entered a long, low building where a man was leaning up against a huge valve, and looking reflectively at half a dozen huge cabinets lined along the room.

Those cabinets, linked by mysterious-looking wires, were the world's most powerful broadcasting station, on test. And

the pleasant-voiced, keen-eyed man looking at them was Mr. W. T. Ditcham, the engineer who designed them.

I asked him to tell me about the station, and here came another surprise, for he made this modern marvel seem the simplest thing in the world. He turned to each cabinet in turn, opened the doors and showed me what it contained, and told how it worked with such delightful diffidence that it was only as the facts began to soak in that one realised one was seeing

first in the modulation amplifier, next in the intermediate amplifier, and then by the final power stages.

Superficially the station is very similar to Brookmans Park, but the phenomenal power calls for many special safeguards.

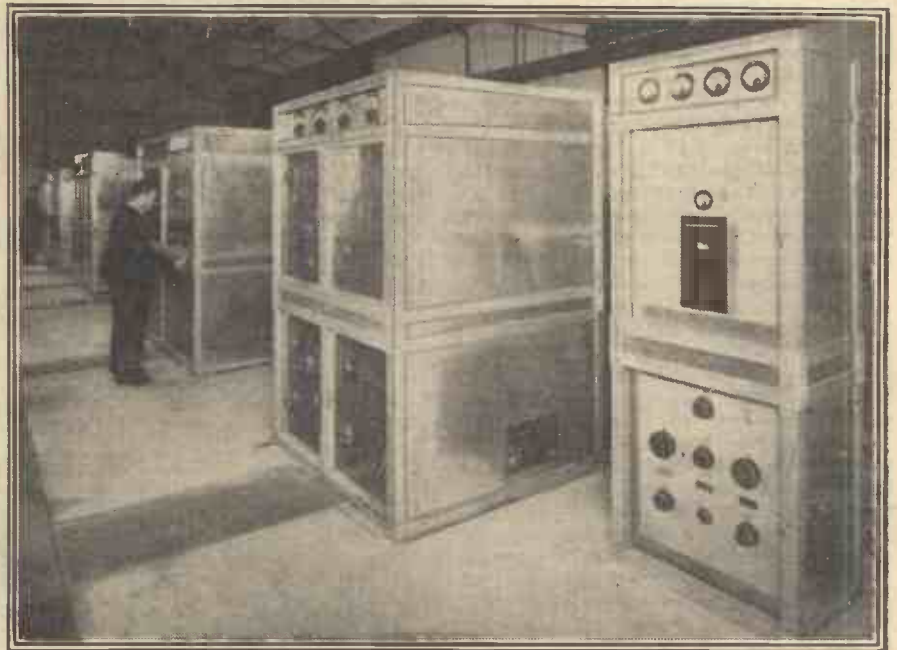
There was, for instance, the "bobber." It was a queer little contrivance bobbing about in a thick glass tube with water pouring past it. And it transpired that it was a sort of sentry, to show that the water cooling the valves was circulating through its pipes properly.

Water-Cooled Filaments.

Just beside it was another gorgeous little gadget which tested the temperature of the water, and if this should get too hot through any fault it pressed a buzzer and lit a lamp to show the engineers what was wrong!

For several years it has been the practice where high power was employed to cool the anodes of the valves. But Poland's new station has the distinction of having the first *water-cooled filaments!*

NOT MUCH TO LOOK AT—BUT FULL OF PEP



Poland's new station is to employ the enormous power of 160 kw.—nearly five times as much as 5 X X! It should be picked up very easily in this country, and is due to start on Christmas Day.

a triumph of engineering. There has been nothing like this station before!

In the photograph on this page you will see the six cabinets, plain, and unostentatious, but packed with problems that have been surmounted. The first one is the master oscillator, with a huge tuning coil and an oh-so-silky condenser, contained in a chamber that is thermostat-controlled so that variations in temperature will not throw out the tuning.

Controlling Wave-length.

There are three ways of controlling the wave-length and keeping it steady, a valve being at present in use, with provision for a tuning fork if required. Or a quartz crystal can be clipped in any moment if desired.

The aluminium cases completely screen one stage from another to prevent inter-action, and so the programme is stepped-up,

Six of these valves were running in the amplifier, two more acting as stand-by in case of accidents. And each valve is worth £500.

By the time I had seen the power house, rectifying valves, etc., I thought that the marvels were finished, but the queerest of all was to come. The engineer led us to the large open-air tank where the specially softened water that is pumped round to cool the valves is stored.

Picking up a cigarette tin he started to thump the stone sides of the tank with a rhythmic tattoo, gazing earnestly at the water, and within two minutes I saw—why—Goldfish!

Goldfish! Dozens of them, and not little ones, but huge fellows as red as post office pillar boxes, all answering the call to dinner. It appears that this specially softened water, warmed by the valves and continually circulating, is a perfect paradise for gold-fish!

RADIO IN PICTURES

By "PENTODE."

In his second article of a novel and fascinating series our popular contributor describes a simple valve circuit, and shows you how to correlate the theoretical diagram with a practical "hook-up."

(2) A VALVE DETECTOR CIRCUIT.



THE slight discrepancy between the theoretical diagram and its pictorial drawing, to which I referred last week, is to be found in the L.T. battery. Theoretically, it is represented as two cells, but in the picture there is only one.

I introduced this minor error for a very definite reason. The low-tension battery's symbol on a theoretical diagram varies between one and three cells, and it is just one of those things which you must not read too literally.

If a circuit has only the one short stroke and the one long stroke in its L.T. symbol, it does not necessarily mean that that circuit will work only with valves of the 2-volt variety.

On the other hand, a three-cell L.T. symbol does not confine the application of the circuit to valves of the 6-volt class. I am taking it for granted that you know that each accumulator cell gives you 2 volts, and that when they are joined in series (that is, with the one negative terminal of one cell joined to the positive terminal of another and the negative of the second to the positive of the third), the result is the sum of the individual voltages.

Our first picture this week shows the addition of a pair of telephone receivers and an H.T. battery to our valve. "H.T." means high tension, or high voltage, and an H.T. battery is composed of a comparatively large number of cells joined in series.

Inside the Valve.

Its theoretical symbol shows two cells joined by a dotted line, and this stands for an indeterminate number of cells.

If you look at the theoretical part of our first picture you will see that we now have two complete circuits. First of all, there is the filament circuit comprising the L.T. battery and the filament of the valve.

Next we have the plate circuit or anode circuit. The plate or anode of the valve is connected to the one terminal of the pair of telephone receivers, the second terminal of these is joined to the positive of an H.T. battery, and the negative of this is joined to the filament.

Apparently, there is a break in this circuit between the plate of the valve and the filament, but this is not really a break when the L.T. battery is switched on, and is making the filament hot. The result of such is that a stream of electrons, which are particles of electricity, are thrown off the filament and pass from this to the anode in a steady stream.

These electrons form a connecting bridge and so current can flow from the H.T. battery through the valve to the plate and telephone receivers.

The amount of current that flows in the circuit will principally depend upon two things. The first is the voltage or electrical pressure developed by the H.T. battery; and the second, the size of the electron stream or bridge connecting the filament and plate of the valve internally.

What the Grid Does.

H.F. and detector types of valves have smaller "electric emissions" than the power or super-power valves that figure in the L.F. stages. But that is quite by the way, and it is hardly probable that you are yet able to see the significance of that.

You will notice that the anode of the valve, which is represented by a thick horizontal stroke, is separated from the filament by a dotted line. This is the symbol for the grid.

The filament is merely a short length of wire made of special metal so that electrons can be emitted at a low temperature, and the grid is a kind of metal mesh that surrounds it. Enveloping the whole is the metal anode

or plate. Thus you can see that all the electrons passing from the plate must get through the grid.

If we put electrical charges on the grid of the valve it will interfere with the passage of electrons passing from the filament to the plate. That is tantamount to altering the current flow in the anode or plate circuit.

It is obvious, then, that we have an arrangement suitable for coupling to the aerial tuning described in the first part of the last article. We can lead the energy from this to the valve grid. But if we couple the tuning circuit direct to the valve circuit shown in the first picture this week, the result will be merely to alter the current flowing from the H.T. battery at a frequency corresponding with the high frequency of the energy of the tuning circuit.

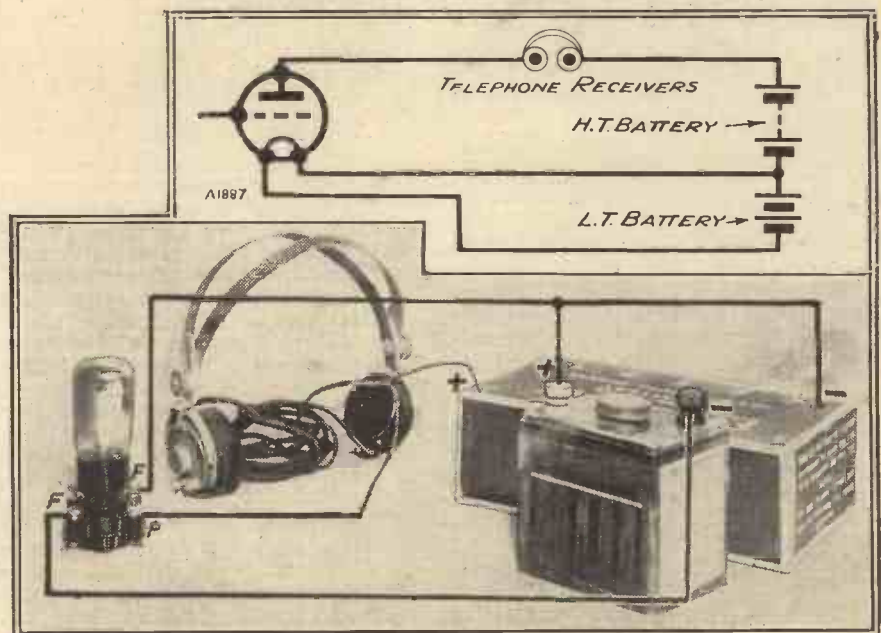
"Disentangling" L.F.

The telephone receivers would fail to respond, but we can entirely change the conditions by interposing two little items—a grid condenser and a grid leak, and these are shown in the second illustration.

These two components render it impossible for the charges on the grid to retain all their H.F. properties. The low-frequency form, corresponding with the vibrations of

(Continued on next page.)

AND NOW FOR THE H.T.



In this illustration two complete circuits are shown. There is the L.T. circuit comprising the accumulator and the filament of the valve. And the anode, or (as it is sometimes called) "plate," circuit, embodying the H.T. battery and telephone receivers.

RADIO IN PICTURES.

(Continued from previous page.)

the speech and music built into the high-frequency current at the broadcasting station, affect the grid, and so the H.T. current varies in such a way that the telephone receivers emit sounds.

The grid condenser is a small fixed condenser (that is to say, unlike the variable, you are unable to alter its capacity), having a value of about .0003 mfd. The grid leak is merely a very high resistance. Two megohms is the usual value for this, a megohm being one million ohms.

The Detector's Duty.

Usually, the grid leak is constructed of a special composition material. It should be noted that to get the best results it is necessary carefully to team up the values of the grid condenser and the grid leak. With a given grid condenser it is not advisable to vary the value of the grid leak to any great extent.

For the benefit of those readers who have a trifle of radio knowledge I am going to

filament are alternatively made positive and negative in relation to each other as the H.F. energy oscillates in the tuning circuit. Meanwhile, there is a very small current flow from the grid of the valve through the grid leak to the filament. This is due to a diversion of the filament-anode electron stream.

The grid current will vary as with the variation of the grid potential. But the variation will not be equal. There is, as we say, a "bend in the grid current curve." Above a certain value of grid voltage of a negative character the grid current rises more rapidly.

The conditions in a normal valve detector circuit are such that the grid current value is situated somewhere near that point of bending when the grid is neutral. Thus you see that the one half-cycle of the H.F. energy will cause a greater increase in the grid current than the other half-cycle will cause a decrease. When the H.F. current is flowing in the one direction the grid current is affected more than when it is flowing in the other direction.

So you have much the same sort of thing as happens when you interpose a detector in a path offered to H.F. energy. With the grid current rising further than its fall

suit, and so the telephone receivers get the low-frequency impulses necessary for their operation.

Nevertheless, there is an H.F. element in the anode circuit because the low-frequency current, you must remember, is derived from distorted H.F. That is, H.F. that is reduced in its effectiveness during its flow in the one direction.

It is a very sticky little point to grapple with, but it is essential that you should remember that one fact—i.e. that the L.F. current impulses flowing in the anode circuit of our second illustration still carries with it a certain amount of H.F. characteristic.

It is essential that you should remember that, for the simple reason that unless you do you will be totally unable to tackle the subject of reaction next week.

I want to make it clear that I am not endeavouring to cover the whole theory of radio in this short series of articles. That would be impossible.

From Aerial to Phones.

Provided that you have the power to "line up" theoretical with practical diagrams, and you have a fair inkling as to what the various components do, you will be armed with quite sufficient knowledge to read practically any "P.W." article intelligently.

The second of this week's illustrations—as by now, I hope, you know—represents a complete one-valve receiver. You have a tuning circuit, consisting of the coil and condenser, that in conjunction with the aerial enables you to select the one station you wish to receive.

Tuned to the wave-length of this station an H.F. energy is developed. This, in the form of a very small current, oscillates backwards and forwards at the rate of something in the neighbourhood of a million times per second.

The tuning circuit is directly connected to the valve, and the energy in it influences the grid of the valve, and this in its turn varies the high-tension current—the current that flows from the H.T. battery through the telephone receivers.

Those Low Frequencies.

Inasmuch as the valve, with the aid of the grid leak and condenser, makes that part of the H.F. current that flows in the one direction more effective than the other, you get a low-frequency effect in its anode circuit. For that reason a valve used in this way is known as a detector valve.

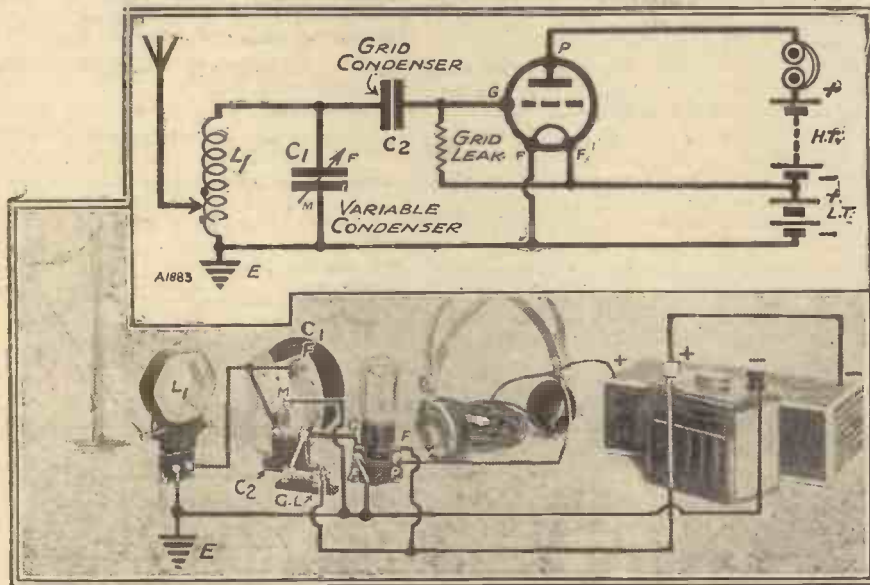
Now just a few words about "low frequency," in case you are not quite clear about it. A low-frequency current is one that varies in its strength, or in the direction of its flow, at a frequency of anything up to 10,000 or 15,000 times a second, as against a million or so of H.F. current.

Speech and music are air vibrations. The frequency of a musical note decides its pitch. Thus a vibration of 256 per second will give you the note of middle C on the piano.

If there were a current in the anode circuit of our detector valve varying in strength 256 times a second, the result would be that the diaphragm of the telephone receivers would also move at this frequency.

They would set up an air wave of 256 vibrations per second and thus reconstitute a musical note.

A COMPLETE VALVE RECEIVER.



The tuning system is now coupled to the valve, which, with the assistance of the grid-leak and condenser, can operate the telephone receivers.

briefly summarise the action of the grid leak and condenser. Many constructors, even those who are able successfully to build complicated multi-valve receivers, never trouble to go deeply into the theoretical side of radio; and to understand such things fairly well I do not think it is essential that they should.

Nevertheless, inasmuch as the operation of the grid condenser and grid leak are particularly interesting, and many correspondents have written to me asking for an explanation of it, I am going to divert a little for that purpose.

Those who wish only to line up theoretical with practical radio need have no compunction at all in skipping the next few paragraphs.

The grid condenser forms no bar to the high-frequency energy, so that the grid and

from a certain point, you alter its average value, and as the H.F. energy itself is altering in value at a low frequency, it is obvious that the grid current will do this also, although, mark you, the grid current is flowing only in the one direction.

With the grid current altering its value, the outcome is that the potential of the grid itself, in relation to the filament, varies similarly and with a low frequency.

In the Anode Circuit.

You see, Ohm's Law says that voltage equals resistance multiplied by current. The resistance of the grid leak is a fixed value, but as the current that flows through it varies, so the voltage across its terminals also varies.

With the grid-filament potential varying at low frequency the H.T. current follows

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The Lissen Battery lasts longer because it has the greatest "Current per cell" content. The big and powerful cells will go on pouring out their energy for you month after month. And all the time the current is pure—silent in its flow, without ripple, without hum. You will notice that the Lissen Battery keeps loud-speaker utterance natural and true.

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One test plug only given to each competitor, and the decision of the Company is final and binding.

COMPETITION CLOSSES SATURDAY,
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There are many other useful tests which enable you to get the best out of your set
CAN YOU DISCOVER ONE?
Then enter this interesting Competition

The introduction of the wonderful little instrument known as the WATES POLYSCOPE has increased the usefulness of the famous original WATES 3-in-1 Meter enormously. Now, it is a simple matter to make many essential tests on valves, to read all voltages of batteries, to test resistances, shorts, and in fact every Radio test you can desire.

Below is our recognised list of tests you can make. Buy your WATES Meter and Polyscope to-day, and see if you can use them for any other useful tests, and win one of the WATES Test Plugs—Free! Now is your chance to learn how useful the WATES Testing Instruments can be and obtain a free gift of great utility for getting the best out of your set.

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THESE ARE THE 50 RECOGNISED TESTS

- | | | | |
|--|---|--|---|
| 1. Measuring Resistance between 50 and 2,000 ohms. | sockets and terminals, and for short-circuit between sockets. | 23. Metal Panel Leakage. | 37. Broken Leads in Telephones, Battery Leads, etc., etc. |
| 2. Internal Short-Circuit in Valves. | 11. Centre Tapped Coils. | 24. Remote Control. | 38. Lightning Arresters. |
| 3. Insulation of Condensers. | 12. Continuity of Winding on H.F. Chokes. | 25. Plugs. | 39. Moving Coil Loud Speakers. |
| 4. Plug-in Coils, 2-Pin. | 13. General Wiring of Set. | 26. Testing Other Meters. | 40. Wave Traps. |
| 5. Short-Circuit in Variable Condensers. | 14. X Coils and DX Coils. | 27. Earth Leakages. | 41. Potentiometers. |
| 6. Continuity of Coils of Wire or Set Wiring. | 15. Switches. | 28. Jacks. | 42. R.C.C. Stages. |
| 7. Six-Pin Plug-in Coils. | 16. As a Linesman's Detector. | 29. Armature Windings. | 43. Grid Leak Holders and Grid Leads. |
| 8. Testing for Short-Circuit. | 17. Aerial Coils. | 30. As Accessory to Wheatstone's Bridge. | 44. Testing Radio Telephones. |
| 9. Testing High Resistance Break in Flexible Leads. | 18. Microphones. | 31. Short-Circuit in Fixed Condensers. | 45. Testing Morse Buzzers. |
| 10. Testing Set Components of all kinds, such as Valve Holders, for connection between | 19. Rotary Converter Windings. | 32. Loud Speaker Bobbins. | 46. Testing Morse Tapping Keys. |
| | 20. Induction Coils. | 33. Rheostats. | 47. Spark Coils. |
| | 21. Field Windings. | 34. Transformer Primaries. | 48. Morse Inkers. |
| | 22. Aerial Leakage. | 35. Volume Controls. | 49. Lamp Fuse Bulbs. |
| | | 36. Fuses. | 50. Testing Radio Telephone Wiring. |



Details of a simply-made little unit which enables you to centralise the control of your loud-speaker extensions.
By G. P. KENDALL, B.Sc.

SOME day, no doubt, we shall all have our houses wired for radio purposes, just as we now have them wired for electric light, electric bells, and so on. What a convenience it will be!

In those happy times we shall presumably have some kind of distributing arrangement beside the set, and from this concealed leads will run off about the house, terminat-

set will be switched through to whichever room the music is wanted in at the moment.

A scheme like this is not such a dream, after all. There is no real reason why you should not fix up something almost as convenient for yourself if you will spend a little time over it.

Running the Leads.

With the aid of a supply of twin bell wire, which is not expensive stuff, and some insulated staples, it is not really difficult to run the necessary extension leads about the house, carrying them round skirting boards and under carpet and so on. When you come to count up you will probably find that only two or three extension points will serve your purpose.

Given the necessary system of extension lines, you then come to the question of some kind of distributor. This is a most essential accessory if your extension system is to work conveniently, and it is a gadget of this sort that we are about to describe.

Quite Simple.

To make the "Distributor" you want, first of all, a piece of ebonite measuring about 4½ in. by 7 in. and upon this you have to mount twelve terminals, four small sockets, and an ordinary L.T. on-off switch. We are describing the distributor in the form of a little panel, because actually its mounting up and fixing in some convenient position will depend very much upon circumstances.

The under-panel wiring you will be able to follow quite easily from the diagram on this page, but we should draw your attention particularly to the fact that from one of the terminals marked "input" a couple of flex leads are taken off, pass up

through two separate holes in the panel and terminate in small plugs which fit the sockets we have mentioned. These plugs provide you with the necessary distribution switching scheme.

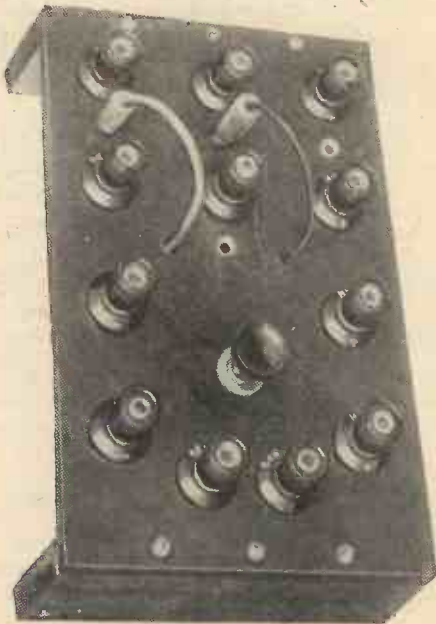
The idea of the unit is that it enables you to switch the output of your set through to any one of the pairs of loud-speaker terminals on the unit. At the same time, it also makes it possible for you to use simultaneously the loud speaker beside the set for tuning purposes, and so on.

EVERYTHING YOU NEED.

- 1 piece of ebonite about 4½ in. × 7 in.
- 12 terminals (Igranic, or Belling & Lee, Eelex, etc.).
- 4 small sockets and two plugs (Eelex, or similar type).
- 1 L.T. switch (Lissen, or Lotus, Igranic, Benjamin, Bulgin, etc.).
- A little wire, two pieces of flex and some small screws, etc.

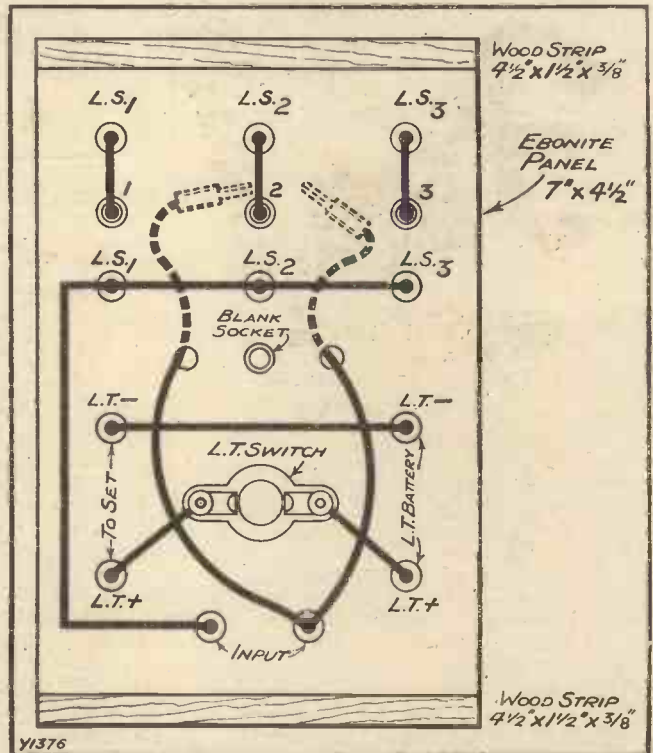
ing in loud-speaker connection points in all the rooms where we are likely to want to listen. Then, by just operating some sort of plug-and-socket device, the output of the

PRIVATE RELAY EXCHANGE



A close-up of the control board which enables you to relay a programme to any room desired.

A USEFUL ADDITION TO YOUR SET



Here is the wiring, which, as you can see, is extremely simple. The wires which pass through the panel are of flex.

We had perhaps better go into the question of the use of the distributor next. Well, first of all, you should connect up the terminals marked "input" on the distributor to the output terminals of your set, it being understood that the set must have an output filter.

(Continued on page 350.)

LATEST BROADCASTING NEWS.

**BIRMINGHAM'S
RADIO REVEL.**

**THE VANISHED VILLAGE—
"ON THE NAIL"—FILM
STAR'S APPEAL—ARTHUR
DE GREEF—PROGRAMME
MOVEMENTS.**

THERE are thousands of listeners who regret that only one "Radio Revel" has ever been organised by the B.B.C. Many will remember the function, which took place at Olympia, when the old Broadcasting Company, in co-operation with the Faculty of Arts, raised a considerable sum on behalf of the Wireless for Hospitals Fund.

In those days—in 1925—broadcasting was not the power it is to-day, and there must be many people who would welcome an opportunity, such as a gigantic gathering at Olympia would provide, to get better acquainted with our broadcasters.

These thoughts emerge from the news that on Thursday, November 6th, the Birmingham Station is holding a big dance at Tony's Ballroom in aid of charities fostered by the Midland Radio Circle. Scores of radio artistes, as well as every member of the Birmingham staff, will be present, and the programme will be broadcast.

The main object of the evening is to raise the remaining £150 of the £1,000 required to endow another wireless cot at the Birmingham Children's Hospital. The Midland Radio Circle has already endowed one and there is every reason to believe that sufficient money for the second will be handed over before Christmas.

The Vanished Village.

There are, of course, talks *and* talks, but one which must surely be looked forward to with interest by all West Regional listeners is in the programmes for Thursday, November 6th, when Mr. George Eyre Evans is to speak on Hawton, the buried village at the mouth of the Towy.

Hawton was swallowed by a terrific tidal wave on January 20th, 1607, a wave which was so huge as also to swamp Cardiff.

In its day the village was sufficiently important to be marked on Saxton's map of 1576, but now only the foundations of the buildings are visible, and then only for a few minutes when the tide occasionally recedes sufficiently.

Mr. Eyre Evans actually stood on the site in 1912, when he carried out investigations for the Royal Commission on Ancient Monuments in Wales. His talk on November 6th will describe what he saw on that occasion.

"On the Nail."

In front of the Exchange in Corn Street, Bristol, are four curious bronze pillars bearing inscriptions and arms of their 17th century donors on which, in those days, the local merchants used to pass money and sign documents over business conducted in the street.

These pillars are claimed as the origin of the ready-money proverb, "Down on the nail," which, no doubt, accounts for the

fact that merchants never took kindly to them, and, consequently, transferred their activities to a proper building.

The story of these old pillars will be incorporated in a revue entitled "On the Nail," which is to be broadcast to West Regional listeners on Friday, November 7th.

The revue will be a sort of burlesque of Bristol life, and will also contain scenes of Neolithic, Norman and Elizabethan periods, and the present time. It has been written by Dorothy Worsley and her husband, and the cast on November 7th will include Donald Davies, Glyn Eastman, and Barry Kendall.

Film Star's Appeal.

Miss Madeleine Carroll, the famous film star, is to talk to Midland Regional listeners on Sunday, November 2nd, when she describes the work of the West Bromwich

and District Hospital, on behalf of which the Week's Good Cause Appeal is to be devoted.

Before she became as famous as she is to-day, Miss Carroll lived in the Midlands, and only a few years ago she was a student at the Birmingham University, where she took a degree and became associated with amateur dramatics.

She was "discovered" by the film producers while a member of the cast of "The Lash," which was then being presented at Brighton, and she made her film debut in 1927 in "Guns of Loos." This is quite the orthodox manner in achieving film fame, especially when it is remembered that Miss Carroll is still only twenty-three years of age.

Arthur de Greef.

Arthur de Greef, the brilliant Belgian pianist, who was a personal friend of Grieg, and is recognised as one of the finest executants of this master's works, is taking part in the Leeds Symphony concert which is to be broadcast to North Regional listeners on November 8th.

Programme Movements.

Miss Norah Baring, who has "starred" in both silent and talkie films, is taking the part of Cecily in "The Importance of Being Earnest" when it is broadcast to London Regional and National listeners on Thursday and Friday, October 30th and 31st respectively.

Holt Marvel, whose name cloaks an important official of the Information Staff of the B.B.C., has revised his high-speed revue, "Give Me New York" for its performance for National listeners on Thursday, November 13th.

LOW POWER—BUT LONG RANGE!

All continents have been worked (on C.W.) and most of Europe on telephony from this amateur-owned station, at Heathfield, Sussex. It is a low-power outfit (10 watts only), and tests on Sunday mornings (9.30 a.m.—10 a.m.) on 41.88 metres, the music being from a pick-up and amplifier.

FOR THE LISTENER.

By "PHILEMON."

A critical survey of some of the recent programmes, with frank comments on the fare provided and the way it is Served Up.

One Swallow.

DID my ears deceive me? I had tuned in for the first news a few minutes too soon. Somebody was speaking about Girls' Clubs. She ceased, and a woman's voice—I will swear it was a woman—said, "You have just heard Miss Lena King, Secretary of the National Members' Guild. The weather report and news will follow in a moment."

So the woman announcer has arrived! Or perhaps it was only a hitch. Perhaps Mr. Farrar had suddenly been called out to see a man about a dog. Or was I dreaming? It was a nice voice, a Cecil-Dixony voice. One swallow does not make a summer, but it looks as if the summer of women announcers were "i-cumen in."

She is probably learning at this very moment how to pronounce Polish and Chinese, and how to say, "I beg your

pardon," when she makes a slip. She only made her bow, and the rest of the evening the men carried on. Thank heaven, it was an English voice.

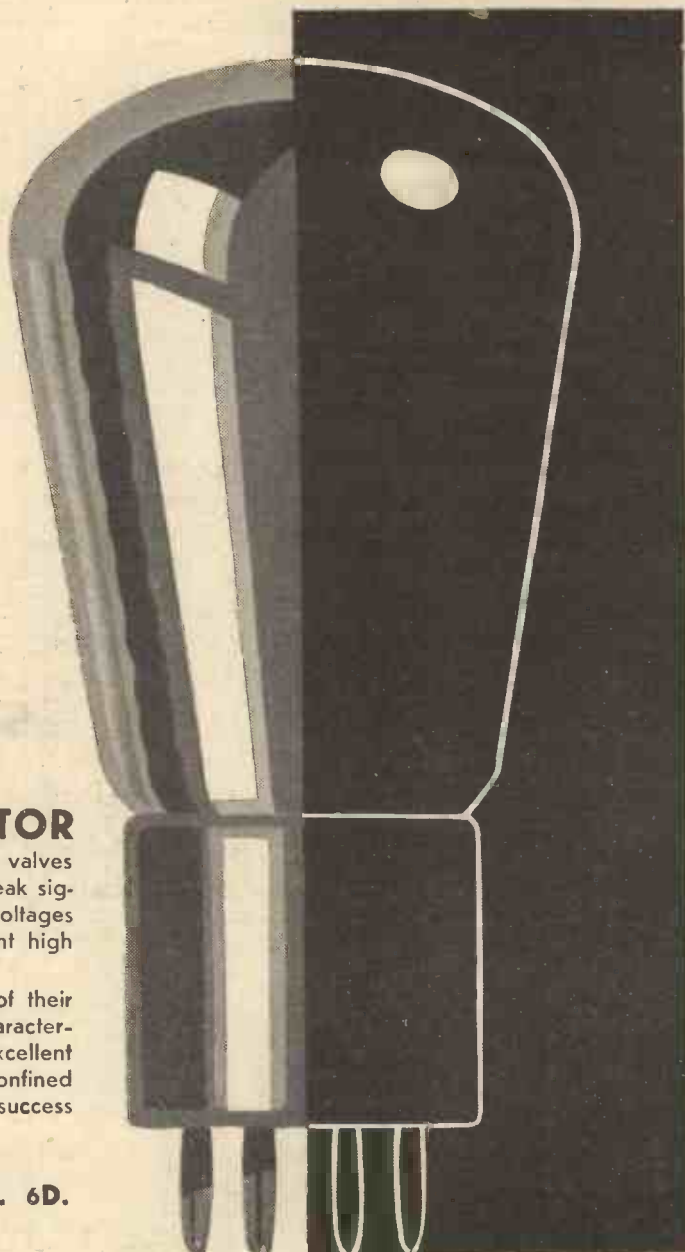
Dialling.

Telephones get more and more amusing. I often telephone at a railway station in order to play with Buttons A and B.

Before I put my pennies in, I always press Button B. I got twopence once. And now Mr. Pink has been telling us how to use the Dial.

He didn't tell us what to do when the finger gets stuck in one of the holes. Once I nearly pulled the face off the dial, getting my finger out of chancery. My only objection to dialling is that there is nobody at the other end to "tell off" when I get the wrong number.

(Continued on page 352)



A SUPER-SENSITIVE DETECTOR

Modern broadcasting conditions demand modern detector valves —valves capable of giving the maximum strength from weak signals yet able to handle without distortion the larger signal voltages obtained in receivers embodying one or more efficient high frequency stages.

The Mullard P.M. series of sensitive detectors, by virtue of their high amplification factors and other efficient electrical characteristics, amply fulfil these requirements and make excellent transformer-coupled detectors. Their use is, however, not confined to the detector stage, for they may also be employed with success as transformer-coupled low frequency amplifiers.

The correct valves to use are:—

2-volt: **P.M. 2DX**; 4-volt: **P.M. 4DX**; 6-volt: **P.M. 6D**.

P.M. 2DX CHARACTERISTICS.

Max. Filament Voltage	2.0 volts	*Anode Impedance	10,700 ohms
Filament Current	0.2 amp.	*Amplification Factor	13.5
Max. Anode Voltage	150 volts	*Mutual Conductance	1.25 mA/v.

*At Anode volts 100; Grid volts zero.

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A
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on any
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*Player's
Please*

*It's the
Tobacco that Counts*

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A NEW H.F. CHOKE
OF UNIQUE DESIGN



An example of British General excellence in design and construction at its very best—a choke of high inductance and low resistance resulting in a performance curve which is almost perfect. Well and sturdily built to give long and satisfactory life.

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REPRODUCERS
which work without
extra power



Just connect this new R.K. to your set and it will give you reproduction of the tone and quality which have made R.K. models famous ever since their introduction.

If you live in a district where there is no electric supply, the R.K. Permanent Magnet model is the finest Loud Speaker you can buy.

There are two other R.K. Reproducers, both obtainable complete in handsome cabinets of polished oak, mahogany or walnut; the Senior with built-in rectifier for use with A.C. mains from £20, and the Standard Senior from £16 16s., as well as the Junior Model, without cabinet, £4 15s., all of which are obtainable through your radio dealer.

PRICE
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Speech
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Ask your dealer for particulars
of hire purchase terms.



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CAPT. ECKERSLEY'S QUERY CORNER

**CHARGING H.T. ACCUMULATORS—
THREE TRANSFORMERS — DISTOR-
TION CAUSED BY A NEIGHBOUR—
WHEN REGIONAL AND NATIONAL MIX.**

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

Charging H.T. Accumulators.

J. F. (Ilford).—"I have a battery of H.T. accumulators giving a total voltage of 200. These I charge from my D.C. lighting mains, the charging rate being accurately adjusted to that recommended by the makers by means of a variable resistance and a milliammeter.

"I find, however, that in order to maintain the charging rate at the initial figure it is necessary constantly to readjust the amount of resistance in circuit until finally no further adjustment is possible and, apparently, current ceases to flow. This occurs before there are positive indications of the charge being completed, and I am wondering if I am undercharging the battery.

"The voltage of my mains is 230."

When a battery is being charged the back E.M.F. rises. Thus a run-down battery staggers to give 1.8 volts. You start pumping in juice.

The battery voltage goes up to 2.0, 2.1, 2.2, 2.3, and small batteries even more. So you start charging your battery with 230-volt mains. Your battery gives about 180 volts because it's run-down, and you adjust your resistance so that not too much current flows between 230 volts one way and 180 volts resisting.

But the battery voltage soon rises—200, 220, 230!! And 230-volt mains against 230-volt battery "no can do"!

The simplest way out of it really is to use a 180-volt battery and scrap 10 cells. You'll get enough out of 180 volts, won't you? Or you might try paralleling.

Three Transformers.

L.S. (Chatham).—"I have on hand a 1.5 ratio transformer which I should like to use in conjunction with my two-stage transformer-coupled amplifier. I have been told by a friend that if I attempt to use three transformers, especially if one of them has a high ratio, there is every likelihood of the amplifier giving trouble.

"Can you tell me, please, whether this is so?"

I must say I do not like a "3-L.F."

receiver! You gain so little except what you don't want. There is an enormous amplification and this has to be cut down if you are to avoid jamming and if you have little relative selectivity before the detector.

Besides which you'd need to be pretty careful to get the thing stable, and when you did a good "2 L.F." might be equally sensitive.

Of course, it could be made to go. You would need strong filtering of each stage so that each stage was independent (de-coupling). You would need to screen very strongly to prevent transformers coupling.

transmitter, the beat note caused by the existence of the two frequencies—receiver and transmitter—gets lower and lower.

It can get so low as to be inaudible. But the existence of this extra frequency is enough to set up locally a distortion of the field caused by the transmitter. Hence bad quality.

And it's awfully hard to find the bloke who is causing the nuisance! The only way to spot him is to be a bit of a detective and see where the effect is worst. That's nearer to him. And write to the B.B.C.

USING A CARPENTER'S BRACE FOR DRILLING



When you come to hold the drill you often find it too small for the jaws to grip. But wind a "spiral" of wire round it as shown, and you will find it holds perfectly.

Of course, in the B.B.C. we use 3 L.F., and more, but it's a specialised job, and I advise against it.

Distortion Caused by a Neighbour.

J. B. (Erith).—"Just recently I have been troubled with a continual distortion on the London transmission, which I am of the opinion is caused by a neighbouring receiver. Can you tell me whether it would be possible for this distortion to occur without my actually hearing howls and whistles?"

Yes! If a near-by receiver is adjusted to be oscillating, but in what is called "the silent point," you can get nasty distortion.

If a receiver is made to oscillate it creates a note of heterodyne with the carrier-wave frequency of the transmitter, and the oscillations caused by the receiver are brought nearer and nearer to the frequency of the

of the two stations on one occasion should hold good always.

"I have, however, noticed that the interference (which is not very strong) is confined to those occasions when either or both the transmitters are transmitting matter originating in a distant studio, such as Manchester. Can your better knowledge of transmission conditions suggest an explanation of this and, if possible, a cure?"

I think I can definitely state that this is a B.B.C. fault. Sometimes one programme gets muddled with the other.

This does not happen at Brookmans Park; it happens in the control-room on the lines bringing the programme. The B.B.C. is fully aware of the difficulty, and is rapidly developing methods to overcome the trouble altogether.

When Regional and National Mix.

M. G. (Barking).—"My receiver is a relatively insensitive arrangement of Det. and 2 L.F. stages for local station reception. In the interests of good reproduction, I have endeavoured to avoid loss of high notes by purposely damping the aerial circuit so that tuning on either of the Brookmans Park transmissions is broad, but not sufficiently so for either station to be heard as a background to the other.

"Unfortunately, however, the arrangement is only partially successful. On some occasions—I can hear the National when tuned to the Regional, and vice versa. This is very puzzling to me, as it seems to me that a degree of selectivity which suffices for complete separation

CONCERNING CARBORUNDUM



An article of particular interest to the crystal enthusiast.
By J. F. CORRIGAN, M.Sc., A.I.C.

CARBORUNDUM is an ex-service crystal. Owing to its even sensitivity and enormous stability, it played an almost universal rôle as rectifier in the receiving sets which were used by the Army and Air Services during the Great War.

Even at the present time, when the majority of rectifying crystals have been banished from the face of the land, the carborundum crystal still possesses its little band of enthusiasts who use it either for regular crystal work on their local station, or as a stand-by detector for emergency purposes. Yet, in some respects, carborundum was never a "popular" crystal in the sense that galena and the various proprietary "-ites" were. Perhaps this fact may be attributed to the very prevalent belief that a carborundum crystal will only function when a local voltage is applied. True it is that a carborundum detector is at its best by far when it is given a local

potential of some 0.7 volt, but if you happen to live within a mile or two of a broadcasting station you will find that a good piece of carborundum crystal in firm contact with a flat piece of steel will give quite effective rectification without any applied potential at all.

Neat Detector Units.

The early carborundum detectors were rather massive and cumbrous affairs, and they were provided with adjusting screws so that the necessary steel contact of the detector could be varied in pressure.

In the modern form of carborundum detector, however, this complication is done away with. The rectifying surfaces are completely enclosed, thereby permanently rendering them entirely free from dust and atmospheric influences; and, generally, a potentiometer unit, together with a small battery for the purpose of applying a small potential across the crystal contact, are assembled on the same base or panel.

There are many curious facts about this radio-sensitive product, carborun-

dum. In the first place it is not a natural product. It consists of a chemical compound—silicon carbide—and it is produced by fusing an intimate mixture of finely-ground sand and purified coke in a high-temperature electric furnace. The current flows through the furnace for a period of eight hours, during which time the temperature of the fused mass reaches no less than 3,500 degrees Centigrade.

After the fused mass has been allowed to cool down, the sides of the furnace are removed, the carborundum dug out and afterwards treated with hot acids in order to dissolve away impurities. The resulting product consists almost entirely of pure silicon carbide, or carborundum.

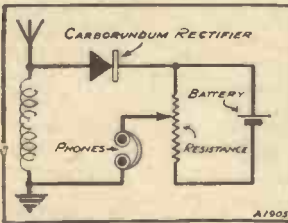
The Outer Shell.

It is found that the carborundum most sensitive for wireless use is that forming the outer shell of the crude mass after its removal from the furnace, and, curiously enough, this portion of the fused mass is the least suitable for other purposes.

Good specimens of radio-sensitive carborundum should have a needle-like crystalline structure. They should be coarse in grain, and should possess a steely-blue appearance, showing here and there iridescent patches of red and purple. Fine-grain and greyish-looking varieties of this product are almost useless for radio purposes.

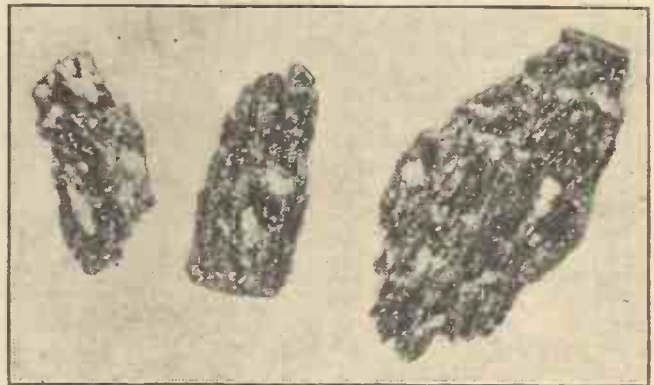
Next to the diamond, carborundum is the hardest substance known to science, and, in view of this fact, it has an enormous use in the manufacture of abrasives and grinding materials. Indeed, even in the heyday of crystal reception the quantity of the material reserved for purely wireless use was an insignificant fraction of the many thousands of tons of the product which are turned out annually.

A SUITABLE CIRCUIT



This diagram shows you how to connect a carborundum detector so that it gets its required potential.

SOME SELECTED SPECIMENS



These are radio-sensitive pieces of carborundum. Note the needle-like crystalline structure.

ALMOST endless ways of connecting terminal tags to various types of leads have been described from time to time, but I have yet to find an improvement upon the little device herewith illustrated, rough and ready though it may be.

A LEAD LEAD



How the lead tubing joins the spade terminal to the copper wire.

CONNECTING TERMINAL TAGS.

A Valuable Hint.
By L. T.

A one-inch piece of lead-covered wire is procured, and the outer lead covering is carefully removed so that a small lead tube remains. The terminal tag is then inserted in one end of this, and the end of the tube is well hammered down on to this tag. Similar treatment is applied at the other end of the tube in which the wire to be

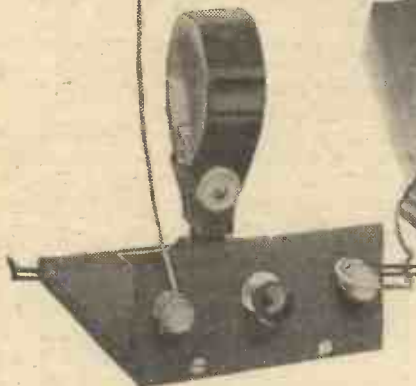
connected to the terminal tag is inserted.

A good and permanent electrical connection between wire and tag is thus effected. For aerial and earth wires and for loud-speaker connections there is nothing to beat the certainty of this method of connection.

It has just one disadvantage though. If the wire is continually moved about from place to place, the time will come when the wire will break away at the place where it is pinched by the lead tube.

Moral, therefore: only employ this type of connection for wires which are to remain permanently in some situation.

The "CONTRADYNE" JUNIOR



Here is "P.W.'s" latest and most useful discovery reduced to its simplest possible practical form. It can be used with any set, and absolutely kills that short-wave jamming on long waves that proves so troublesome with hundreds of thousands of even modern receivers.

IN our article on the standard version of the "P.W." "Contradyne" we gave you a pretty good idea of what an extraordinarily effective gadget it is. Now let us see how simply it can be made if desired. We almost hesitate to do so, because when it is finished you are pretty sure to say, "Why, there is nothing in it! What are they making all this song and dance about?" We have no misgivings really, of course, because we are sure that you will realise that this is just one more proof of how ex-

cellent a device the "Contradyne" really is. It does its job with 100 per cent efficiency, and there is so little in it that you can make this simplified version in half an hour. What more could one possibly ask?

for advantage which rather surprised us when we first observed it. There are quite sound technical reasons for this gain, but we cannot go into them at this point. As a matter of fact, the interested reader will find some notes on this subject in our article describing the standard version of the instrument.

What It Really Is.

So much for what the "P.W." "Contradyne" does. Now let us see what it is. Well, actually it is just a lump of inductance placed in series with the aerial lead and provided with a switch to short-circuit it when you desire to work on the ordinary (low-wave) band. Of course, it is not quite so simple as all that, because it requires to be a lump of inductance of approximately the right size.

This is no real difficulty, however, because it is not at all a critical matter. What it amounts to is that if the inductance is not big enough it simply does not do the job, while if it is too big it reduces your selectivity on long waves, and makes the stations spread rather, so that you may find it difficult to separate Radio-Paris from 5 X X.

The Size of Coil Required.

These limits are quite wide ones, because the size of inductance which begins to spoil the long-wave selectivity is very much

greater than the one which is just big enough to do the job, and it is very easy to find some size in between which serves the purpose properly.

In our original model of the "Contradyne" we used a home-made coil with some tappings to enable the right amount of inductance to be found, and now we want to show you how the same effect can be achieved by using a plug-in coil. A little experimenting with one or two different sizes is all that is needed to obtain satisfactory results in this case.

To make up a "Contradyne" upon these lines, all you require is a small wooden baseboard, a little strip of ebonite upon which you should mount two terminals and an ordinary on-off switch, and a coil holder. Fasten your little terminal strip to the baseboard, screw down the coil socket, and then wire up as follows.

How to Wire Up.

Join the left-hand terminal (A_1) to one side of the switch and to one side of the coil holder. Join the other terminal (A_2) to the other side of the switch and to the other side of the coil holder, and you have your "Contradyne" ready for use.

Now to try out the device. Disconnect the aerial lead from your receiver, and instead connect it to A_1 on the "Contradyne."

(Continued on next page.)

THE PARTS YOU WANT.

- 1 Baseboard, 6 in. x 4 in.
- 1 Ebonite strip, 4 in. x 2 in.
- 1 On-off switch (Lotus, or Lissen, Benjamin, Red Diamond, Wearite, Ormond, Igranie, Ready Radio, Bulgin, etc.).
- 1 Coil socket (Igranie, or Lissen, Ready Radio, Lotus, Wearite, etc.).
- 2 Terminals (Belling & Lee, or Ealex, Igranie, etc.).
- Some screws and a little wire for connections.

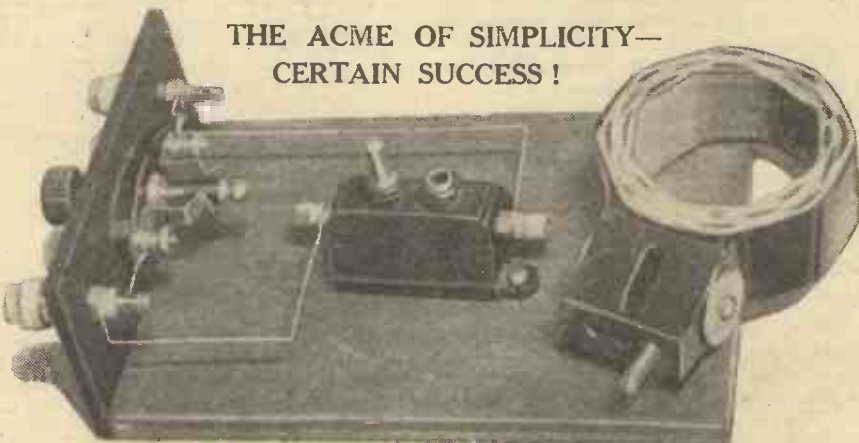
Maybe some of those who read this article will not have seen the article describing the original version of the "P.W." "Contradyne," so perhaps we had better just explain briefly what it is all about.

In a nutshell it is this: A startlingly complete and effective cure for that old problem of the local station breaking through and causing interference on the long waves. Almost every user of a fairly simple kind of set who lives pretty close to a broadcasting station must have been annoyed by this nuisance at one time or other, and will realise in a moment what a blessing the "Contradyne" is going to be to him.

Increases Strength of Reception.

This in itself is enough to make the Inductor a notable contribution to the pleasure which we all hope to get from radio in the coming season, but it does even more than this. With the great majority of sets it produces a distinct increase in the volume of the long-wave stations, a quite unlooked-

THE ACME OF SIMPLICITY— CERTAIN SUCCESS!



It is a device that uses only the parts you can see above; it can be made by anyone. And yet it is completely effective.

THE "CONTRADYNE" JUNIOR.

(Continued from previous page).

Wire A_2 on the "Contradyne" to the old aerial terminal on your set and close the switch on the "Contradyne." Now put the necessary long-wave coils in your set, or operate your wave-change switches so as to go over to long waves, and tune to some point fairly low on the dials, where the local station normally begins to break through fairly strongly.

Next put the switch on the "Contradyne" to the "off" position, so bringing the instrument into operation, and try a plug-in coil of size No. 100 in the socket. You will now probably find that the interference has been enormously reduced and it may disappear altogether. If it does, well and good, the job is done, and you can proceed to tune-in the long-wave stations with all your old trouble removed and note how their volume has gone up perceptibly.

For Very Bad Cases.

If you find that the No. 100 coil has merely reduced the interference and not satisfactorily removed it, try instead a No. 125 or No. 150, one or other of which will be pretty sure to do the trick. In very bad cases you need to use a No. 200, but this is extremely unusual. The idea, as you will probably have gathered, is to use a coil only just large enough to remove the interference effectively and not sufficiently large to cause selectivity to fall off on the actual long-wave stations themselves.

That is really the whole story, but there remain just one or two miscellaneous points we should like to mention about the general use of the "Contradyne." In the first place, you will find in the majority of cases that if your set has an optional series condenser it is better to cut this out when you are using the "Contradyne."

Fixed Condenser Not Needed.

This is not always necessary by any means, but we have found one or two cases where leaving the series aerial condenser in circuit caused undesirable effects to appear, and so we suggest that it should always be cut out. It is very rarely needed on long waves in any case, and now that you have got rid of the bogey of interference from the low-wave station you are not likely to find it necessary.

Now let us just repeat our warning about the use of the "Contradyne" with receivers of other types than those described in "P.W." In certain of these it will not work, these types being the ones in which some form of aerial coupling is employed other than the aperiodic or auto-coupled schemes used in practically every POPULAR WIRELESS set. It amounts to this, the "Contradyne" is essentially a "P.W." device to work with all "P.W." sets, but there are certain other types for which we do not recommend it.

Works Either Way Round.

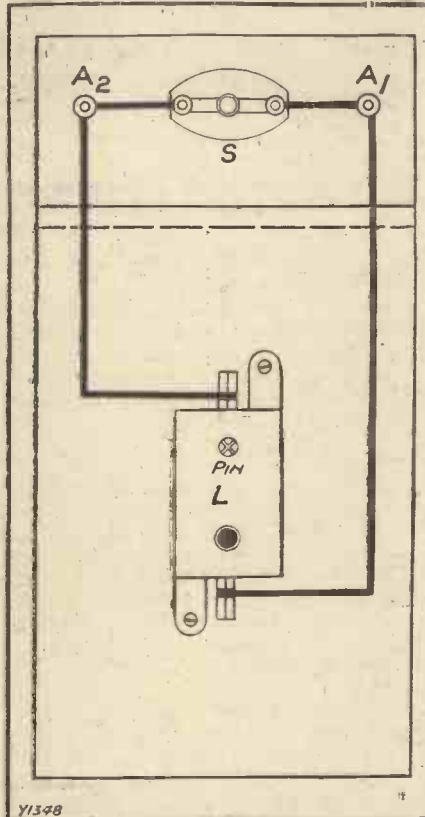
Finally, it is to be noted that it really does not matter which way round you mount the "Contradyne." If it is more convenient to join the aerial lead to terminal A^2 and to wire A^1 to the aerial terminal on the receiver, by all means do so. There is no right way round for this device, and it

works equally well with either system of connection. However you use it, do not forget to close the switch whenever you want to work on the lower wave-band.

This is important, as you will realise when you remember that the function of the "Contradyne" is to prevent low-wave stations getting through to your set.

It will naturally do this on either wave-band, so if ever you find your low-wave results have suddenly fallen right off, have a look at the "Contradyne" switch. You will probably find you have forgotten to close it.

ONLY FOUR LEADS



The wiring should occupy you for only a few minutes.

TESTING LARGE FIXED CONDENSERS.

A simple scheme using no devices additional to your set.

MOST of you have, no doubt, noticed that when a large fixed condenser of 1 or 2 mfd. is connected across an H.T. + tap and H.T. -, it is possible to remove the wander plug for this tap without the set immediately ceasing to operate.

The smaller the current being taken, the longer will the set go on working; and also the larger the condenser the greater will be the period before results fade away. This fact is, of course, due to the reservoir effect or storing capabilities of the condenser.

It forms a convenient method of testing large fixed condensers of .5 mfd. and upward. All that has to be done is to connect the condenser to be tested across an H.T. + tap and H.T. -, switch on the set, and then remove the wander plug supplying the particular tap and note if reception continues for a while.

It is, of course, advisable to choose a tap which is supplying very little current, and the detector valve terminal will generally prove very suitable.

Immediately Indicates Fault.

If the condenser has no capacity or has a high-resistance leak, results will stop practically at the same moment as the wander plug is removed. You should naturally test the condenser for a short by means of phones and a battery before testing in the above manner.

If there is already a reservoir condenser across the detector tap inside the set, it should be removed before carrying out tests. A mains unit is just as suitable as an ordinary H.T. battery.

CONDENSER CONSIDERATIONS.

Two useful little paragraphs.

When trying a circuit in which the primary of the low-frequency transformer is made to serve as an H.F. choke as well, be sure that the transformer you have in mind for this circuit is not one which has a condenser connected permanently across its primary.

Although 2 mfd. is the usual value recommended for an anti-motor-boating condenser, larger capacities are sometimes better, but are not specifically recommended on account of the extra expense.

WHEN TO CHARGE.

Don't let your accumulator run right down, or you may ruin it.

IT is not an easy matter if you do not possess a voltmeter to tell when your low-tension accumulator requires recharging. But if you are to keep it up to scratch, and so get the maximum life from it, it is very important that you do not over-discharge it.

Many people use an accumulator until it is absolutely run right down and will not even produce a feeble whisper from the set. This is the quickest way to ruin the cells of an accumulator.

When an accumulator is discharged its voltage begins to drop very quickly, so that hardly any extra running time is gained by over-discharging it. The voltage to which it is usually permissible to drop each cell is 1.8, and down to this value you will not notice any appreciable falling off in volume from the receiver.

Unmistakable Indication.

But as soon as the voltage goes below, you will find results getting weaker and weaker, and this should be your signal immediately to disconnect the L.T. accumulator and have it charged. Do not wait until results fade right away.

An even more sensitive indication that it is charging time may be obtained from the reaction control. As soon as the accumulator voltage drops even a little you will find that the reaction condenser has to be turned farther round to give the same effect as usual.



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2 ReadRad duograph slow-motion dials	13	0	
1 ReadRad differential condenser, '00015	5	0	
1 ReadRad on-off switch	10		
1 ReadRad filament rheostat	2	0	
3 Benjamin Vibrolders	4	6	
3 ReadRad single coil holders	2	6	
1 Formdensor, type G	1	6	
1 T.C.C. '01 fixed condenser	3	0	
1 ReadRad '001 fixed condenser	10		
1 ReadRad '0003 fixed condenser	10		
1 Varley H.F. choke	9	6	
1 ReadRad "Hilo" H.F. choke	4	6	
1 ReadRad 2-meg. grid leak and holder	1	4	
1 R.I. Hypermu L.F. transformer	1	10	0
1 ReadRad H.T. fuse and holder	1	3	
1 ReadRad Standard screen	2	0	
1 Drilled terminal strip, 18 x 2 ins.	2	0	
10 Engraved Belling Lee terminals	2	6	
2 Lewcos coils, No. 60X	9	6	
1 Lewcos coil, No. 50 C.T.	3	6	
2 Lewcos coils, No. 250X	13	0	
1 Lewcos coil, No. 100 C.T.	4	6	
3 Valves as specified	1	19	0
1 Set ReadRad Jiffilinx	2	6	
Screws, plugs, etc.	1	5	
TOTAL (including valves and cabinet)	£9	16	0

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- KIT C** with valves and cabinet **£9: 16: 6**
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1 Drilled ebonite panel, 12 x 8 ins.	6	0	
1 Hand-polished oak cabinet with 7-in. baseboard	19	0	
1 ReadRad '00015 differential condenser	5	0	
1 ReadRad '0005 Brookmans condenser	3	6	
1 ReadRad duograph slow-motion dial	6	6	
1 ReadRad '0005 variable condenser	4	6	
1 ReadRad on-off switch	10		
1 ReadRad "Hilo" H.F. choke	4	6	
1 ReadRad 2-meg. grid leak and holder	1	4	
3 ReadRad single coil holders	2	6	
2 Benjamin Vibrolders	3	0	
1 ReadRad '0003 fixed condenser	10		
1 Lissen Super L.F. transformer	19	0	
1 Drilled terminal strip, 12 x 2 ins.	1	6	
9 Engraved Belling Lee terminals	2	3	
1 Set ReadRad Jiffilinx	2	6	
1 Lewcos coil, No. 40	3	6	
1 Lewcos coil, No. 60	3	6	
1 Lewcos coil, No. 50	3	6	
1 Lewcos coil, No. 100	4	6	
1 Lewcos coil, No. 250	4	6	
1 Lewcos coil, No. 150	4	6	
2 Valves as specified	19	0	
Screws, flex, plugs, etc.	1	3	
TOTAL (including valves and cabinet)	£6	7	0

- KIT A** less valves and cabinet **£4: 9: 0**
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- KIT B** with valves less cabinet **£5: 8: 0**
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- KIT C** with valves and cabinet **£6: 7: 0**
or 12 equal monthly payments of 11/9

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

- KIT A** less valves and cabinet **£4: 4: 6**
or 12 equal monthly payments of 7/9
- KIT B** with valves less cabinet **£5: 12: 0**
or 12 equal monthly payments of 10/3
- KIT C** with valves and cabinet **£7: 2: 0**
or 12 equal monthly payments of 13/-

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1 Hand-polished oak cabinet with 10-in. baseboard	1	10	0
2 ReadRad 3-point on-off switches	3	0	
2 ReadRad variable condensers, '0005	9	0	
2 ReadRad duograph slow-motion dials	13	0	
1 ReadRad differential reaction condenser, '00015	5	0	
1 Wearite filament rheostat, 15 ohms	1	6	
1 ReadRad on-off switch	10		
6 ReadRad single coil holders	5	0	
4 Benjamin Vibrolders	6	0	
1 ReadRad '0002 fixed condenser	10		
1 ReadRad '0001 fixed condenser	10		
2 T.C.C. '01 fixed condensers	6	0	
1 ReadRad '001 fixed condenser	10		
1 ReadRad '0003 fixed condenser	10		
2 T.C.C. 1 mfd.	5	8	
2 ReadRad 2-meg. grid leaks and holders	2	8	
1 R.I. H.F. choke	7	6	
1 ReadRad "Hilo" H.F. choke	4	6	
1 Varley 100,000-ohm resistance and holder	7	0	
1 Ferranti A.F.3 L.F. transformer	1	5	0
1 ReadRad H.T. fuse and holder	1	3	
11 Belling Lee engraved terminals	2	9	
1 ReadRad Standard screen, 10 x 6 in.	2	0	
1 ReadRad G.B. clip	2	6	
1 Terminal strip, 21 x 2 in.	2	6	
2 Lewcos coils, No. 35	7	0	
2 Lewcos coils, No. 60	7	0	
1 Lewcos coil, No. 250X	6	6	
4 Valves as specified	2	7	6
1 Set ReadRad Jiffilinx	4	0	
Screws, flex, plugs, etc.	1	6	
TOTAL (including valves and cabinet)	£11	5	6

- KIT A** less valves and cabinet **£7: 8: 0**
or 12 equal monthly payments of 13/8
- KIT B** with valves less cabinet **£9: 15: 6**
or 12 equal monthly payments of 18/-
- KIT C** with valves and cabinet **£11: 5: 6**
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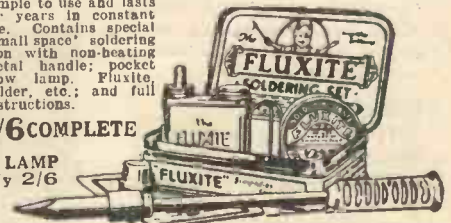
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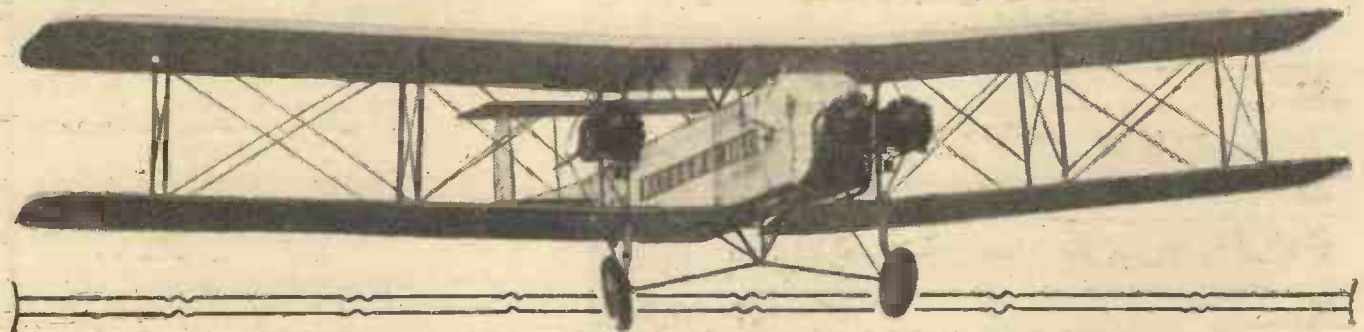
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RADIO IN THE AIR



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

ALTHOUGH comparatively few of us have occasion to travel by air, we nevertheless feel the fascination of this latest and most rapid means of transport, and there is no doubt that in the not very distant future aeroplane travel will become as popular as motor-car travel to-day.

One of the reasons why travel by air is so rapidly gaining in popularity is because the attendant risks of air travel have been, if not entirely eliminated, very much minimised, and I believe that statistics show that the safety of air travel is at any rate comparable with that of travel by train or road.

Safety First.

Perhaps the most important aid in the safety of air travel is the modern radio outfit with which the aeroplane is equipped. Indeed, just as wireless has ensured the safety of ships at sea, so it is now safeguarding planes in the air.

We have become so accustomed to the use of radio for all manner of communication that we may not perhaps realise that each application of radio communication has its own peculiar difficulties, and this is especially so in the case of radio communication between an aeroplane and the ground or between one aeroplane and another.

I have recently received a very interesting description of the radio arrangements on the famous air routes between Chicago, Oakland and San Francisco and between Seattle and Los Angeles.

The Boeing Company, which controls these services, has carried out over a number of years its own special radio experiments and has developed an aeroplane radio equipment which meets all the requirements of these particular routes.

The Pilot's Enemy.

Pilots on these routes can now carry on direct conversation with ground operators from an altitude up to 12,000 feet and at a distance of 200 miles.

Ground stations for transmission and reception have been established at every 100 miles along the routes and in this way all pilots are kept constantly informed as to weather conditions and other matters of importance.

Everyone knows that bad weather is the great enemy of the aeroplane pilot; in fact it is now almost his only serious enemy.

"Bad weather is the airman's greatest danger," says our contributor. This is where radio is rapidly becoming invaluable, for weather warnings and meteorological charts can now be sent from ground stations to aircraft many miles away, to warn them of impending danger.

The pilot's task is made much simpler, however, if he can be kept constantly informed of weather conditions ahead of him and be given precise instructions with regard to the position of the landing ground, and how he is to make his landing.

All this and much more is now possible by means of the very much simplified radio equipment available for aeroplanes.

ment was settled, a large number of experiments were carried out in order to determine the most suitable wave-length; eventually it was found that a wave-length of 90 metres was suitable for all required altitudes and also for day and night operation.

Some Special Problems.

Some of the special technical problems encountered are extremely interesting. It is found necessary, for instance, to "bond" the aeroplane completely; that is, to connect electrically together all metallic parts.

The bonding of the aeroplane is necessary not only in order to reduce interference, but also to prevent the possibility of the aeroplane catching fire, since an insulated piece of metal, if of proper size and character and in a certain position, may pick up a sufficient electrical charge to produce sparks.

The ignition of the aeroplane engine must be very carefully shielded, otherwise the interference from it will render radio communication impossible.

Shielding the Engine.

If you were to listen with a radio receiver in an aeroplane in which the motor had not been properly shielded, all you would hear would be a terrific storm of crashes, these, of course, originating at the make-and-break contacts in the distributor, from the magneto and from the actual sparks in the sparking plugs.

This type of interference is overcome by encasing all the spark leads in flexible

copper armour, and even this apparently simple operation must be carried out in such a way as not to interfere with the efficient working of the motor and of the aeroplane.

In the equipment used on the above-mentioned routes the radio apparatus is mounted behind the pilot.

WEATHER WARNINGS FOR AIRMEN



Receiving a meteorological chart on an airship from an aerodrome many miles away. This is a recent development in commercial radio service.

The equipment used in the machines, on the routes mentioned above, weighs about 100 pounds and is practically automatic in operation; it requires no adjustment on the part of the pilot, whose full attention therefore may be given to the flying of the machine.

Before the final form of the radio equip-

SHORT-WAVE NOTES.

By W. L. S.

New Experiences with "Threshold Howl"—Periodic Oscillation—S.G.'s on Short Waves.

THERE seems to have been an epidemic of receiver-building of late; numbers of my readers have written appealing letters about troubles they have run into with their new sets. Added to this, I have made a new set myself, and a friend of mine has also launched out and encountered some of the funniest little "snags" imaginable. All of which gives me a lot to write about; but, I am afraid, nothing very solid in the way of replies to the questions that arise.

First of all, we will dive into the question of "threshold howl" again. Just after having had a lengthy and heated argument with a fellow-fan on the subject, and decided several things about it, I have had to revise all my ideas once more.

Four Contributory Causes.

Our original argument was on these lines: Threshold howl is undoubtedly made worse if one does the following things: (1) Uses a very good transformer (which will almost certainly have a high primary inductance). (2) Uses a large reaction coil and small reaction condenser. (3) Uses an H.F. choke in the detector anode circuit. (4) Uses the 'phones direct in the L.F. anode circuit instead of employing choke-filter output.

Now each of these four points would lead one to suppose that the basic cause of the trouble is something to do with the total inductance in the detector plate circuit, combined with the phenomenon of the H.F. getting through to the L.F.'s.

Added to this we have the fact that neither of us has ever met the noise unless L.F. amplification is used. Therefore we decided that we should not be going far wrong in deciding that it is a form of L.F. instability. So far, so good.

Now the item occurs that rather upsets the apple cart. I have made myself a new receiver, all in a nice metal box with nice tidy wiring, consisting of an S.G. stage and a detector *only*. Right away on the first test it shows up a terrible threshold howl, the like of which has never been heard in the country!

Is it a Detector Problem?

This is completely cured by (a) using choke filter output, or (b) slightly compressing the resistance that is across the 'phones as a volume control. H.F. chokes in the 'phone leads and small bypass condensers have no effect whatever.

Now, can we be safe in assuming that it is entirely a detector problem, after all? It rather looks like it.

And now for another mystery. My friend's receiver, construction of which has been proceeding "in parallel" with my own, is completed. It consists of a detector and one L.F., with no S.G. (shame!).

It worked extraordinarily well, immediately, on 40 and 20 metres, and there seems to be no trouble with the reaction control,

although a well-known make of 1:7 transformer is used, which would normally cause a threshold howl audible in Scotland.

The trouble, however, is on 10 metres, and takes the form of a regular sliding in and out of oscillation (quite smoothly) with a regular period of *eight seconds*. Query No. 1 is this: Is this a form of "threshold howl" with a frequency of $\frac{1}{8}$ instead of the usual 500 cycles or so? Query No. 2: If not, what is it?

Here it may be mentioned that the absence of howl is probably due to the use of a resistance between the reaction coil and the transformer primary instead of the usual choke.

A NEW POLISH GIANT



A Marconi engineer examining one of the main panels of the new 160 kw. broadcaster to be erected near Warsaw. It will be the most powerful broadcasting station in Europe.

I cannot find anything in the set that is capable of charging up and discharging to give this effect, and although it sounds exactly like a grid choking in some way, it certainly is not that.

The Useless L.F. Stage.

It is to be hoped that by next week we shall have found out what it is, and I shall be able to enlighten my readers who are interested in problems. Meanwhile, there is no prize offered for the solution.

Leaving these distasteful troubles alone, I have one or two remarks to make about

my own new receiver. First of all, I find that ample volume from all ordinary signals (with a good pair of 'phones) is obtained from S.G. and detector.

When I use a note-mag. at all, I always have to turn down the volume control to reduce the general "mush," and I find, almost invariably, that I turn it down to give about the same level that I get without the note-mag. at all. So why waste space, money and current?

Another point worth mentioning is the "pulling" of an H.F. stage if the coupling condenser to the detector is too large. Naturally I only refer to a tuned stage, from which some amplification is undoubtedly obtained.

Grid-Condenser Variations.

When working under the ideal conditions one can tune in a signal on the detector grid tuning condenser, and vary the aerial tuning condenser (across grid and filament of the S.G. valve) without varying the pitch of the signal. The last-mentioned control will behave more or less as a volume control. When things are not all that they might be, the signal will completely disappear when the condenser is varied, or the set will even go out of oscillation with a "plop" as it is brought in tune.

If tuned anode coupling is being used (I always use parallel-fed tuned anode) the remedy is to reduce the coupling condenser to the detector grid. Personally I am using a neutralising condenser about half in, which gives ample coupling for 40 metres or anything below, and possibly too much for 10 metres.

Another idea is, of course, to use transformer coupling with an untuned primary, your normal detector grid coil forming the secondary and being tuned quite in the ordinary way.

Incidentally, screening between the two coils (the H.F. grid coil and the detector grid coil) must be good or "pulling" is bound to result.

NUTSHELL NOTIONS.

Simplifying Soldering—Choke Outputs.

If you find when soldering you have to hold the iron on to the surface for rather a long time, it is a sign that the iron is not hot enough or that the places to be soldered are dirty.

One disadvantage of dirty surfaces and poor heat from the soldering iron is that you are liable to melt adjoining ebonite, etc., through failure to get a quick joint.

Remember that the point of the soldering iron should be kept clean, and must not touch an ebonite or any similar surface, or it will immediately require re-cleaning.

A choke-condenser output for the loud speaker greatly assists in overcoming motor-boating.

Try-

POWER GRID DETECTION..

with the

L210

Power grid detection has been proved to give far better quality than the anode bend method while being at the same time considerably more sensitive. Rectification is linear, providing the correct values of grid condenser and leak are used. Get full details from the "Wireless World" for May 7th, 1930 and try it out with the Mazda L.210—one of the best valves for the purpose.



THE AMAZING

MAZDA

RADIO VALVES

CHARACTERISTICS

Fil. Volts	-	-	-	2.0
Fil. Amps	-	-	-	0.1
H.T. Volts	-	-	-	150
Amplification Factor	-	-	-	15.5
Impedance (ohms)	-	-	-	10,000
Mutual Conductance (mA/V)	-	-	-	1.55

MAZDA L.210 PRICE 8/6



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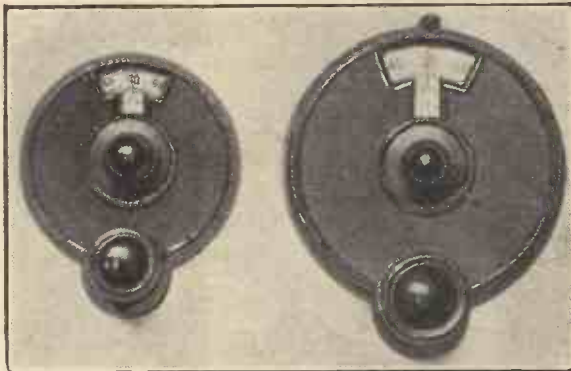
EDISWAN

FROM THE TECHNICAL EDITOR'S NOTE BOOK.



NEW IGRANIC DIALS.

HOW much easier everything is these days for the radio enthusiast in regard both to building and operating sets. At one time, for instance, real skill acquired only after some long experience was needed to tune a set closely.



You will easily be able to see which is the "Minor" and which the "Major" of these two new Igranic dials.

Nowadays, however, slow-motion controls render this a much simpler business.

These thoughts were awakened in my mind by the arrival of samples of two new Igranic slow-motion dials. They are items that raise no price barriers against their wide use for the one, the "Major" (3½ in. diameter), costs only 4s., and the other, the "Minor" (2½ ins.), but 2s. 9d.

They are very nice dials indeed, both to operate and in appearance. Their gearing, 6-1 the "Minor" and 4-1 the "Major," seems just right for fine tuning plus moderately rapid searching.

They are obtainable only in a dark brown finish, but they go well with any panel.

And I must not forget to add that their finish is really good—they may be cheap in price, but they don't look it!

MAGNUM GANGING SWITCH.

In multi-valve sets, wave-change switching can be greatly simplified in cases by ganging switches. That is to say you couple the two or three separate switches to a central control by means of some kind of linking.

A very easy method of doing this is to be seen in the new Magnum ganging switch. A squared rod passes through the centre of the device and enables any number to be joined together.

The Magnum ganging switch is easily adaptable for any position on the baseboard and its soldering tags are accessibly arranged. By the way, terminals are not provided, and while these may be rather difficult to arrange on multi-way switches I, personally, like to have them, as no doubt do all those constructors who are not particularly keen on soldering.

This Magnum switch is very soundly designed and constructed and its action is good. The list prices are, two-way, 3s.; three-way, 3s. 6d.; four-way, 4s. The push-ball plunger for operating the switch singly or in ganged units costs 1s. 6d.

A CHEAP L.F. TRANSFORMER.

There is now available a British transformer having a special alloy core that retails at 7s. 6d. This transformer is made by Accessories, Ltd., Birmingham. It has a ratio of 1-3½, and it is built into a green coloured metal casing.

The four terminals are widely spaced at the top and are clearly marked. It is a very light transformer weighing but a few ounces and it is small in size, but the weight and dimensions of an L.F. transformer are no longer indications of its efficiency.

The use of special alloy cores makes it possible to produce tiny transformers having excellent characteristics. I find this Accessories, Ltd., L.F. transformer to be quite good. It has not got the high primary impedance achieved by some makes which, however, cost a good deal more, but, on the other hand, it has not some of the miserable qualities located in quite a few other varieties. At 7s. 6d. it strikes me as being quite competitive.

LEWCOS PUBLICATIONS.

The new Lewcos catalogue of radio products issued by the London Electric Wire Co. and Smith's, Ltd., comprises 68 pages, and is of a particularly interesting character to home constructors. There is also being circulated free to the public a sheet of blue prints illustrative of four recommended sets using Lewcos coils and other components.

A FINE CABINET.

Messrs. Picketts, Ltd., of Bexley Heath, are now in production with their Radiola-Gram, a fine cabinet designed to accommodate a complete radiogram outfit. The turntable and pick-up are accommodated at the top on a hinged deck, an original

feature which renders the set completely accessible from the front.

Underneath is the space for the set, and below that the loud speaker and battery or mains unit compartment. The particular model sent us for review is the Radiola-Gram De Luxe, and is in the Queen Anne style.

It is beautifully hand french-polished, and with its piano hinges and tasteful

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

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

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

fittings it constitutes a fine piece of furniture.

A good point is the provision of a heavy, domed lid, which can be closed down while a record is being played.

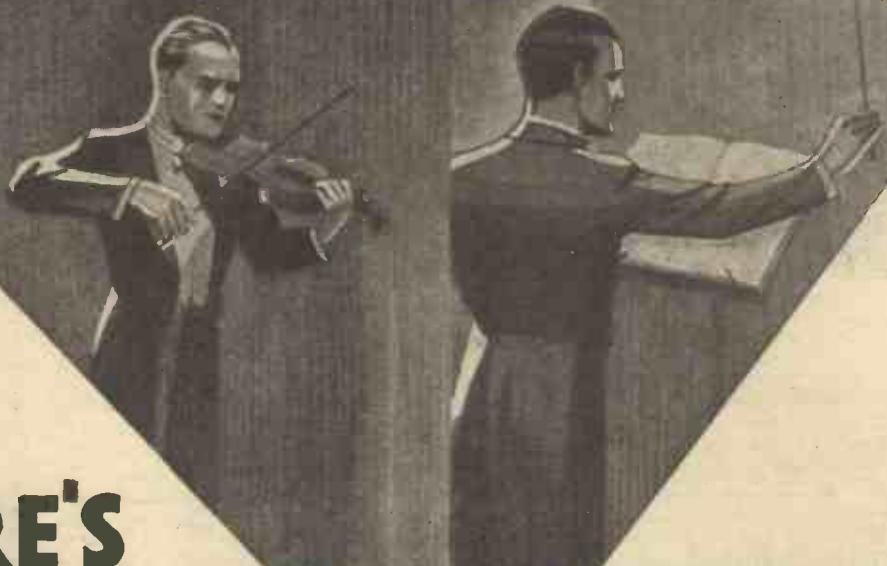
Those constructors who are turning their attention to the building of a new set would be well advised to get into touch with Messrs. Picketts, and obtain details of this and other of their substantial, well-made and excellently finished cabinets.

AMPLION ACTIVITIES.

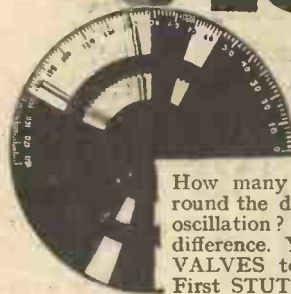
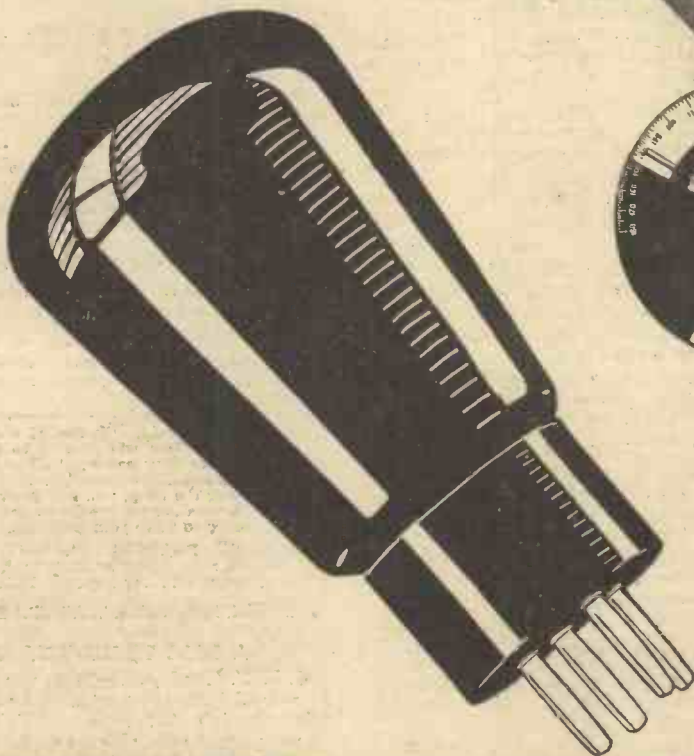
Leaflets dealing with the Amplion Two-valve All-mains Receiver, Amplion Loud Speakers, and the Amplion Two Screened-grid Cabinet Set are among the interesting publications due to Graham-Amplion, Ltd.



The Pickett Radiola-Gram Cabinet.



THERE'S STUTTGART — NOW LONDON



How many times have your explorations round the dial been rewarded with piercing oscillation? It is your valves which make the difference. You need TUNGSRAM BARIUM VALVES to bring in far distant stations. First STUTTGART, clear and strong. The least pressure on the dial—less than 4 metres separate them—then LONDON—or almost any programme you wish.

And there are other reasons why TUNGSRAM BARIUM VALVES are better for your set. They are more economical—they make more of your batteries. And they give better performance; long range, volume, perfect tone and long life. Yet remember they cost considerably less than any other valves of similar quality.

L.F., 5/6 ; H.F., 5/6 ; R.C., 5/6 ; Power, 7/3 ; Super-Power, 8/- ; A.C. Indirectly Heated H.F. and L.F., 9/6 each ; A.C. Directly Heated Power, 9/6 each ; A.C. Directly Heated H.F. and L.F., 7/9 ; Rectifying Valves, 10/- each. Tungram Photo-Electric Cells, Nava E., £2 : 17 : 6 ; Nava R., £3 : 3 : 0.

TUNGSRAM BARIUM VALVES



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

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

The constructional articles which appear from time to time in this journal are the outcome of research and experimental work carried out with a view to improving the technique of wireless reception. As much of the information given in the columns of this paper concerns the most recent developments in the radio world, some of the arrangements and specialties 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.

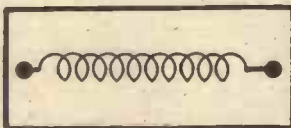
QUESTIONS AND ANSWERS

AN AERIAL CIRCUIT VOLUME CONTROL.

D. M. (Brighouse, Yorks).—“Is it possible to fit a 25,000-ohm potentiometer as a volume control in the aerial circuit? I ask because

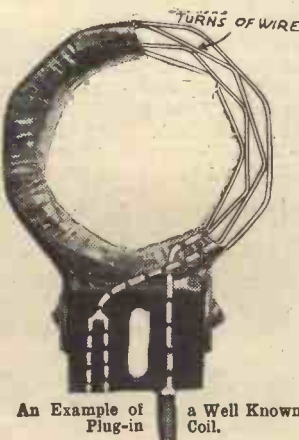
“INSIDE” INFORMATION.

No. 2.



The theoretical sign for a coil—any single-winding type is a simple spiral, as shown above, with appropriate connecting-points. (In this case, plug and socket.)

Below you see that this is, indeed, the basis of coil-construction, though the efficiency of the finished article largely depends on correct alignment, spacing, and robust mounting.



THE NEW “P.W.” “DIAGRAPHS.”

the particular set in question is a very packed-in job, and the only convenient place to get at for making alterations to the wiring is the side of the box between the aerial and earth terminals.

“It is a three-valve set, and the aerial goes to an aerial coil which is placed up close to the grid coil, the earth terminal being connected to the bottom of both coils, to the tuning condenser, filaments, etc.

“I have tried connecting it in the aerial lead, but it does not seem to make a nice, smooth variation. Is there any other way?”

All you have to do is to connect the slider of the potentiometer to one end of it, and to run a wire from this point to the earth terminal. Then run another wire to the other end of the potentiometer to the aerial terminal, and you will find that variations of the slider will enable you to get a smooth control between full volume and a whisper.

SILENT-POINT OSCILLATION.

“SUFFERER” (Gt. Grimsby).—“I do not know a lot about wireless, but I do know good music when I hear it; and I used to hear it from our set. But lately it has been very disappointing, with a lot of really unpleasant distortion that seems to come on without the slightest warning and without anything being touched.

“I have been informed I am suffering from ‘silent-point’ oscillation. I do not know what that is, but I do know I am nearly at boiling-point, not silent-point. Anyway, what is silent-point oscillation, and does it cause distortion?”

“If so, why is it called silent?”

From your description, we think it is very likely that you are the victim of the silent-point oscillation type of interference.

We are sure that you will agree it is a particularly unpleasant kind of interference, but it often happens that the person who is causing it has not the slightest idea of what he is doing to his neighbour's reception; so, for the benefit of everyone concerned, we will describe a typical case.

Imagine a man with a new valve set with two dials, one marked “tuning” and the other “reaction.” He first of all turns the tuning, and presently picks up a station broadcasting.

It is not quite loud enough for his liking, so he tries to make it stronger by handling the reaction dial. As he increases reaction, so the station gets louder; but presently he gets a loud whistle as well. He is oscillating, so he turns his tuning dial to try and get rid of the whistle (it is a radio crime to do this, for it sets up a whistle in every set for miles round), and he finds that as he alters his tuning, so the note of the whistle goes up or down, according to whether he is increasing or decreasing the tuning.

Still not understanding a bit what he is doing, he finds that by turning his tuning dial carefully in a certain direction he can bring the howl down in pitch from a very high tone to a lower, then lower still, finally to a growl, and, by careful tuning, he can reach eventually a “silent point.” Beyond this point the growl comes back again, and finally gets

to a shriek as tuning is carried further; but there is just one point where the actual whistle disappears—namely, the silent point.

When a set is operated in the manner described above it completely ruins reception on all neighbouring aeriols. Moreover, it spoils the quality on the set on which it happens, and the tragedy of it is that far better results could be attained by the owner of the set if it were not oscillating.

The reason of it is, of course, too much reaction. The reaction dial should be turned well back, so that alterations of the tuning should not cause whistles or shrieks in the telephones or loud speaker.

The proper way to handle reaction in order to get sensitivity and distant stations is described in detail in “The Key to the Ether,” “P.W.'s” free booklet. Other listeners who are not interested in distance reception will find much helpful information regarding the proper handling of the set in the B.B.C. free book on “Oscillation,” which is obtainable upon application to any broadcasting station or to the B.B.C., Savoy Hill, London, W.C.2.

THE FUSE FOR THE OUTPUT CIRCUIT.

B. M. (Clacton-on-Sea).—“I have a choke-coupled output circuit to the loud speaker arranged so that one side of a 4-mfd. condenser is connected to one end of the choke, and to the plate of the valve. The other side of this condenser goes to one loud-speaker terminal, and the remaining loud-speaker terminal to L.T.—

“If the condenser broke down, I should get 200 volts across the loud speaker. Can I put a fuse in to prevent trouble of this kind and, if so, at what value should it blow?”

Yes, you should put a fuse in between the condenser and the loud speaker. Almost any low value fuse as used for radio work will do, as, under normal conditions, there will be practically no current flowing in the circuit. The amount of current that will flow in the event of a breakdown will depend on the resistance of your loud speaker, and Ohm's Law will give you the figures.

With 200 volts on the plate and a 2,000-ohm loud speaker, you will get 100 milliamps. (1 amp.), and many fuses used for radio work will blow long before this figure is reached.

HOW IS THE SET GOING NOW?

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.

A GOOD THREE-VALVER.

G. L. W. (Bradford).—“Can you put me on to a good three-valve set, Det. and two L.F., using plug-in coils? I did not originally want to use plug-in coils because of the trouble of changing, but after making a mess of the last coil unit I tried I decided not to try it again. (I cannot afford to buy one, but I have plenty of coils left over.)

“P.S.—Where has Oslo gone?”

You will by now have received your free gift from “P.W.” of the four blue prints and no doubt have discovered that No. 58 is just the set you are looking for. It employs plug-in coils, but they are so arranged that they remain permanently in position and wave-changing is carried out by a simple switch on the panel. This set should do exactly what you require.

Regarding your P.S., the Oslo station is undergoing alterations at the moment of writing, and will probably be taking up a long wave-length in the near future as a permanency. Look-out for tests from him on about 1,070 metres.

(Continued on page 348.)

BETTER RADIO WILL COST YOU LESS THIS SEASON



H.T.2. 9 1/2 x 7

How many high tension batteries will you need this season to give your new big efficient valves the current they should have? One every month or two! And however much you pay, however often you replace them — you can't stop dry batteries running down. Dry batteries lose power — power you've paid for, power you can never recapture — even when the set's switched off! Put in a set of National Dagenite H.T. accumulators now at the start of the season. They're compact, they're clean and except for a shilling or two to re-charge at long intervals the first cost is the last you need ever pay for H.T. Follow the lead of the B.B.C. and the great talkie companies. Get pure music from a background of velvety silence by using the steady unfailing current from H.T. accumulators — Dagenite High Tension accumulators. From National service stations and dealers everywhere.



Re-charge from the house mains at a cost too small to notice, with a National 'Dagenite' trickle charger.
FOR A.C. MAINS 49/9
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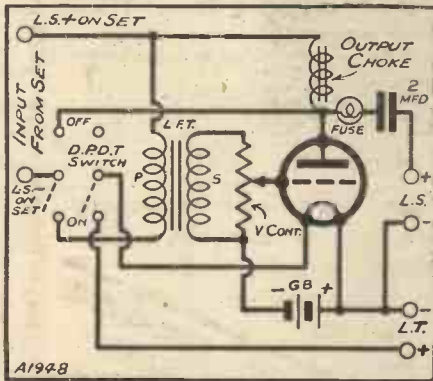
RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 346.)

SWITCHING AN L.F. AMPLIFIER.

In connection with Popular "Wirelets" No. 18, September 6th and 13th issues of "P.W.", many readers have been interested in applying the system to a transformer stage instead of to the anode resistance as shown.

AN EASY CHANGE-OVER.



This is the method used by "Chief Officer," and described on this page.

One reader's letter is of special interest on account of the fact that an output choke is switched into a circuit which did not previously employ it. The letter is reproduced below instead of in the Correspondence Columns,

so that it will catch the eye of those looking for a circuit of this type.

"The Editor, POPULAR WIRELESS.

"Sir,—In POPULAR WIRELESS No. 431 there is Popular 'Wirelets' No. 18 which caught my eye. In consequence, I thought that you may be interested in the one-valve amplifier which I had designed and am using on my set at home.

"Enclosed you will find a rough diagram showing the circuit. I am using this amplifier on a screened-grid three, which has no output circuit (only the direct one). The quality is very much improved even when the amplifier is shut off, as the output-filter-choke circuit is automatically shunted on to the last valve.

Yours truly,

'CHIEF OFFICER.'

"Manchester Wharf, E.1."

2 LO'S POWER.

G. R. W. (Tiverton).—"I see that the power of the London Station has been increased, and the Regional is now 45 kw. as against the old 30 kw., whilst the London National on 261 has gone up to 68 kw. But I have not noticed a great change in the strength of reception at this distance when taking into account the improvement that always takes place at this time of the year.

"Is the new power being used yet?"

There have been no increases in the power of the London stations. Although the figures in kw. used to express the power are now bigger than formerly, this is due not to an increase in power, but to an alteration in the method of reckoning the output of the station.

Until recently there have been several ways of calculating the power of a broadcasting station, and some European countries used one way and others used another way. The fact that two stations using identical power might be quoted in widely differing figures, according to the method of reckoning that power, resulted in an agreement between the European countries to all adopt one certain method of reckoning.

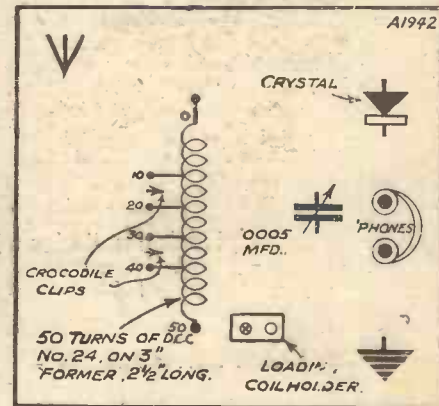
This is now being done, and in order to bring the B.B.C. stations in line with the rest of the Continent, the new method of reckoning power has been applied to them, with the result that the figures are higher than formerly. The actual power has not been increased (and there is no intention of increasing it at the moment), so any improvement you may now have noticed is due to the seasonal change which, as you say, results in better reception during the winter season.

HILVERSUM AND HUIZEN.

W. M. (Gt. Holland).—"Why it is that sometimes the 1.875-metre station relays Hilversum and at other times Huizen, and the

(Continued on page 350.)

POPULAR "WIRELETS" No. 22



Here are the "components" for a good crystal set, based on a simple home-made coil, and with separate tapping-points for the crystal and the aerial circuits. Can you "wire-up" this circuit? (Look out for the answering diagram next week.)

SPECIAL ANNOUNCEMENT TO LONDON LISTENERS!

YOU would doubtless like to enjoy the advantages of High Tension Accumulators—and so be spared the expense and unreliability of Dry Batteries. The problems of initial cost and re-charging need no longer trouble you. Our unique service offers you the famous CAV High Tension Accumulators fully charged and ready for immediate use. They are delivered to your door (anywhere within 12 miles of Charing Cross) at convenient intervals; and at an inclusive charge which represents a vast saving over your present expenditure, and definitely guarantees better reception than partly discharged Dry Batteries.

Over 10,000 London listeners testify to the excellence of this unique High and Low Tension Accumulator Service.

Write for interesting Price List NOW.

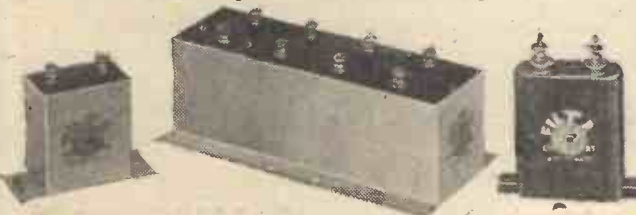
RADIO SERVICE (LONDON), LTD.,

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Telephone: NORTH 0623.

"FILTA BANK" CONDENSERS

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4.4.2	Tin	15/6
4.4.4	Tin	15/-
2	Tin	3/-
2	Bakelite	3/3

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READY-TO-ASSEMBLE
£ 3/5/0

- No. 219. A Radio or Radio Gramophone Cabinet, 3' 9" high, 2' wide, and 1' 6" deep. The battery and loud speaker compartments are at the bottom and are partitioned off. Size of the baffle behind the fret is 24" x 24". Metall: fabric for the fret front is included. Opening at the top and back. This cabinet will take a panel 2 ft x 9 ins. or smaller.
- | | | |
|-----------|---|--------------|
| Oak 65/- | Ready to Assemble Mahogany 70/- | Walnut 80/- |
| Oak 85/- | Assembled Ready to Polish Mahogany 90/- | Walnut 100/- |
| Oak 105/- | Assembled and Polished Mahogany 120/- | Walnut 135/- |

CHAS. A. OSBORN (Dept. P.W.),
THE REGENT WORKS, ARLINGTON ST., LONDON, N.1.
Phone: Clerkenwell 5095. And at 21, Essex Rd., Islington, N.1. Phone: Clerkenwell 5634.
All models carriage paid. Send for 56 page illustrated catalogue. Send 3d in stamps.

MODEL No 219



MIDNIGHT REVIEW

"I wonder if it's the battery?" said father after puzzling over the set till midnight: and when he tried an Ever Ready instead, the reception was perfect. That's what the Ever Ready was designed for—to give perfect reception as well as to last a long time. All through its long life it stays up to pitch. You get no fading. You have no distortion. The Ever Ready is made by an exclusive process—an exceptionally thorough and careful process. It stays alive for months, and while it's alive it's awake! Every Ever Ready battery is guaranteed to give satisfactory service by a company which has been making reliable batteries for 28 years.

Ever Ready batteries are made for all wireless sets. If you own a portable you can obtain an Ever Ready of the right size and shape to fit it. Write for free list, which gives full particulars, including exact dimensions in inches.

**BRITISH MADE
HIGH TENSION
BATTERIES**



The batteries that give unwavering power

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THE SLOGAN



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Secrets of Success**

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COLLEGE, LTD.,
Dept. 106, SHEFFIELD.



RADIOTORIAL QUESTIONS AND ANSWERS.

(Continued from page 348.)

same uncertainty appears to exist with the 1,071-metre station? Which is which?"

We do not wonder that you have been unable to disentangle the positions as it is certainly a puzzle—in fact "double Dutch."

Actually the stations concerned are Huizen (Holland) 1,875 metres; Hilversum (Holland) wave-length 1,071 metres. In addition there is a short-wave Hilversum station, on which broadcasts are sent out during the time that the powerful maritime wireless telegraphy station at Scheveningenhaven is working to Dutch shipping.

So that without any further complication, the "Hilversum" situation would be rather difficult, as sometimes the programme is going out on the long-wave station, 1,071 metres, and sometimes (generally until 5:40 p.m.) on the 298.8 metres station. This in itself would be rather confusing, especially as the times of working and change-over at week-ends are different from those during the week.

But in addition to this, there is an arrangement by which the Hilversum programmes are sometimes sent out from the Huizen aerial, and vice versa. For instance, during July, August and September, "Hilversum" was going out from Huizen, and "Huizen" from Hilversum. They change four times a year, so for the next three months it is probable that each station will be sending its own programme, though this cannot be said for certainty.

KEEPING THE OUTPUT IMPEDANCE CONSTANT.

R. P. P. (Cheltenham).—"I use a high-resistance potentiometer across my loud speaker for volume control, the slider being connected to the set and altering the volume according to whether more or less of the resistance is in circuit.

"I am told that the disadvantage to this method is the fact that the output impedance should be kept constant, which is not the case when the total resistance in circuit is varied, and that another variable resistance could be connected so that no matter what the position

of the slider the total impedance in the plate circuit would not be altered.

"What are the connections for this?"

It is possible to maintain a more uniform impedance and thus a more even response when wide variations of volume are dealt with in this way, but there is no easy way of adding an extra resistance to the existing potentiometer for the purpose, so far as we are aware.

What is needed is a potentiometer with a dual arm arranged so that any movement which cuts out one of the resistances automatically brings in the other, and vice versa. Double potentiometers of this type have attained considerable popularity in the U.S.A., and are obtainable in this country also, but you require a double potentiometer, and not an alteration to the existing one.

THE SPARKING CONDENSER.

"SPARKING" (Cleekheaton).—"Quite by accident I have discovered that the large condenser (4 mfd.) I use in my choke output system will give a very large spark even some hours after the set has been switched off.

"I always take the H.T. negative plug out when attending to wiring, etc., or checking over my leads, etc., and feeling quite safe on this account I accidentally put a screwdriver across and discharged this condenser, and got a really large spark. Quite startling!

"It was such a tremendous crackle that I became curious when I discovered that the H.T.—plug was out, so preparing myself for the shock I tried a screwdriver again. Nothing happened.

"I have found since that it only happens once when the set has been on, but even hours after it has been switched off I can get one fat spark by touching the terminals. Is it O.K.?"

Perfectly O.K., and an indication that this condenser and the rest of your insulation are in good condition.

As you are using a really big condenser it will hold quite a large charge which is sufficient to produce a surprisingly large spark—some hours after the charging current (in your case that of the anode circuit) has been removed, providing that the insulation of the condenser and its associated apparatus is good.

Your spark, instead of pointing to something wrong actually proves that the insulation is thoroughly satisfactory.

THE "P.W." DISTRIBUTOR.

(Continued from page 331.)

To the pair of terminals marked "L.S.1" connect your local loud speaker, that is, the one which will be used along with the set. Connect your two pairs of extension lines to the terminals marked "L.S.2" and "L.S.3."

This is how you use the distributor. Start off with the two plugs removed from the sockets. To bring the local loud speaker into action, insert one of the plugs, it does not matter which, in socket No. 1. To transfer the output of the set to one or other of the extension lines, transfer this plug to the appropriate socket, No. 2 or No. 3.

To bring the local loud speaker into action again, take the remaining plug and insert it in the No. 1 socket. Similarly, you can bring both the extension line loud speakers into action by placing the plugs in the No. 2 and No. 3 sockets. The blank socket upon the panel is for whichever of the plugs happens to be out of use.

The "On and Off" Control.

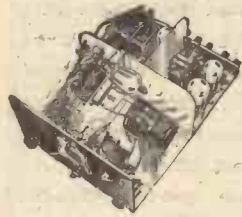
We thought that since this distribution board will function at times as the main control, it would be handy to have upon it an "on and off" switch.

You need not use it if you do not want to, but to bring it into action, proceed as follows. Connect your L.T. battery to the terminals marked L.T.— and L.T.+ Battery, upon the unit. Wire up the L.T.— and L.T.+ terminals which are marked "set" upon the unit to the appropriate terminals upon your set. Keep the set on-off switch permanently turned on and control with the unit L.T. switch.

MAKE UP THIS FINE ALL-ELECTRIC RECEIVER

"SENSITITE"

A.C.—SCREENED GRID. DETECTOR. PENTODE
Everything Supplied. Nothing Else to Buy.
All the latest Refinements.



One-knob control—Illuminated dial—Gramophone pick-up—Automatic grid bias—Simple selectivity adjustment. No soldering—A screwdriver and pliers is all you require—Panels and screens drilled. Full size blue print. **£9-10-0**

This highly efficient all-mains Receiver is unique in many respects. Simple to build—simple to operate—it has truly remarkable selectivity, sensitivity and purity of reproduction.

It is not only selective enough to entirely separate the twin stations when these are but 5 miles away, but will bring in, at moying coil strength all the principal European stations.

Write for particulars. From your dealer or direct from

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"PURATONE"

VALVES

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Power - - - **5/3**
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2, 4 or 6 volts.

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Accommodates Set, Speaker, Batteries, Eliminator. Especially suitable for Mains Sets. For panels 21 x 7 or 18 x 7. Can also be adapted for Corsor Empire Melody Maker, etc. Oak or Mahogany finish, only **90/-**

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The Unit incorporates the Ferranti Anode Feed System, which has been developed to avoid "hum" and "motor-boating," and is specially suited for use with Sets operating Moving-Coil Speakers.

Will feed Receivers having up to 2 H.F. stages, detector, and one or two L.F. stages.
For 200/250 Volts, 49/100 Cycles Supplies.
Maximum Output 100 Milliamps at 200 Volts.

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TESTS EVERYTHING



**VALVES
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H.T. AND L.T.
MILLIAMPS
*Everything!***

The All-in-One Radiometer gives you a definite answer to every question you put to it. It will tell you, at once, whether a valve is "good" or "dud." If your batteries are failing it will show you just where you stand, giving you

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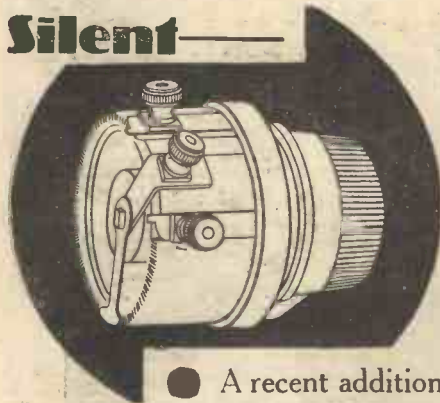
12/6

PIFCO Obtainable through all good Wireless Dealers.

PIFCO ALL IN ONE RADIOMETER

P. 4.

Smooth and Silent



● A recent addition to Colvern productions—the Variable Colverstat—has many applications. It is necessary that it be silent, constant and smooth in adjustment, consequently all Variable Colverstats are wire wound and are designed to operate silently. The ideal volume control, price 5/6.

The Colvern Booklet gives a list of resistances and values available and also contains much other matter of interest to the constructor. It includes Coil measurements, Circuits, fixed Resistances, Switches and illustrates suitable tuning coils for ganging screen grid valves for multi stage receivers.

The Colvern Booklet sent free on request.

COLVERN : RADIO :

Advt. of Colvern Ltd., Mawneys Road, Romford

PARASITES OF THE ETHER.

(Continued from page 325.)

it makes a strong impression even when very far distant on a sensitive radio receiver.

The static content of the earth's atmosphere is largely influenced by the sun. It is calculated that the amount of solar radiation reaching the earth each day is equivalent to twenty thousand billion horsepower. This energy is chiefly composed of electromagnetic waves, visible light, ultra-violet rays, and streams of electrons and ions. In addition the earth receives a liberal daily allowance of a very penetrating type of radiation (Millikin rays) coming to us from inter-stellar space.

"In a Sea of Static."

All this has a very definite effect in ionising the atmosphere and charging it with static. For instance, streams of ions and electrons projected from the sun, particularly during a period of sunspot activity, swirl around the earth's magnetic field and create space currents. These in turn induce corresponding "ground" currents in the interior of the earth, and so give rise to magnetic disturbances which react upon the electrical equilibrium of the atmosphere.

Regarding the earth as immersed in a sea of static, the passage of deliberately transmitted wireless signals can be compared with a comparatively small but regular succession of wavelets.

Superimposed on these one must imagine a constant fret of atmospheric "disturbances" comprising irregular movements and surgings, such as are caused in the ocean by wind, tide, and other natural influences. Such disturbances may vary in size from infinitesimal ripples to full-sized waves, and even an occasional tidal flood.

FOR THE LISTENER

(Continued from page 332.)

An irascible friend of mine, finding the number engaged at the third time of asking, dialled O.D.A.M. The O called up the operator, and the other three letters turned her into a Miss Pink.

Italy.

The conversation between Mr. Wickham Steed and Dr. Kermania on Italy, in the series, "The World and Ourselves," was a model of what such a talk should be. Compliments did not fly.

Wickham Steed was against Fascism, and Dr. Kermania is Mussolini's man in London. So they were at polite loggerheads all the time. Thrust and parry, and no quarter.

Dr. Kermania, who spoke English charmingly, was quite able to hold his own, and made out a good case for Fascism. Fascism, he held, was the best form of government for Italy at the moment.

Wickham Steed argued against it on general principles, and rather as if he was imagining that we in England were threatened with it. His arguments were sound enough from our point of view, but hardly, as it seemed to me, from the Italian point of view.

I have been in Italy both before and since the war, and the improvement since

(Continued on page 354.)

BROWNIE

Not just a 'box of tricks'—but a really superb all-electric 3-valve receiver in a handsome, richly polished, solid walnut cabinet—that's the wonderful new Brownie DOMINION MAINS S.G.3. It's the modern set for the modern home... no batteries, no accumulators... no bother, no expensel! Just switch it on—and then sit back and enjoy at last—the perfect broadcast!



MAINS S.G.3

Price, including royalty and valves £18/10 OR

Ask your dealer to demonstrate the new Brownie DOMINION MAINSETS. In any case, write now for illustrated catalogue of the complete range of mains and battery operated receivers.

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32/3
DOWN

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AS SPECIFIED FOR USE IN "FERRANTI'S" NEW CHARTS

RD 47 3 point 1/8 ; by post 1/8
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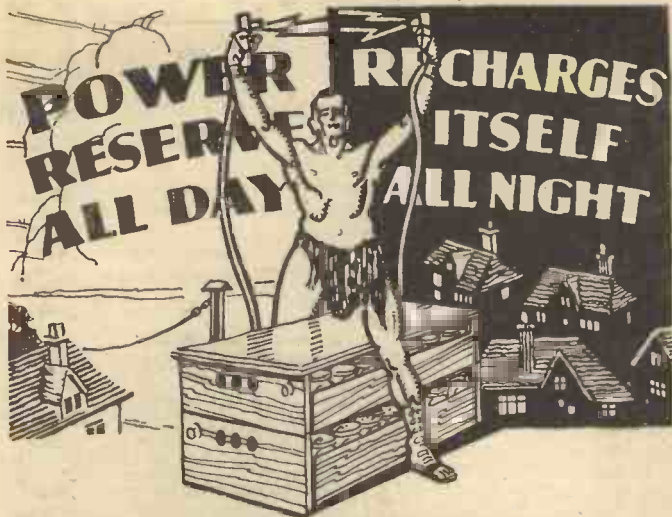
LOUD SPEAKERS REPAIRED, 4/-

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Transformers 4/-. Headphones 4/-, all repairs magnetised free. Tested, guaranteed, and ready for delivery in 24 hours.

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DX THE STANDARD PLUG-IN COIL
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Your Battery Set as TROUBLE FREE as an "all mains" yet smoother-steadier and safer

Though mains supply for your set may not be available in your district, you can enjoy trouble-free H.T. supply for 12 months or more with the added benefit of the smooth, unfluctuating flow of power from a Standard Cartridge type Wet H.T. Battery. Millions of Standard Cells are in daily use with thousands of users who were determined to stop wasting money on costly dry batteries. Why continue to suffer the inconvenience of wasteful dry batteries. Install the Standard for 7/6 down and get wonderfully improved reception—without trouble.

From Radio dealers, Curry's & Halfords.

WATES STANDARD PERMANENT H.T. BATTERY

This large capacity Battery for 7/6 down.



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 To STANDARD BATTERY CO. (Dept. P.W.),
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 I enclose Lecker and details of 2-tray
 Battery (as ill) No. 90V. for
 7/6 DOWN and 5 monthly pay-
 ments of 7/6. 2 cells, 14V.
 Spare No. 2 cells, 14V.
 5/6 per doz. Batteries
 of any voltage
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The lightest, lowest loss & most efficient Condenser extant. Capacities: 0005, 00035, 00025, 00015

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A great little variable compression type condenser.

F 0001
 J 0003 1/6
 G 001
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Bakelite cased 600 volt test mains Condenser.

Prices 3/-, 2/2, 1/9, 1/6

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Drum dial, 8/6 with one Condenser, 13/- with two, 17/6

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Send **23/6** Only **1931 Osram Music Magnet Kit.** 2 S.G., Detector and Power. Cash Price **£11 15s.** Balance in 12 monthly payments of 18/6.

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Send **12/9** Only **Lissen S.G. Three Kit.** S.G., Detector and Power. Cash price **£6 19s.** Balance in 11 monthly payments of 12/9.

THIS WEEK'S SPECIAL

Send **10/-** Only **Cosmor Melody Maker Kit 1931 Model.** S.G., Detector and Power. Cash price **£6 17s. 6d.** Balance in 11 monthly payments of 12/9.

IMPORTANT NOTICE.—All the above Kits include valves and cabinet.

Send **8/6** Only **Exide 120 Volt W.H. Type Accumulator in Crates.** Cash price **£4 13s.** Balance in 11 monthly payments of 8/6.

Send **7/4** Only **Ekco 3F.20 H.T. Eliminator.** 20 m/a. Tappings for S.G., 60 volts and 120/150 volts. For A.C. Mains. Cash price **£3 19s. 6d.** Balance in 11 monthly payments of 7/4.

Send **10/9** Only **Regentone W.5 Combined H.T. Eliminator and Trickle Charger.** 1 S.G., 1 variable and one fixed tappings for H.T., L.T. charging for 2, 4, and 6 volts. For A.C. Mains. Cash price **£5 17s. 6d.** Balance in 11 monthly payments of 10/9.

Send **6/5** Only **Farrand Inductor Speaker** for perfect reproduction. Unit and Chassis complete, ready mounted. Cash price **£3 10s.** Balance in 11 monthly payments of 6/5.

Send **4/7** Only **Blue Spot 66R Unit** with Major Chassis. Cash price **£2 10s.** Balance in 11 monthly payments of 4/7.

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P.W. 25/10/30.

FOR THE LISTENER.

(Continued from page 352.)

that amazing son of a stonemason took the helm is one of the most astonishing things in modern history.

The Staff of the B.B.C.

Sir John Reith said in Manchester, "You may consider the B.B.C. to be right or wrong, the programmes good or bad, but be in no doubt about this, that the efforts of the staff to discharge their responsibilities to the maximum benefit of the maximum number of listeners are sincere, unrelenting, and supreme." And so say all of us.

But the word "unrelenting" is amusingly ambiguous. I have listened to items sometimes which have made me feel that the B.B.C. is extremely unrelenting and merciless.

Choice of Good Music.

One learns to pick and choose. In the lighter forms of music in the programmes this is necessary. It is not difficult to draw the wrong number.

But recently I have made three bull's-eyes: Keith Falkner and Hans Kindler in their vocal and 'cello recital, Pouishnoff at the piano, and Tatiana Makushina singing Russian songs. All first rate.

I was particularly grateful to the announcer for giving in a few words the purport of Makushina's songs. I suppose I ought to be able to enjoy a good song, even if I don't know what it is about; but I find that it adds a good deal to my enjoyment of a song in a foreign language if I know beforehand whether it is about a Flea or a Flounce or Eternal Felicity.

Gramophone and Stone.

I wish to offer my tribute of praise to the very excellent little programmes of gramophone music which are arranged from time to time by Mr. Christopher Stone. They are invariably enjoyable, being chosen with much ingenuity, and out of a knowledge of records which must be unrivalled. The gramophone is one of the best broadcasters.

"Romance."

By Joseph Conrad. Produced by Peter Cresswell. It is rather odd that Conrad, who was not a novelist of the dramatic type, should lend himself so well to radio plays.

It would be exceedingly difficult to adapt him to the ordinary stage. The multi-studio apparatus makes it possible. This is where radio scores.

"Lord Jim" was very good. "Romance" only one degree less good. Its faults were faults of production. The opening seemed to me to be weak.

The first two or three minutes of a radio play are all-important; for it is much easier for listeners to switch off than it is for an audience to leave the theatre. The imagination must be captured at once. I found that my interest tarried a little.

The tempo all through was on the slow side, and there seemed to me to be rather too much of the sotto voce business, when one imagines the actors cheek by jowl with the microphone, whispering creepily into it.

But it is easy to criticise. It was an excellent entertainment; a fine story, ingeniously adapted, well spoken, and cleverly managed all through.

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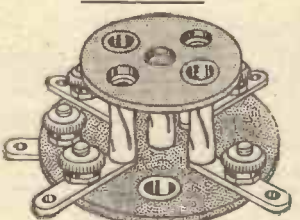
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CORRESPONDENCE.

THE "NEUTYPE" FOUR

**A MAINS UNIT PROBLEM.
"DOUBLE DUTY LOUD SPEAKERS."**

Letters from readers discussing interesting and topical wireless events or recording unusual experiences are always welcomed; but it must be clearly understood that the publication of such does in no way indicate that we associate ourselves with the views expressed by our correspondents, and we cannot accept any responsibility for information given.—EDITOR.

THE "NEUTYPE" FOUR.

A Cornish reader's very satisfactory experiences. The Editor, POPULAR WIRELESS.

Dear Sir,—May I just add a few words of praise in favour of the "Neutype" Four, which I have just constructed? It is a very fine set, and does a lot more than you claim for it. On the long waves Daventry simply roars in with no reaction, whilst Radio Paris, Motala, and Hilversum come in almost as well. Hulzen, Zeesen and others come in at full loud speaker strength with a small amount of reaction. Selectivity is very good. I can tune in Zeesen while Daventry and Radio Paris are both working without a trace of either in the background. On the short waves (200 metres to 500) a station seems to come in on every degree of the dial. A piece of wire 15 ft. long stretched across the room will bring in the London and Midland Regionals at good L.S. strength, without any reaction, whilst with a little careful tuning I can bring in about a dozen foreign stations at quite good strength. When working with an outside aerial I have to use a volume control on quite a number of stations. In conclusion, I consider this an excellent circuit. If any amateur is in doubt of what to build, I advise him to try this one, and I think he will be well rewarded. As a reader of "P.W." for six years I have found no other wireless book to equal it. Wishing it the best of luck.

I remain,
Boscastle. S. BURNARD.

A MAINS UNIT PROBLEM.

The Editor, POPULAR WIRELESS.
Dear Sir,—I would like to reply to Mr. G. S. Mathieson's letter in a recent issue of "P.W." regarding H.T. eliminators.

Mr. Mathieson's last paragraph: "Notice voltage your valves are meant to take, and see that you give

NEXT WEEK

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them that amount." But can he say how, without guessing, when the majority of up-to-date manufactured H.T. units have two fixed (one negative and one power) tappings, and two variable, with no high resistance voltmeter?

Without the H.R. voltmeter how can one tell the amount one is giving the S.G. valve, since that valve especially is supposed to be very critical as regards voltage? Yet how many manufacturers include them? I know the price would rise, but it would probably save one's valves.

Again most units cover 200 to 240 volts, a gap of 40 volts which again means guessing. The power tapping gives, say, 180 volts, but on what voltage, 200 or 240?

Perhaps one of the well-known manufacturers of H.T. units could enlighten us regarding this point, as I know it would be of great interest to a number of your readers.

Yours faithfully,
East Sheen, S.W.14. A. LEFEVER.

"DOUBLE DUTY LOUD SPEAKERS."

The Editor, POPULAR WIRELESS.
Dear Sir,—I read with interest in a recent "P.W." Mr. Mec's account of the signals he gets from the primary of a transformer, the secondary of which is used as an L.F. choke. I would like to assure Mr. Mec that the energy developed in the primary is by no means supplying him with extra signal strength; it is energy developed in the wrong place, due to the fact that there are passing through the secondary variations of current strength, i.e. signals. Now this

(Continued on next page.)

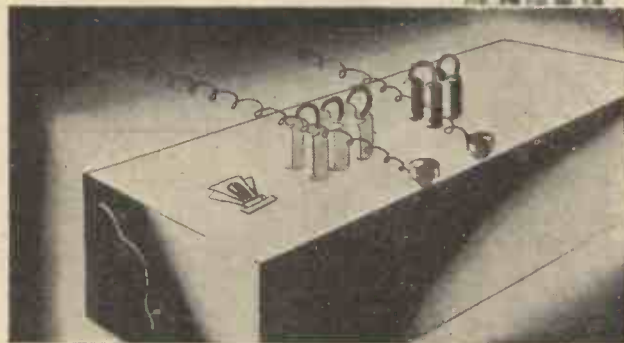
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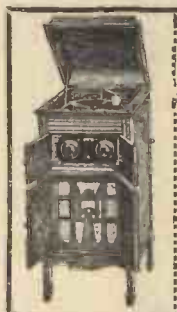
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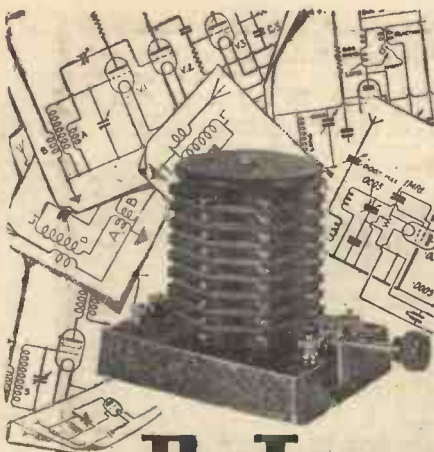
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M.C.14

CORRESPONDENCE

(Continued from previous page.)

shows that the secondary is not acting efficiently as a choke. The signals, instead of being completely choked back, are passing partly through the 4-mfd. condenser and partly through the secondary which has, apparently, an impedance not much higher than the condenser.

A sad state of affairs! If Mr. Mee substitutes for the transformer a good high impedance choke, practically all signals will choose the lower impedance path offered by the mfd. condenser and L.S., and there will be an improvement in signal strength at the proper place—the output terminals, instead of half the signals dutifully entering the L.S. and the other half wandering through the "choke."

Yours faithfully,
C. LEHANE.

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POPULAR WIRELESS
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WHERE ARE THE MILLIAMMETERS?

The Editor, POPULAR WIRELESS.

Dear Sir.—In the words of that once popular song, "I May Be Wrong, but—" it seems to me that in connection with the modern "Quality Rush," too much attention is paid to getting super high notes and to going right down in the depths, and not enough emphasis is paid to avoiding overloading of power valves.

How many sets does one find without a milliammeter, and in which the output valve is being given more than it can deal with? I think I should be correct in saying nearly every one—surely a thoroughly undesirable state of affairs!

Yours faithfully,
"Logic."

ADVERTISEMENTS

As far as possible all advertisements appearing in "P.W." are subjected to careful scrutiny before publication, but should any reader experience delay or difficulty in getting orders fulfilled, or should the goods supplied not be as advertised, information should be sent to the Advertisement Manager, "Popular Wireless," 4, Ludgate Circus, London, E.C.4.

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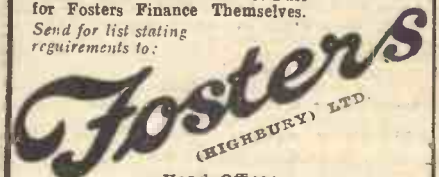
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TECHNICAL NOTES.

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

Ebonite Drilling.

WHEN drilling ebonite panels for the mounting of components, it sometimes becomes necessary to make rather large holes...

It is occasionally recommended that a smaller hole should be drilled first and that this should then be enlarged by means of a file or some similar tool.

This is quite a practicable way of enlarging a hole in ebonite, but there are one or two little precautions which you should bear in mind.

In the second place, I do not know whether you have noticed it, but if you attempt to enlarge a circular hole by means of a flat tool there is a curious tendency for the hole when enlarged to be more or less three-cornered or triangular.

A Curious Effect.

If you try to enlarge a circular hole by means of a triangular file the hole tends to come out with four corners or roughly square.

The best way to avoid it is to do the cutting very gradually and not to exert too much force. At the same time the ebonite panel may be gradually shifted around into different positions.

Incidentally, the taper of the tool should not be too slight, otherwise there will be a tendency for the tool to jam in the hole, whilst on the other hand, if the taper is too pronounced you will make a tapered hole instead of a parallel one.

Pentodes.

I have been several times asked whether it is possible to use a pentode valve taking its low-tension supply direct from the A.C. mains.

Hitherto, there has been some difficulty in producing a valve of this kind, but quite recently the first example of the indirectly heated type has been put on the market, type A.C.-Pen.

This has the usual 4-volt filament, taking about one ampere, and has a very high amplification factor; the magnification factor is in the region of 100.

There are some special precautions advised in connection with the use of the valve; for one thing the output should be suitably by-passed in cases where the reproducing unit is deficient in the lower frequencies.

(Continued on next page)

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COMPLETE SET OF COILS 35, 50, 60, 100, 150, 250; to cover short and long wave-lengths can be bought with the KIT OF PARTS. FOR ONLY 8/6 EXTRA.

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FARISH**
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TECHNICAL NOTES.

(Continued from previous page.)

Permanent or Electro-Magnet.

The comparative simplicity and convenience of permanent-magnet speakers commended this type very much to listeners during the past year or two, but there is still, in my opinion, a good deal to be said for the electro-magnetic moving coil type, notwithstanding its extra weight and bulk and the need for a separate field-exciting current.

Personally, I have always preferred this type of speaker for its robustness of volume and quality of tone and in view of the great improvements which have been made in the design of speakers of this kind quite recently I think it still more than holds its own with the permanent magnet type.

As quite a number of the letters which I receive from readers deal with some aspect or other of the loud-speaker question, it may perhaps be interesting to say something on the general question of loud-speaker characteristics and those of the moving-coil type in particular.

Diaphragm Mounting.

As you know, one of the main objects is to obtain equal response, or at any rate as uniform response as possible, over the ordinary range of audio-frequencies and this is largely a matter of the design both of the moving coil and of the diaphragm.

One point, the importance of which is not always fully appreciated, is the question of the escape of the vibrations around the edge of the diaphragm. This effect, which is specially liable to occur with large-amplitude diaphragms such as those in powerful moving-coil loud speakers, is minimised by the suitable mounting of the diaphragm at its edge and partly by the use of a suitable baffle in which to mount the whole reproducing unit.

As you know, one of the peculiar characteristics of moving-coil speakers is the booming effect so often found in the lower ranges, but this in more recent types has been overcome to a surprising extent without restricting the movement of the diaphragm appreciably.

Value of the Bass.

This is very important if the full value is to be given to the reproduced bass notes. In this connection I may say that

(Continued on next page.)

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TECHNICAL NOTES

(Continued from previous page.)

sonally, I think the importance of the bass notes, or perhaps I should say the difficulty of securing the proper and proportionate reproduction of the bass notes, is apt to be exaggerated.

Personally, I prefer not to have the bass too prominent, in fact, to have it somewhat suppressed and a little extra prominence given to the upper frequencies.

When considering the higher frequencies, it is very important to be sure that there is no tendency to squeakiness, and the aim of the designer should be to strike a happy mean between an over-predominant bass giving rise to boominess and a high-pitched thin or squeaky reproduction.

Design of Magnetic Circuit.

Another point in the design of a moving-coil loud speaker, or a permanent magnet speaker, for that matter, is the concentration of the magnetic field upon the region occupied by the moving coil. A well-designed magnetic circuit may make a considerable percentage difference to the amount of field current necessary to excite the speaker.

When designing the magnetic circuit, however, mechanical considerations have to be considered as well as the magnetic features of the circuit. We have to remember that the moving coil has to move within the magnet gap and in doing so it acts as a piston and pushes the air to and fro.

If the unit is so designed that there is considerable resistance occasioned by this movement of the coil, it will mean that there will be a damping or cushioning effect upon the armature and this will lead to a reduction in sensitivity and most probably also to distortion or at any rate to a non-uniform reproduction over the audio range, since the effect will differ with different frequencies.

Choosing a Good Unit.

I mention these points not because the majority of my readers will actually be concerned with the construction of the loud-speaker unit, but because only by appreciating the features necessary for efficient reproduction are you in a position to distinguish between a unit which is well designed and one which is not.

As a matter of fact, notwithstanding that extravagant claims are often made for loud speakers such as the claim to an absolutely uniform response over the whole audio-frequency range, there is still ample room for improvement and often quite a small change in the design or construction of the loud-speaker unit will make a surprising difference to the performance.

A Matter for Experiment.

It is reasonably correct to say that with the majority, if not, indeed, with all magnetic circuits, it is a matter of some difficulty to predict from theoretical considerations precisely how the circuit will function, inasmuch as the factors which govern it cannot as a rule all be accurately known. Therefore, it becomes largely a matter of experiment and practical test, and this brings it within the range of the home experimenter.

(Continued on next page.)

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TECHNICAL NOTES.

(Continued from previous page.)

Furthermore, the type of quality of reproduction which will suit one listener will not necessarily suit another, so that it is impossible to draw any hard-and-fast rule as to what may be considered the standard or perfect type of reproduction, and this again still further enlarges the field for development.

Test Your Voltages.

A letter from a reader in this journal a short time ago emphasises a point which I have previously mentioned in these Notes. In the case in question a mains unit had been installed instead of the high-tension battery previously used, the set having a screen-grid H.F. amplifying stage.

It was found that whereas the set had operated perfectly well on the battery, it went into violent oscillation with the mains unit. On testing, it was found that both the

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The lead joining it to the set should be as as possible, because a earth-lead often causes hand capacity effects.

If you are installing a mains unit, pay particular attention to the instructions about its earth connection. Often in such cases a must be inserted between the set and earth, by means of appropriate terminals on the unit.

LOOK OUT FOR THE MISSING WORDS NEXT WEEK.

Last week's missing words (in order) were: Direct. Alternating. Smoothed. Voltage. Voltage. Rectifier. Transformer.

screen grid and the other valves were receiving a voltage far in excess of their rated value.

The H.T. Voltages is Important.

Notwithstanding the advice so frequently given, to apply a high-resistance voltmeter, I am afraid that quite a large percentage of experimenters never know with any sort of accuracy what voltage they are applying (I am speaking more particularly of mains-unit operation) to their different valves. Bearing in mind the great developments of valve design and the fact that the efficient operation of modern valves in many cases depends critically upon the application of the correct voltages, it is surprising that so little attention is paid to this point by amateurs.

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