POPULAR WIRELESS, July 7th, 1928. REGISTERED AT THE G.P.O. AS A NEWSPAPER.

THE BEST RADIO PAPER TO BUY.

# Popular Wireless

Every Thursday PRICE 3d.

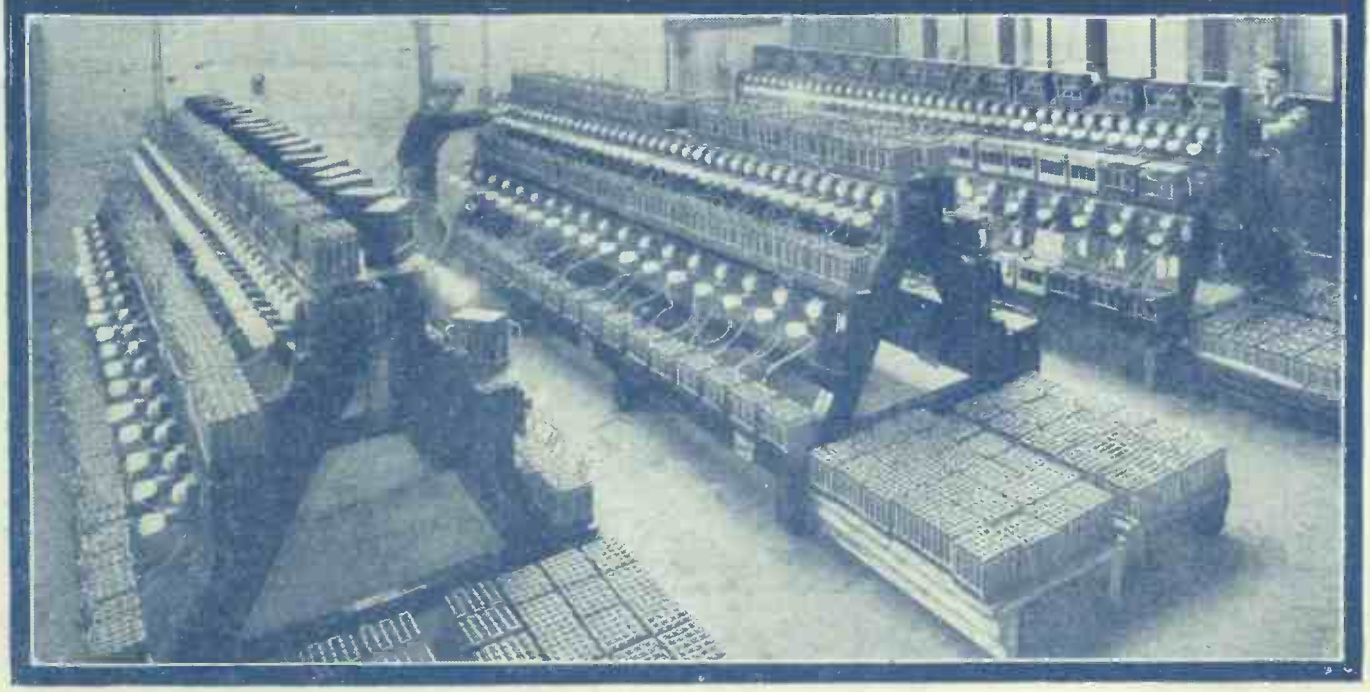
No. 318. Vol. XIII. INCORPORATING "WIRELESS" July 7th, 1928.

## BATTERIES FOR YOUR SET

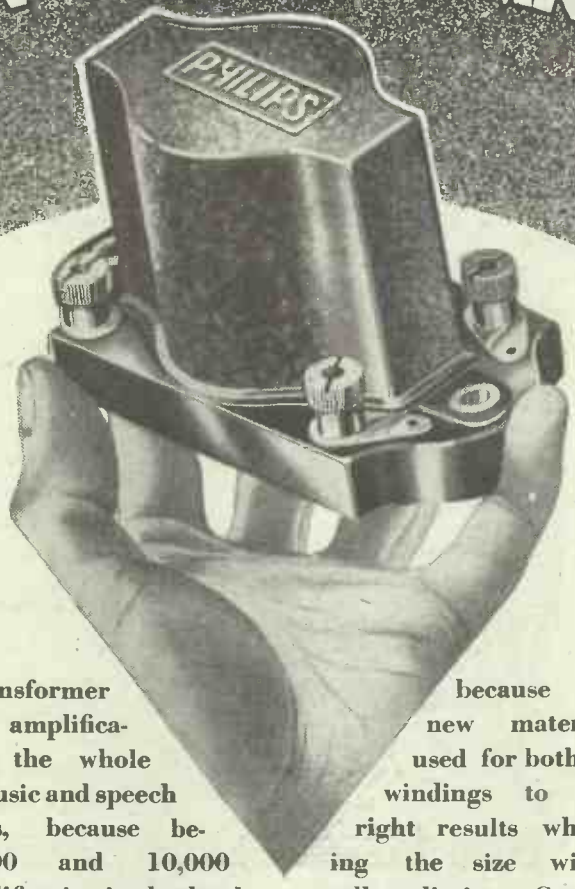
### H.T., L.T. AND G.B. TYPES WE CAN RECOMMEND.

A Comprehensive Range of the chief makes of accumulators and dry batteries suitable for any type of wireless receiver.

*(SEE PAGE 629)*



# THE NEW PHILIPS TRANSFORMER

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# PHILIPS

*for Radio*

# Popular Wireless

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Assistant Technical Editors: K. D. ROGERS, P. R. BIRD, G. P. KENDALL, B.Sc., A. JOHNSON RANDALL.


## RADIO NOTES AND NEWS.

### The Father of All Valves—Radio and D X Flight—The Modern Mark Tapley—De Groot De-parts—Funk About Football—Beam Broadcasting.

**A Pleasant Dilemma.**

THE general custom is to rave at 2 L O and turn over to 5 G B, or *vice versa*, but it happened to me, the other night, that one of these stations was broadcasting an item which I desired to hear as greatly as I wished to hear what t'other one was doing. A new kick against the poor B.B.C., eh? "*Whoi-i on earth* do they go and put two items that I like over the ether simultaneously?"

**A Bold Experiment.**

SURELY congratters are due to the Australian Press Association who proposed, and to Mr. L. McMichael and all others concerned who carried out that bold experiment to ascertain whether it was possible to receive a special programme from 3 L O (Melbourne) on a train conveying 600 Scottish Australians on a visit to their old country. The show was a great success and good L.S. signals were received on a McMichael six-valve short-wave set.

**These Also Serve.**

YES, they also serve, who only stand and roll gaspers or fill tins with baccy. How often I have lit my pipe for a meditative burn—and cast many a thought to the lad, or lass, who diddled up the weed in the neat (and expensive) little packet. This sitting up half the night for American and Australian stations must add oodles of quids to the revenue accounts of the baccy magnates; hence it is good to learn that some of the rake-off is passed on to their staffs. All this, because I see that the Imperial Tobacco Co., Ltd., has just given its Dublin staff a sports ground of 22 acres, complete with pavilion and dressing-rooms. A wise and happy firm.

**The Father of All Valves.**

I WAS interested to see that Dr. J. A. Fleming has been taking, if not a conspicuous, a thought-worthy part in a newspaper discussion of a subject far removed from electrical engineering—a theological one. Dr. Fleming has retired, but, like most great men, he does not grow older or feebler in mind, and I hope we shall hear a lot of him. Never let us forget that he was the first man to apply the properties of a glowing filament to the sweet uses of radio reception.

**Radio and D X Flight.**

"LADY LINDY'S" flight across the Atlantic has proved once more that radio is worth its weight in aero. Owing to its failure—which is no fault in the principle, for it is possible to keep a radio set O.K. for twenty-four hours, surely?—the aeronauts were reduced to looking at chalked messages on the decks of ships. Any aerial expedition that dispenses with radio is at once reduced to the level of a desperate gamble.

**ASSAULT AND BATTERY!**

Heat is an enemy of both L.T. and H.T. Batteries—don't keep them near fires, hot-water-pipes, or in other places where heat will assault them.

**Time for the Globe.**

I MUST confess that Professor A. Korn's proposal for a central radio time-signal station leaves me lukewarm. Even a degree of accuracy of one hundred-thousandth of a second does not attract me. I like a generous interpretation of the time, especially on Sunday mornings, when I reckon on a little laxity of the domestic arrangements. Nine-thirty breakfast, plus a humanitarian margin for shaving and "poshing-up." And so say all of us, eh?

**The Modern Mark Tapley.**

YOU all know Mark Tapley of "Martin Chuzzlewit," who became all the jollier as his troubles multiplied. Surely Mr. Derek McCulloch (Uncle Mac) is his reincarnation. Having undergone twenty-one operations on account of war wounds, they say that he is a ray of sunshine and can hardly be restrained from a continuous output of humour. Heaven send us more B.B.C. men like that—and to him, health and strength.

**The Gesture Magnificent.**

I DON'T think! After the announcement of the result of the Prayer Book division in Parliament the B.B.C. shut down. A completely silly, narrow-minded and irregular action. On the basis of the voting it is safe to assume that the majority of listeners were opposed to the measure, but although no right-minded person wants to rejoice over a victory fraught with the elements of religious war, there is no sense in stopping the broadcasting of dance music. If adherents of the proposed new Book were so profoundly affected, they had no business to be listening-in. Yes! there *is* a crank with power in the B.B.C. Of that I am convinced. There are several.

**De Groot De-parts.**

SO De Groot is leaving the Piccadilly Hotel after twenty years, because the competition of knife-and-fork music has beaten him. The diners have won but a Pyhrric victory, for De Groot will enhance his reputation thereby—not, I hasten to add, because he leaves the hotel, but because he will become more widely known, as he is going on tour. He has played "La Boheme" 10,000 times at the Piccadilly, and not a single fox trot. How *does* he do it?

**Photograms to 'Frisco.**

DO you know that it is possible for you to step into Marconi's Telegraph Office at Radio House, Wilson Street, E.C., with a photograph of little Willie, the only baby in the wide world, and cause

(*Continued on next page.*)

# NOTES AND NEWS.

(*Continued from previous page.*)

an exact copy of it to be delivered to an adoring auntie in San Francisco, or Chicago, New York, Boston, Cleveland, St. Louis or Los Angeles within a few hours ? No ? Well, it is the fact. Or you can send a facsimile drawing, or piece of writing, by the same method, or even a cheque. The charge is £10 for a picture five inches by three inches, to New York ; beyond New York the charge is £9 7s. 6d. per five inches by seven inches, or less.

### Photo-telegraphy in China.

IT is reported that a photo-telegraphy service is to be opened between Pekin and Mukden. As it is impossible to represent the Chinese ideographs by Morse symbols, it would appear that photo-telegraphy is a gift of Providence to the Chinese. And I suppose the process will be equally useful to the Japanese. Anyway, judging from the results of Marconi's latest photogram system, Morse has seen "the writing on the wall," so far as radio is concerned, and we shall soon be able to transmit our messages all over the world in our own "hand of write."

### Letter from a Beef-Breeder.

"P. W." is honoured with letters from Britons and others from all parts of the habitable globe. A man in the Argentine (H. R. of "La Pampeana") writes a most cordial epistle, half in praise of "P.W." and half in glorification of dear, dumb, old 5 S W. If the B.B.C. could read the mail I get from overseas Britons they would turn 5 S W into a company on the instant. Look here, H. R., 5 G B has simply *got* to continue—and, in reply to your inquiry, I am partial to a beefsteak and a cocktail with any he-man who is fond of radio.

### Funk About Football.

THE Football League has, I understand, asked clubs to refrain from having commentaries on their games broadcast. As in the case of theatre and music-hall proprietors, I consider that the League has missed the psychological truth embedded in the apparently ugly and dangerous setting. To me it is unbelievable that the number of persons who would normally attend a match but would stay away if it were broadcast would be sufficient to affect the gate receipts to an extent which anyone other than an actuary would notice. It's a mistake which, I hope, will be spotted by the clubs.

### Up, the Empire !

A DIRECT radio-telegraph service is now being conducted between Kenya and this country. Telegrams to all places in Kenya and Uganda will be accepted at any P.O. telegraph office, but at present only "deferred" messages can be handled, *at 9d. a word*, and Daily Letter Telegrams at 4½d. per word, with a minimum charge of 7s. 6d. for 20 words. Deferred at ninepence a word is decidedly high, not from the purely telegraphic standpoint, perhaps, but surely the Colonial Office is interested in the matter. Dash it, Kenya wants *developing !*

### Radio the Super-Collector.

ACCORDING to Mr. J. C. Stobart of the B.B.C., the total amount of charitable contributions raised by London and Daventry appeals for 1926 was over £11,000, and for 1927 £36,736—a fine testimonial to the immense value of broadcasting in publicity work and to the generous nature of the public in this country. I should not object to an extension of this side of the B.B.C.'s activities, because it is begging robbed of most of its terrors, and does not annoy or inconvenience the beg-ee.

### "Uncle Arthur" Reappears.

MR. A. R. BURROWS, never-forgotten "Uncle Arthur" of early broadcasting, so rarely emerges from his hermitage, the Secretariat of L'Union Internationale de Radiophonie, that an announcement by that entity is of extreme interest. The Council of the Union, in a conference at Lausanne, at which Admiral Carpendale was present, and another conference of broadcasting engineers, at which some twenty European countries were represented, recently concluded their sittings.

## SHORT WAVES.

A Magnetic Pick-Up : A Scotsman retrieving a falling threepenny bit.

* * *

"I don't know whether to believe Bill's DX reports or not."

"Oh, Bill's honest. He even writes to the local stations, for verification of selections heard, before he puts them down in his log-book."

"Radio News."

* * *

Another wireless pirate hunt is shortly to take place. We certainly hope it will be "fine" for them.

* * *

An Ealing correspondent is very upset because his local dealer will not replace the accumulator which he recently purchased. He says it is quite O.K. on 2 L O, but he can't get 5 G B.

* * *

"The Warsaw broadcast station can be received in this country with two calves," we read in a daily paper.

Surely this is not leg-itimate ?

* * *

There is no truth in the rumour that the reason crystal sets are now going out of fashion is because the Royal Society for the Protection of Cat's Whiskers have raised a protest.

* * *

Listening to Ma's—over the garden wall.

* * *

A. : Can you tell me what's been broadcast on the radio this evening ?"

B. : "Yes ! Why do you want to know ?"

A. : "Just to prove to my wife where I've been."

* * *

Enclosed in this green, grassy plot
Lie the remains of Samuel Blott.
He struck a match to find the crystal spot—
His clothes ignited and, alas, his end was very hot."—"Popular Radio Weekly."

### Trams, Lifts and Relays.

THE Council recommended that the identity of broadcasting stations should be stated as clearly as possible. So do all of us. Hooray ! The engineers discussed methods of eliminating interference from trams and lifts. (More "power" to them !) And also the question of long-distance relays by telephone lines and cables. Apparently nothing was said about programmes or Morse—a grave omission from the agendas. Admiral Carpendale was re-elected President of the Union, and we look to him as a Navy man to show special interest in bands and bandmasters !

### Note for Sir Oswald Stoll.

SIR OSWALD STOLL will no doubt be greatly edified by the news that the Italian Ministry of Communications would make short work of his anti-broadcasting attitude if he (Sir Oswald) were operating in Italy, for in that country a decree has been issued obliging artists to broadcast, if so required, from Rome, Naples, and Milan. A little Fascisti touch now and again in British affairs wouldn't do much harm to us, unless we were compelled by decree to listen to Chamber Music or talks on the Foundations of Blithery.

### Afternoon Broadcasting.

THE B.B.C. announces that between July 2nd and September 21st inclusive, afternoon programmes shall begin at four o'clock, with certain exceptions, viz., on Thursdays 5 X X and 2 L O will broadcast Westminster Abbey service at three ; and on Thursdays 5 G B will relay at three the Bournemouth Municipal Orchestra ; on Saturdays and Sundays broadcasting will normally begin at three-thirty, and on Wednesdays once a month the Kneller Hall Band will be relayed by 5 G B at three-thirty.

### Small Beginnings.

ON June 3rd, thirty years ago, Lord Kelvin, with Lady Kelvin and Tennyson, were visiting Marconi's experimental radio station at the Needles. To show his belief in the great future of wireless telegraphy, he insisted on paying a shilling each for messages sent to four friends. The first paid radio ever sent read : "Sir George Stokes, Lensfield Cottage, Cambridge. This is sent, commercially paid, at Alum Bay, for transmission through ether. One shilling to Bournemouth and thence by postal telegraph fifteen pence, to Cambridge.—Kelvin.

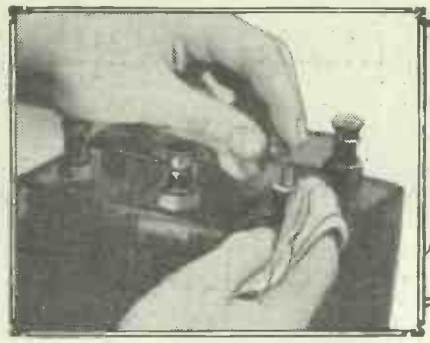
### Thirty Years Hence.

THREE decades after Kelvin gave his blessing to the young inventor, Marconi built the British Empire Beam System and the Derby result was by its means known in Australia a few seconds after the event. Shall we, in thirty years, looking at moving pictures of events in Australia, transmitted by television, be able to mutter to our grandchildren stories of our recollections of the earliest attempts at television by a man called Barnes—"or maybe it was Bairns or Baird" ? Well, I sincerely hope so.

### Beam "Broadcasting."

A WEEK or so back a select party of distinguished radio men from New York were shown by Senatore Marconi, at the Bridgwater Beam Station, how he could receive ordinary broadcast transmissions from Montreal, using the same apparatus and aerial, *at the same time*, as was being used for the usual Morse telegraphy. No trace of Morse interference was noticed whilst the dance music rattled through. This sounds like "a bit of orl right" for those parts of the Empire blessed with Beam stations.

ARIEL.



# The ACCUMULATOR HOW IT WORKS

**Some interesting facts which will help you to maintain and get the most out of your L.T. battery.**

**By J. F. CORRIGAN, M.Sc., A.I.C.**

THE very simplest form of accumulator is that illustrated in the photograph, Fig. 1. Here, two small platinum or lead plates are immersed in a dilute solution of sulphuric acid. Now, if a current of a few amps is passed into this simple cell the water will be split up by the current into its constituent elements —oxygen and hydrogen, the hydrogen collecting in small bubbles of gas at the negative pole, and the oxygen being formed at the positive plate of the cell.

If, now, the external battery is removed, and the cell leads are joined together, a small current will be found to flow through them for a short time. This current is due to the "polarisation" of the cell electrodes, that is to say, to the formation of the electro-positive hydrogen at the negative plate of the cell, and the electro-negative oxygen at the positive plate.

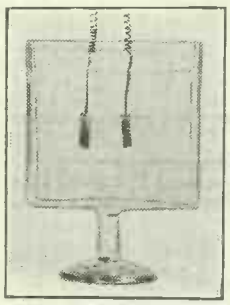


Fig. 1. The simplest form of accumulator. Two platinum (or lead) plates immersed in dilute sulphuric acid.

Such a simple cell, therefore, constitutes a primitive type of accumulator, and, in fact, this type of "gas battery," as it was once called, was at one time employed as a miniature source of current.

The modern accumulator originated in an invention of Faure about the middle of the last century. Faure's cell contained two lead plates which were coated with red lead or minium. These plates were immersed in a dilute solution of sulphuric acid and a current from an external battery was passed between them.

Under such conditions, it was found that the red lead on the first plate became further oxidised to lead peroxide owing to the liberation of oxygen at its surface, whilst the second plate, in virtue of the fact that hydrogen was liberated at its surface, had its red lead content reduced to metallic lead of a spongy porous form.

### The Modern Battery.

When, now, the external battery was removed, and the leads joined up together, a current was found to flow through the external circuit, during which process the spongy lead was reconverted into red lead at the negative plate, the lead peroxide also being returned to red lead at the positive plate.

Such an accumulator proved very inefficient—in the first place, because its capacity was extremely small; and, secondly, because several by-reactions proceeded at the same time which militated against the free conversion of the one lead compound into the other.

Nevertheless, it is upon this simple and somewhat crude invention that the modern accumulator is based, and an appreciation of its mode of action will enable us immediately to grasp the fundamentals of the up-to-date accumulator.

A modern accumulator in its simplest form consists of two lead plates which are contained in a suitably constructed glass or celluloid vessel. The accumulator plates are cast in the form of grids in the interstices of which is packed the active material of the accumulator. In its *charged* condition the positive plate of the accumulator contains lead peroxide within its grid-like structure, and the negative plate of the cell holds its active material in the form of spongy lead.

Fig. 3. The negative plate of an accumulator containing spongy lead.

The positive and negative plates of an accumulator are shown in the illustrations, Figs 2 and 3. It is easy to distinguish between them, the positive lead peroxide plate having a chocolate-brown colour, and the negative spongy-lead plate presenting an almost uniformly-grey appearance.

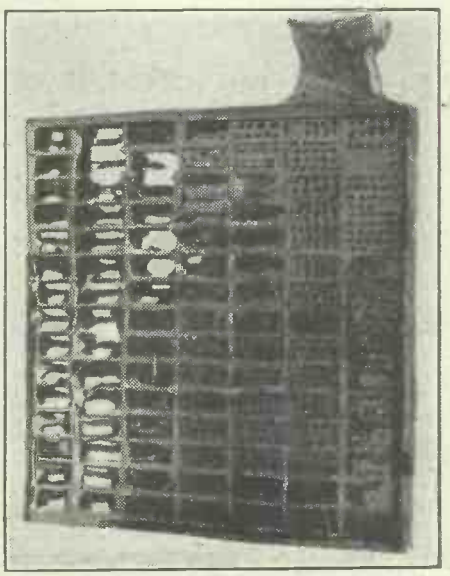


Fig. 2. The positive plate of an accumulator with some of the active lead peroxide material removed in order to illustrate the structure of the plate.

Two such plates immersed in a solution of sulphuric acid constitute an accumulator in the charged condition.

During the process of discharge of the accumulator the current leaves the cell by the positive lead peroxide plate, and, as the current passes, the lead peroxide on the positive plate is reduced to a lower state of oxidation, whilst the metallic lead on the negative plate is oxidised to a lead oxide.

Complex as such a process of continual change may appear, it is not all that goes on within the accumulator. During the discharge of an accumulator lead sulphate is formed as an intermediate compound, and it is the mechanism of the formation of this lead sulphate and of its reconversion into lead peroxide and metallic lead that is not fully understood at the present time.

### Why Sulphate is Harmful.

If the cell does not work smoothly, or if in any way the accumulator is badly treated or neglected, the lead sulphate appears on the plates in a very difficult soluble form, and, as such, it refuses to take its part in the cycle of operations. The lead sulphate thus formed clogs the plates of the cell, and prevents further action. An accumulator in such a condition is said to be "sulphated," and, as every amateur knows, it requires special treatment in order to get rid of the insoluble sulphate deposit.

As a matter of interest the reader will see at Fig. 4 a "close-up" photograph of an accumulator plate which has become sulphated. It should be noted that the sulphate deposit has collected on the surface of the plate in the forms of white scaley flakes, thus covering up entirely the unattacked active material in the plate.

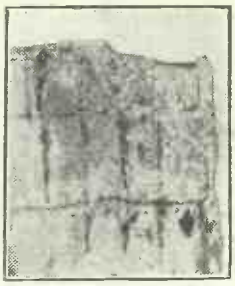


Fig. 4. A "close-up" of a sulphated accumulator plate.

Regarding what is known as the capacity of an accumulator, this quantity is measured in "ampere-hours," one ampere-hour being the quantity of electricity equivalent to a current of one ampere flowing for one hour.

The E.M.F. of a fully-charged accumulator is about 2 volts. The cell maintains this potential until it is nearly discharged, at which point a very rapid fall in voltage manifests itself. In practice it is best to re-charge an accumulator as soon as its voltage drops below about 1·85 volts.

Generally speaking, low-discharge rate accumulators are less liable to give rise to trouble, owing to the less sensitive condition of their active material. Nevertheless, within recent years accumulators for wireless work have been so enormously improved in efficiency that very little consideration may be given to this fact when deciding upon any particular type of cell to use.

# TELEVISION AGAIN!

**So much ambiguous tosh has been written about Television that readers will welcome this straightforward statement on the present position.**

**By THE EDITOR.**

A READER has sent me a newspaper cutting (which I had already seen), headed: "Television for All," this being a two-column advertisement which appeared in several newspapers last week concerning the Baird "Seeing-in" Set shortly to be on sale, according to all accounts, at a price of £25.

Following this article, there has appeared in the newspapers the prospectus for International Television, Ltd., capital £700,000.

The finance question of television is no concern of ours. This is a technical paper and it is not within our province to criticise the issue of prospectuses and the like; such questions and such problems must be left to the intelligence and commonsense of our readers. But in connection with the advertisement above referred to, headed "Television for All," the writer who sent me the cutting says in his accompanying letter: "In view of 'P.W.'s' thousand-pound challenge and attached articles, what *are* we to believe? Perhaps an authoritative article on this advertisement would clear the air for alleged television once and for all."


**No special Battery Number could be complete without reference to the famous Exide batteries. The one shown here (Type W J G) is a super-constant Grid Bias Battery.**

### What Scientists Say.

We had thought that, in making a friendly challenge of £1,000 to Mr. Baird, we had cleared the air technically, inasmuch as we published the considered opinions of such scientific experts as Sir Oliver Lodge, Dr. Roberts, and several well-known American physicists including Dr. Lee de Forrest. All these opinions were unanimous on at least one point—and a very vital point, too—viz., that, as far as known television systems were concerned, television from the public utility service point of view was impracticable, and that television to the extent of seeing a boat race, or cricket at Lord's, or racing at Ascot, would necessitate the invention of an entirely new system.

Sir Oliver Lodge suggested that the Cathode Ray television system (which was fully dealt with by Mr. A. A. Campbell Swinton, F.R.S., in a recent issue of "Modern Wireless") offered, possibly, the best hopes as regards known systems.

But in the advertisement which my correspondent has sent me and which, of course, was a prelude to the issue of the publicity in connection with International Television, Ltd., we find it stated, *inter alia*: "Now the day of mere experiment is past and television has been brought within the range of all. . . . At the Radio Exhibition, to be held at Olympia in September, the Baird televisor will be on view and arrangements are being made for holding public demonstrations in an adjoining building. From that time onwards anybody will be able to purchase a "Seeing-in" set for probably as little as £25, and with it witness in his home moving images of events transmitted from a broadcasting station."

### "Might Mean Anything."

Here, again, we have to point out that this sort of publicity is misleading. Take, for example, the phrase "Moving images of events transmitted from a broadcasting station." This might mean anything. It might mean a full-blown concert with the artists in evidence, or it might mean Mr. Baird's old dummy blinking its eyes and opening its mouth. If people are going to pay £25 for an apparatus which will show Mr. Baird's dummy doing tricks like this, they will be paying very highly for what, although an ingenious experiment, does not constitute television in the sense that it justifies the remark quoted above that "Now the day of mere experiment is past and television has been brought within the reach of all."

Further on in this optimistic publicity announcement we find this phrase: "Of the possibilities of the future development of this astonishing invention it is hardly necessary to speak. We can all imagine for ourselves that the day cannot be far distant when, without leaving our chairs at home, we shall be able to see Ascot in all its excitement and glory, or a Test Match at Lord's (or at Sydney, for that matter)—see, that is, the actual events themselves at the moment of their occurrence, not just moving photographs of them some time afterwards."

Yes, we can all imagine for ourselves that day (probably very distant) when, without leaving our chairs at home, we shall be able to see Ascot in all its excitement and glory, etc., etc.; but if Mr. Baird, when he produces his home televisor on sale at the Exhibition, can show anything like a recognisable moving scene of events occurring at Lord's or at Ascot (or at Sydney), we will cheerfully renew our £1,000 challenge.

Following this paragraph, it is stated that: "The truth is that, without envisaging these possibilities of the future, Mr. Baird has provided for our immediate assimilation as much as we can reasonably be called upon to digest."

This really is the limit. It is difficult to refrain from indulging in sarcasm. The idea of providing something for "our immediate assimilation," because it is as much as we can "digest," is too ridiculous for words!

### "Pure Bunk."

Perhaps it would be best to close this article by reproducing extracts from a letter which was addressed to the London Press by the writer a few days ago.

"The references which have been appearing in the Press in the form of advertisements by the Baird Television Development Company allude optimistically to the time when we shall be able to see by wireless moving events at Lord's, Ascot, etc. It is the opinion of bona fide scientists that such references are excessively optimistic.

"I, myself, will go further and say that they are pure bunk. It is the considered opinion of the leading physicists in this country that, until a new system is discovered, known methods of wireless television will never lead to a state of affairs which will enable the ordinary householder to instal an apparatus which will allow him to see moving events at Ascot or Lord's.

"Although sensational experiments have been reported in connection with the reception of recognisable faces by television on the 'Berengaria,' etc., these experiments have not been duplicated in the presence of reputable and impartial scientific authorities.

"In the circumstances, one can only agree with the various City editors who have written in the Press to the effect that participation in the Baird Television Development Company, or in the new International Company, is a gamble. It is well that the public should realise this."

## INSIDE AN ACCUMULATOR

**Apart from the electrolyte or "acid," an ordinary accumulator merely consists of a containing case with cover, two sets of plates with separators, and the connecting terminals, nuts, etc. (Generally there is one more negative plate than positive.)**

# The "G.P.K." TWO

**This, the latest "wave-change" set, is an excellent little "H.F. and det." of the highest sensitivity, and good selectivity.**
**By the "P.W." RESEARCH DEPT.**

THE modern wireless receiver has reached a very high state of efficiency, but it still retains that factor which to many readers is an everlasting irritant, namely, having to change the coils when it is desired to go over from one wave-band to another. We have in this country a batch of stations which operate on a wave-band between 200 and 500 metres, and then we have a special high-power station operating on a wave-band of approximately 1,600 metres. In addition, there is a large number of Continental stations operating on both high and low wave-bands.

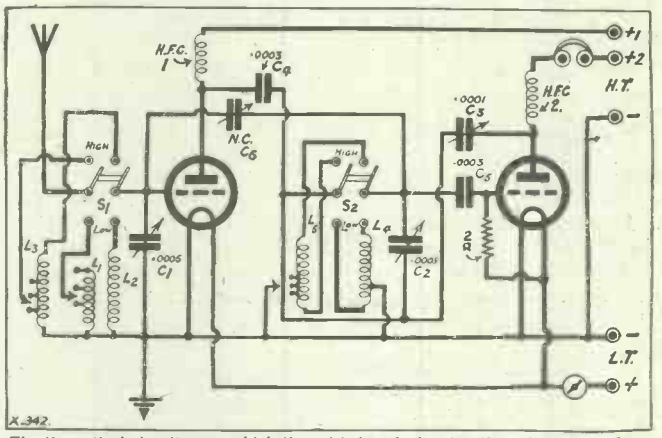
### A New Development.

As every listener knows, to go over to the longer waves usually necessitates the change of at least one coil. The "P.W." Research Department, under the direction of Mr. G. P. Kendall, has for a long time been experimenting with a view to designing receivers which will operate efficiently on both wave-bands without the bugbear of coil changing. The "G. P. K." Two is the latest result of these experiments, and is a thoroughly sound and practical job which may be tackled by the constructor without fear of failure. Since the receiver is a new development, a few words on the circuit itself, before beginning the constructional details, will not be out of place.

To commence with, the receiver employs one high-frequency stage followed by a detector with reaction. It is really intended for long-distance work, using the telephones only. For those who wish to use a loud speaker the Research Department evolved a two-valve L.F. amplifier, to match up with the "G. P. K." Two, so that the construction and testing of the H.F. and detector could be carried out first of all, after which the amplifier could be built as a separate unit at leisure. The "G. P. K." Amplifier, incidentally, will be described in a future issue.

If you look at the theoretical circuit you will see that there are two double-pole change-over switches. On one side these are marked "high" and on the other "low." "Low" indicates the position for the normal broadcast band, and "high" that for 5 X X and similar stations operating on the longer waves. With the switches in the position marked "low," the aerial is coupled by means of a semi-aperiodic coil, marked $L_1$, to a secondary coil $L_2$. $L_1$ has tappings so that the best number of turns for selectivity or signal strength may be obtained. Individual aerials, of course, vary, and the tappings on the coil $L_1$ have been chosen with the

*(Continued on next page.)*




The theoretical circuit upon which the set is based, showing the extreme simplicity of the switching scheme.

## COMPONENTS AND MATERIALS.

1 Panel, 14 in. × 7 in. × ¼ in. or ⅜ in. (Any good branded material).
1 Cabinet to fit, with baseboard 14 in. deep and pair of brackets (Original by Peto-Scott. Standard size, available from all well-known cabinet suppliers—Arteraft, Bond, Camco, Caxton, Makerimport, Pickett, Raymond, etc.).
2 ·0005 mfd. variable condensers, square law or S.L.F., with slow-motion drive or vernier dials (J.B. in original set. Any good standard make).
2 Double-pole change-over switches of the anti-capacity type (Dubilier "Minicaps" in set. Another suitable type is the Utility).
1 ·0001 or ·00015 mfd. reaction condenser (Bowyer-Lowe, Cyldon, Peto-Scott, etc.).
1 On-off switch (Benjamin, Igranic, Lissen, Lotus, etc.).
2 Sprung valve holders (W.B. in set. Any of the standard makes can, of course, be used, such as the Lotus and others of good quality).
1 Baseboard neutralising condenser. (Any standard type).
2 H.F. chokes (Any standard makes. Bowyer-Lowe, Burne-Jones, Climax, Colvern, Cosmos, Igranic, Lissen, R.I.-Varley, etc. Note.—It is important that chokes of different makes should be used in the two positions, e.g. in the original set the second choke is an R.I.-Varley and the first a Burne-Jones. It is desirable to choose a fairly compact type for the first position).
2 Standard loading coils. (Burne-Jones, Paroussi, Wearite). Note that these should be mounted edgewise, as shown.

Materials for B.B.C. wave coils (see text).

2 ·0003 mfd. fixed condensers (Clarke, Dubilier, Igranic, Lissen, Mullard, T.C.C., etc.).
1 2-meg. grid leak and holder (Dubilier, Igranic, Lissen, Mullard, etc.).
1 Terminal strip, 12 in. × 2 in. × ¼ in., and 9 terminals (Belling-Lee, Eelex, Igranic, etc.).
3 Tapping clips, bare wire or Junit and Systoflex for wiring, or a covered wire such as Glazite, sundry pieces of flex, etc.

## THE "G.P.K." TWO.

(Continued from previous page.)

knowledge that the constructor will be able to find a tapping which suits his particular aerial arrangement with the minimum of trouble. The H.F. valve is coupled by means of the well-known parallel feed arrangement to a tapped coil marked $L_4$. The H.F. valve is stabilised with the aid of a neutralising condenser, which is joined from the grid of the detector valve to the grid of the H.F. valve. (This scheme was adopted as the result of considerable experiments with other methods.)

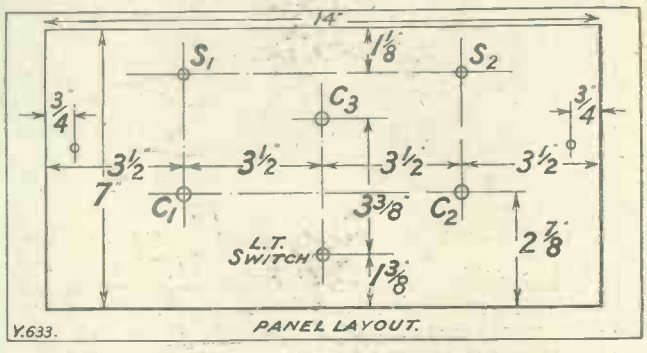
### The General Layout.

The feed condenser, which is marked $C_4$ in the diagram, is taken to the other end of the coil $L_4$, and also to one side of the reaction condenser. A filament tap is provided about one-third of the way along the coil. Both of these coils are of a type suitable for home construction. With the switches in the position marked "high," the coils marked $L_3$ and $L_5$ are brought into circuit. (These are simply two of the "P.W." standardised loading coils which were described in the June 16th issue of this journal.) The aerial circuit now becomes auto-coupled, and various degrees of selectivity may be obtained by placing the tapping clip on any one of the available tappings. The H.F. coil is equally simple, being more or less identical in principle with that for the normal broadcast band, except for the fact that there is a choice of three filament tappings. We shall say more about these tappings in the operating notes. It will be seen that the circuit arrangement is extremely simple, and it is, in fact, far more frightening on paper than in actual practice.

Suppose we now take a look at the back-of-panel diagram, in conjunction with the photographs, and notice how symmetrical the lay-out is. There are two large tuning dials. That on the left, looking at the front of the panel, tunes the aerial secondary circuit, while that on the right tunes the H.F. circuit. Between these two dials and a little above them is the knob which operates the reaction condenser, and just below this the filament on-off switch. Immediately above each of the tuning controls are the two-way change-over switches. With the particular make used in this receiver the change over from short to long waves is made by moving the switch levers over from left to right.

So much for the front of panel. Now turn to the back of panel, and note carefully the positions of the components on the baseboard. It is inadvisable to deviate in any way from the arrangement used, since it is the result of much experiment. You will note that the various coils are placed in positions carefully chosen to minimise the effect of interaction between them. This is very important, and no departure from these positions should be made. The components employed in the set are not of a critical nature, and those of any good makes can be employed. The radio chokes, however, must have a high inductance value, otherwise the set will be hopelessly inefficient on the longer waves, and, in addition, if the chokes are badly designed it may not be easy to stabilise the receiver at certain points on both wave-bands.

The first step in building this receiver is the construction of the coils. The high-wave coils can be bought ready made or home wound from the details given on page 534 of the June 16th issue of POPULAR WIRELESS. The remaining two coils are wound on 3-in. diameter formers of any good insulating material, such as Paxolin, Pirtoid, Radion, etc. (The original coils were wound on "Super-Pirtoid" tubes.) We will start first with the aerial coil. The secondary winding, $L_2$ consists of sixty turns of No. 24 D.C.C. wire, close wound. The length of the former is 3½ in., and the winding is commenced approximately one inch from one end. This end of the coil, which we will call the lower end, is connected to earth, while the other end goes to the first change-over switch $S_1$.




On top of this coil and over the lower half of the secondary winding is wound the semi-aperiodic aerial coil. The turns are spaced away from the secondary windings by means of seven ¼-in. diameter lengths of wood rod. This aperiodic winding consists of twenty-five turns of No. 24 gauge D.C.C., and tappings are taken at fifteen and twenty turns, counting from the end which is joined to earth. The other end of the coil, namely, that which is nearly opposite to the centre of the secondary winding, is left free, this giving three positions for the aerial clip.

### The H.F. Coil.

These positions are, therefore, fifteen, twenty, and twenty-five turns. The H.F. coil consists of sixty turns of No. 24 D.C.C. wound on a 3-in. diameter by 3½ in. long former of the same type as that used for the aerial coil. A tapping is taken twenty turns along the coil. This tapping is joined to L.T. negative and to the flexible lead which terminates in the clip for the long-wave H.F. coil. The two ends of the winding go to the second change-over switch $S_2$.

The coils are mounted on the baseboard in a very simple manner. The aerial coil is placed in a vertical position on the baseboard. A length of wood about half an inch square is cut the same diameter as the former and inserted in the lower end, being held in position with the aid of two wood screws. A hole is bored through the centre of the wood strip, and a third wood screw secures the whole coil to the baseboard. The H.F. coil is placed horizontally about 1½ in. above the baseboard. Two 1½-in. lengths of wood are screwed to the coil former and to the baseboard to hold it in position.

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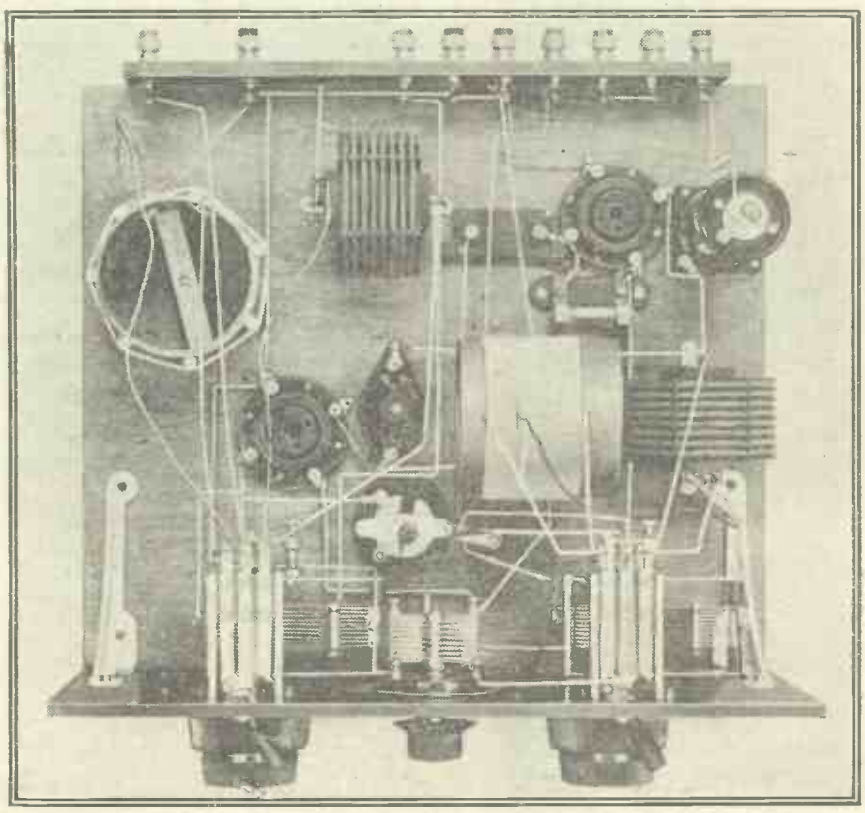
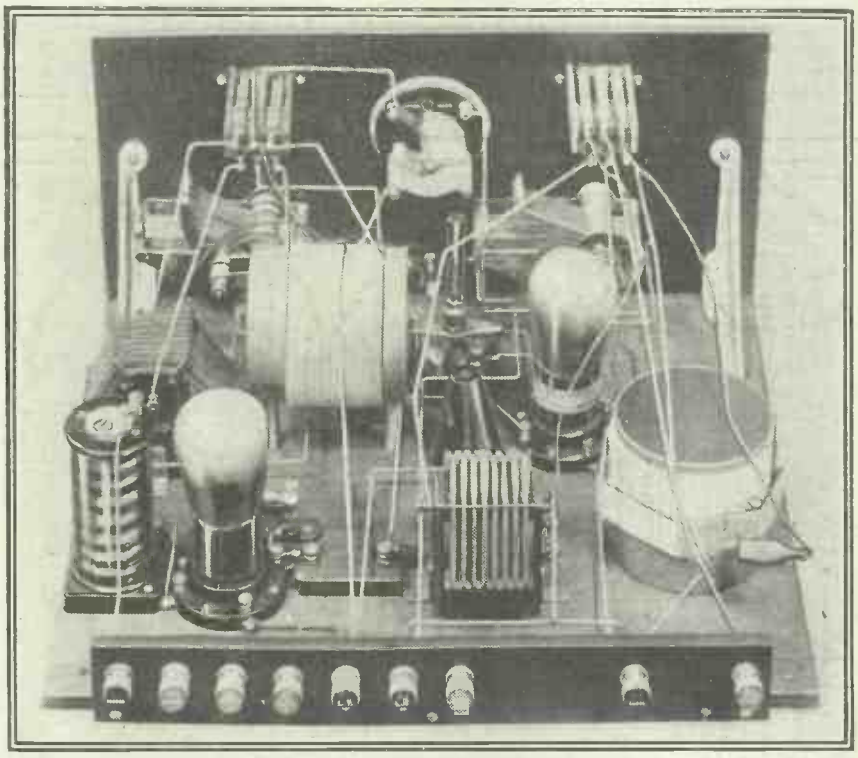


The placing of the coils is important, and you should try to copy the original rather carefully.

## THE "G.P.K." TWO.

*(Continued from previous page.)*

The rest of the construction of the set is quite straightforward. Mark out the positions for the various components in accordance with the dimensions given on the diagram. The only difficulty will probably be cutting the holes for the two-wave change switches, but practically every maker of repute supplies a template with each switch, together with full instructions for cutting the necessary slots. In other cases the face-plate serves as a template. These slots can be made with a small fretsaw, or by drilling a number of small holes and then filing out the slot. Having placed the components in position on the baseboard, commence the wiring with the wires nearest to the baseboard first. That is to say, the various leads to the H.F. choke, valve holders, neutralising condenser, on-off switch, etc., should be carried out first, and, lastly, that wiring which goes to the change-over switches, the reaction condenser, and to the various coils. If you proceed in this manner you will have no difficulty, but do not start at the top and attempt to work downwards.



Separate switches are used for the input and output circuits of the H.F. side, thus minimising chances of interaction between plate and grid wiring.

### Wiring Up.

Certain of the leads may conveniently be joined up before the coils are mounted in position, and amongst these may be mentioned those to the filament switch and certain others to the reaction condenser, tuning control, and neutralising condenser. Work as far as possible from the panel towards the rear edge of the baseboard, for it is those leads which are near the panel that are most difficult to get at. A final point: When you wire up the first switch do so with a valve in position in the H.F. valve holder, otherwise you may find that the valve will foul the lead.

You will note that the neutralising condenser employed has a fairly long handle. Even so, it is no easy matter to adjust the position of the moving vanes without bringing the hand rather close to certain of the components. This may tend to upset the neutralising, owing to the effect of "hand capacity."

The remedy is to cut a slot in the top of the handle so that the end of a piece of wood, shaped like a screwdriver, may be inserted.

The point-to-point connections for the set are as follows:

### Point-to-Point Connections.

One filament socket of $V_2$ to the H.T. – and L.T. – terminals, to the tapping on $L_4$, to the earth terminal, to the "O" (marked "IN" on some makes) terminal on $L_3$ to the bottom ends of $L_1$ and $L_2$, to one filament socket of $V_1$, to the moving vanes of the ·0005 variable condenser $C_1$ and to the "earthing" plate terminal on the ·0001 reaction variable condenser $C_3$.

Remaining filament contact of $V_1$ to one side of the L.T. on-off switch, to the remaining filament contact of $V_2$ and to one side of the 2-meg. grid leak holder.

Other side of the L.T. on-off switch to the L.T. + terminal.

Remaining side of the 2-meg. grid leak holder to the grid of $V_2$ and to one side of the ·0003 fixed grid condenser $C_5$.

Other side of $C_5$ to the moving vanes of the neutralising condenser, to the moving vanes of the ·0005 mfd. variable condenser $C_2$, and to the bottom centre contact of the wave-change switch $S_2$.

Fixed vanes of the neutralising condenser to the grid of $V_1$, to the fixed vanes of the ·0005 condenser $C_1$, and to the bottom centre contact of $S_1$.

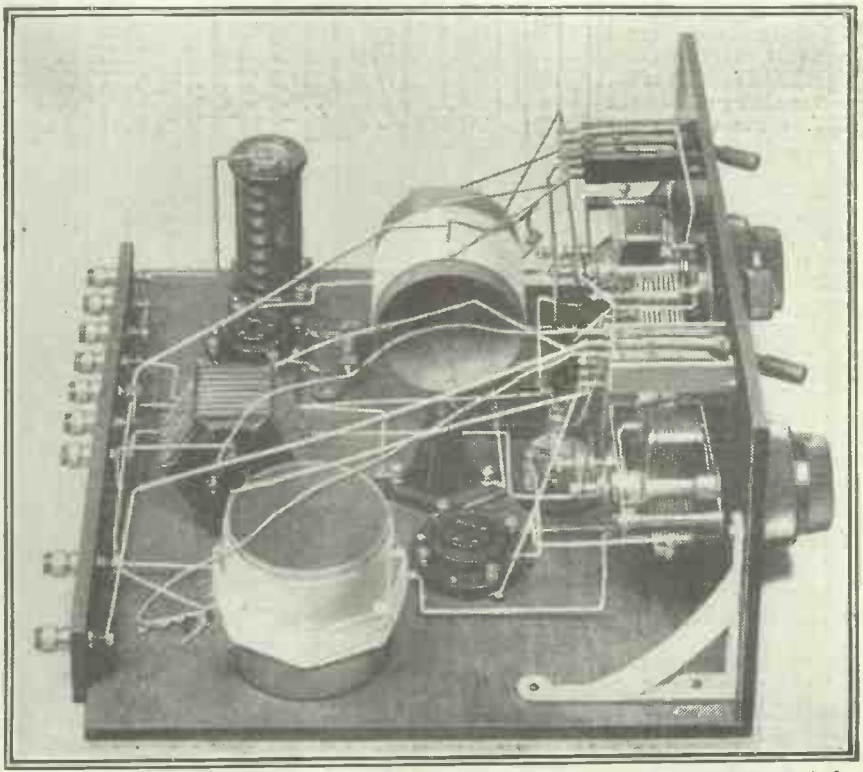
Top centre contact of $S_1$ to the aerial terminal.

Bottom right-hand contact of $S_1$ to the top end of $L_2$.

Bottom left-hand contact of $S_1$ to the "216" terminal (marked "OUT" on some makes) on the coil $L_3$.

Top right-hand contact of $S_1$ to a tapping

*(Continued on next page.)*



The wiring of a set with wave-change switching is necessarily a little more complicated than that of the interchangeable coil type, but this photo and the wiring diagram should make everything clear.

## THE "G.P.K." TWO.

*(Continued from previous page.)*

clip, via a flexible lead, which engages with the tappings on $L_1$.

Top left-hand contact of $S_1$ to the "60" or "80" terminals of $L_3$ via a flexible lead.

Plate of $V_1$ to one side of the H.F. choke (1) and to one side of the ·0003 fixed condenser $C_4$.

Other side of $C_4$ to the fixed vanes of the ·0005 condenser $C_2$, to the top centre contact of $S_2$ and to the moving vanes of the ·0001 reaction variable condenser $C_3$.

Fixed vanes of $C_3$ to the bottom contact on the H.F. choke (2) and to the plate of $V_2$.

Top contact of the H.F. choke (2) to the 'phones — terminal.

'Phones + terminal to the H.T.+2 terminal.

Top left-hand contact of $S_2$ to the "O" (or "IN") terminal on the coil $L_3$.

Bottom left-hand contact of $S_2$ to the "216" (or "OUT") terminal on the coil $L_5$.

A flexible lead goes from the tapping on $L_4$ (which also goes to H.T.— and L.T.—), to one of the tappings on $L_5$.

Top right contact of $S_2$ to the right-hand end of $L_4$ (the end of coil nearest to its tapping).

Left-hand end of same coil ($L_4$) to the bottom right-hand contact of $S_2$.

Remaining side of the H.F. choke (1) to the H.T.+1 terminal.

### Operation.

The operation of the "G.P.K." Two is a perfectly simple matter.

Connect the aerial and earth leads to the terminals so marked, and join up the L.T. and H.T. batteries. Connect a pair of telephones to the 'phone terminals, joining the tag with the red stripe (if there is any distinction between the two tags) to 'phones +.

Insert a valve of the "H.F." type in the H.F. valve holder $V_1$, and a similar valve in the detector socket $V_2$. Such valves are those which have an impedance of 20-30,000 ohms and an amplification factor of 15-20.

Apply an H.T. voltage of, say, 80-100 volts to H.T. + 1, and about 60-70 volts to H.T.+ 2.

Light the valves by pulling out the "on-off" switch (or by pushing it in, in the case of some makes).

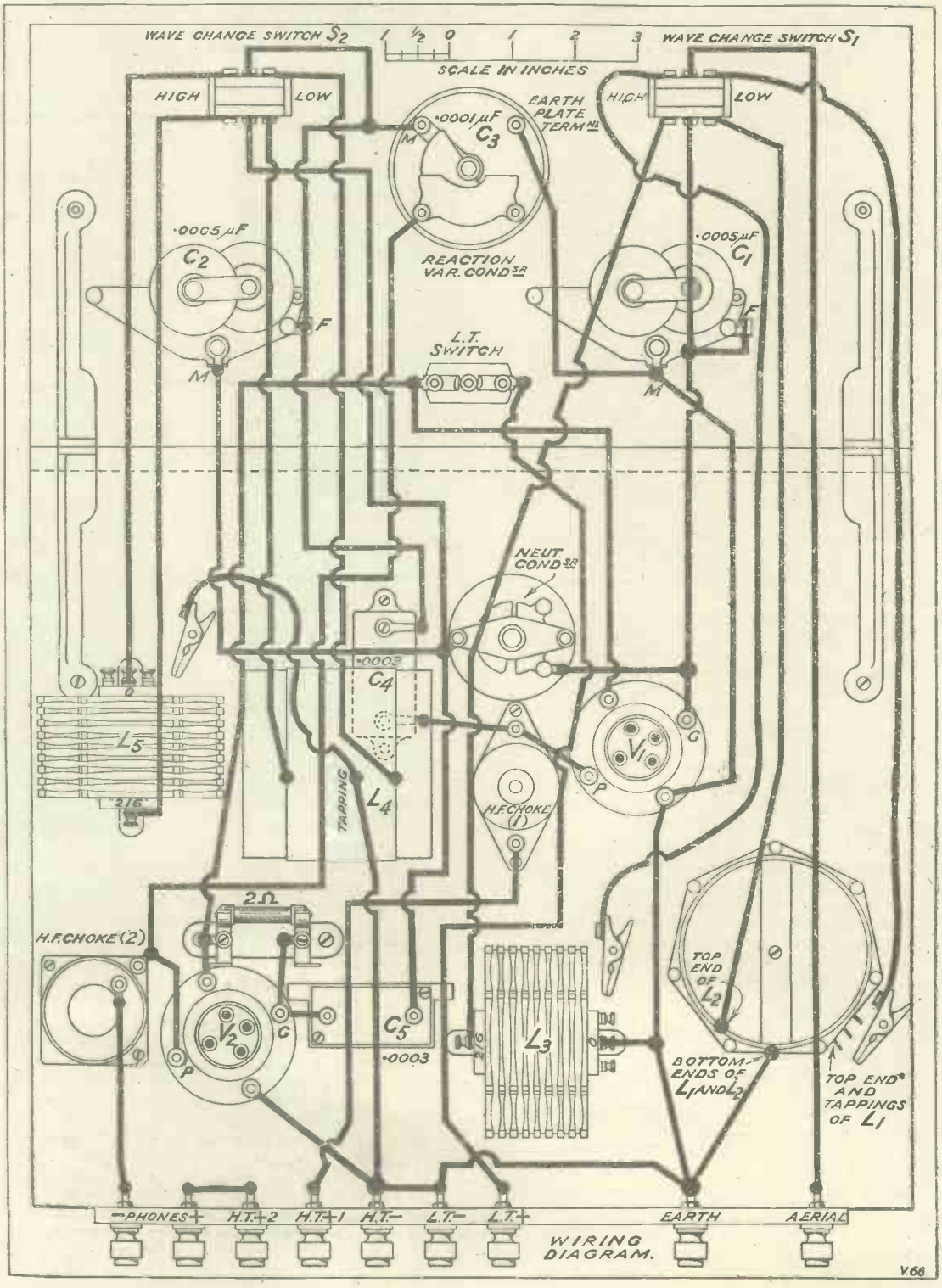
Place the wave-change switch across in the positions marked "low." Connect the tapping clip for the aerial winding $L_1$ on the largest tapping. Now tune in your local station with the reaction control at its minimum. It is possible that the H.F. valve will tend to oscillate, so rotate the vanes of the neutralising condenser so that they are just in mesh. Find a position where no oscillation occurs at any point on the tuning range with the reaction condenser at zero. The H.F. valve is then stabilised.

Now switch over to the long waves, placing the tapping clip for $L_3$ on the largest tapping and the clip for $L_5$ on the 60 tap.

The set should remain perfectly stable, provided you have stabilised it correctly on the "low" waves.

To increase signal strength increase the value of the reaction control.

Try the tapping clips for $L_1$ and $L_3$ in all the available positions until you obtain the degree of selectivity which suits you best on the "high" and "low" waves. Vary the H.T. voltages to suit your valves. Those values suggested are only intended for the preliminary tests.



# WHEN H.T. WANDERS

**Is your H.T. battery running down very quickly? If it is, the "juice" may be escaping to earth for the reason outlined in the following article.**

**By G. V. DOWDING, Grad.I.E.E.**

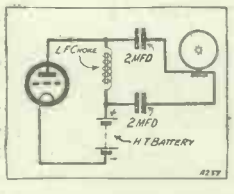
IF you desire to work two or more loud speakers from the same receiver, you will generally find it better to connect them in series. That is to say, you join up the instruments so that L.F. impulses from the receiver flow through each one in succession. You take a wire from one loud-speaker terminal on the receiver to one of the loud speakers. From this latter's second terminal you take a wire to one of the terminals on the other, or one of the other, loud speakers. From the remaining terminal of the last loud speaker of the chain a lead is taken back to the remaining loud-speaker terminal on the receiver.

This series method of connection makes it fairly easy to wire up several rooms, but if you disconnect one of the speakers, do not forget to join together the ends of the wires taken from it. If you do not do this the whole system is disconnected. In the ordinary course of events the loud-speaker leads carry the H.T. current which feeds the last valve in the set. There is an element of danger in connecting long loud-speaker leads to a receiver unless some system of by-passing is introduced.

### Dangerous Voltages.

It would be safe enough if the loud-speaker leads were of the same robust character as the electric-light wiring. They do not have to carry similar current to this, but the voltage across them will be nearly as high in many cases. In the majority of hook-ups the negative terminal of the H.T. battery is connected directly to earth. Indiscriminately to connect a long lead to the loud-speaker terminals means that, in effect, you are taking a connection from the H.T. positive all round the room, or all round the house, as the case may be.

If the insulation of the wire is not quite what it should be, and if it is taken close to damp walls or gas or water pipes, a short circuit of the H.T. battery can readily occur. At the least, this will mean that the battery will run down quickly. At the worst, if an H.T. accumulator or mains unit is employed, dangerous sparking may occur.




All these possibilities of trouble can very easily be eliminated by means of a simple by-pass scheme. One such is shown both pictorially and theoretically in the accompanying diagrams. The only components that are necessary are an L.F. choke and two fixed condensers.

### An Incidental Advantage.

Once these are installed in the proper manner, it does not matter if the long loud-speaker leads are of the flimsiest character.

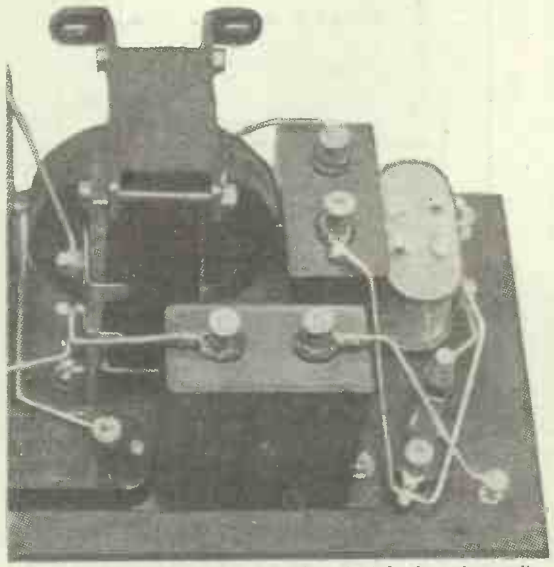
The L.F. choke replaces the loud speaker in the anode circuit of the last valve on the set. It offers no barrier to the steady H.T. current which feeds the plate of the valve, but, as its name indicates, it has a choking effect on L.F. current. These L.F. impulses are bypassed through the fixed condensers and the loud speakers. There is practically no loss of volume, and there may be a distinct gain in respect of quality of reproduction.

Incidentally, it is an advantage not to have the steady anode current passing through the loud-speaker magnet windings. The 20 milliamps or so which is sometimes found in the anode circuit of the last valve of a multi-valve receiver is really too much for the average loud-speaker magnets to carry. Additionally, having by-passed this steady anode current, it does not matter which way the loud speaker is connected up. No demagnetisation can possibly occur.

### The Components Concerned.

The L.F. choke should have ample inductance and a low ohmic resistance. The inductance should be of the order of 20 henries or so, and the resistance of the order of hundreds, and not thousands, of ohms. If the resistance is great there will be a serious drop in H.T. voltage. Also, the choke should have plenty of iron, so that it does not saturate easily. There are now a number of quite good output chokes available. Suitable types that occur to mind are those due to R.I.-Varley, Ltd., Ferranti, Pye, and so on.

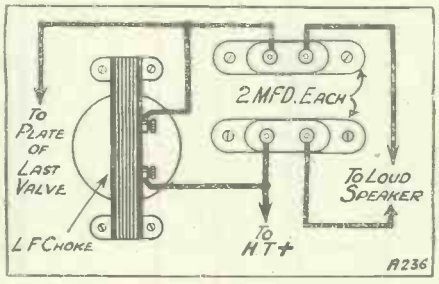
The fixed condensers need not be of the large sizes used in mains units. It is possible to dispense with one of the fixed condensers, although this is not advisable. Complete protection is only afforded when two are used. The three components which comprise the bypass system can be made up in the form of a separate unit and connected to the receiver externally.



Here are the elements of a separate output loud-speaker unit. Additionally, however, to the two fixed condensers and the L.F. choke can be seen a variable resistance, which is used as a volume control.

### Included in the Set.

A better practice is to build the components into the set itself. There will be ample room in the majority of receivers for this. A slight tendency towards crowding in the L.F. end of a set is not liable to cause trouble. If necessary the choke and the condensers can be mounted on the back of the panel itself, if there is not room on the baseboard. The connections are simple and straightforward. The wires which go to the two loud-speaker terminals should be taken instead to the two terminals on the L.F. choke. One terminal of each of the fixed condensers is also taken to one each of the terminals on the L.F. chokes.




The other fixed condenser terminals can be joined to the loud-speaker terminals. Do not try to use an old L.F. transformer as the choke. The output choke is an extremely important item, and it is well worth while purchasing one of the high-class guaranteed varieties. You will find it worth while fitting a by-pass scheme of this nature to your receiver, even if you are not going to run long loud-speaker leads. It is incorporated in every modern multi-valve receiver of a high-class nature.

In this way a designer of a set can arrange his output circuit so that, as with the remainder of the outfit, all its characteristics make for highest efficiency.

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

# RADIO PHOTOGRAMS

CARE OF H.T. ACCUMULATORS—COVERING THE PLATES—RESULTS OF TESTS, ETC., ETC.

**Radio Photograms.**

THE wireless photogram service, which has been conducted by the Marconi Company since May, 1926, for the transmission of photographs, drawings, signatures and fascimiles of all kinds by wireless between London and New York, has now been extended so that photograms received in New York by wireless may be transmitted by wire on to other important centres in the United States.

A photogram sent from London by wireless addressed to other cities is transferred in New York to the telephone-wire picture service of the American Telegraph and Telephone Company, the cities included in the wireless-and-wire photogram service being Boston, Cleveland, Atlanta, Chicago, St. Louis, Los Angeles, and San Francisco.

**Popular Uses.**

In this way it is possible for illustrations of the day's happenings, the latest European fashions, or facsimiles for business or engineering purposes to be received in the cities mentioned within a very few hours of their being handed in at the London office.

The wireless photogram service between London and New York has been widely used, since its inauguration, for the transmission across the Atlantic of news pictures, cheques, facsimile signatures, newspaper advertisements, engineering plans, and even Christmas cards. To send between London and New York a picture 5 in. by 3 in. costs about £10.

**Care of H.T. Accumulators.**

I do not know what proportion of my readers use high-tension accumulators, but I imagine that there must be quite a large number of these batteries in use, judging from correspondence. Therefore, I thought a little hint might be useful, from experience with a special test which I have in hand at present.

In this test, which is really a life-test on several high-tension accumulator batteries and also a number of H.T. rectifiers for charging the same, the accumulators are continuously working, either on charge or discharge, for twenty-four hours a day, and the tests have been going on now for some months continuously. In many cases the accumulators are overcharged (without being discharged) for weeks at a time. You will readily understand that the accumulators in these circumstances require much more frequent attention than when they are in use in normal service. A day's charging of twenty-four hours at 100 milliamperes is equivalent to about one or even two months' ordinary service, so that whereas in the ordinary way the accumulator might require topping-up, say, twice a year, it requires topping-up every three or four days in these tests.

In one or two of the batteries on test the level of the electrolyte is rather difficult to see, and when topping-up with distilled water it was rather a nuisance having to bring the level to an exact mark in each case.

**Covering the Plates.**

There is really no necessity to raise the level of the electrolyte to any precise mark, however, provided it is more or less up to the top of the plates, and I find it is much more convenient to take a small syringe with rubber bulb (one of the large fountain-pen fillers with rubber bulb about 1 in. diameter will serve the purpose excellently), and put simply "one syringe-full" into each cell. It is easy to ascertain, after a little observation, about when the cells are ready for topping in this way, and it saves a great deal of time just to put the same amount of distilled water into each instead of having to fiddle with adding extra tiny drops to bring the level to an exact mark.

**Results of Tests.**

Incidentally, although the results of these tests are not yet complete, it is remarkable how differently various high-tension

(*Continued on page* 648.)

## ON THE TRACK OF RADIO TROUBLES!

This photograph shows a corner of "P.W.'s" Technical Query Department, which exists to help readers who are in any radio doubt or difficulty. In the far corner Mr. A. J. Randall, who is in charge of this department, is dictating to his secretary. Seated on the extreme right is Mr. G. T. Kelsey, of "Antipodes Adaptor" fame; whilst opposite to him is Mr. A. S. Clark, designer of several popular receivers, including "The Summer One."

NEWS FROM SAVOY HILL. FROM OUR OWN CORRESPONDENTS.

# MORE ABOUT THE HUSH-HUSH VAN

—THE RETURN OF CECIL LEWIS—P.M. ON SAVING—A MICROPHONE ROMANCE, ETC., ETC.

**More About the "Hush-Hush" Van.**

THE B.B.C.'s new "hush-hush" van, first described exclusively in "P.W.," proved to be of great practical value on the first occasion it was used, during the broadcasting of the recent Aldershot Command Searchlight Tattoo, when, owing to the ease with which the extreme difficulties were surmounted, it was immediately voted to be the "greatest thing in the world."

The staff at Clapham had an almost day-and-night job during the week before the event to get the van ready in time, but the whole success of the show, in which five different microphones were used, depended on its completion. Consequently, the Tattoo "came over" like it has never done before, while the engineers were able to work with the confidence that they had an efficient control point, with all their gear properly and permanently assembled, instead of having to grope about in semi-darkness round the tailboard of a lorry.

The van has given a new enthusiasm to the engineers to tackle what have hitherto been certain difficult and to them almost unwanted broadcasts, including the Southern Command Military Tattoo, which is to be relayed from Tidworth on Saturday, August 4th. Like that from Aldershot, the Tidworth show will be done in two parts, the first at 9.30 p.m., consisting of the sounding of the First Post by massed trumpeters of the 2nd Infantry Brigade and Royal Artillery, the entry of the massed drums and fifes of twelve regiments, followed by a similar number of massed bands, together with other fascinating musical evolutions before the grand finale starts at 11.30.

**The Return of Cecil Lewis.**

Cecil Lewis, who since he left the headquarters' staff of the B.B.C. to write and produce broadcast plays as he thinks they should be done, has spent a good deal of his

(*Continued on page* 646)

## HEAR FRANK WESTFIELD AND HIS BAND EACH FRIDAY

**You need pure H.T. current when the music of massed instrumentalists is being broadcast to you. See that you have a LISSEN New Process Battery in your set therefore. Then the rendering of individual instruments will be kept sharply defined. The melody and harmony Mr. Westfield and his fine band are going to make for you will be delightful to listen to. Because LISSEN Battery current is smooth. It is steady and sustained. The power lasts. There is eternal silence in every cell. So all the time every note of music is clear. Tones are true and reproduction natural all the time if you use the LISSEN New Process Battery. For in this Battery you get a new process and new chemical combination which produces pure D.C. current.**

**Conveniently for you this pure H.T. current is put into battery form by LISSEN. 10,000 radio dealers have it available for you. Before Mr. Westfield next plays to you ask in time at your nearest dealer's for a LISSEN New Process Battery and show plainly by the way you ask that you will take nothing else.**

| | | | |
|---|---|---|---|
| 60 volt (reads 66).. | .. 7/11 | 9 volt Grid Bias | .. 1/6 |
| 100 „ ( „ 108).. | .. 12/11 | 4½ „ Flash Lamp | .. 5d. |
| 60 „ Super Power | .. 13/6 | (4/6 a dozen) | |

**LISSEN LTD., 8-16, Friars Lane, RICHMOND, SURREY**

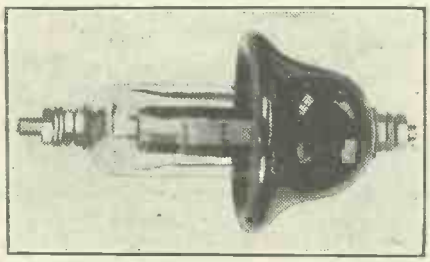
*Managing Director: Thomas N. Cole*

# FROM THE TECHNICAL EDITOR'S NOTE BOOK


### Protection Against Lightning.

I WONDER how many constructors, even in these enlightened days, have their aerials specially protected against the effects of lightning? Some who have not may argue that an aerial is very efficiently earthed even if the path to the ground or water-pipe is diverted slightly. But a point they may forget is that the coils in a set which may be interposed in this path can offer an enormous electro-magnetic "inertia resistance."

So great can this be in the case of a sudden high potential developed by lightning, that a tremendous electric strain can be created between the acrial and earth. To this the resistance of a small gap of air becomes



The tube of gas is inside the outer protective glass container. You can clearly see the "spark gap."

negligible, and the energy will leap across it with the greatest facility and in so doing will cause a spark.

And the so-called lightning arrester is, in effect, a small gap of air, or, in other words, a spark gap. In principle it is merely two pieces of metal placed a small distance away from each other. One is connected direct to earth, the other to the aerial.

Rather more elaborate than the usual lightning arrester is the new automatic type due to Messrs. Philips Lamps, Ltd. In addition to an adjustable spark gap it embodies a tube of rare gas, both of these being enclosed within a weatherproof glass container surmounted by a porcelain cowl. A stout galvanised iron bracket is provided for wall fixing.

### A Novel Feature.

The aerial is connected to the one terminal to which a lead is also taken for the receiving set, while from the lower terminal leads run to the earth and to the set.

You will know exactly what the adjustable spark gap is and does, but the most ingenious and novel feature of this device is the tube of gas.

To a low voltage, such as is represented by a radio signal, this tube would offer such an immensely high resistance that for all practical purposes it could be ignored. But the moment the potential collected on the aerial reached a certain pressure—a pressure well within the safety margin, by the way—the particles of gas within the tube are ionised and thereby become conductive, and the device offers a comparatively easy path to earth. And, after the dangerous energy has been dispersed, the conditions revert to normal. And you should remember that you do not need actual lightning to produce high potentials on your aerial. Or, I should say in common parlance, the aerial does not have to be "struck by lightning" before this can happen. Excessive charges due to "atmospherics" can collect on an aerial until quite high voltages are generated, and it is these sorts of potentials that are automatically disposed of by this Philips automatic arrester.

The price of this latest Philips production is 9s. 6d.—rather a lot of money, but, once fitted, it requires no attention and gives complete protection; and, in fact, makes the aerial a "lightning conductor" for the whole house.

### Regarding L.F. Amplification.

There is a great deal to be said for the "dual impedance" form of L.F. coupling, and it is surprising that it has hitherto received such little attention. It is similar to choke-capacity coupling, except that an L.F. choke replaces the grid leak. In one Igranic Dual Impedance Coupling Unit, several of which were recently received for test, we therefore find two L.F. chokes and a coupling condenser.

The article looks very much like an L.F. transformer, and has four terminals on the top which, being marked P, G, H.T. + and G.B., tend to complete the illusion. An instructive feature is that these four terminals take their places in a clear diagram which is printed on the top of the unit, showing the internal connections of the device. I am hoping that the photograph I have had taken will clearly show this.

The operation of a dual-impedance coupling unit is a very interesting but rather involved business. I am afraid I will only confuse you if I endeavour to sketch the theory in the short space I have at my disposal. But I must mention that for a successful dual-impedance coupling it is necessary that the values of the chokes and condensers should be very carefully arranged.

You see, advantage is taken of the resonance frequency of the circuit formed in order to maintain amplification at low frequencies. That this has been successfully accomplished in the Igranic dual-impedance coupling unit is shown by the fact that the following results were obtained with a low-frequency amplifier comprising one stage of resistance-capacity coupling and two stages of dual-impedance coupling.

### The Performance Curve.

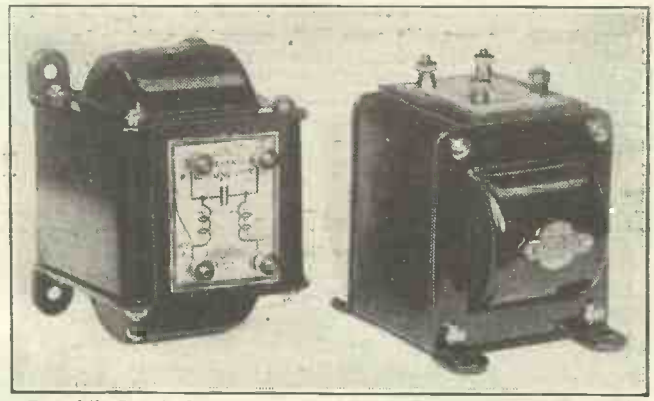
A carefully measured input was applied across the grid and filament of the first valve, and the voltage developed across the output choke was measured and a performance curve plotted. This shows that the amplification does not fall below

**Traders and manufacturers are invited to submit radio sets, components and accessories to the "P.W." Technical Department for test. All tests are carried out, with strict impartiality, under the personal supervision of the Technical Editor, and readers are asked to note that this weekly feature is intended as a reliable and unbiased guide as to what to buy and what to avoid.**

10 per cent of the maximum at any point between forty and six thousand cycles per second.

This curve, as readers will agree, is rather remarkable for a complete amplifier, including three stages of L.F. amplification. The claim is made for dual-impedance coupling that grid choking is obviated, and that the amplification of strong and weak signals is more nearly proportional.

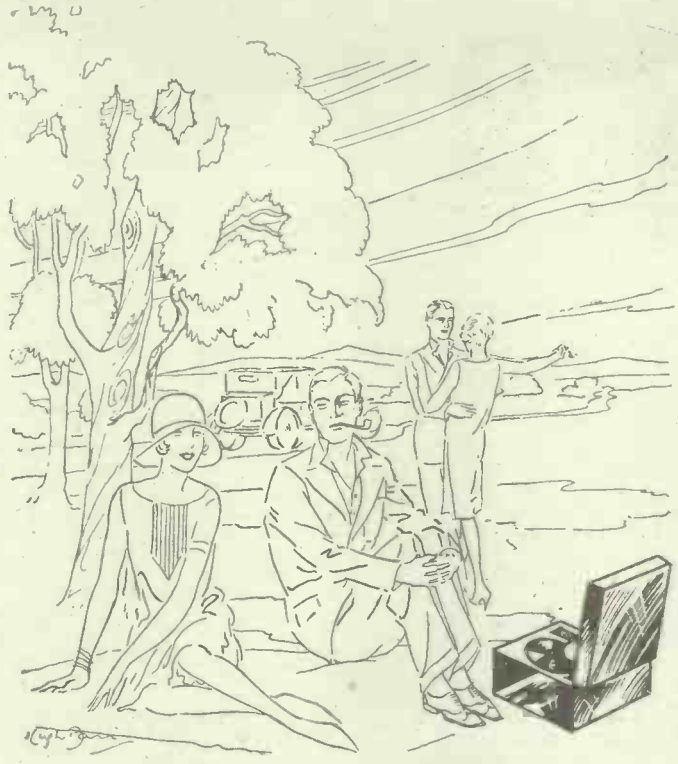
Tests were made with various input voltages at a constant frequency. Amplification should, of course, have been constant, but actually it was found to fall slightly, the difference between the amplification at two and five volts input being 2·6 per cent.



Two of the Igranic Dual Impedance Coupling Units. Note the diagrams between the terminals on each.

A comparative test made with a resistance-coupled stage showed a difference of 19·5 per cent. Further, the average amplification was found to be distinctly less than in the case of the dual impedance coupled stage. Certainly dual-impedance appears to be very attractive, and I am looking forward with interest to some further experiments I have planned in connection with it.

# IN THE TWILIGHT



Music has great charm in that most fascinating period of the day—'twixt sunset and dusk. To enjoy it wherever you may be—in the house or garden, on the tennis court or river, or by the countryside—in fact, anywhere, at any time; for dancing, or just for the entertainment provided by good music perfectly produced, take the line of least resistance and invest in one of the new Lissen products, the

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(As illustrated)
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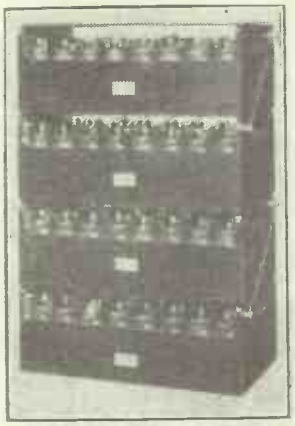
# BATTERIES FOR YOUR SET

**A comprehensive outline of recommended H.T., L.T., and G.B. batteries for use with all classes of wireless receivers, together with interesting data on the care and maintenance of wet and dry batteries.**

**By G. P. KENDALL, B.Sc.**

PROBABLY no part of a wireless outfit gets less consideration than the batteries which supply the juice, yet certainly no part is so well able to make or mar the results or influence the general quality of the service which the installation will give. The fact is that most of us are far too prone to take our batteries for granted and give little or no thought to the really very vital questions of choosing the right type for our particular purpose, selecting a suitable and economical size, and so on.



A four-tray H.T. assembly of wet cells (Wet H.T. Battery Co.). Each tray contains 32 cells, giving 48 volts, and varies in price from 18/- to £1 11s. 9d. complete, according to the size of the cells.

So much annoyance and disappointment, not to mention waste of money, can result from this happy-go-lucky procedure that this special article is being written to help readers of "P.W." to make a general survey of the whole question of batteries, and so arrive at a clear understanding of their requirements and the best methods of meeting them. It is hoped thereby to enable everyone who reads these notes to decide definitely on the best procedure in his own particular case and so put his battery affairs on a sound and reasoned footing, with the assurance of that satisfactory and economical service which cannot be obtained without a little consideration and a knowledge of the special characteristics of the various types and sizes.

Now, it must be explained before we start that this article does not profess to be a complete review of all the types and sizes made by all the different manufacturers, because to give such a review, useful as it would be, is quite impossible within the limits of space of a single article in such a weekly journal as "P.W." The only course open within those limits is to try to give a general explanation of the problem and the points to be considered in making a decision, so that each reader may get a clear idea of the things to be taken into account and learn how to organise his own affairs to the best advantage.

### Watch Your G.B. Battery!

Let us take first the simplest case of all, that of the grid-bias battery. Now, all those of us who have L.F. stages in our sets use "G.B." batteries nowadays, and because we know that in normal circumstances no current is actually drawn from this battery some of us are rather inclined to assume that any old battery will do, and furthermore that it will last indefinitely.

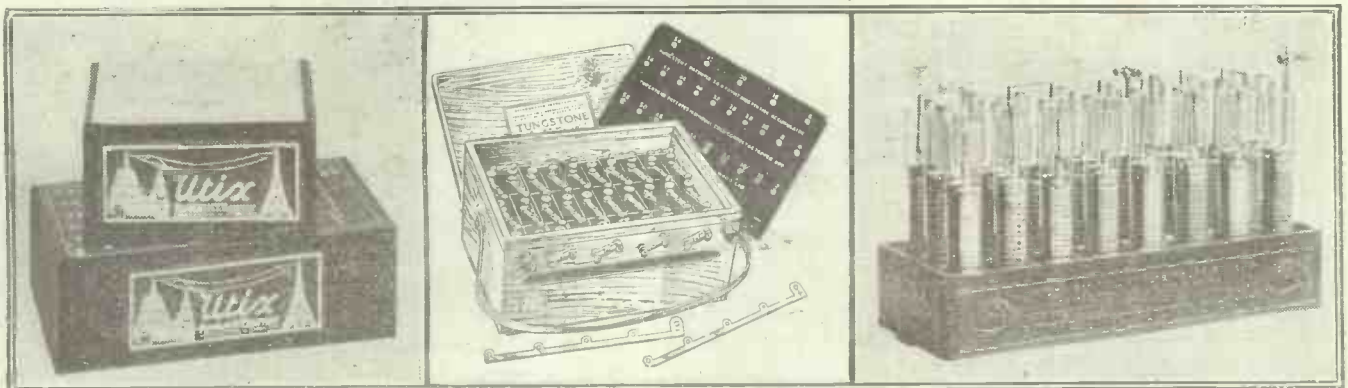
It is no uncommon thing to come across a man who complains that his H.T. batteries do not last nearly as long as they should and that quality is bad, and then to find on investigation that he bought his G.B. unit "some time last autumn," and all that is the matter is that it has run down and is no longer giving enough volts to make the last valve sit down to its job without drawing an excessive current from the ill-used H.T. battery!

Although it is true that no current is actually drawn from the G.B. battery when it is used in the ordinary way, it does *not* follow that it will last for ever. On the contrary, the ordinary small dry cell has a definitely limited life under even these conditions, after which it begins to deteriorate, in some cases quite rapidly. This is what is called the "shelf-life" of the battery, and it is only while it maintains nearly its original rated voltage and low internal resistance that it is of use for grid-biasing purposes.

An example of the larger type of H.T. accumulator (Oldham). Each tray contains 4 blocks of 10 volts each, made up in glass boxes, giving a total of 120 volts. The price of this battery complete is £3 19s. 0d.

It is a mistake to try to make G.B. batteries serve too long. They are cheap,

(*Continued on next page.*)




On the left are two examples of Messrs. Ripault's "Utix" dry H.T. units. These are a standard line of very moderate price (60 volt, 7/11; 99 volt, 13/6), and should not be confused with the special "Self-Regenerative" Ripault battery, which gives remarkably long and satisfactory service. In the centre is one of the Tungstone range of H.T. accumulators, which possess many good features. Prices range from £5 15s. 0d. for the 60-volt (de Luxe) unit, to £3 for the 84-volt battery. On the right is an example of the interesting "NIFE" accumulator, which uses steel and nickel plates in an alkaline solution. The 30-volt H.T. unit illustrated sells at 30/- complete with crate.

# ALL TYPES OF BATTERIES FO

and to renew them at proper intervals is really an economy, because it means a saving of H.T. consumption. Just when to renew is a little difficult to judge without measurement, and in this connection the reader is urged to get a voltmeter, spending

The best advice which can be given is *not* to spill accumulator acid on the carpet, but if you do chance to be unlucky, you can minimise the damage by neutralising the acid with an alkaline solution such as ammonia or washing soda.

a little extra to get a good one of the high-resistance type such as the Ferranti, and use it at intervals. Such a meter will really and truly save its cost in a surprisingly short time, besides taking the blindfold element out of all your battery-life questions.

### Size of G.B. Cells.

Since no current is taken from the G.B. battery, it might be thought that one made up of the smallest cells would serve, but this is not necessarily so, for in many cases rather larger cells have a longer shelf-life. Everything depends, however, on the quality of the battery, and the use of a good voltmeter will soon enable you to discover the types which give the longest service. For example, there is in the "P.W." laboratory a 9-volt Lissen unit which is over nine months old, yet still shows a reading of 8·8 volts! Without the voltmeter test, this battery would have been scrapped long ago.

Now, what about the low-tension supply for the valve filaments? Here there is rather a wide choice of sources of supply, and a little careful consideration is needed before we can make a correct decision for any given case.

The first point to be considered is that of charging facilities. If you live in a rather out-of-the-way spot or for any other reason anticipate difficulty in getting an accumulator charged, there is no doubt that you should give very serious consideration to the claims of the modern types of wet primary cells.

These cells are now produced in a great variety of sizes, so that you can suit practically any type of set, even those taking quite a large current. These cells are made up so that the elements are very easily renewed, so that when they have been in use for a period depending upon the current normally drawn (many months if you choose a large size), it is a simple and inexpensive matter to give them a new lease of life.

### A Wet Battery Tip.

These wet batteries in their modern form give very satisfactory results, but there is just one point which must be taken into account, and that is that they give about 1½ volts per cell, and since most modern valves are designed to run from 2, 4 or 6-volt accumulators you must provide suitable resistances. Thus, if you are using 2-volters you will require two cells, which will give 3 volts, resistors being then required to cut down the voltage to two.

If, of course, you take the advice which has been given and buy a voltmeter, you can use variable rheostats and adjust each to the right value by connecting the meter across each valve socket in turn and adjusting the resistance to give exactly the right voltage when the valve is actually working. Failing the use of a meter, it is safest to use a fixed resistor for each valve (or a calibrated type of resistance), the correct resistance being determined by dividing the excess voltage of the battery by the current which should be drawn by the particular valve.

The G.E.C. 66-volt dry H.T. battery is made up of interchangeable strips of cells with robust spring clip connectors and sells at 12/6 (standard) and 22/- (super-capacity).


Left: A Peto & Radford glass-box type 20-volt H.T. accumulator unit, which is of the large-capacity type and sells at 12/6. It is supplied "dry-charged." Left centre: Two of the interchangeable 4½-volt units supplied by the British Battery Company for assembly in H.T. battery form. They are provided with special connectors and sell at 6/- a dozen. Right centre: One of the well-known C.A.V. range of L.T. accumulators. The one illustrated is a 2-volt celluloid-case cell, prices of these ranging from 11/- for the 20-amp. hour (actual) size to 21/- for the 60-amp. hour type. Right: One of the "Hellesen" range of dry batteries (A. H. Hunt & Co.). The 60-volt unit seen here is of the "single capacity" size, selling at 10/6. Double and treble capacity batteries of this make are also available.

# R YOUR SET—*(continued from previous page).*

These batteries deserve consideration wherever charging is difficult or is regarded as a nuisance, and may even be regarded as serious rivals to the more widely used accumulator, but, of course, the latter type also has special advantages of its own, and here again there are some special points to be noted by those who wish to get the best service from their batteries. First, as to the type to be chosen: this will depend mainly upon the number of valves in your set and upon their type, i.e., whether they are very greedy fellows or not.


**The Siemens 9-volt grid bias unit, which is fitted with a special fixing flap for attaching to the back or side of the receiver cabinet, and is sold at 2/-.**

### Glass Box Accumulators.

If your receiver uses only one or two valves, or perhaps even three if they are of a very low-consumption variety, there is a special comparatively new type which has many advantages. This is the comparatively small type of cell put up in glass boxes by a number of the leading manufacturers, which is fitted with a special kind of plate which can be supplied in a ready-charged condition, so that all the battery needs is to be filled with acid, left to stand for a specified time, and then put into use. (A practical tip: use such batteries for only a few hours the first time, and then send them for a normal charge. They will then much sooner reach their full rated capacity in many cases.) Good examples of this type are the Exide, in which make the well-known "D.T.G." cell was one of the pioneers, the Ediswan "Loten" and the various Oldham cells of graduated sizes. (Most makers supply them in a number of sizes to suit different sets.)

These cells are particularly valuable for sets running on 2 volts, their special feature being that they will give a very long slow discharge, holding their charge for a remarkably long time under these conditions.

A possible drawback is that they are rather weighty, but this is really only noticeable with 6-volt assemblies.

### Calculating the Size.

Where the set uses 6-volt valves, particularly when they are numerous and of the types taking a fair amount of current, an accumulator of the larger current capacity variety is really needed, and here all you need is to gain some idea of the best size to get for the most economical and satisfactory service. In general, it is a safe rule to use as large a battery as you consider yourself justified in purchasing, for two reasons: (*a*) the battery will not have to work so hard and will have a longer life, (*b*) there is far less risk of a large battery being damaged by charging at an excessive rate by unscrupulous garage proprietors.

All the same, too big a battery has obvious drawbacks, in the shape of unnecessary weight and a tendency to sulphation through too inactive a life, so it may be as well to indicate how you may decide upon a size to suit your own case. First settle how often you consider it will be convenient to have the battery recharged.

Suppose you decide upon once a fortnight, and estimate that the set will be used, say, four hours a day. This gives a total of 56 hours running on each charge, which we will call 60 hours to allow a small margin.

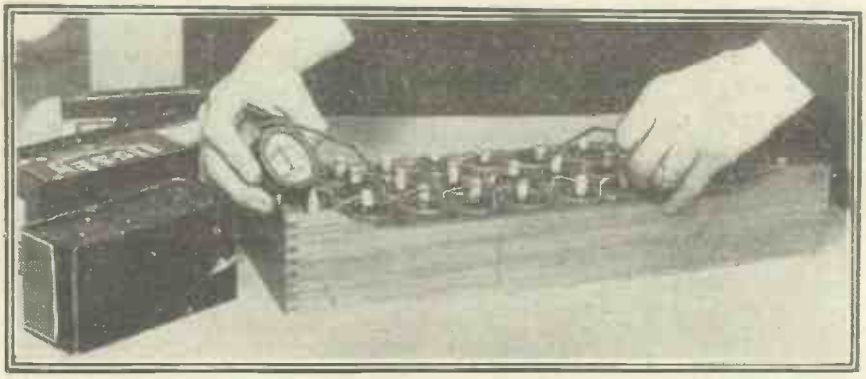
Now ascertain the total current consumption of your set. Suppose you are using three valves of the ·1 amp. type. The total current will then be ·3 amp. Now, the minimum size of accumulator to comply with the conditions will be found by multiplying the current by the hours of running on a charge, and the result (say 20) is in "ampere hours" (actual capacity, not "ignition" rating).

Now we come to the vexed question of H.T. supply, and here we reach so large a subject that we shall only be able to deal with the main points in a very brief manner. The choice is between three main types: (*a*) a good dry-cell variety, such as the Ever-Ready, Hunt, Lissen, Ripault, and Siemens, to mention just a few of the reliable makes, (*b*) the H.T. accumulator, and (*c*) the wet-cell type.

### Choosing the Type.

Briefly, these are the factors on which you should base your choice. If your set is quite a small one, a good dry battery of the ordinary small size will give you long and satisfactory working at the minimum of expense.

If your set contains more than two valves, or if any one of them is a power valve, you really need something larger, because small batteries will run down very rapidly and prove very expensive in the long run.



**Even in the case of a wet type of H.T. battery it is advisable to do all testing with a fairly high resistance voltmeter, to obtain a true reading and avoid running down the battery unnecessarily.**

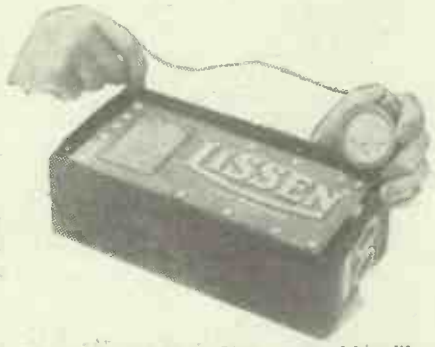
(*Continued on next page.*)


**Left: A specimen of the Hart "Enduro" type of 2-volt L.T. accumulator. The cell illustrated is of 13 amp. hours capacity (actual), is made up in a neat glass box, and sells at 6/-. Left centre: One of the series of robust glass-box L.T. accumulators produced by Messrs. Oldham. The "CLG" 2-volt cell seen in the photo has a capacity (actual) of 20 amp. hours, and is priced at 9/10. Right centre: An interesting alternative to the L.T. accumulator is one of the modern types of primary batteries, of which the Le Carbone "AD" cell is a good example. The single cell illustrated has a minimum life of 500 amp. hours per zinc, and will give "peak" currents of 5-8 amps. if required; the price is 27/9 complete. Right: One of the Siemens extra-heavy duty H.T. dry batteries. This is the 45-volt unit, which contains 30 cells and sells at 19/-.**

# BATTERIES FOR YOUR SET.

*(Continued from previous page.)*

The choice now rests between a dry battery of the larger (super-capacity) kind, which will again give satisfactory service, an H.T. accumulator, which will give excellent results if properly looked after, and provides a very good solution of the problem if charging facilities are satisfactory, and a wet H.T. battery. This last is also a very good method if one of the




One of the well-known Lissen range of long-life dry H.T. batteries. The one seen here is the 100-volt unit (actually 108 volts) which sells at 12/11.

modern long-life non-creeping type is used, and will appeal particularly strongly to the country dweller.

### Heavy Duty Batteries.

When we come to the largest sets of all, using four and five valves, often with a super-power type in the last stage, the choice becomes a little more difficult, since we must now provide for quite large H.T. currents. The ordinary small type of dry or wet H.T. battery is now a thoroughly bad investment, because we shall be taking so much current that it will be hopelessly overloaded, and so have a very short life indeed.

Even an accumulator H.T. battery, if of the smallest type, will not be satisfactory in this case, for the current may be so large that it will only last a short time on each charge, and its life will be seriously shortened by the very frequent charging and then discharging at an excessive rate.

With really large sets, especially where one or even two super-power valves are employed in the last stage, we must make up our minds that the only real economy is to face the necessary rather heavy

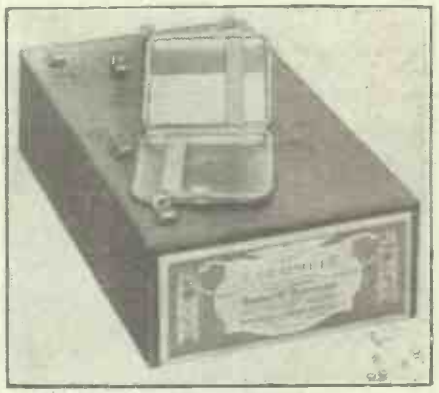

Messrs. Ever Ready supply a complete range of dry batteries for wireless purposes, this specimen being the "Popular Two" 66-volt unit, which is priced at 9/6 and is intended for the smaller type of set.

initial outlay, and buy some really large batteries of the "super-capacity" kind, which will stand up to heavy loads without their lives being shortened.

This rule applies to all the various types of battery, even the accumulator, and it cannot be too strongly emphasised that this is the only way to obtain really satisfactory service as well as economy. There is no surer way of guaranteeing oneself a thoroughly annoying time than to use badly overrun batteries, with their objectionable characteristics of high internal resistance, rapidly falling voltage, crackling and frying noises, and so on.

The choice between the three main types of H.T. batteries (dry, wet, and accumulator) is a rather difficult one upon which to advise you, and probably the best thing we can do is to marshal the main facts before you and leave the decision for you to make in accordance with your own particular conditions and requirements.

Now, the large super-capacity dry battery has the special advantages of requiring no attention whatever, and being very simple indeed to replace, so that it is decidedly convenient for the completely



One of the pioneer types of heavy-duty dry H.T. batteries was the Columbia (Messrs. J. R. Morris), of which one of the 60-volt units (price 22/6) is illustrated here. Incidentally, this photo points a moral: something which obviously should not be done!

non-technical user, who wants as little bother as possible, but even here just a little care is needed, and the use of a good voltmeter at intervals is very desirable, lest the battery may gradually "age" and begin to cause trouble in the set of a perplexing nature.

### Choose a Large Size!

The wet type is capable of giving very good service over long periods, provided that you choose one of really adequate size, a point on which the suppliers of the modern types will always advise you willingly. In this case a little attention may be needed from time to time, and it is most vital to carry out the makers' instructions faithfully and painstakingly. A badly assembled and neglected wet battery is pretty sure to give trouble sooner or later, and cannot in any case give the long and satisfactory service of which it should be capable.

The wet type undoubtedly possesses very considerable attractions for the country dweller who lacks charging facilities, and also for the set user who dislikes the nuisance of taking a large and heavy H.T. accumulator to be charged, with the attendant drawback of having to close down for an evening until the battery comes back recharged. They undoubtedly represent a

The new Ediswan "Loten" accumulator takes the form of an oblong glass box, which may be found very convenient for fitting into a battery cabinet. It is supplied "dry-charged," and the 2-volt cell illustrated has a capacity (actual) of 20 amp. hours and is priced at 10/6.

decidedly economical way of obtaining H.T., since not merely is their first cost moderate in most cases, but the process of renewal of the elements when the time comes is quite inexpensive.

The H.T. accumulator has the special advantage, when of adequate size and properly looked after, of giving a very constant voltage and particularly low internal resistance, this last being a point of ever-growing importance with modern sets of the powerful and sensitive type. Where good charging facilities are available it probably represents something of a "de luxe" H.T. supply, always assuming that it is given reasonable care. It is not in most cases particularly low in first cost, and there is a certain amount of expense involved in recharging, but this latter is usually light, and a good battery should last for several years.

**BATTERY SUPPLIERS APPROVED BY "P.W."**

Messrs. Batteries, Ltd.
" The Battery Co., Ltd.
" Brandes, Ltd.
" British Battery Co.
" Le Carbone. [Ltd.
" Chloride Electrical Storage Co.,
" Edison-Swan Electric Co., Ltd.
" Ever Ready Co., Ltd.
" The General Electric Co., Ltd.
" Hart Accumulator Co., Ltd.
" Louis Holzman.
" A. H. Hunt, Ltd.
" Lissen, Ltd.
" The Marconiphone Co., Ltd.
" J. R. Morris.
" Oldham Accumulators, Ltd.
" Peto & Radford, Ltd.
" Ripaults, Ltd. [Ltd.
" Rothermel Radio Corporation,
" Siemens Bros. & Co., Ltd. [Ltd.
" Tungstone Accumulator Co.,
" C. A. Vandervell & Co., Ltd.
" The Wet H.T. Battery Co.

**NEXT WEEK—**
**"CHARGERS AND MAINS UNITS."**


One of the handiest forms of grid-bias battery is the 9-volt unit. The Marconiphone example seen here sells at 2/-.


*The "Wireless World" says:*

**"We hope that other dry battery makers will follow Messrs. Ripaults' lead and come out into the open with details of the average life which may be expected from their cells.**—*See page 478, May 2nd issue.*

# FACTS AND FIGURES

The figures shown below in respect of a "High-Class Ordinary Battery," are, as a matter of fact, identical with those which recently appeared in a Trade organ, and from the figures shown it will be seen that

## RIPAULTS SELF-REGENERATIVE H.T. DRY BATTERIES

**have nearly DOUBLE THE LIFE of an "Ordinary High-Class Battery."**

| Capacity and Rate at which Discharged. | Useful Life | | Extra Life given by Ripaults Battery. |
|---|---|---|---|
| | Ripaults Self-Regenerative Battery. | Any High-Class Ordinary Battery. | |
| **Standard Capacity** discharged at 5 m.a. | **550 hours** | 320 hours | **230 hours** |
| **Double Capacity** discharged at 10 m.a. | **475 hours** | 260 hours | **215 hours** |
| **Treble Capacity** discharged at 15 m.a. | **500 hours** | 280 hours | **220 hours** |

**Standard Capacity** - - - 60 volt 10/6 - - - 99 volt 16/6
**Double Capacity** - - - 60 volt 15/6 - - - 90 volt 22/6
**Treble Capacity** - - - 60 volt 19/6 - - - 90 volt 29/6

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# OPERATING A MOVING-COIL LOUDSPEAKER

**The moving-coil loud speaker gives perfectly realistic radio—provided it is operated properly. This article tells you how.**

**By A. JOHNSON-RANDALL.**

ONE of the chief topics of conversation among enthusiasts these days is moving-coil loud speakers and the type of circuit to be used with them. The moving-coil instrument is rapidly achieving great popularity, and well it might do, because there is no shadow of doubt that the reproduction obtained is far in advance of most other types of speakers. With the average amount of care the quality can be made amazingly life-like, but the main worry of the listener in the past has been the price.

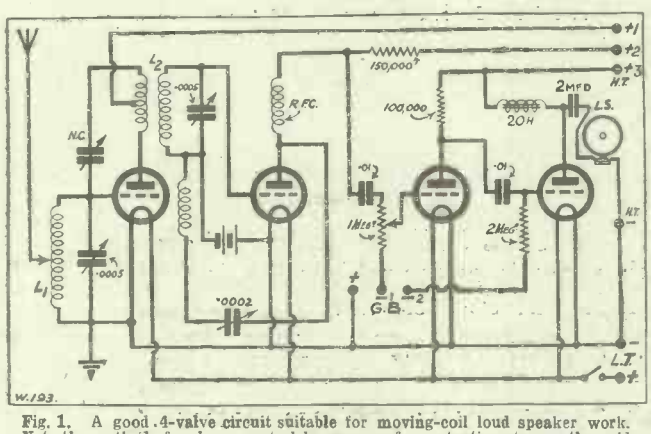



Fig. 1. A good 4-valve circuit suitable for moving-coil loud speaker work. Note the method of volume control by means of a potentiometer on the grid of the first L.F. valve.

Until recently the cost of the complete moving-coil equipment was in the neighbourhood of fifty pounds, which, of course, was far too much for the man-in-the-street to pay. At the present time there are two types of moving-coil instruments normally sold ready for use at a moderate price with the exception of the baffle. One is the British Thomson-Houston Unit, which is very similar to the one which they have standardised in their de-luxe set. The other is the Magnavox, which is sold in this country by Messrs. Rothermel Corporation, Ltd., and is, of course, of American origin.

### Different Types.

The listener can purchase either of these units with the sure knowledge that he is obtaining a first-class job, backed up by sound design. He will not be disappointed in the reproduction provided he uses a suitable circuit. Moving-coil instruments are normally made in two types. One of these makes use of a high-resistance winding, having a value of something like a thousand ohms, and the other employs a low-resistance winding having a value of perhaps only fifteen ohms.

The former type is designed so that it can be used in conjunction with an ordinary output filter circuit, whereas the low-resistance winding requires a special output transformer having a ratio usually of 25 to 1. Both types of windings give excellent results, but probably the low-resistance type is more robust. In any case, most manufacturers prefer the low-resistance coil, in which case the primary of the output transformer is connected directly in circuit with the anode of the last valve instead of the more usual output filter.

Moving-coil loud speakers are quite sensitive, and many enthusiasts are under the impression that a very large and powerful set is required to work them. Let me tell you at once that any first-class circuit designed to give good reproduction can be used satisfactorily in conjunction with the average moving-coil instrument. Moving-coil speakers can be used in conjunction with the mains, or an accumulator, and finally there is the permanent magnet type which requires no external battery to energise it. It is merely a question of getting an extremely powerful field and, of course, the most convenient thing is to make use of the ordinary electric-light supply mains.

In some cases, however, these are not available and the purchaser has the choice of what one may term the low-tension type, which is one that obtains its field current from a separate accumulator, or the permanent type. The mains and accumulator types are a little more sensitive than those of the permanent-magnet type, and, in my opinion, are preferable where suitable facilities exist. I, personally, use a permanent type and there is very little in the matter of sensitivity between it and an ordinary balanced-armature cone.

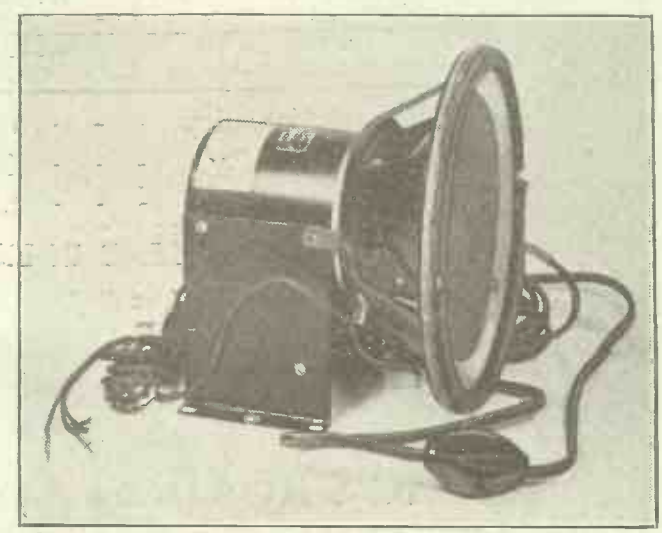
### Obtaining Maximum Quality.

At fifteen miles from 2 L O it will work quite well off any four-valve set, and, in fact, will give quite average volume from three valves. The whole point is that a moving-coil loud speaker gives such excellent reproduction that any slight distortion in the amplifier seems to be magnified a hundredfold and, in consequence, becomes intolerable.

This is probably why the impression has been formed that some very special circuit is necessary, but if one stops to think for a moment it will be evident that if one takes care to permit no distortion to occur, then the quality obtainable from the speaker will be at its maximum.

Any good straightforward circuit, handled

(*Continued on page* 636.)



The main features of a moving-coil unit are well shown in this typical model (Magnavox).

# OPERATING A MOVING-COIL LOUD SPEAKER.

(Continued from page 634.)

in an intelligent manner, is suitable. Figs. 1 and 2 show two rather ordinary circuits. I have deliberately chosen these circuits to show that a moving-coil instrument does not require anything abnormal in the way of a circuit arrangement.

The Fig. 2 circuit is an ordinary three-valve Reinartz detector, followed by two L.F. stages. $L_1$ is a No. 35 plug-in coil, $L_2$ a No. 60, and $L_3$ a No. 25 or 35. The detector operates on the anode-bend principle, and a small three-volt battery, marked G.B.$_2$, provides the necessary grid voltage for correct working. Then comes a stage of resistance-capacity coupling, and this is followed by an L.F. transformer having a ratio of 2½ to 3-to-1. Among suitable transformers may be mentioned the Marconi Ideal 2·7 to 1; Ferranti A.F.3 and A.F.5; R.I.-Varley straight line, etc., etc.

### The Output Circuit.

For volume-control purposes a ·5 megohm potentiometer can be connected across the secondary winding. The type of output circuit rather depends upon the loud speaker chosen. For instance, if a low-resistance winding is used, then the primary of the 25 to 1 output transformer will be connected in the output circuit in place of the output filter shown. On the other hand, if a high-resistance winding is employed then the output filter should be retained. It may be mentioned, however, that the low-resistance winding, together with its output transformer, can be used with an output filter by connecting the primary of the 25 to 1 transformer across the L.S. terminals.

The famous Rice-Kellog loud speaker, manufactured and sold in this country by the British Thomson-Houston Co., Ltd.

Many readers, however, will not wish to go to the expense of both a 25 to 1 output transformer and an output filter. This circuit should operate a moving-coil instrument satisfactorily up to distances of eight miles from an ordinary B.B.C. station.

The last valve must, of course, be of the "super-power" type, and should have an impedance of 3,000 to 4,000 ohms.

In order to obtain the very best quality it is desirable to use the highest H.T. voltage available. That is to say, if 200 volts, then it is advantageous to use them; but if, on the other hand, only 120 or 150 volts are available, there is no reason why good results should not be obtained. It only means that the volume which can be handled without distortion is less than in the case of the higher voltage.

The reader must, therefore, be prepared for slightly less volume on a voltage of 120 if he wishes to get his results free from distortion. If irritating "dithers" and other unpleasant sounds are heard emanating from the loud speaker it is highly probable that the volume wants cutting down a trifle or alternatively the H.T. voltage increasing. Of course, with any increase of H.T. voltage it is absolutely necessary to use more grid bias. It is quite useless altering one without the other.

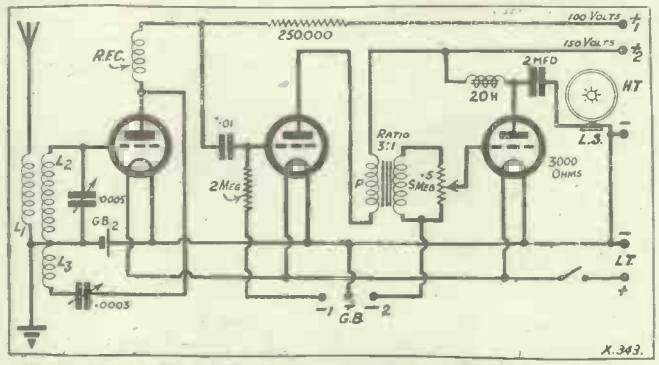



Fig. 2. This 3-valve "purity" receiver employs anode-bend detection, followed by resistance and transformer coupling.

Fig. 1 shows our friend the straight four-valve circuit with a split-primary neutralised H.F. stage. It is scarcely necessary to describe this arrangement in detail, but briefly the first valve is one of the normal "H.F." type, $L_1$ being a split-primary type aerial coil and $L_2$ a split-primary H.F. transformer. It is desirable to use some sort of screening, such as one of the standard cube screening boxes.

The detector operates on the anode-bend principle as in Fig. 2, and this is followed by two R.C. stages, the values being as shown. The remarks applicable to Fig. 2 apply also to this arrangement, and the L.F. side is treated in exactly the same manner.

### Volume Control.

A convenient form of volume control is shown, namely, a 1-megohm potentiometer operating on the first L.F. valve. These potentiometers, incidentally, are marketed by the G.E.C. In both of the circuits the chief points to remember are as follows. Do not use too much reaction, otherwise distortion is bound to occur. Use the very highest H.T. voltage you have on the L.F. valves and make sure that you use the correct grid bias in each case. Finally, do not try to obtain terrific volume.

If you wish to fill a large hall you will have to use several valves in parallel in the last stage, and such an arrangement would be quite outside the scope of this article. These two circuits are intended to be suitable for ordinary domestic loud speakers where only moderate volume is required. The four-valve circuit will operate a moving-coil instrument up to distances of fifteen to twenty miles from a B.B.C. main station.

It is a help in any circuit intended to work a moving-coil instrument, to place two valves in parallel in the last stage.

This should only be done, however, when the anode current available is practically unlimited. One would not parallel valves if the only source of H.T. was from dry batteries. If large accumulators or a mains unit are in use, two valves may be paralleled as follows. Place another valve-holder on the baseboard alongside of the existing socket normally used for the output valve. Then join the anode of one valve-holder to the anode of the other, the grid of one to the grid of the other, and so on.

# RADIO ITEMS OF INTEREST.

Just before the recent trouble broke out near Tientsin, the Chinese government had erected a broadcasting station there.

* * *

The Croydon aerodrome transmitting station is situated at the southern end of Mitcham Common, about two and a half miles away from the aerodrome itself.

* * *

Mr. Gerald Marcuse, the owner of 2 N M (the first Empire short-wave broadcaster), has recently been granted an extension of his licence by the P.M.G.

* * *

The Rugby telephone service to Canada is open not only to subscribers in Britain but also to those in Belgium, Germany, Holland, Sweden, and France, the connection from Rugby to these countries being via the ordinary cables.

* * *

Not long ago the New York Police Department bought 110 wireless direction-finding sets at a cost of about £3,000. It is now announced that these are to be sold by auction, experiments having proved that the sets are too tricky for the average policeman to handle.

* * *

The Munich Station, which works on a wave-length of 557 metres, recently scrapped its metal masts and replaced them with wooden masts, 190 ft. high. This has improved the range of the station by removing a certain amount of absorption which had previously hampered reception.

# "EDISWAN Quality"
# 100% BRITISH
## AND
# 100% VALUE

## LOTEN DRY-CHARGED ACCUMULATORS

**The particular superiority of the Ediswan Accumulator lies in the absolute purity of all of the materials used; the special construction of the grids which make shedding impossible under ordinary treatment, and in the special glass containers which render unnecessary the use of separators, often the means of inducing injurious foreign matter into the accumulator.**

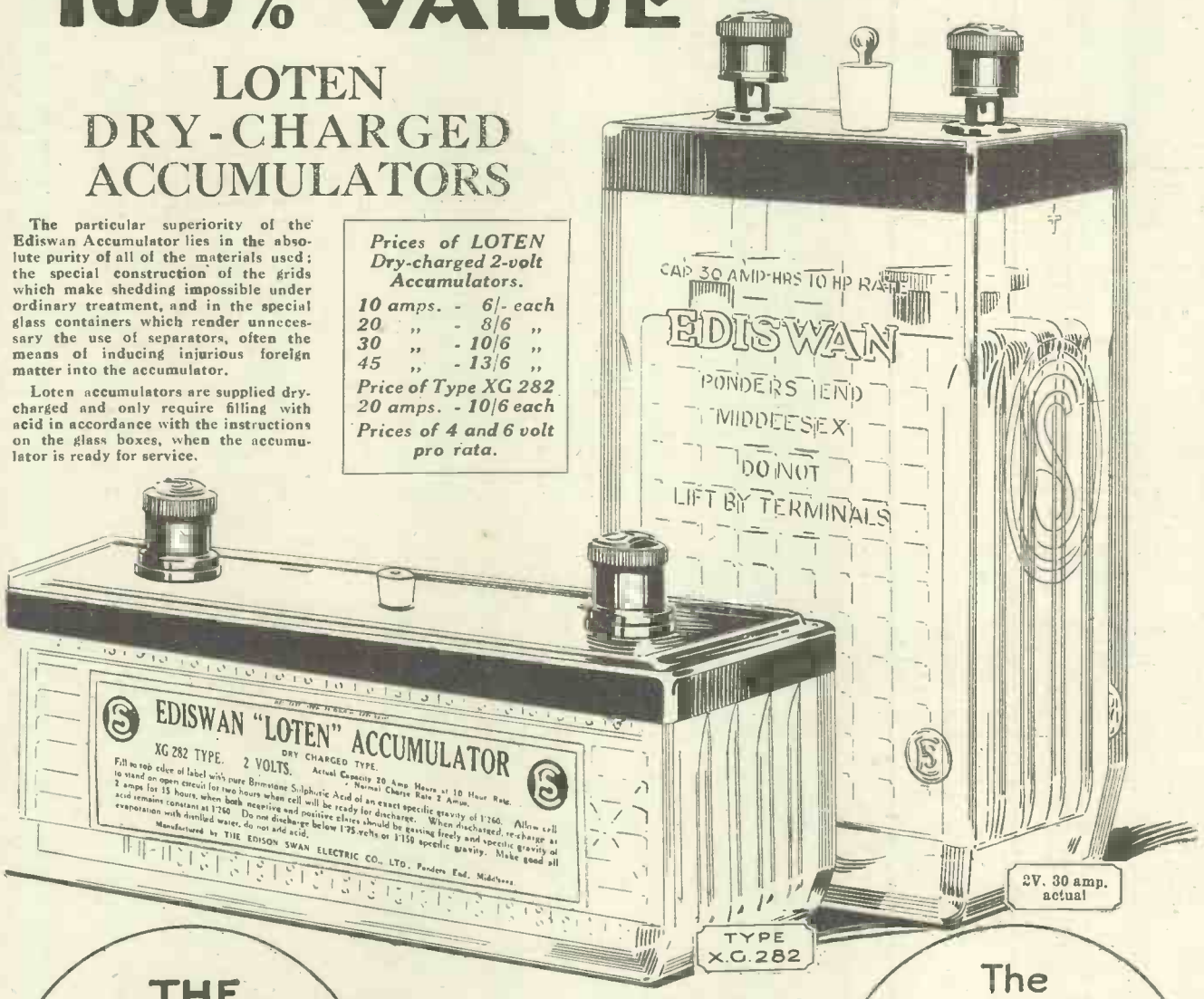
**Loten accumulators are supplied dry-charged and only require filling with acid in accordance with the instructions on the glass boxes, when the accumulator is ready for service.**

***Prices of LOTEN Dry-charged 2-volt Accumulators.***

| | | |
|---|---|---|
| *10 amps.* | - | *6/- each* |
| *20* | *,,* - | *8/6* *,,* |
| *30* | *,,* - | *10/6* *,,* |
| *45* | *,,* - | *13/6* *,,* |

***Price of Type XG 282 20 amps. - 10/6 each***

***Prices of 4 and 6 volt pro rata.***




THE 100% BRITISH ACCUMULATOR

*Advt. of*
*THE EDISON SWAN ELECTRIC CO., LTD.*

*Manufacturers of all types of Accumulators and Dry Batteries.*

The capacity of all **EDISWAN** ACCUMULATORS is based on the 10 hour rate of discharge

# RADIOTORIAL

**All Editorial Communications to 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 and photos. Every care will be taken to return MSS. not accepted for publication. A stamped 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 receivers. As much of the information given in the columns of this paper concerns the most recent developments in the radio world, some of the arrangements and specialities described may be the subject of Letters Patent, and the amateur and the trader would be well advised to obtain permission of the patentees to use the patents before doing so.*

## QUESTIONS AND ANSWERS.

### SPLIT-SECONDARY CONNECTIONS.

T. R. B. (Durham).—"In the standard split-secondary high-frequency transformer how are the various windings connected to the pin? I mean what part of the transformer is connected between 1 and 2, for instance?"

In the standard split-secondary H.F. transformer the various windings are connected to the pins as shown below. Primary winding, between pins 1 and 2. One half of the secondary winding between pins 3 and 4. Other half of the secondary winding between pins 5 and 6.

### CHOKE COUPLING WITH OLD L.F. TRANSFORMER.

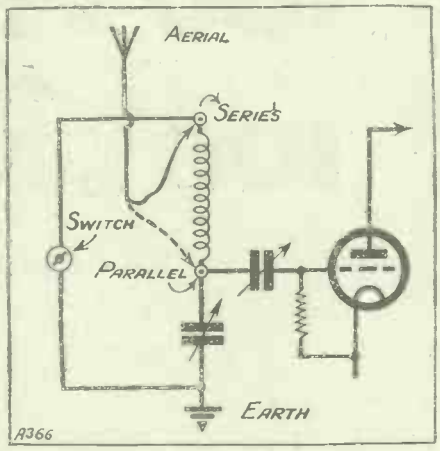
S. R. Y. (Paris).—"Can the winding of a low-frequency transformer be used for the purpose of choke coupling, and if so, what are the connections?"

In a general sense the connections for choke coupling are exactly the same as for resistance coupling. In the case of a Det.-L.F. set, for instance, the lead to the plate of the detector valve would be taken from that end of the choke winding which is connected also to the coupling condenser. The remaining end of the choke winding goes to H.T. positive.

The grid of the last valve is connected to the remaining side of the condenser in the usual manner and also to the grid leak, the other end of which goes to grid-bias negative. Telephones or loud speaker are connected in the plate circuit of the last valve as usual. (The secondary of a transformer can be used as a choke in this manner even when the primary has been burnt out.)

### A "CHITOS" VARIATION.

One disadvantage of sensitive super-circuits of the "Chitos" type is the fact that owing to the unusual characteristics of such circuits they generally do not operate as well upon long waves as upon the medium wave-band.




For readers who particularly wish to hear 5 X X, Hilversum, Zeesen, or other popular long-wave stations, this is a great disadvantage. The curious thing, however, is that in some cases extremely good long-wave results *are* obtained with such circuits, and in this connection the following letter to the Editor from a Builth Wells reader will be of interest.

"I have built up the one-valve "Chitos" described in POPULAR WIRELESS some time ago," he says, "and the results obtained on the medium wave-band are very good, although I have left out the

(*Continued on page* 640.)

# RADIOTORIAL QUESTIONS AND ANSWERS

(*Continued from page 638.*)

variable resistance I have and a fixed condenser in the aerial lead and a fixed condenser across the batteries.

"Seeing in POPULAR WIRELESS that some readers have difficulty in finding coils for 5 X X, I thought perhaps they might do the same as I've done, and then be able to use the same coils as I used for an ordinary straight single-valve set. The accompanying sketch will show you how I've arranged my 'Chitos' for the long waves, and I can get Daventry (5 X X), Radio Paris, Zeesen, and Hilversum, and some unknown station, on the long waves.

"To get 5 X X, I fix aerial to parallel terminal and turn switch on, joining series aerial to earth.

"P.S.—Please note 5 X X is approximately 100 miles away, and works small loud speaker."

## THE CAUSE OF INTERMITTENT DISTORTION.

"VERY WORRIED" (Sale, Cheshire).—"I am very worried about it all. Knowing nothing about wireless and being of a musical turn of mind, I thought I would take expert advice about the kind of set I wanted and put myself in the hands of your Query Department.

"I got my set made up to the specification you sent me and I must admit that the results were absolutely satisfactory in every way. In fact, it was a bit of a revelation to me.

"But what I cannot make out is this. For about a fortnight the set has suddenly become distorted at some time or another during the evening, making speech pretty difficult to listen to, but music intolerable. To a critical ear the distortion is absolutely terrible, but the funny thing is that it does not stay for long, and sometimes we go for several days without hearing anything of it.

"At other times it is a misery to switch the set on. What puzzles me is that several times it has come on without the set being touched in any way at all whilst we have been listening.

"The people to whom I take the accumulator have suggested that it might be due to a neighbour's set interfering with mine, but I do not think this is the case because I never hear a howl or anything like that—just the awful distortion. What do you think is the cause of this?"

From your description we think it is pretty certain that the trouble does not lie in your set at all, but is caused by one of your neighbours. Every symptom

## ONE CAUSE OF CRACKLING.


**Wander-plugs are a frequent source of faults, and it pays to "open" the contacts now and again, to make sure of a good connection at this point.**

you advance points to the fact that somewhere near your aerial is another aerial attached to a set on which far too much reaction is being employed.

Probably the person using it is quite unaware of the interference which he is causing so if possible we should ask any of your neighbours who have wireless sets whether they are experiencing the same kind of interference as you are. A few tactful inquiries should certainly prove whereabouts the interference is at a maximum.

For instance, if you find evidence that it is very strong at one end of the road and at the other end is hardly noticeable, you can be pretty sure at which end the disturbing aerial lies. In all cases of this kind it is a good plan to get into touch with the local broadcasting authorities, who will render you every assistance in their power.

This type of oscillation interference is nearly always caused inadvertently, and we feel confident that with the aid of the B.B.C. and friendly cooperation among the neighbours, you will be able to trace the offending set and persuade the owner of the error of his ways.

## THE "FREE-GRID" ONE.

S. B. W. (Westmorland).—"I am very interested in one-valve sets, and think of building the 'Free-Grid' One. Can you give me the point-to-point connections for this set, in *words*?"

The required information is given below:

POINT-TO-POINT CONNECTIONS.

Æ to pin No. 5 on coil base.
E to pin No. 4 on coil base.
Grid to pin No. 1 on coil base and to fixed vanes of $C_1$.
Pin No. 2 to moving vanes of $C_1$, and to one side of condenser $C_2$. Other side of $C_2$ to Fil.—of valve holder and to L.T.—. L.T.+ to H.T.— and to one side of $R_1$.
Other side of $R_1$ to Fil.+.
Anode to one side of H.F. choke and to fixed vanes of $C_3$.
Moving vanes of $C_3$ to pin No. 6.
Other side of H.F. choke to 'phone terminal—.
Other 'phone terminal to H.T.+.
This completes the wiring.

## TROUBLE WITH THE NEIGHBOURS.

G. F. (Derbyshire).—"I never had any trouble with my crystal set until my neighbour got a one-valve set, and now I find that every time he switches on he sends away my programme. Do you think the best way to get over this would be for me to get a two-valve set?"

Although we sympathise with you in your dilemma we must honestly say that to buy a two-valve set and try to shout your neighbour down would not be the right way to get over the trouble. It is true that for a time you might manage to improve your reception at his expense, but what will happen if he buys a *three*-valve set?

(*Continued on page 642.*)

# RADIOTORIAL QUESTIONS AND ANSWERS

(*Continued from page* 640.)

Possibly you think to yourself "In that case I'll get a four-valver," but although you might be able to afford a greater increase of valves than he can, you would not be able to go far in this direction without causing other neighbours to suffer!

Possibly one of these other neighbours might settle the dispute by cutting you both out with umpteen valves, so what we should recommend is for you to try and get together and endeavour to minimise the *cause* of the trouble in a friendly spirit. The real reason for the fact that your set and your neighbour's are interfering with one another is because your two aerials are too close together.

We should try the effect of varying the positions of these. For instance, if they are at present running parallel at approximately the same height, try separating them as widely as possible, keeping one as high as possible at the house end and the other as high as possible at the far end.

In this way one slopes up and the other slopes down and you may find great improvement in both the sets, even though the gardens are narrow ones, compelling the aerials to run more or less parallel to one another's length. If the gardens, however, are fairly wide ones, try the effect of shifting the aerials as far apart as possible, the main idea being to prevent the wires running parallel.

If you are both using the water-pipe as an earth we should certainly recommend that one of you should change over and try a buried outside earth, as sometimes an alteration in this respect is of considerable use in minimising such interference. Although interaction between aerials is one of the most troublesome faults to eradicate, we have no doubt that a little experimenting along these lines will do far more towards a satisfactory solution of your problem than merely adding another valve to your set, and it will certainly prove much less expensive.

The great thing is to co-operate and compare results when the various aerial arrangements are tried out, it being almost certain that in some position or another you will find a minimum of interference which gives you both a fair share of the programmes.

In very bad cases it is sometimes necessary for the valve set to use an indoor aerial arranged under the roof, but this is only a last resort and in all probability you will find that if the two outdoor aerials are properly positioned you will be able to overcome the difficulty.

### TUNING CONDENSER FOR TWO-VALVE SET.

S. F. (Glasgow).—"In the directions for a two-valve set H.F. and Det., which I am building, the list of components gives the anode tuning condenser capacity as ·00025 mfd. I have no condenser of this size, but I have a ·0003 mfd. condenser on hand. Will this do?"

Yes, the small difference in capacity will make very little difference, especially if the number of turns on the anode coils is slightly reduced (say by five to ten turns) to correspond with the increase in capacity.

## QUESTIONS & ANSWERS ABOUT BATTERIES.

### CHARGING ACCUMULATORS FOR NOTHING.

W. L. (Chadwell Heath, Essex).—"Before I came here to live I read somewhere in one of the electrical books that it was possible to charge low-tension accumulators from the electric-light mains free of charge, provided that the electric-light system was of the direct-current variety.

"I was living up North at the time and we had not electric light in the house, so although I was interested I did not take particular attention as to exactly how this could be done. Now, however, I have settled down in a house which has direct-current electric-light system, and if it is a fact that charging could be done for nothing I should be very glad to know of the exact method.

"I have already inquired diffidently among my neighbours here who have wireless aerials, but so far I have not met anyone who does it, so I am wondering if there was a snag in it or whether what I read was right?"

It is a fact that it is possible to charge small low-tension accumulators from D.C. electric-light mains at an absolutely negligible cost.

As you probably know, the resistance of an L.T. accumulator is very low, whilst the voltage of direct-current lighting mains is very high. Consequently, in order to obtain a low charging rate it is necessary to use high resistances in series, and in an ordinary charging apparatus it is the loss in the resistance that makes for the wastage of the method. If, however, your accumulator is placed in circuit so that the ordinary household lamps *when used for lighting* are acting as series resistances, you will notice no reduction in the illumination given by the lamps, and the current flowing through them will at the same time charge the accumulator.

In this way, the method can be considered as being absolutely cost-free, but, of course, the amount of charging current available will depend upon the extent to which the lights are used.

The method of wiring is to break that main which is earthed at a point close to the main switch, so that all the current passing through the various lamps on that main will have to pass this point. Two terminals should be provided and the accumulator must be joined up here, great care being taken that the terminals are connected in the correct charging position—that is to say, the positive of the accumulator towards the positive main and its negative towards the negative of the supply.

The most convenient method of inserting the accumulator is by means of a double-pole double-throw switch, the two central terminals of which are connected to the broken supply main. At one end of the switch the outer terminals are shorted together, so that when the switch is in this position the mains are restored to their original condition.

The L.T. accumulator is then joined across the other two end terminals in its correct position for polarity, and consequently when the switch is thrown over in this direction the accumulator is automatically charged whenever the lamp current is switched on.

### RENEWING WET BATTERIES.

V. W. D. (Berkhamsted).—"Regarding the Wet Battery Hints which were given on page 456 of May 26th issue of "P.W.," I believe I have read of a method of overcoming this difficulty by means of sal-ammoniac in tablet form. Can you tell me if this will overcome the difficulty of creeping, and if so, where the tablets can be obtained?"

The use of sal-ammoniac concentrated in tablet form is often recommended to overcome the trouble named. The price of such tablets is only about twopence per dozen (they can be obtained from the Eton Glass Battery Co., 46, St. Mary's Road, Leyton, E.10.) If two of these tablets are dropped into the cell and the distilled water is poured on after the battery is set up, the danger of creeping is greatly reduced.

(*Continued on page* 644.)

# RADIOTORIAL QUESTIONS AND ANSWERS

(*Continued from page 642.*)

**TESTING BY 'PHONES AND DRY CELL.**

"IGNORAMUS" (Birmingham).—"It is not very long since I first started to read POPULAR WIRELESS, and what I like are the simple articles that tell you how to make and do things. Your little tip for removing spilt accumulator acid saved me a pretty penny, so now I make it a rule to try and understand as much of 'P.W.' as I can. But there's a lot that beats me! For instance, several times I have come across the expression 'the 'phone and dry-cell method of testing,' and I should like to know what this means?"

Defects in the wiring of a receiver, or those arising from faulty components, may often be detected by a very simple series of tests with a pair of 'phones and a dry cell. One tag of the 'phones should be connected to one terminal of the dry cell, and two flex leads should be connected, one to the remaining 'phone tag and the other to the remaining terminal of the dry cell (a flash-lamp battery is quite satisfactory).

## "P.W." TECHNICAL QUERY DEPARTMENT

***Is Your Set "Going Good"?***

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 a revised scale of charges, can be obtained direct from the Technical Query Dept., "Popular Wireless," 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.

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

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

On the other hand, if one of the flex leads is connected to the socket of the coil holder and the other to the plug, if a double click is heard, there is a short-circuit across the holder.

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

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

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

Complete circuits may be tested in this manner. For example, if the A.T.C. is in parallel with the A.T.I., in a simple tuned aerial circuit, one flex lead placed on the aerial terminal and the other on the earth terminal will give a certain test for continuity between these points.

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

# NEWS FROM SAVOY HILL.

(Continued from page 624.)

time in Italy, carrying out that part of his contract which provides for the performance of twelve radio dramas in a year. Next month he is returning to London to produce three of his efforts, two of them being dramas and the other a comedy sketch.

The dramas, which are entitled, "Improvisations in June" and "Good Breeding," will be heard from 5 G B on July 24th and 31st, and from London on July 25th and August 1st. Each of these plays will take nearly an hour and a half to perform, and from what one hears about them, they are decidedly odd, if not actually startling compared with what listeners are accustomed, even from the pen of Lewis.

The comedy sketch, which is called "Chez Cupid," will be included in a variety programme from London on Saturday, July 28th, so what with rehearsals and the actual broadcasting of the plays, it seems that "C. A. L." is going to have anything but a holiday.

### P.M. on Saving.

The Prime Minister's speech at the Assembly of the National Savings Association will be relayed from the Hotel Majestic, Harrogate, at 9.15 p.m. on Friday, July 20th. Prominent members of the movement from all parts of the country will attend the gathering at the invitation of the Mayor and Corporation of Harrogate, and the occasion is important inasmuch as there are 27,000 Savings Associations and 100,000 voluntary workers engaged in inculcating the virtues of thrift among all sections of the community.

### A Microphone Romance.

Another romance of the microphone is revealed in the marriage which took place at the church of St. Mary Abbotts, Kensington, on Saturday, June 30th, between Mr. Howard Rose, the dramatic producer at Savoy Hill, and Miss Barbara Couper, a young actress who has appeared in many of the successful broadcast plays during the last two years.

Mr. Rose, who before he joined the staff of the B.B.C. had a wide experience of theatrical work, having been with Sir Herbert Tree, Sir George Alexander, and Henry Ainley, first met his future wife at an audition in the studio. Since then Miss Couper has played the parts of Catherine in "The Taming of the Shrew," that of the girl in "Landing the Shark" and recently of Rosalie in the French play of that name.

### A Menin Gate Relay.

Preliminary arrangements are well under way to broadcast the great commemoration service to take place under the auspices of the British Legion at the Menin Gate, outside Ypres, on Wednesday, August 8th. The service, which is to be addressed by the Archbishop of York, and probably attended by the Prince of Wales, is the culmination of a week's pilgrimage of ex-service men and the relatives of the fallen to the battlefields of France and Belgium.

Many thousands of people are making the pilgrimage, so that the service should be one of the most impressive ever heard. An interesting point in connection with the broadcast is that the line between Ypres and London will be tapped to enable the Belgian stations to relay the proceedings to their own listeners.

## TECHNICAL NOTES.

(Continued from page 624.)

accumulators behave under the rather drastic treatment to which these are being subjected. One accumulator has become sulphated and corroded to an extraordinary degree, but amongst the collection are accumulators of certain well-known makes (you will appreciate that I cannot mention names) and I am glad to say that these are coming out of the ordeal remarkably well.

They have been subjected to all manner of abuse, such as long-continued overcharge, over-discharge, charging and discharging at currents much greater than the rated values, allowing the electrolyte to fall during charging below the top of the plates, thereby exposing part of the plate and also increasing the strength of the acid, and so on. In spite of this the better-class batteries have shown practically no signs of deterioration whatever.

### Remarkable Performance.

This speaks volumes for the improvements which battery-makers have effected in high-tension accumulators during the past two or three years, and from the observations which I have been able to make I feel convinced that a really reputable present-day H.T. accumulator, whilst being the best possible source of H.T. supply, gives almost no trouble whatever. The objection which has sometimes been urged against H.T. accumulators, that they require a good deal of attention and are liable to go wrong, although it may have been justified three or four years ago, is in my opinion emphatically *not* justified to-day.

I continually have submitted to me all manner of devices for supplying high-tension and low-tension current, and, therefore, it is just as easy for me to use one as another, but I am more than ever of the opinion that for *results* there is nothing to equal a satisfactory accumulator battery, whether high-tension or low-tension.











PLEASE MENTION "POPULAR WIRELESS" WHEN REPLYING TO ADVERTISEMENTS

# Dependability

I am only one of the thousands of radio owners who buy Mullard every time.

Experience has shown me that a Mullard product can be relied upon to carry out its claim—*to improve radio reception.*

Take for instance the new Mullard "Permacore" Transformer. It possesses many interesting and outstanding features. Remarkably small and neat it has a silver primary and nickel secondary winding. Resonant peaks, which give unnatural reproduction, are entirely eliminated.

Mullard P.M. valves with the wonderful P.M. Filament and a complete range of the Mullard P.M. products are stocked by every dealer.

**Mullard**
***MASTER · RADIO***

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R.R.

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

# ALL ABOUT CHARGERS AND MAINS-UNITS


# Popular Wireless

Every Thursday PRICE 3d.

No. 319. Vol. XIII. INCORPORATING "WIRELESS" July 14th, 1928.


## SPECIAL NUMBER:

# CHARGERS AND MAINS-UNITS

A very useful guide to all types of chargers and mains-units to suit all sets, pockets, and D.C. or A.C. Mains.

(*SEE PAGE 663.*)

# Popular Wireless

Scientific Adviser:
Sir OLIVER LODGE, F.R.S.
Editor:
NORMAN EDWARDS.
Technical Editor: G. V. DOWDING, Grad.I.E.E.
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## RADIO NOTES AND NEWS.

### Study the Heart!—Radio and the Mains—The Jervis Bay Affair—High Society—Whales, Seals, and Radio—Science and Romance—The "Sceptic's" Three.

**Comparisons are Odious.**

OH, dear, yes! But they are sometimes salutary and instructive. Owing to the dry weather my fountain-pen refused to deliver its inky wit and wisdom, thus giving me time to subject the Cape Town programmes to what "Lady Lindy" (Hoo-ray!) would probably call "the once over." Ve-ry instructive.

**The Cape Programmes.**

I DON'T say that I would swap 2 L O and 5 G B for the Cape Town station, because 2 L O and young Dave are at the centre of the world and have the pick of the basket to play with. But I *do* say that the Cape Town fellows have the right ideas about broadcasting. They are not trying to educate their uncles and grandfathers—or even the kids. Their programmes show the human touch, and music constitutes, I should say, 80 per cent. of them. No more than three-quarters of a hour of "talks" a day, no "first performances," no chamber music, and not an intolerable deal of songs to a ha'porth of orchestra.

**Our Nursery Rhyme.**

One little nigger-boy.
"Spirituals"—of course!
Nine more joined him,
And then it was worse.
Ten little nigger-boys,
"Atta, boy!"—of course!
Tune in another wave!
We'd sooner hear Morse.

**Tax Evaders.**

I DO not pretend to feel specially indignant with those who try to evade the payment of the licence fee, because they are only just so many unsporting members of society, and there are plenty more and worse. Petty meanness, like bilking cabmen, robbing the railway of a bob or the 'bus of a penny, omitting to correct the cashier who gives too much change, or giving twopence to a porter who crawls under a train to rescue a guinea hat—all these are bound to exist, like scorpions and fleas. But, oh, I do wish the licence-fee evaders would not say "They didn't know"! Can't they think up a prettier lie—something snappy, with a kick in it?

**Care of the Aerial.**

THE well-to-do and slightly "close" maiden lady next door has removed. Thank the stars! Our radio has spoken its piece more quietly ever since the flitting. But you should have seen the chauffeur trying to coil up the valuable aerial! This having been in position for some six years was not so supple as it was, and consequently kinked violently in about forty spots. Once it eluded his petroleus (*my* word) grasp and rolled into the coalshed! It broke twice. That I will affirm on oath. There's going to be some trouble in a respectable household soon.

**Tastes in Broadcasting.**

ON the other side I have a worthy couple who specialise in the Children's Hour and "talks." Pretty ghastly, because they have a sort of loud loud-speaker which they bring outside on to their back veranda. Thus, while *we* are trying to attune ourselves to the songs of the birds who are making havoc amongst our fruit, especially the strawberries, which are, curiously, the "apples of our eye," we have to listen to those children's hours. My only remedy is to wait for a fair wind and then to burn rubbish and weeds at the bottom of the garden. The "french" windows are then shut and we can gloat over the foe. Suburban nights! What?

**British Industries Fair, 1929.**

THE advent of next year cannot be guaranteed. But still, arrangements for the B.I. Fair are being pushed forward by the Department of Overseas Trade. Owing to the record success of the last Fair it has been found necessary to provide 100,000 square feet more stand space, roughly a 40 per cent. increase. Roll up, exhibitors! The Empire still seems to be a going concern. As yet we show but the most indistinct signs of following Rome and the old Greeks into the ranks of departed glories.

**"Toujours la Politesse."**

THIS is not so bad. A client (a lady) of a radiotelegraph company complained that she had sent a radio to Rome three days before and apparently the message had not arrived. The resourceful counter-clerk smiled and replied, "Give it

(*Continued on next page.*)

## NEXT WEEK'S SPECIAL NUMBER.

This view of one of "P.W.'s" new offices at Tallis House, Tallis Street, shows some of the Editorial staff at work. They are assisting in the preparation of next week's Special Number, which is to be devoted to Coils and Condensers. "P.W." readers will readily recognise Mr. G. V. Dowding (centre), Mr. K. D. Rogers (left), and Mr. P. R. Bird (right).

# NOTES AND NEWS.

*(Continued from previous page.)*

time, madam! Remember! *Rome was not built in a day.*" That boy deserves promotion.

### Study the Heart.

WHICH reminds me of another telegraph yarn. Behold the female of the species, rampant at the counter of the radiotelegraph company. She had sent a radio to hubby, reminding him of the anniversary of their wedding. No reply. Was he indifferent, or had the message gone astray? The unknown genius, but profound student of the feminine psyche, replied, "Well, madam, our system is infallible; I guess he's waiting for the pearls to be matched. *And I don't wonder at it!*"

### The B.B.C. 1927 Report.

THIS document, which can be got from the Stationery Office for threepence, though it cannot be compared with "P.W." at the same price, is nevertheless well worth reading. It is a plain statement of a year's work by the best broadcasting authority in the world. Much as I detest some of the stuff "put over" by the B.B.C., much as I disagree with the B.B.C.'s idea that we—all you people and I—need educating and that they are the boys to educate us, I must admit that they have moved. My chief fear is that they will degenerate because they no longer need show a profit.

### Radio and the "Mains."

A. J. N. (Nr. Bristol) and several others, have written, in perturbed strain, with reference to a speech made by the electrical engineer of Worthing, who apparently implied that to hook the radio set to the mains without intimation—he does not seem to have disclosed whom one must intimate—is illegal. He spoke of fines, and of the necessity for drastic regulations directed against radio, which is "a perfect nuisance." Rough luck! I have asked our borough electrical engineer and he says he can't guess what the Worthing man is talking about. So don't worry.

### The "Jervis Bay" Affair.

THIS incident, which might well have been much more serious, furnishes another and new proof of the value of having radio on board ships. Suppose that the stowaways had not been mastered! The first few wireless messages would have sufficed to mobilise the Empire's whole maritime force, if necessary. It is interesting to speculate on the effect which radio might have had on the fortunes of "Breadfruit" Bligh, and on those of the mutineers who sent him a-sailing in an open boat to Timor. Perhaps there would have been hangings, instead of Pitcairn Islanders.

### An Enterprising Firm.

IF you are in any doubt as to the proper use of an R. I.-Varley component, don't forget that this enterprising firm has opened new showrooms at 103, Kingsway, where reliable advice will freely be offered. This, you must particularly note, is a showroom and not a shop where salesmen will groan in chorus if you leave without a parcel under your arm! All interested constructors are welcome.

### Round Browns'.

S. G. BROWN, LTD., have sent me a copy of the "Brown Budget Summer Number." You might do worse than "blue" a penny on a postcard asking for a copy, which is all about the Brown Works at North Acton, W. 3. Everybody knows Browns', but not the works. I'll bet that if you coaxed the flivver to N. Acton you would get a real welcome and see something better than the average "pictures."

### High Society.

LET me strike the right note for a Society par. I believe I have to begin with "My dears, I'm utterly thrilled," or some such bilge. However, I know that the biggest ball of the year happened on June 20th at the Great Fosters Hall. A couple of thousand folk rolled up, including the Prince, the Duke of Gloucester and Prince George. What I like about it was the democratic touch. Amplion's had charge of the arrangements for shoving loud speakers and public-speech gear around the place, and they went to the extent of including in their operations a marquee containing the waiting chauffeurs. Good!

## SHORT WAVES.

We've just heard a good relay
Of Sydney (2 F C);
As their time's ahead, I wish they'd say
Who'll win the 3.33.—"Radio News."

* * *

First Housemaid: "Is Professor Wise absent-minded?"
Second Ditto: "Is he? Last night when the baby cried he twisted its nose to eliminate the static."

* * *

THE ENTHUSIAST'S LAMENT.
People may come and people may go,
But whenever they do our wireless won't go.

* * *

A rather well-known American lady recently appeared at a fancy-dress ball as a loud speaker. Everyone applauded when she was presented with the first prize. They said it was such a good representation.

* * *

LIKE EVERYTHING ELSE.
The experimenter's aerial always has its ups and downs.—"Pop. Radio Weekly."

* * *

Policemen in America, we read, are to be provided with pocket radio-receiving sets. A return to beat reception, perhaps?

* * *

PAPA WAS NO JACK BARRYMORE!
Mother (wife of famous radio announcer): "Now run along to bed, kiddies; and, when you say your prayers, don't forget to do as daddy said, and pray that television may never come."—"Radio News."

* * *

There was a young fellow named Hector
Who asked his new girl to select a
Nice jewel or confection,
To prove his affection.
She proved a good *crystal detector.*

* * *

"Making an H.F. Choke" was the title of an article which recently appeared in this journal.
One of our most enthusiastic readers wants to know how to make the rest of the set (his neighbour's, of course) do the same thing.

* * *

Here is the resting-place of one poor soul,
Who fell from the top of his aerial pole.
Super-regenerative sets were his only sins,
So we trust he's listening-in with a pair of wings.

### Whales, Seals and Radio.

LOVERS of that grand story "Moby Dick," the great white whale, will hate to think of a whaler girt, so to speak, with such unsporting gear as radio direction-finders and telephone sets. It seems to load the dice. But solid business, alas! eliminates the gambling element. The Southern Whaling and Sealing Co., Ltd., after two seasons' experience of radiotelephone sets, are so pleased with the results that they are going all out on radio gear this year. "The Southern Express," the floating factory for the South Shetlands, and three whalers, will be equipped with D.F. sets and telephone sets.

### Science and Romance.

"THE Southern King," attached to the South Georgia base, where Shackleton is buried, carries out materials, stores, and men, and returns with oil. She is completely equipped with wireless telephone and telegraph sets, including short-wave gear for communication with the British Post Office stations, and with other apparatus for talking to ships and local coast stations. D.F. and screened valves are also used. Is the life of whale or seal "worth the candle" in face of such an array of science? Is it fair, I ask you?

### This Cricket!

I AM ordered smartly to attention by an Edinburgh reader because in a recent note of mine the Great Barrier Reef was credited with 12,000 miles of length. The excuse is that the printer, thinking of his latest cricket score, added a nought to my figures, and the fellow who read over the "proof" was thinking of his bank balance—and let the nought pass. Sorry! Call it 1,200 miles. Then get a hook-up on the lines of the "Sydney Two," and you will pull in 3 L O, which you say you have never heard.

### Back Numbers of "P.W."

FOR these application, with payment, should be made to our Back Number Dept. It sometimes happens that a certain number is unobtainable, and there you are! Flummoxed! However, our sporting friend, Mr. W. A. E. Rowett, Buckland, Fairborne Rd., St. Austell, Cornwall, kindly offers to lend any back numbers from No. 250, *which we may not be able to supply,* if the postage is refunded and the copy kept clean and uninjured. But, as he says, it's better to be a regular reader.

### The "Sceptic's Three."

W. A. E. R., who offered to lend Mr. Elston his set, has made up the "Sceptic's Three," and is preparing to demolish the doubters. Indeed, he threatens to write an article about it, and says that the closing passage is poetic. Don't shoot! Poetry excepted, the Editor is open to give a fair show to any article submitted to him without fear or favour. However, as editors have to turn down more stuff than they publish, you've got to deliver the right goods or get a disappointment. But there—rejection slips are merely a tonic to a born writer.

### Our "City" Par.

THE recent offer of shares in the Baird Television business resulted in an early over-subscription. The investing public is a highly courageous body, with a faith that moves mountains. As I prefer to keep my dough in an old stocking I never make fortunes—and never "just miss" doing so. My motto has always been: "When X's are bad, buy a cable; when the cable breaks, use radio."

ARIEL.

# "Eliminator" Difficulties

**A brief review of small points which sometimes puzzle the owner or prospective purchaser of a Mains Unit.**
**By P. R. BIRD.**

ONE of the very first minor difficulties in connection with eliminators is the name given to this class of apparatus. "H.T. Eliminators" they are often called, and—whisper it not aloud—a great many people still wonder exactly how the H.T. is eliminated.

The fact is, of course, that the H.T. is not eliminated at all. The name "H.T. Eliminator" is wrong, and what is meant is "H.T. *Battery* Eliminator."

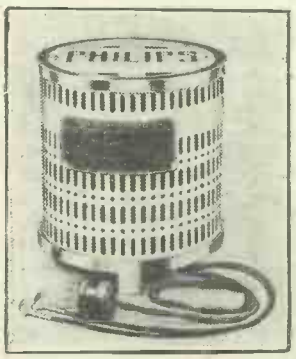
Since there is now a growing tendency to use the house-wiring for supplying low-tension to the set also, the expression "L.T. Battery Eliminator" also has been seen in print; but there is every reason to believe that this clumsy title will soon give place to "L.T. Unit," which is a much better description of such instruments.

### Readers' Experiences.

Before dealing with the slight difficulties which may arise with any particular class of mains unit when installed, it will be as well to refer to those preliminary difficulties regarding the choice of such an instrument. Is it the best way of supplying current to the set? Is it expensive? Is it dangerous?

These and many similar questions are continually asked, and perhaps the best way to answer them for "P.W." readers is to state the experience of other readers who have tried the various types of mains units advertised or described in this journal, and in "Modern Wireless" and "The Wireless Constructor."

In general it may be said right away that experience has shown that mains units are amongst the most satisfactory



One way of eliminating charging troubles is to charge your own batteries at home. Working from A.C. mains, this Philips' Battery Charger will maintain either H.T. or L.T. accumulators, the rates varying from 1·3 amps. (L.T.) to 75 m/a or so for H.T. charging.

devices in common use for radio work. If properly installed and of suitable type they are safe, certain and economical, and, incidentally, their increasing popularity is largely due to the fact they assist purity of programme reproduction—the ideal at which we all aim.

Although there are several excellent receivers available which derive all their current from the mains, most readers of

Working from A.C. mains of 200/250 volts this H.T. Battery Eliminator (H. Clarke & Co., (Manchester), Ltd.) has one 60-volt tapping, one giving 120 volts, and one variable between 0 and 100 volts. The maximum output is 50 m/a, and the price £8 15s. including Royalty.

"P.W." whose houses are lit by electricity have been content to use only the *H.T.* class of mains unit. And it is a significant fact that most of them have expressed unqualified approval of the results given, and of the low cost of upkeep.

### Under the New Scheme.

Two little difficulties which are continually cropping up are those in the form of the following questions:—

(*a*) "Are mains units for use with A.C. or for D.C.?"

(*b*) "If the Electricity Scheme is put into force in my district within the next five years, can I use the same mains unit after alterations to the electricity supply have been made?"

To the first question the answer is that mains units have been designed for either A.C. or D.C. mains respectively, the chief difference in the instruments being that when A.C. mains are employed some form of rectifying apparatus must be included in the mains unit, as well as the usual "smoothing" and voltage regulating devices.

Regarding the new Electricity Scheme, officially the view is taken that in no circumstances should the consumer suffer because his electricity supply is being standardised or otherwise modified; and any apparatus which he works from the present mains will therefore be re-conditioned free of charge, or replaced by similar apparatus which will work equally well under the new conditions of supply.

It has been said that in the past mains units have been used chiefly for H.T. supply, and not for L.T. But an important change has just taken place. The recent application of dry rectifiers and electrolytic condensers to the needs of the radio set has now resulted in the appearance of a practicable L.T. supply unit, and the first constructional details of an instrument of this kind—for use with A.C. mains—are appearing in the August issue of "The Wireless Constructor," under the title: "The Harris 'Stedipower' L.T. Unit."

Reverting to the H.T. supply unit, the chief difficulty which arises in use is the presence sometimes of a slight hum, audible in the programme pauses. Inadequate smoothing is the usual cause, and this can be remedied by the use of larger shunting-condensers or greater "choking."

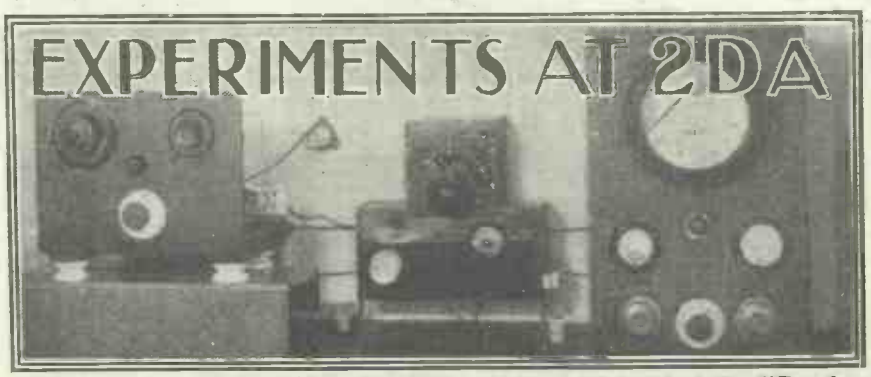
### Overcoming Humming.

Generally the detector valve's supply is the guilty party, and before alterations to the unit are tried it is a good plan to connect in the external H.T. + lead an extra L.F. choke. Even the secondary of a "burnt-out" L.F. transformer will often serve to cure this trouble, as the current carried by the detector valve is quite small.

This Ediswan Home Accumulator Charger works from A.C. mains and charges either 2-, 4-, or 6-volt accumulators. The "all-in" price is £2 17s. 6d.

Before purchasing or making a mains unit, make sure that it will supply enough current—the anode current requirements of your valves can be found from the charts supplied by the valve makers.

# EXPERIMENTS AT 2DA



**A brief account of some interesting tests recently carried out at the "Popular Wireless" Experimental Transmitting Station.**

**By THE ENGINEER-IN-CHARGE.**

MANY may imagine that transmission is more interesting in every way than reception. This, however, is only so up to a certain point, for it is a fact that after the first interest and excitement of transmitting has passed, there is a great temptation to experiment more with the receiver than with the transmitter.

At the present moment, for instance, many of the once well-known "live" amateur call-signs are seldom heard on the ether, and yet there is little doubt but that their owners are still actively interested in radio, and most likely busy in solving many—some of the ever-recurring and interesting reception problems.

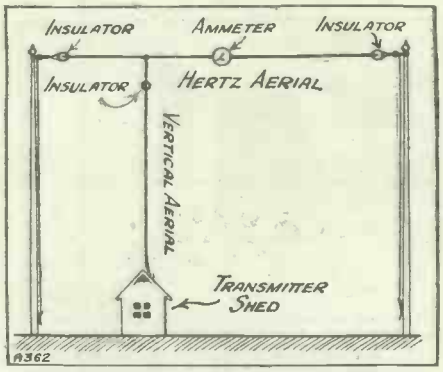
### The Half-Wave Hertz.

When 2 D A was originally taken over as the POPULAR WIRELESS Experimental Station this was realised at once, and it was decided that experimental reception and transmission must be carried on together and not one neglected for the other.

On the receiving side the main object was to get a reliable and efficient short-wave receiver which should possess the advantages of stability and ease of operation, even though a stage of high-frequency amplification were incorporated.

In the near future it is intended that details shall be given of the receiver used at 2 D A, but at present it still falls somewhat short of the ideal. Then, again, there was the problem of purity of reception on short waves. In the course of much practical experimenting in this direction many useful ideas and hints have been collected.

So far as transmission is concerned, the following account of some tests at 2 D A should indicate the interesting type of problems that can crop up in the course of quite normal working. The first transmission by the "P.W." station on 45 metres was carried out in connection with the use of a half-wave Hertz oscillator as the radiating system.




"The Hertz aerial . . . was not taken down, but the feed—or down-lead—was simply disconnected from the horizontal part and an insulator inserted between it and the actual aerial."

For certain technical reasons the Hertz was discarded in favour of a vertical aerial with an earth. Since, however, it was intended that the Hertz aerial should be used again in the future, it was not taken down, but the feed—or down-lead—was simply disconnected from the horizontal part and an insulator inserted between it and the actual aerial. The vertical aerial was, therefore, simply a wire supported by and underneath the Hertz aerial but insulated from it.

Transmissions took place on this vertical aerial, and quite satisfactory results were obtained, except that they proved most erratic. Within a few hours of receiving a report of a steady R7 at 200 miles, 2 D A would be reported at the same distance as R7 to 2 with bad fading.

### Two-Wave Transmission.

For some time such contrary reports continued to come in, until eventually a clue to the problem was discovered in a report on the station's transmission which stated that, at times, two waves were being radiated on practically the same wavelength. It was at once realised that the Hertz aerial was radiating as well as the vertical, although the two were supposed to be effectively insulated from each other. Accordingly, a small hot-wire type ammeter was inserted in the centre of the Hertz aerial and the aerial hauled up again to the top of the aerial mast.

It was found that during transmission on the vertical aerial a reading was obtained on the ammeter in the Hertz aerial which was clearly being excited by the vertical one. Apparently most of the efficient radiation from the aerial system was taking place from the Hertz aerial, for as soon as this was taken down and the vertical aerial only used, results became exceedingly poor. Curiously enough, the Hertz aerial without the vertical aerial, was quite as unsatisfactory as the vertical aerial was without the Hertz.

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# SHORT-WAVE NOTES.

**By W. L. S.**

IF the utility of short wave-lengths for long-distance communication can be judged from the number of expeditions now relying largely on their short-wave apparatus, it is by now far greater than that of the long-wave, high-power stations which used to accompany such parties. Imagine the amounts of trouble involved by (1) a half-kilowatt set working on 600 or 1,000 metres, and (2) a 50 or 100-watt short-wave set, which will have an almost certain range of three or four times that of the bigger station!

### Captain Durrant Again.

The Doytt-Brazil Expedition, with its little station G M D, has been putting excellent signals into Great Britain for several nights now, and I believe that their power is at times no greater than 30 watts. In contrast with this, I have been told that a half-kilowatt spark set in the Amazon wilds (where G M D is now) has a range of approximately sixty miles with good luck!

Another interesting station is W S B S, on board the famous "non-magnetic" yacht "Carnegie," which is cruising round the world making studies of terrestrial magnetism, magnetic declination, ocean currents, etc. W S B S is operated by one of the "crack men" of the American Radio Relay League, and puts out a fine crystal-controlled signal on several wave-lengths.

Then we have G L Y K, Col. Millard's yacht "Adventuress," which at the time of writing is well north of the Arctic Circle. G L Y K keeps schedules with G F A, our own Air Ministry station, and works with amateurs as well. "Behind the key" in this case is Capt. Durrant, who operated the famous stations G H H and 1 D H in Mosul some few years back.

There are at present other expeditions and boats far too numerous to list, all equipped with short-wave apparatus and putting very nice signals into the places intended for them!

Of course, when one gets out to sea the chief disadvantage of the shorter waves, namely, local screening, disappears, so that there is every reason to believe them now quite as reliable as the "old-fashioned" longer waves.

### The Low-Power Tests.

The R.S.G.B. "QRP Tests," which concluded recently, and took the form of tests for transmitters with 10-watt transmitters and indoor aerials, did not seem to be very well patronised. Very few stations were heard that seemed to be participating, and one can only conclude that the voluntary use of an indoor aerial and, therefore, the probable loss of "one week's DX" did not prove popular among the transmitters of this country. There really seems a danger that the "DX" and "Q S L card-collecting" craze will supersede genuine experimental work, as most of the old stagers who used to collect such valuable data seem to be "off the air."

One of the features of the 20-metre band at present is the extraordinary number of African stations that are audible in the evenings. F K-2 M S and F K-4 M S, both in Kenya, are particularly good, while F O-1 S R (Rhodesia) comes through like a local at times. The F O (Union of S. Africa) stations are absent!

# B.B.C. and TELEVISION

**The B.B.C.'s Chief Engineer is convinced that Television is only in the experimental stage, and that some entirely new discovery is needed to make it a practicable proposition.**

**By LAWRENCE W. CORBETT —who was recently "P.W.'s" New York Correspondent, and is now in this country.**

SO much has been written of late concerning the possibilities of the availability of television in the very near future, and of the practicality of transmission of still pictures so far as the ordinary broadcast listener is concerned, that the writer decided to get expert opinion on the matter, and for this purpose was fortunate in obtaining an interview with Captain Eckersley.

"The first thing I want to do," said Captain Eckersley, after I had broached the subject, "is to deny the frequent rumour to the effect that the B.B.C. will, in the 'fall' (the 'autumn' Captain Eckersley suggested, as I repeated his statement) set apart a definite period for the transmission of photographs by wireless."

"Do you believe," I questioned, "that the art is insufficiently advanced to warrant the B.B.C. devoting any time to it?"

"It is less a question of that than one of whether or not there would be sufficient demand for such a service. There is, admittedly, plenty of room for improvement, but from a commercial standpoint many of the present systems are capable of remarkable results. Then there is always the human element to contend with. No matter how meticulously carefully a picture may be transmitted, and no matter how perfect may be the equipment at the receiving end, it is by no means a difficult matter to ruin the picture at the receiver if the operator is apt to make one small slip. Indeed, this is also true in the case of broadcasting—but how much more so in picture work!

### Radio Photographs.

"Synchronisation is one of the most important things in wireless photograph transmission. Unless precise synchronisation is provided for at both receiving and sending ends the picture will be a hopeless failure—another place where the human element depends to a certain degree."

"But supposing a 'perfect' system of photograph transmission did exist, would you personally recommend that the B.B.C. give up some of the present programme time to transmitting pictures?" I questioned.

"I doubt very much whether the average listener would be interested," replied Captain Eckersley. "If he needs a picture for permanent record, he'll find it in his morning paper. I can, however, see one very useful application of the system. A stockbroker on holiday might be away from home all day and upon his return in the evening may wish to read some of the market prices. Perhaps he entrusted the

Capt. Eckersley, Chief Engineer of the B.B.C.

duty of copying down the reports as broadcast earlier in the day to his butler, who may be a little hard of hearing. How much more satisfactory it would be if a photograph of the printed reports could be transmitted and a permanent record made for the stockbroker's homecoming.

"Many wireless enthusiasts confuse television with photograph transmissions. Having seen in the press glowing accounts of the success of still picture transmissions and the optimistic reports of its imminency so far as the average listener is concerned, they are expecting to be able to buy an attachment for their receivers which will enable them to see the artists before the microphone simultaneously with their entertainment.

"Such a system in all its essentials constitutes television, an art which, I believe, is very far from perfection. The present so-called successful forms of picture transmission are not nearly so pretentious. All they promise is a small picture which takes several minutes to transmit, and after that the received print has to be treated chemically before the picture is visible. Television, on the other hand, in my opinion is still in a very definitely experimental stage."

There are so many different systems of photograph transmission nowadays that it is becoming increasingly difficult to keep track of them all. More has been done in America, perhaps, to stimulate public interest than in any other country. Several broadcasting stations in that country have transmitted pictures on pre-arranged schedules.

### "A Different Proposition."

Very little attention has been paid to the efforts of these pioneers by the listeners, except just so much attention as is necessary to learn when these transmissions are due so that another station may be tuned-in.

"Now if television were perfected," commented Captain Eckersley, "that would be a different proposition. There would be, I believe, a very popular demand for the B.B.C. to take it up. But in its present form it would be useless for us to do anything. We might just as well have inaugurated a broadcasting system twenty years ago with the Poulsen arc as the nucleus of our transmitting equipment. I believe that a radical discovery is necessary before television will be practicable, just as the valve made broadcasting possible."

Captain Eckersley thinks that none of the existing television methods can succeed without the aid of some far-reaching discovery.

As I took leave of Captain Eckersley, he again emphasised the fact that the B.B.C. while yielding to no one in its desire to promote invention and to encourage new ideas, had to be particularly vigilant to avoid any action or comment which might create ill-founded hopes in the minds of its vast constituency of listeners.

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

# MAINS UNITS

FOR A.C. OR D.C.—A POINT FOR MANUFACTURERS—L.T. ELIMINATOR —HEAVY RESISTANCES—TOTAL CURRENT—CONNECTION TO MAINS, ETC.

AS this issue of POPULAR WIRELESS is largely devoted to the interesting and important subject of chargers and mains units, the Editor has asked me to deal mainly with this subject in Technical Notes.

For some reason—perhaps because of the large amount of correspondence which I receive in connection with these matters—I seem to be unable to get entirely away from this subject.

However, it is one which must become of greater and greater concern to the growing number of radio users.

Strangely enough mains units and chargers are almost always assumed to be for use on alternating supply current. It is true that a certain number of D.C. H.T. supply units are sold and used, but, speaking generally, when you discuss "mains supply units" or chargers you are apt automatically to associate them with A.C. supply rather than D.C.

### For A.C. or D.C.

This is really quite wrong, for there is a very large proportion of direct current still in use in this country—considerably over 60 per cent.—and, furthermore, I can tell you that the rather widespread idea that all the D.C. is ultimately to be changed over to A.C., is also quite wrong. In town areas, more particularly in the central parts, where D.C. is installed over distances of up to five miles, it is practically certain that this will *never* be replaced with A.C. Therefore, whilst there is over 60 per cent of D.C. in this country at present, there will be permanently perhaps 30 or 40 per cent of D.C. which will never be changed over.

Consequently, it is a matter of considerable importance to provide high-tension and low-tension eliminators, as well as low-tension chargers, for those whose electric supply is of the D.C. variety.

### A Point for Manufacturers.

This is an aspect of the matter which seems to have been largely overlooked by manufacturers, but it is one which I suggest will be well worth their serious attention.

You will notice that in the case of high-tension accumulators or high-tension eliminators the problem is quite easy, for with high-tension batteries on D.C. supply you simply have to use a lamp or other suitable resistance, whilst with high-tension eliminators for D.C. supply the only problem is that of smoothing, and since the current is small the smoothing problem is a fairly straightforward one.

With low-tension D.C., however, the problem is entirely different, and is really more difficult than with A.C. For you first of all have to find some means of stepping-down the voltage—that is, if you are to avoid wasting about 90 to 95 per cent of the energy drawn from the mains. A method of stepping-down the voltage has been described by me in some issues of this journal and "Modern Wireless," some few months ago, and I may say that this method has now been thoroughly worked out and devices based upon the method will probably be on the market in the forthcoming season.

### "MR. ANNOUNCER."

Miss Mimi Crawford with the "Selector" set she uses in her popular number, "Mr. Announcer," at the Duke of York's Theatre, London.

### L.T. Eliminator.

Unless the method indicated by me in the above-mentioned articles is used, there are several rather difficult features which arise with the D.C. low-tension eliminator. The first is, of course, the successful smoothing out of the heavy current (up to 2 amperes) drawn straight from the mains, and the second is the provision of suitable resistances for regulating the current to the filaments of different valves if these are used in parallel in the ordinary way.

### Heavy Resistance.

You will observe that if the voltage from the mains be reduced to, say, 6 volts, as applied to the filaments, by means of a series resistance, the value of this series resistance must be comparatively large, and, what is perhaps even more important, its current-carrying capacity must also be large.

For instance, to take a case in point, if the mains voltage is 250 volts D.C., and we want 6 volts available for applying to the filament, then the resistance, in order to put one ampere through the filaments, must be about 244 ohms, and this, as I remarked a moment ago, must be a resistance of such a type as has a current-carrying capacity of up to, say, 2 amperes.

Such a resistance becomes quite a disproportionate item in the assembly of a low-tension eliminator.

### Total Current.

Now the total current through all the valves in parallel is determined mainly by the series resistance used and the resistance represented by the valve filaments themselves is insignificant compared with the main series resistance. Therefore, we can assume that whatever we do by way of switching about the valve filaments, the total current passing from the mains will be approximately constant.

(*Continued on page* 679.)

NEWS FROM SAVOY HILL. FROM OUR OWN CORRESPONDENTS.

# POLITICAL BROADCASTING ABANDONED

WHAT ABOUT BROADCASTING HOUSE?—EXTENSION FOR 5 S W— HARRY WELDON FOR THE MIKE—

A HIGH official at the Conservative Central Office has stated that there is to be no party political broadcasting after all. The B.B.C., for some mysterious reason, will say nothing about the matter. The truth appears to be that the B.B.C.'s initial mistake of consulting the three parties proved fatal. In the present keen state of political feeling, no agreed plan was likely to eventuate from a conference.

Following the inevitable deadlock the Governors of the B.B.C. decided to drop the whole thing. For many reasons the average listener will sigh his thankfulness to be spared a flood of party politics. On the other hand, the prospect of an occasional "dog-fight," with lots of bitter invective, had a certain programme value.

But there is no doubt this would soon wear off, to be replaced by consistent boredom with "statesman-like" utterances and parliamentary platitude. It will be interesting to observe how the parties blame each other for the breakdown of the negotiations. Or will they agree to put the blame on the B.B.C. ?

### What About Broadcasting House?

The B.B.C. has fallen lamentably behind in this matter of an appropriate headquarters. Both the Americans and the Germans are now a long way in advance. Some time ago there was a rumour of a move to Kingsway, near Bush House. Then Grosvenor House was mentioned. But nothing has happened. It is high time the Governors got busy on this and put a stop to the spread of sections of the B.B.C. all over London like one of the temporary Government departments during the War.

(*Continued on page* 678.)

# The P.W. "UNI-POWER"

**Here is a good idea—a combined amplifier and H.T. mains unit. If you want good quality loud-speaker reception, and your mains are A.C., be sure to read this article.**

**By L. H. THOMAS.**

THE day of the man who thought he could obtain full loud-speaker strength and perfect quality from a set supplied by a single 60-volt H.T. battery is over. He existed in large quantities until the advent of the moving-coil loud-speaker, which had the effect of revolutionising all our previous ideas of "quality" and of making more listeners dissatisfied with their receivers than anything else has ever done, before or since.

The pendulum has swung and it is now a common grievance that one cannot obtain even respectable purity of reproduction from a set unless the said set is extraordinarily wasteful of the precious "juice" and extremely expensive to maintain.

**COMPONENTS USED.**

- 1 Panel, 21 in. × 7 in. × ¼ in.
- 1 Cabinet and loose baseboard for same, 12 in. deep (Artcraft, Bond, Camco, Caxton, Makerimport, Pickett, Raymond, etc.).
- 3 Non-microphonic valve holders (Ashley, Bowyer-Lowe, Burndept, Burne-Jones, Igranic, Lotus, W.B., etc.)
- 1 Power transformer and rectifier valve to suit. (See text.)
- 2 32-henry chokes. (Any good chokes, of about this size, Climax, Marconiphone, Pye, etc. Alternatively, a single choke of double type, such as Igranic, or R. I.-Varley.)
- 2 ·02 condensers (Must be mica. Dubilier, T.C.C., etc.).
- 1 250,000-ohm wire-wound resistance and holder.
- 1 100,000-ohm wire-wound resistance and holder (Dubilier, Igranic, Mullard, R. I.-Varley, etc.).
- 1 ·1-meg. grid leak and holder.
- 2 1-meg. grid leaks and holders (Dubilier, Igranic, Lissen, Mullard, etc.).
- 1 4-mfd. condenser and 2 2-mfd. condensers, 400 v. D.C. type (Dubilier, Ferranti, Lissen, Mullard, T.C.C., etc.).
- 1 Bradleyohm, type E.10 (Hamley Bros.).
- 1 Five-terminal strip.
- 1 On-off switch.
- 2 Panel brackets.
- Wire, Systoflex, etc., and wood-screws and bolts.

### Quality with "Cones."

I would not for one moment dream of arguing that the many cheap loud speakers on the market will give reproduction equal to that obtainable from a moving-coil instrument. There are, however, several at quite low prices which will deliver remarkably *good* quality and reproduce over a very wide range of frequencies without requiring any current other than that supplied them by the set itself.

Several of the well-known types of cone loud speaker with permanent-magnet movements will give such good reproduction when properly treated that, in a small room, there is really not a great difference between their performance and that of a moving-coil speaker.

Even in this case, however, if the reader is at all particular he will agree that results are not at all good in the usual way until one uses at least 120 volts of H.T. with a super-power valve, and the voltage may be pushed up as high as 180 with beneficial results. Obviously, those who are fortunate enough to be equipped with mains will be able to make use of them to great advantage, and will be able to put them to excellent use without the necessity of going to the extra expense and complications which are at present too often attendant on the moving-coil speaker.

### The Amplifier Section.

The amplifier described in this article operates straight from A.C. mains, and the mains are also used to supply H.T. to a terminal at the left-hand end of the front panel, which may be taken back to the set with which the amplifier is used, thus dispensing with batteries there.

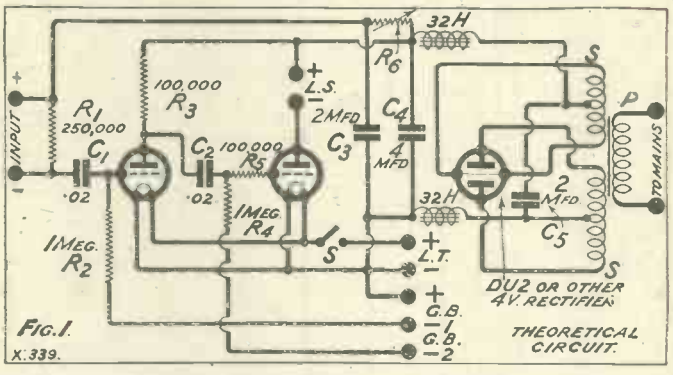
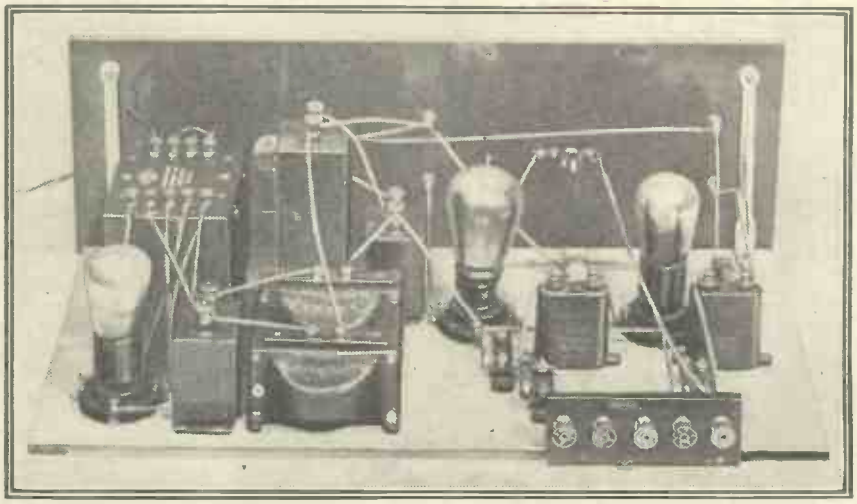



FIG. 1. X.339.

There must be many who are using single-

(*Continued on next page.*)



This photograph of the "works" shows that the wiring is quite straightforward, and not likely to trouble even the inexperienced.

## THE P.W. "UNI-POWER."

(Continued from previous page.)

valvers or "H.F. and detector" sets who would like to use a loud speaker but are so pleased with the performance of their present sets that they do not wish to scrap them. To them especially this amplifier should make an appeal, for the original set may remain untouched, while the amplifier and eliminator is added.

### No Filament Rheostats.

Fig. 1 shows the complete theoretical lay-out, and, as far as possible, the amplifier and eliminator sections have been kept separate. Dealing with the amplifier first, it will be seen that it is a perfectly straight two-stage resistance-coupled affair, battery connections being made to terminals at the rear of the set, corresponding to the five terminals shown in the circuit diagram.

No filament rheostats are provided, as these are very seldom used with L.F. amplifiers; indeed, it is doubtful in this case whether one would find it possible to obtain any results at all with the valve working at any other voltage than that at which it is rated. In any case, there is no advantage, and since in a set of this type it is necessary to use 2-, 4-, or 6-volt valves, which will almost certainly be run from an accumulator, filament rheostats would simply mean waste of baseboard or panel space.

A simple on-off switch for the filaments is provided on the panel. There is really nothing more to be said about the amplifier until we arrive at the operating details, except to call attention to the 100,000-ohm stabilising resistance in series with the grid of the last valve.

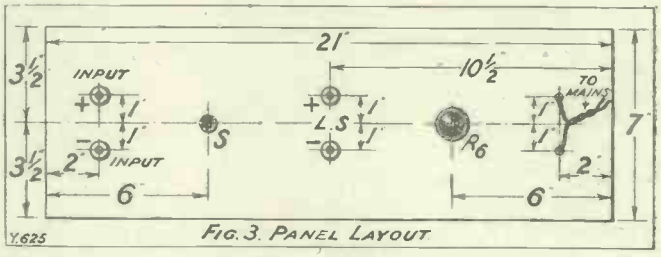


FIG. 3. PANEL LAYOUT.

With regard to the eliminator, there is considerably more to be noticed. Full-wave rectification is employed, one of the double-plate makes of valve being used in conjunction with a suitable transformer. One of the photographs shows a Heayberd Type 703 transformer, which gives 200–0–200 volts from the H.T. secondary, at 20 m.a., and 2–0–2 volts at 1·6 amperes from the L.T. secondary.

Both windings are centre-tapped, and it is this transformer that is really sketched in the theoretical circuit diagram. The valve used in conjunction with this may be a D.U.2 (Mullard) which takes 1·1 amperes at 4 volts, or a 42/U (Cosmos).

The other two back-of-panel photographs show the Igranic power transformer, which has a similar filament winding and is, therefore, suitable for similar valves, but has an H.T. secondary giving 250–0–250 volts at 100 m.a.

The smoothing circuit consists of two 32-henry chokes, with a 2-mfd. condenser across the "input," and a 4-mfd. across the "output." This is the usual "brute-force" filter and is quite sufficient for ordinary purposes. This is another point which begins to become a little troublesome when a moving-coil loud speaker is used, as the amount of smoothing necessary increases rapidly as larger currents are taken from the supply.

Now with regard to the H.T. supply back to the detector valve. This is taken from the main positive H.T. terminal, in series with a "Bradleyohm" variable resistance, which gives a working range of 10,000 to 500,000 ohms.

On actual test with a current of

(Continued on next page.)

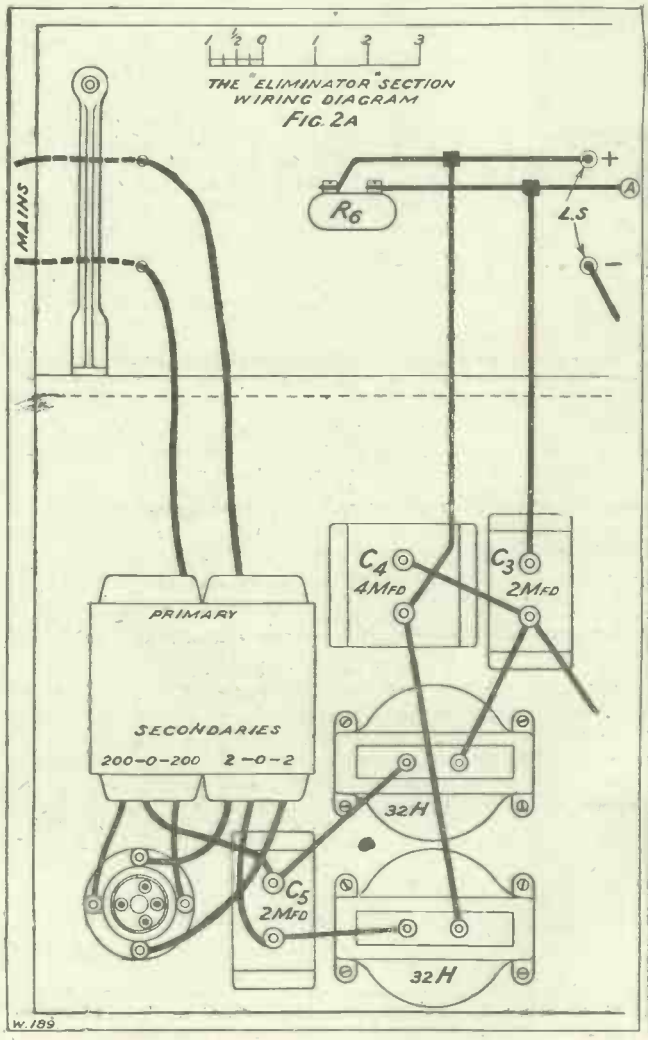


FIG. 2A.

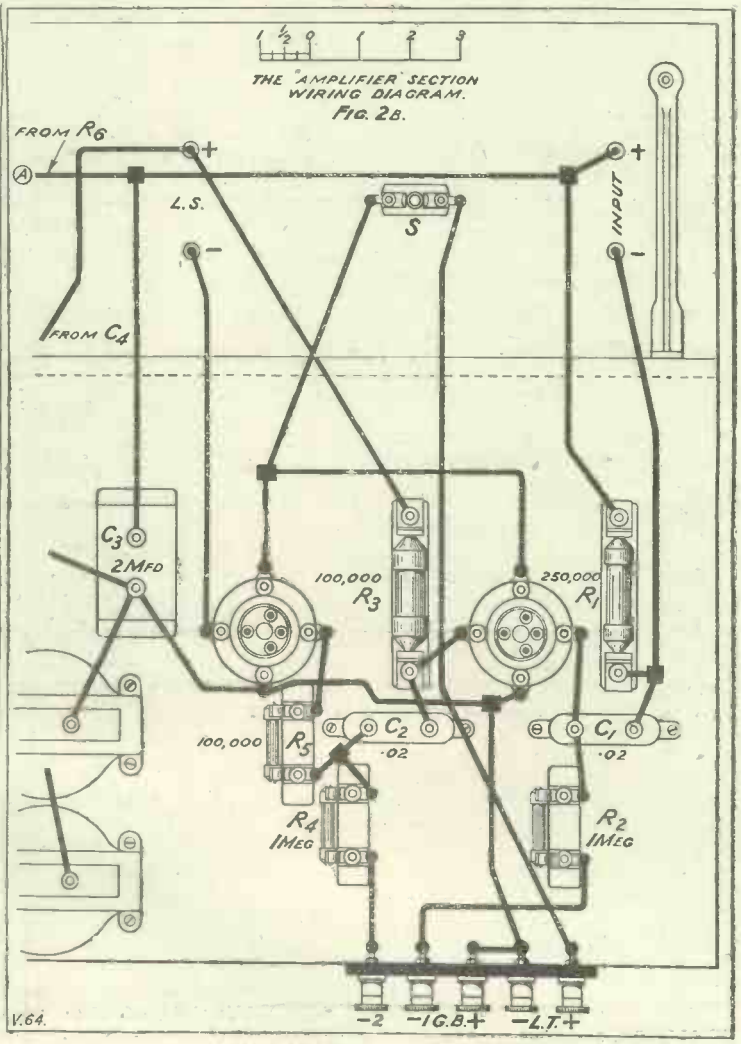


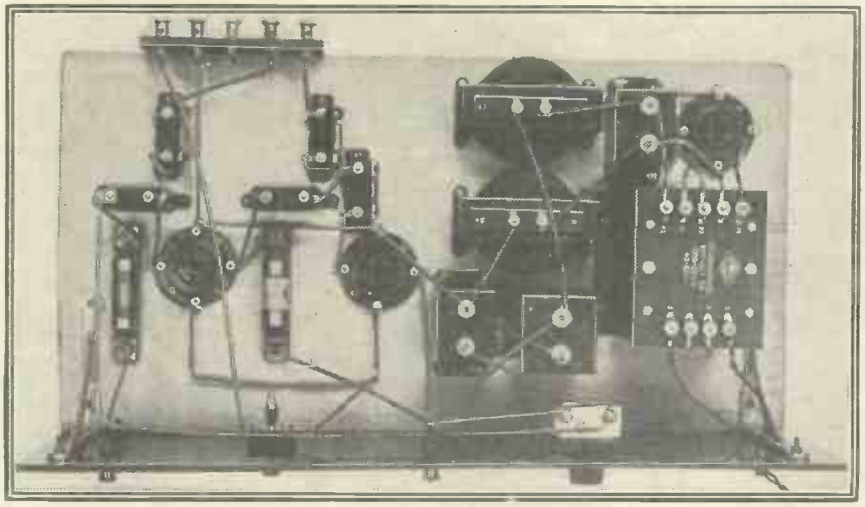
FIG. 2B.

## THE P.W. "UNI-POWER."

*(Continued from previous page.)*

3 milliamps flowing in the plate circuit of the detector valve, this resistance was found to give a voltage range of, roughly, 36–96 volts, which is a very good and convenient range.

If two valves or more are to precede the amplifier, however, and the currents under consideration are to be greater than this, the lower-resistance "Bradleyohm," Type E.5, should be used. That in the set at present is a Type E.10. It is important to note that another 2-mfd. condenser is connected across the "output" from this Bradleyohm and H.T. —. This is, of course, essential, as the resistance is in series with the plate supply to the detector valve, and a suitable by-pass is a necessity.



No filament rheostats are used, as they are really unnecessary and their omission simplifies wiring and lowers the cost.

### Note These Switch Hints.

With regard to constructional details, the photographs clear up most of the points, and the back-of-panel diagram will be found a further help. It will be noticed that the whole baseboard has as nearly as possible been kept in two separate sections, as has the panel. Looking at the set from the rear, all the left-hand half is eliminator, and all the right-hand half amplifier. All wiring is protected with Systoflex, in view of the fact that moderately high voltages are in use.

The connections to the mains themselves are made by a flex lead, which is taken through two holes in the panel, and terminates in a suitable adaptor or plug for insertion in the nearest socket. No switch for the mains has been included in the set, as it is undesirable to have any bare contacts about on the mains side of the transformer, and there will always be an external switch at hand for cutting off the current when necessary.

In connection with this, always switch off the mains *first*, and then the filaments of the amplifier valves. If the filaments are switched off first the condensers in the filter circuit will remain charged, and may give someone a nasty shock several hours afterwards!

If the mains are cut off first the condensers will discharge through the set; it will be noticed that the loud speaker does not cease to operate until a second or so after the mains switch has been opened, on account of this discharge of the condensers. With the actual condensers in use in this set I have obtained quite a good spark after the set has been switched off for forty-eight hours; both a testimonial to the excellence of the condensers and a warning as to the advisability of switching off the mains first!

When the whole set has been wired up finally, test over all the wiring with great care, as an accidental "short" on a set of this kind is sometimes liable to have much more serious consequences than would be the case in an ordinary battery-operated set.

Check the wiring over with both the back-of-panel diagram, and, if you can, the theoretical circuit diagram. Probably any reader who undertakes the construction of this set will have at least sufficient technical knowledge to enable him to do the latter, although quite a number of "old hands" seem uncommonly scared by circuit diagrams which introduce power transformers and chokes!

The amplifier-eliminator may now be connected up to your existing set, and it is here that we have to be careful to find the right arrangement.

We will assume first that it is an ordinary single-valver, as it will no doubt be in the vast majority of cases. The procedure is to connect the "+ Input" and "— Input" terminals across to the + and — 'phone terminals on the valve set, and to *disconnect the H.T. battery from the latter altogether.*

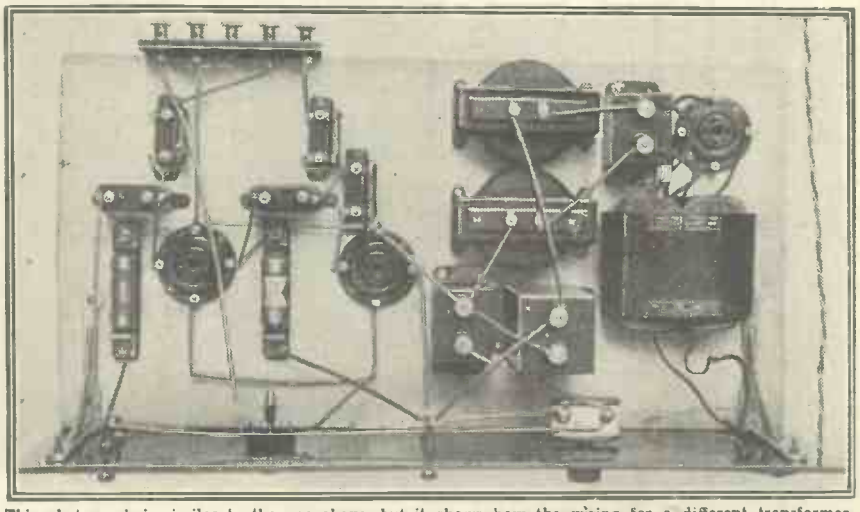
The H.T. will now be supplied by the eliminator, and thus we shall have two wires going back to the single-valver, one of which goes to the old set's "+ H.T." terminal, but no battery is connected. This will look odd, but is quite correct. There will, as a rule, be a fixed condenser across the 'phone terminals of the set; should there not be, a ·0005 fixed condenser should be provided.

### The Unit In Use.

If the original set consists of an H.F. stage and detector, so long as there is only one H.T. terminal, the procedure is the same. If there are two, it is as follows: Take the H.T. battery right away from the set. Connect the two or more H.T. positive terminals all together, and connect positive and negative 'phone terminals across to the positive and negative input terminals on the amplifier. The valves in the original set now all have the same value of H.T., but in practically every case this will make no difference at all to the working of the set.

In all the above remarks it has been assumed that the same L.T. battery is to be used for working both the small set and the amplifier. There is no possible objection to doing this, but if for any reason separate accumulators are used, simply connect the negative side of the "set" accumulator to the negative side of the "amplifier" accumulator.

You will doubtless know all about your own set, and there is no need for any operating details in this direction. If you have followed the above instructions it should simply be found that anything that was previously audible at good headphone strength on the set will, when the amplifier adjustments are correctly made, be receivable at full loud-speaker strength.



This photograph is similar to the one above, but it shows how the wiring for a different transformer can be arranged.

Now for the battery and valve details. The detector in the original set may not be quite suitable now, since it has a high

*(Continued on page 676.)*

# FROM THE TECHNICAL EDITOR'S NOTE BOOK


**Concerning Voltmeters.**

A VOLTMETER, as every reader of "P.W." will surely know, is an instrument that measures voltage or potential difference. But it is probable that quite a few people do not realise the important fact that a voltmeter indicates only the voltage across its own two terminals. That, you might consider, is a rather unnecessary or even a queer statement. An obviosity, as it were.

But you will realise its real significance if you recall to mind that, according to our old friend Ohm's law, voltage equals current multiplied by resistance. Now a voltmeter cannot be expected to know what sort of resistance is going to exist between its two terminals when it is tapped across a part or whole of a circuit. But whatever this is, a certain current is going to flow through the voltmeter, since itself it offers an alternative path in the circuit. And it is upon the value of this current that the voltmeter readings are based.

The Ferranti Voltmeter referred to in the accompanying article.

You see, an ordinary voltmeter has a definite ohmic resistance, which is fixed and remains unalterable. Therefore, you have in the voltmeter itself one factor of Ohm's law which is constant, and, in a sense, the instrument multiplies this by whatever current passes through it, and the result is a voltage reading.

**"A Complicated Process."**

But the current which flows through the voltmeter is not necessarily the whole of the current which is flowing from the source of supply at the moment of measurement. It would be in the case of a battery not connected to anything else except to the voltmeter. If there are other things connected across a battery, such as the filaments of valves, then current will be flowing through these as well as through the voltmeter, and the only way you could obtain a true calculation of the voltage across that battery in these circumstances would be to add the current flowing through the two circuits together and multiply the result by the resistance of the one circuit added to the resistance of the other, and which is the voltmeter. This would be a rather complicated process, and not one likely to appeal to the average constructor. He would and does expect a voltmeter to do all the calculation necessary.

Placing two resistances in parallel gives a resultant resistance somewhat less than that of the smaller resistance. If the resistance of the voltmeter is very high compared with the other resistance, that of the circuit across which it is tapped, the resultant resistance is not going to be lowered much, and similarly the additional current flowing via the voltmeter will be, in these circumstances, comparatively small, and for practical purposes could be ignored.

The point I am driving at is that for a voltmeter to be able to give fairly accurate indications of the voltage existing across two points of a circuit, it must not itself upset the existing circuit conditions by increasing the current flow by any appreciable extent.

**A Vital Requirement.**

If the current flow were a matter of a thousand amperes it would not be of much moment if the voltmeter used offered a path of such resistance that half an ampere or so flowing through it increased the total by that degree, but you will see that in radio, where we frequently deal with only milliamperes (thousandths of an ampere), it is necessary that the voltmeter should be of a very high resistance. That is in regard more particularly to H.T. supplies, such as are derived from dry H.T. batteries and H.T. mains units.

And, speaking of mains units, here the requirement is even more vital, for a mains unit has itself, in most cases, a moderately high internal resistance, which still further complicates things. The whole affair is rather a tricky business, and I would like to devote more space to it. However, if you have gathered that a low-resistance voltmeter need not be sneered at as useless and inaccurate, but that for certain purposes, such as for measuring H.T. voltages, a high-resistance voltmeter is essential to give a true idea of the state of affairs regarding potential differences, then I can draw your attention to the new Ferranti portable voltmeter, which I have recently received.

This has the very high resistance of 1,000 ohms per volt. I should explain, too, that it is called a portable voltmeter because it is neither of the watch-pocket or panel-mounting type, but can be stood on a table and is provided with terminals. It is of the triple-range variety, and the ranges are zero to 10, zero to 50, and zero to 250 volts. It also incorporates a protective fuse, which can be replaced in the event of its burning out.

In appearance and construction it is similar to the other Ferranti radio meters, and in view of the recent reports we have published concerning these, readers will not need to be reminded that in general they are of a satisfactorily high standard of quality. Let me conclude with a useful if rather broad generalisation. A voltmeter cannot have too high a resistance. A low-resistance voltmeter may give moderately accurate indications in certain cases, but the more ohms (or hundreds of ohms, I should say) the instrument possesses, the more likely it is to prove a faithful servant in varying applications.

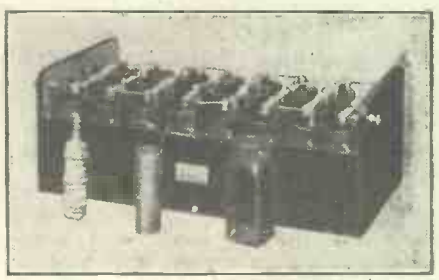
**Wet H.T. Progress.**

Some two or three years ago somebody thought of the idea of using miniature wet sac Leclanché cells for supplying high-tension current. It was a good idea, but at first it was spoilt. In order to achieve compactness—for to give only 75 volts 50 cells are required—tiny little jars containing tiny little quantities of electrolyte, tiny sacs and tiny zincs were used.

**Traders and manufacturers are invited to submit radio sets, components and accessories to the "P.W." Technical Department for test. All tests are carried out, with strict impartiality, under the personal supervision of the Technical Editor, and readers are asked to note that this weekly feature is intended as a reliable and unbiased guide as to what to buy and what to avoid.**

However, it was not long before certain manufacturers entered the field and produced larger and more robust cells stoutly made and designed to resist corrosion and capable of providing useful orders of current. So far so good, but these changes were more or less at the expense of compactness. A hundred or two volts of wet H.T. meant a fairly vast area of battery.

But even this snag has now been conquered by the Wet H.T. Battery Co. They supply a container constructed somewhat after the style of an expanding bookcase. The container has its bottom sides grooved so that one can be mounted on top of the other in order to build up any desired voltage. Each container holds 32 cells, giving a maximum voltage of 48.



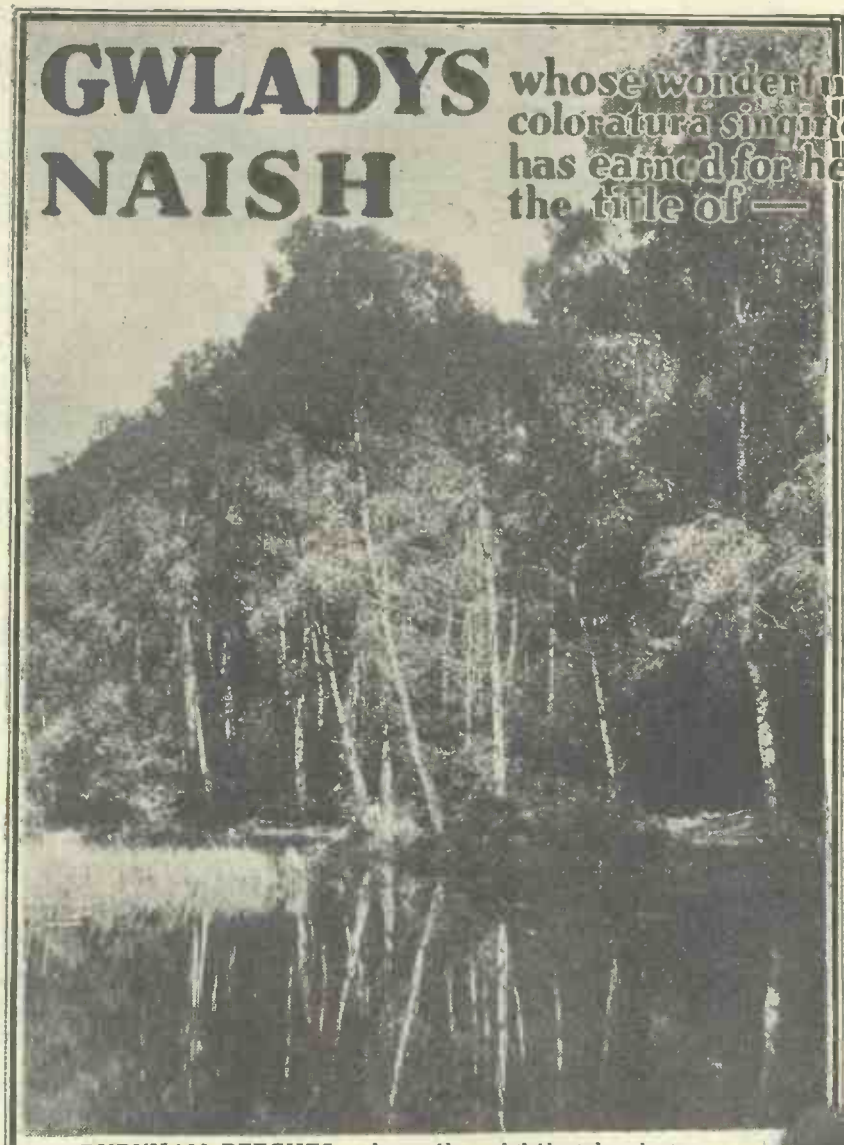
A battery made by the Wet H.T. Battery Co.

Two sizes are made, one to hold 32 either No. 1 or No. 2 cells, and the other one to hold 32 No. 3 cells. The latter is 1¼ in. greater in height, the other dimensions for both types being the same, *i.e.*, 15 in. by 8 in. This new container is known as the "Unibloc." It is robustly and cleanly made, and far away in advance of the earlier types of containers for wet H.T. batteries.

# GWLADYS NAISH

whose wonderful coloratura singing has earned for her the title of —

# "The WELSH NIGHTINGALE"



BURNHAM BEECHES, where the nightingale sings.

Nightingales in the wood and the greater nightingale in the studio. Here is song that will impel you to listen if you are using the pure power of a Lissen Battery for your H.T. For this battery produces perfectly pure D.C. current by means of a new process and a new chemical combination which is known only to Lissen. It will keep the wonderful voice of Miss Gwladys Naish so liquid, so clear, that you will hear a perfect rendering of coloratura singing.

You can get no better power for radio than the Lissen New Process Battery. It lasts longer. It is smooth flowing. It is noiseless, steady and sustained. There is no ripple in it anywhere—there is no hum. You will never go back to any other form of current for radio once you have used the Lissen Battery.

If you would like to hear what perfect coloratura singing is like, make a special point of having a Lissen New Process Battery in your set in time to hear Miss Gwladys Naish broadcasting.

You can get it at one of 10,000 radio dealers. Be sure you ask for it in a way that shows plainly you intend to take no other—delightful radio reproduction will be your reward.


*Photo by CLAUDE HARRIS*

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100 volts (reads 108) 12/11
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4½ " Pocket Battery 3d.
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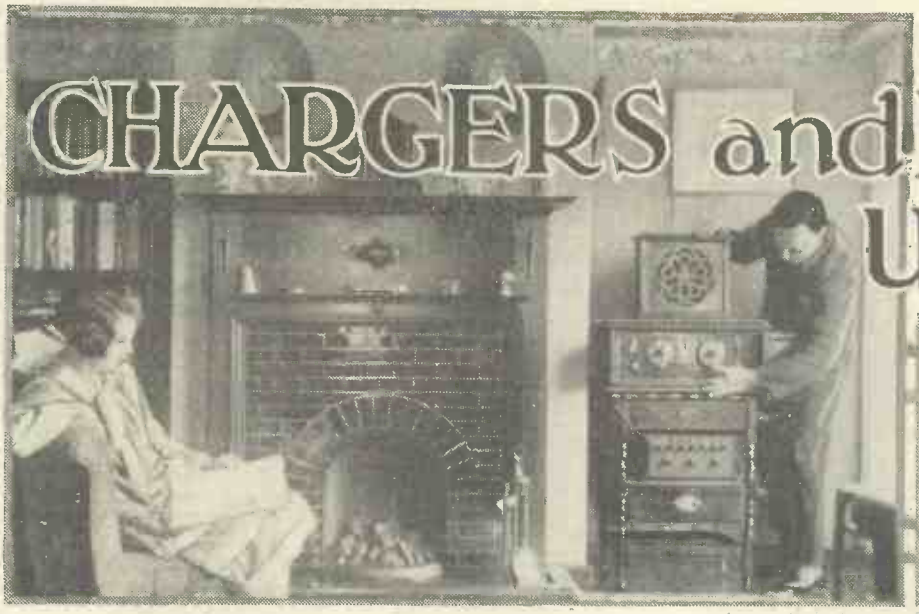
# CHARGERS and MAINS-UNITS



**This special article provides a valuable general survey of the whole problem of power supply from the mains, and will enable you to choose the arrangement which will best suit your own particular needs.**

**By G. P. KENDALL, B.Sc.**

LOGICALLY no doubt, we ought to regard the use of batteries to run any kind of electrical gear in daily use as an out-of-date proceeding, and it is easy to argue that every wireless set should be designed to run entirely from the mains. There is just one little flaw in the reasoning, however, and that is that only a limited proportion of us have the electric mains in our houses!

Batteries, therefore, must remain an important source of supply for very many years to come, and we must be on our guard against the assumption that mains-driven receivers are the only ones worth thinking about, lest we be led into a contempt for the battery type which it does not deserve.

### The Ideal Supply.

Obviously, the use of good, well-designed mains H.T. and L.T. supply units represents the ideal state of affairs from the point of view of unvarying constant performance and freedom from battery noises and the nuisance of replacement or recharging, and those readers who have mains available should undoubtedly consider seriously whether they are yet making the fullest possible use of them. It is for their special benefit that this article is being written, in an endeavour to give a general survey of the subject, showing what methods are available, and so enabling the reader to form an idea of the scheme best suited to his own requirements.


**A special feature of the Philips H.T. units for A.C. mains is the very neat and safe arrangement of the plugs and sockets. These units employ valve rectification. The one illustrated is the type 3003, which gives six different H.T. voltages (up to about 200 volts) and a choice of three different grid-bias voltages ranging up to 40 volts. The price is £10 10s.**

First of all, what about the L.T. supply? Assuming the use of ordinary valves (not the special A.C. type, which really call for a special article to themselves) there are three main methods available to us, and so far as two of these are concerned they really suit entirely different circumstances, so that there is no great difficulty in deciding between them. The first of the two methods in question is the use of a large battery charger, and one or two fair-sized accumulators, the procedure being to use each battery for, say, a week or a fortnight, then replace it with another and charge up battery number one fairly quickly with the charger, putting it aside thereafter until the other requires charging again.

This method is best suited to large sets drawing a considerable current, especially in those cases where a good deal of experimental work is done and more than one set is used at a time—wherever, in short, the L.T. consumption is really heavy—and there is a great variety of suitable chargers on the market.

### Types of Charger.

The principal types are these: Vibratory reed, electrolytic, dry rectifier, valve rectifier, and provided that you choose a really good make there is probably not very much to choose between them. It is true that there is a certain amount of prejudice against the vibratory type, but this is chiefly due to the fact that some of the

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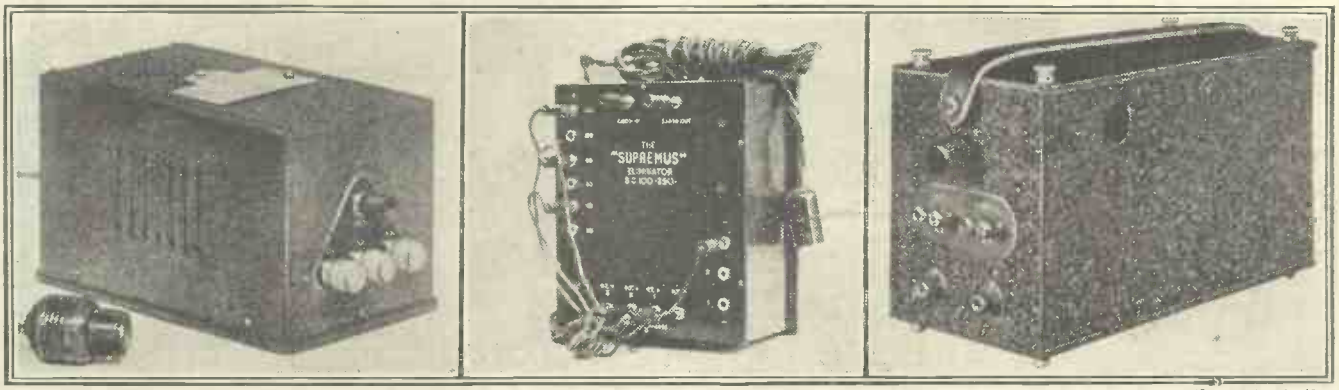



**On the left here is the "Ekco" trickle charger (A.C.), which uses a dry metallic rectifier, charges at ½ amp., and costs 52s. 6d. In the centre is the "Supremus" model 3 C de Luxe unit for D.C. mains. On the right is the Gecophone model B.C. 1400 for use on D.C. mains, which is provided with two fixed voltage teppings and one continuously variable one for the detector. The price of this unit is £6 10s.**

# VARIED TYPES OF CHARGERS AN

earlier models were very poorly designed and made, and gave lots of trouble and damaged the battery on occasion.

One, for example, which was used by the writer of these notes some years ago had a horrible habit of stopping charging during the night, and thereafter running as a buzzer until discovered and stopped. The resulting effect on the battery can be imagined!

A simple way of finding the polarity of D.C. mains. Cut one of the wires going to a lamp socket, dip the two ends in a glass of water to which a pinch of salt has been added, and note from which wire the greater quantity of bubbles rise. This is the negative.

### Safety Devices.

There are not very many of these vibratory instruments left on the market nowadays, probably because of the ill-repute into which they fell some time ago, but it can be taken that those now sold are free from the earlier vices and are fitted with safety devices which protect the battery fully, so that they may be used without qualms. Their chief advantage is that most of them give a large charging current (usually about 5 or 6 amps.), and so are suitable for the biggest batteries.

The electrolytic type has never become very popular in this country, although it is used a good deal in America, and there are not very many examples sold. Its main advantage is low first cost, since it is as a rule a fairly simple instrument with no expensive parts, but here again the sins of some early productions have created in the minds of users a certain amount of prejudice which is quite unjustified in the case of modern types.

The main objections to this kind of charger are the risk of spilling if it is carelessly treated, and the fact that a little attention to the rectifying liquid is needed at intervals (fairly long ones, as a rule), but these are not very grave ones, after all. Most electrolytic chargers give only moderate currents up to one or two amps., which, of course, is sufficient for medium-sized batteries.

The "dry" rectifier is a comparative newcomer in the wireless field, and its capabilities have scarcely been appreciated by the average listener as yet. New types of chargers employing this device in one form or another are appearing on the market very rapidly at the present time and bid fair to become extremely popular.

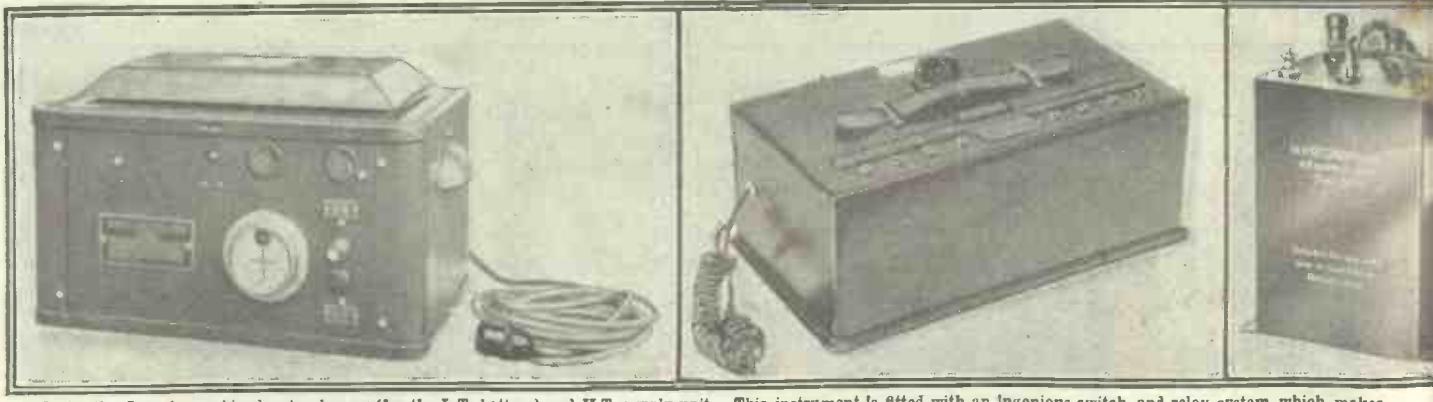
Their special advantages are to be found in the fact that they are perfectly dry, very robust, and quite permanent, so that there are no replacements needed, and further, in their high efficiency, i.e. the small current taken from the mains to give a certain output of charging current.

### Trickle Charging.

The charging current given by this type is usually not very large, normal figures being half or three-quarters of an amp., and hence they are usually employed in what are called "trickle" chargers. These are units giving a comparatively small output, which are intended to be used to *keep* a battery charged rather than to recharge one which has been run right down in service.

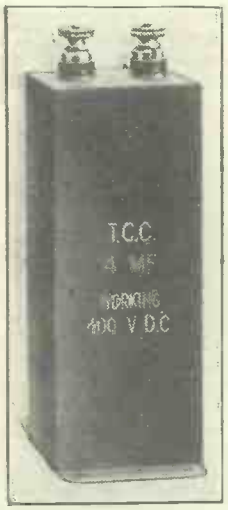
This is an excellent way of using a battery, the scheme being to arrange a change-over switch so that the battery can be switched over from the set to the output terminals of the charger, which latter is then switched on at the connection to the mains and charges up the battery ready for use again. If this is done every night after turning off the set the battery is kept permanently in good health, and there is never the annoying risk of its running down in the middle of the programme. A good example of this type of charger is

The "Pendleton" charger supplied by Messrs. Ward & Goldstone for use on A.C. mains. It gives currents up to 1½ amps., can be used for charging 2-, 4- or 6-volt accumulators, and costs £2 15s., or £3 10s. with an ammeter as illustrated.



Left: the Igranic combined auto-charger (for the L.T. battery) and H.T. supply unit. This instrument is fitted with an ingenious switch and relay system which makes the whole operation automatic. The price is £11 10s. or £13 15s., according to the output required. To the right of this is one of the "Efesca" range of mains H.T. units. The one illustrated is the Model 4 for A.C. mains, which is provided with three H.T. tappings and three for grid bias, price £4 10s. In the centre of these pages is one of the Marconiphone models, the "D.C.3," which is intended for supplying the H.T. for fairly small sets from D.C. mains, and is priced at 35s. On the right is a partly assembled H.T. unit (A.C. mains) made up with the special components supplied at £7 12s. 6d. complete with valve

# D MAINS-UNITS—*(continued from previous page).*




It is most important when buying reservoir condensers for a home-made mains unit to see that the rated "working" voltage is well above the normal voltage which the finished unit will give. The example seen here is a T.C.C. 4-mfd. condenser.

the Ferranti, which will put half an amp. continuously into a 2-, 4-, or 6-volt battery, and possesses the very high efficiency figure of 60 per cent.

This same form of dry metallic rectifier is being adopted by many firms for this type of charger, and also for H.T. units, examples being recently introduced by Messrs. Burndept. H. Clarke, E. K. Cole, and others, and they are being found to give excellent service.

### Valve Rectification.

When we come to chargers employing some form of vacuum or gas-filled valve for rectification (we are still dealing with types for A.C. mains) we find an almost bewildering variety of types to choose from, and it is quite impossible to go into technical details as to the manner of working of all of them. It must suffice to assure the reader that all those produced by reputable firms are perfectly safe to buy, and will give long and satisfactory service, although it must be remembered that sooner or later the rectifying valve will require replacement. This last is not a very heavy item, however, for such special valves are not expensive nowadays.

Most of the valve rectification types will give moderately large charging currents, of the order of one or two amps. or a little more, and are very suitable for general work where there is a good deal of charging to be done, especially where more than one battery is used and it is desired to be able to recharge them over-night. Good examples of such chargers are the Ediswan, Mullard, Philips, Igranic, Heayberd "Overnight," Tungar, etc.

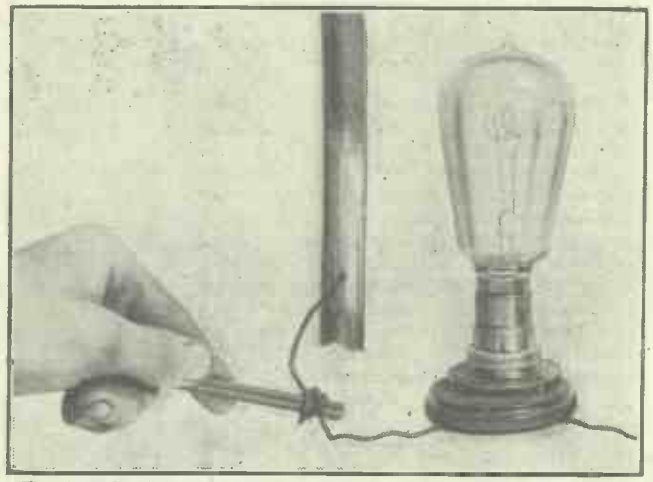
### Special Rectifiers.

In addition to valve rectification chargers intended to give fairly large currents there are a few trickle chargers operating on the same principle, but this type of charger more commonly uses a rectifier of either the dry metallic type (Clarke, Ferranti, Burndept, Ekco, Regentone, etc.) or the electrolytic variety (Goltone, G.E.C. H.T. type, etc.).

All the chargers discussed so far have been intended for use with alternating-current mains, and it is to be noted that the great majority of the chargers on the market are designed for a supply of this kind. Charging a single battery from D.C. mains is not a very economical business, and it is not often done at home, and hence is not very well catered for. There is at least one trickle charger of this type, however, namely, the "Indispenso," produced by Messrs. Ward & Goldstone, which can also be used for charging at rates up to one amp. where a "power" supply of D.C. is available.

Before we leave the L.T. side of the subject passing reference must be made to units intended to serve as actual L.T. battery eliminators. These units run direct from the mains and give a supply of low-voltage direct current which can be used for running the valve filaments direct without a battery at all. Such units are only just beginning to appear in this country, although they have been used in America for some time, and when they are of really sound design they represent a very good solution of the whole problem. We are likely to hear much of them in the near future.

In the majority of cases where such a filament supply is available it is in the form of a combined H.T. and L.T. unit, examples of such instruments being the Marconiphone and Regentone, but there are not many of these units yet in production. The technical difficulties are considerable, and their fairly high cost puts them at a disadvantage in comparison with the trickle charger and small battery.



How to find out which pole of your D.C. mains is "earthed." Take a wire from one pole through a lamp, and touch the bared end on a cleaned place on a water-pipe (be careful not to touch the end yourself !) If the lamp lights up the *other* pole is the earthed one.

### H.T. Chargers.

Chargers for H.T. accumulators are not very numerous, since it appears that such batteries are mostly used by people who have no mains and so must send them

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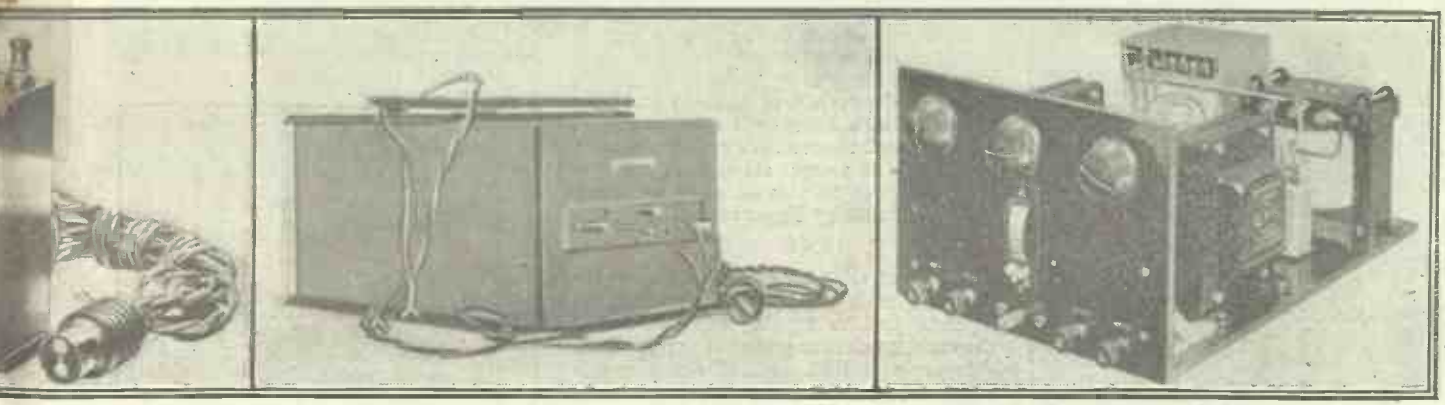


by Messrs. Louis Holzman. This unit incorporates the "Q.R.S." gas-filled filamentless rectifying valve, which will deliver up to 85 milliamps at 200 to 220 volts. A meter is provided for the measurement of the voltages on the various tappings and of the current being drawn. The special transformer and heavy-duty chokes are manufactured by Messrs. R. I. & Varley, who produce a number of special components of high quality for the home construction of mains units. The next photo (to the left) shows a "Goltone" H.T. unit (model P.A.) for use on A.C. mains. The one illustrated is intended for sets using up to four valves, is provided with four tapping points, and will give up to 15 milliamps, the maximum voltage being about 120. The price of this model is £5 5s. complete.

## CHARGERS AND MAINS-UNITS.

*(Continued from previous page.)*

out to be charged. Those who have the mains available, of course, more often run their sets direct from a mains H.T. unit. Such chargers as are available are mostly

One of the first trickle chargers for A.C. mains using the dry rectifier was the Ferranti illustrated here. It will charge a 2-, 4-, or 6-volt battery at a ½-amp. rate, and costs 55s.

of the valve rectification type, and there is little to be said regarding the choice of one to suit your own requirements.

The main point is to see that the one chosen gives an adequate charging rate for the battery you employ. For example, if your battery is rated for a charging current of 150 milliamps, it is not advisable to get a charger giving only 50 milliamps, because frequent charging at this low rate is not likely to be good for the health of the battery, unless you take care that it is never run down more than about half way.

### "Trickling" the H.T.

Probably the best thing to do in a case like this would be to regard the unit as a trickle charger, and give the battery a refreshing charge each night. If you wish to charge at long intervals you should see that the charger gives at least 100 milliamps for this particular battery, and in like proportion for other sizes.

When we come to the question of H.T. supply direct from a mains unit it seems at first that the choice will be a difficult matter, since there is a most bewildering array of different types available. However, once we have got our ideas clarified a little as to what we need for a particular set, it becomes comparatively simple.

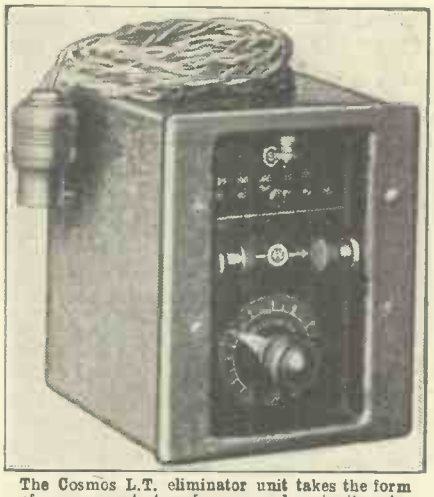
One of the Burndept range of mains units. The photo shows one of the first introduced by this firm, namely, the Universal Heavy Duty model, which gave currents up to 40 milliamps at voltages up to 180. Price, £9 17s. 6d.

First of all, are the mains direct or alternating current? If they are "D.C." the choice immediately becomes much easier, because the number of types here is comparatively small, since there is no question of rectification, and it is purely a matter of smoothing and voltage adjustment. Making a correct choice is now a matter of selecting a reputable make to ensure reliability and freedom from hum, and deciding upon a model capable of supplying your set adequately.

### Dangers of Overloading.

This last is a most important point, since to use a very small H.T. unit on a large set is simply asking for trouble. The usual results are the appearance of a hum which would not be heard if the unit were not overloaded, probable "motor-boating" resulting from the running of several valves from a single positive tapping, and possible breakdown in the overworked unit itself. It must be taken as a general rule that it is only when the set is of the one- or two-valve variety is it wise to use one of the smallest mains units.

With sets of this small size extraordinarily compact and inexpensive units will serve quite well, and it will be found that most



The Cosmos L.T. eliminator unit takes the form of a compact transformer and potentiometer device which supplies alternating current at 4 volts for running the "heaters" of the special Cosmos A.C. valves. It can be obtained to suit any supply voltage at £2 10s.

of the manufacturers cater for this type of receiver. There is even one little unit (Ekco) which is so small and neat that it can be plugged into a lamp socket!

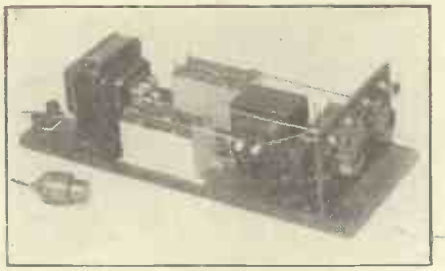
When we come to the larger sets it must be admitted right away that the only wise procedure is to buy a fairly large unit, and so make certain of freedom from the troubles which have been mentioned. It is even as well to get a rather more elaborate unit than the present set calls for, simply so that it will be able to cope with any future demands by bigger sets still.

### Important!

The great point is to see that the unit is provided with an adequate number of separate positive tapping points, so that the various valves or groups of valves (H.F., detector, and L.F., or L.F. and separate power tap) can be given individual feeds, so reducing chances of undesirable "back-coupling" effects.

It is also desirable that at least one of these tappings should be variable within fairly close limits. A few examples of such D.C. units are the Atlas, Climax, Ekco, Gecophone, Marconiphone, etc.

Turning to H.T. units for A.C. mains, it must be confessed that the choice is going to be rather difficult, simply because there are so many different and excellent methods of rectification available. All that can really be said is that so long as you go to a



Another example of a home-assembly kit for an H.T. unit (A.C. mains) is the Wholesale Wireless outfit, which uses a valve rectifier and costs £3 5s., giving currents up to 60 milliamps.

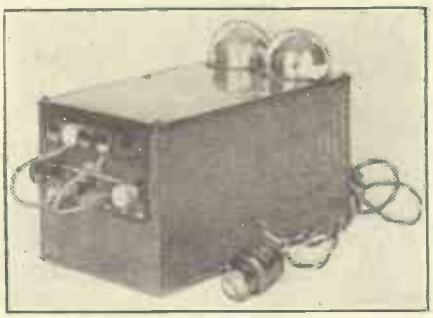
reputable maker you can be sure of good service, and we must leave you to decide whether you prefer some sort of vacuum or gas-filled valve rectifier, the dry metallic type, or some other form.

Where assistance can be given is in the matter of size, number of tappings, etc., and here it is to be observed that very much the same reasoning applies as in the case of D.C. units, except that it is even more important than before not to try and use too small a unit for a good-sized set. To do so with an A.C. instrument is practically certain to produce a bad hum, and will also very probably shorten the life of the rectifier. Therefore be sure to choose one with a rated maximum output well above your likely requirements, and although this means rather more expense, you have the consolation of knowing that most valve rectifiers last much longer when run below their maximum.

### Plenty of Tappings Desirable.

It is just as important as ever to choose a unit with plenty of separate positive tapping points, and if you use three or more valves it is very desirable that there should be at least three tappings, with the possible exception of "det. and 2 L.F." sets, where two will suffice.

For your guidance, the following names are given as a selection of a few of the safe and reputable makes of A.C. H.T. units: Atlas, Benjamin, Burndept, Climax, Dubilier, Ekco, Falk Stadelman, Gecophone, Heayberd, Holzman (sets of parts), Igranic, Marconiphone, Mullard, Metro-Vick, Philips, Regentone, Ward & Goldstone, etc.



One of the "Climax" range of mains H.T. units. The one seen here is for use on A.C. mains, and will give up to 50 milliamps and a maximum voltage varying from 150 to 200, according to the load. The price is £4 without rectifying valves.

### THE SCIENCE MUSEUM RECEIVER.

The Editor, POPULAR WIRELESS.

Dear Sir,—I notice in your issue of June 2nd a letter from Mr. N. B. Hunt, criticising the Science Museum receiver. I was largely responsible for the design of this receiver.

There are one or two points in the receiver which, in the light of present knowledge, could be improved slightly; but it is not the object of this letter to discuss the merits of this receiver—rather to correct Mr. Hunt on the point of time constant of resistance-capacity coupling.

I have had discussions with many people on this question of time constant. I think there is a somewhat mistaken idea abroad that resistance coupling introduces a time constant, the argument being, because we have a condenser and a resistance, we must have a time constant. This is so in certain cases, particularly when we wish to charge the condenser. In a resistance-capacity amplifier, however, we do not wish to change the charge on the condenser at all; in fact, for perfect results the charge between the condenser plates should remain unchanged, but the potential of both sides of the condenser should be raised and lowered simultaneously.

In order that there should be no change in the charge in the condenser with a given current flowing through it (this current is to feed the grid leak), the capacity of the condenser must be large. If the condenser was infinitely large, then it would obviously pass D.C. without taking up a potential difference, and an amplifier using such a hypothetical condenser would, in fact, be a D.C. amplifier. In practice, if the condenser is made sufficiently large that it only reduces the amplification by about 1 per cent at the lowest frequency it is considered necessary to transmit (say 20 or 30 cycles), then the time constant condition does not arise.

All the above, of course, assumes that the remainder of the amplifier is practically perfect as regards the high tension, grid bias, etc.

With regard to the loud speaker, however, this undoubtedly has a time constant due to the relatively large mass of the coil and diaphragm. Thus, while the frequency characteristic of the speaker may be relatively good, it does not give a true reproduction, as the system takes a considerable time to reach a given amplitude of motion.

Yours faithfully,
H. L. KIRKE.

British Broadcasting Company.
Clapham Park, S.W.4.

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### FILADYNE ONE-VALVER.

The Editor, POPULAR WIRELESS.

Dear Sir,—I have roughly made up the one-valve Filadyne described by Mr. English in an April issue of POPULAR WIRELESS, and can honestly say I am astounded with the results obtained. I am about 80 miles from the nearest station (Cadiz), which comes in extremely well. Last night I got the following stations very loud on headphones: Sevilla, Madrid, Barcelona, Rabat, Toulouse, and a few others. I am using a 35-volt battery, a 2-volt 10 amp. accumulator, and one 2-volt Cleartron valve. Coil details: Two home-made cardboard formers, aerial coil 60 turns, filament coil 70 turns, and grid coil 45 turns.

Thanking Mr. English for such a wonderful set, and wishing POPULAR WIRELESS every success.

Yours faithfully,
GERARD W. BALDWIN.

Gibraltar.

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CORRESPONDENCE.

# THE SCIENCE MUSEUM RECEIVER

## FILADYNE ONE-VALVER. THAT RADIO SCEPTIC—

**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.**

### THAT RADIO SCEPTIC.

The Editor, POPULAR WIRELESS.

Dear Sir,—I have noticed with a singular interest an article in "P.W." for June 2nd, by Mr. Elston, entitled "That Radio Sceptic." I regret to say that I cannot hold with Mr. Elston. I was in London in March this year, and was calling on a friend living near Croydon, who asked me to listen to his two-valve set—a 0—v—1. The set was the simplest of its kind, using just two swinging plug-in coils,—a parallel tuned grid coil—a Marconi Ideal 7-1 L.F. transformer and a B.S.A. cone loud speaker. The total outfit could not cost more than £5 (excluding the loud speaker).

Stations heard at excellent loud-speaker strength were Milan, 5 G B, Langenberg, Katowitz, Toulouse, Stuttgart, London, Manchester, Barcelona, 5 X X, Koenigswusterhausen, and several more.

Living in 1926 at Ludlow, Salop, I used a 0—v—2 for broadcast and ultra-short wave-lengths (range 1/6—560λ). Forty stations could be received on 'phones and well over 20 on a loud speaker, at really good strength. Why, in 1924, I could receive three stations on a loud speaker, living in Lincolnshire, on a 0—v—1! I have always used two plain, simple circuits—both have appeared in "Wireless Weekly" and "Wireless" time and again long ago. One uses capacity reaction, the other a swinging coil.

May I suggest that all sceptics improve their aerial and earth system before they fix the limit of a two- or three-valve set (0—v—1 or 0—v—2). That's where the fault usually is. Get your aerial 50 feet up in the air, and your earth, a large metal plate, three or four feet down. Give your valves some fresh H.T., and use a good loud speaker. Some people still think that a small speaker is more sensitive! Let me conclude by saying that I have never used anything superior to two transformer-coupled L.F. stages and that, after five years' practical radio, I am not given to exaggeration. I admit that there is often reason to be sceptical. But one ought not to forget that people with small sets have big ideas about volume because they have never heard the "real thing."

Yours truly,
A. E. LIVESEY,
Experimental Radio E G-6 L I.

15, Rue d'Orleans, Pau, B.P., France.

### "ARGENTINE—FORWARD, PLEASE."

The Editor, POPULAR WIRELESS.

Dear Sir,—In your "Radio Notes and News" of April 28th, with the heading "Argentina—Forward, Please!" one of your readers inquires if we receive 5 S W, etc., over here, and, in reply, I am one of the large crowd of amateurs and radio enthusiasts in this country who is very interested in short-wave reception from the Old Country, as well as from Yankeeland, and you will be doing Britishers, as well as many other nationalities all over the face of the globe, a great favour if you and "Argentinian" would be so kind as to use your valuable influence with the B.B.C. to try and get them to transmit on Saturdays, and, if possible, on Sundays, because we, over here, as well as the majority of the British Colonies, are situated on this side of the Equator, and our time is far behind your time over there—we hear Big Ben at 7 p.m. now; a month ago it was at 8 p.m., then, if we sacrificed our cocktail and got home early, we had a chance to hear the latter part of the dance music and the charming old Big Ben which fills our hearts with joy, and often brings tears into our eyes, and now, being winter-time with us, we lose all the fun, and have to comfort ourselves listening to Uncle Sam, who (W G Y) transmits very well up to about 12 p.m. every night. We always look forward to our next holiday in order to get 5 S W, which transmission is as good and, of course, to us, better than any other, but we do wish they gave us something on Saturdays. Try and convince them of the universal benefaction and blessings that they will be giving to millions of patriots and admirers all the world over by giving us a Saturday transmission, and a sermon or something else on a Sunday.

With reference to the latter part of your inquiry, there are many of us who are of the same opinion, while others are very fond of "Mate."

Yours faithfully,
R. G. ROBERTS.

Acevedo 1332 Banfield,
F.C. Sud., Argentine Republic.

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### AEROPLANE RECEPTION.

The Editor, POPULAR WIRELESS.

Dear Sir,—You will probably be interested to hear how I kept in touch with the progress of the aeroplane v. train trial between London and Edinburgh by wireless. Remembering having read an article in "P.W." (June 11th, 1927), I tried tuning in Croydon at midday of the trial and succeeded in hearing him speaking to 'planes on the cross-channel service.

At 1.35 Croydon reported 'plane passing Skegness. Aeroplane's reply not heard. At 2.35 Croydon asks if plane is passing Bridlington—or is it Cramlington? Air liner replies he is passing Bridlington. From the above information and the help of a map I estimated the time of arrival at Cramlington aerodrome, which eventually proved correct within minutes. At 3.35 aeroplane reported he was approaching Newcastle, and I was able to see 'plane land at 3.55, as aerodrome is only about a mile and a half from my home.

I again heard him at Berwick asking the train to signal if he could be heard on the train.

The above was received on a three-valve set (1-v-1) and proved, as was stated in the article alluded to above, to be very fascinating.

I wonder if many readers followed this at this distance from Croydon (10 miles north of Newcastle-on-Tyne.

Yours faithfully,
W. T. Y.

Newcastle-on-Tyne.

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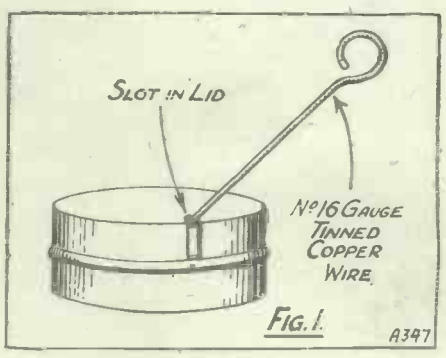
# A SOLDERING TIP.

To be successful with any soldering operation, one must be a staunch disciple of cleanliness, and unless the fingers are kept clean, things are sure to get messy. How often do we find that the Fluxite is being applied to the joint positions with a matchstick, which frequently gets dropped completely in the tin and whose resulting appearance is indicative of the unsatisfactory job that is likely to result.

A far better plan is to procure a length of No. 16 gauge tinned copper wire, bend one end to the form of a loop so that it can be held nicely with the fingers, and then flatten out the other end into a small spade shape. By having a three or four-inch length of wire, the loop end is well away from the flux and the fingers can thus be kept clean.

In order to maintain the flux free from dust, etc., it is inadvisable to leave the wire in the flux with the lid only partially covering the surface. It is quite simple to close the lid properly by adopting the plan shown




in Fig. 1. Merely slit the lid edge in one place so that it slips over the wire diameter. The wire is then always to hand and the flux kept clean until required for the next job.

# THREE USEFUL HINTS.

The best place for an earthing switch is immediately underneath the lead-in, so that the lead taken from the former can go straight down to earth.

* * *

Where interference is troublesome it is very often a decided advantage to shorten the aerial by twenty feet or so, especially if it is any way near the maximum length allowable by the P.M.G. (100 ft.).

* * *

Instead of merely twisting the aerial wire round the lead-in and screwing the nut straight on to the wire, it is a good plan to solder a large spade terminal to the aerial, as this allows a much larger and more satisfactory contact to be made.

# TELEVISION— THE POSITION TO-DAY.

**The B.B.C. is watching Television and Tele-Photo developments with the utmost care, and in this article the prospects of a public service are reviewed.**

By THE EDITOR.

WE publish in this issue a special interview with Captain Eckersley, the Chief Engineer of the B.B.C., which was granted to our Correspondent, Mr. Lawrence Corbett, a few days ago. Mr. Corbett, who has been for many years our correspondent in New York, has now returned to this country, and, at my special request, recently had a long talk with Captain Eckersley with regard to collaboration between Television interests and the B.B.C.

Our readers will note from this interview that Captain Eckersley, with his usual broadmindedness and his usual desire to look as far ahead as possible in the best interests of listeners, has obviously come to the conclusion that television is not yet ready for the public. As our readers know, we have from time to time done our best to place before them the full and true facts regarding the position of television to-day; we have published articles by such eminent authorities as Sir Oliver Lodge, Mr. A. A. Campbell Swinton, F.R.S., Dr. J. H. T. Roberts and Dr. Lee de Forrest; and now we are pleased to be able to present to our readers the views of Captain Eckersley.

### "Over-enthusiastic Press Publicity."

These views, as will be seen from the interview, are decidedly cautious; and it is well that they should be, for Captain Eckersley, as Chief Engineer of the B.B.C., has a difficult and by no means enviable position to maintain with regard to the policy of the B.B.C. towards British inventions.

It has been claimed by innumerable writers in the Press that television is the invention of Mr. J. L. Baird. We say that this is untrue, and that television—like wireless—is the particular invention of nobody, but is due to the work of many people. Mr. Baird has his system and, as we are the first to admit, it has its many merits; but, unfortunately, owing to over-enthusiastic press publicity and to the claims made by those associated with Mr. Baird, we have been forced, much against our will, to adopt an attitude which many people seem to consider to be antagonistic to Mr. Baird.

### "Excessive Credulity."

The truth of the matter is, however, as many of our more impartial readers will realise, that we are specially anxious to safeguard our readers from falling into the all-too-easy trap of excessive credulity in wireless matters. Captain Eckersley, in stating that the B.B.C. will not collaborate or co-operate with television interests as at present developed, is doing the right thing; and though certain critics in the press may scream hysterically that a British invention is being ignored while America is taking it up, Captain Eckersley knows, as all who care to study the subject know, that to adopt television at this time and at the present state of its development would simply be a waste of time and a waste of money, and would result in due course in the great disappointment of the B.B.C.'s many millions of clients.

Readers may rest assured that the B.B.C. is watching television and tele-photo developments with the utmost care. It has recently investigated several systems, but those systems are not yet ready to be incorporated in a public service such as is the B.B.C.

### "Ridiculous Bunkum."

Television to-day is still in the stage of experiment, and until some radical and new discovery is made—a discovery which must be analogous in importance to the discovery of the wireless valve—it will not be in a satisfactory state to take its place as an aid to British broadcasting. We congratulate Captain Eckersley and the B.B.C. on the fairness of their decision, which has been taken up in the face of any amount of public opposition. But they may rest assured that that opposition is based on ignorance and an overweening desire to back up something which, because it is British, must necessarily be of first-class importance and value.

That sort of self-delusion is useless. Britain undoubtedly has the finest broadcasting service in the world, but to adopt the attitude that television has been perfected by Mr. Baird and that the B.B.C. should now take it up and boost it—in other words, foist it upon the public—is ridiculous bunkum.

It may be taken for granted that directly television attains a state of perfection which warrants its use as a public utility service, the B.B.C. will see to it that the British public gets the best, and readers may also rely on the fact that POPULAR WIRELESS, which is spending a considerable amount of money every month in maintaining a first-class intelligence service with regard to the progress of television, will let its readers know directly any vital improvement is made, or when some discovery is made which will lift television from the experimental plane to a plane which makes it of real use and value to the community.

### "The Insuperable Obstacles."

As an interesting method of experiment, television at the present moment stands supreme, and, as we have pointed out time and again, we wish to be among the first to offer our congratulations to Mr. Baird upon his pioneer work; but we deprecate, and always will deprecate, publicity methods in which he suggests that in the near future the detail of perfecting television will be, in itself, a detail. As our readers know by the articles we have published by Sir Oliver Lodge and others, that very detail in television is in itself one of the insuperable obstacles against which the leading physicists of this country have so far battered in vain.



For all we know to-morrow, some scientist, perhaps even Mr. Baird himself, may come across the great secret to the solution of the television problem, and that secret may lift television into the realm of practical utility. If it does, we shall be indeed most glad, and shall be the first to offer our sincere and hearty congratulations, and to urge the B.B.C. to reinvestigate the possibilities of what will undoubtedly one day prove to be a very great adjunct to British broadcasting.

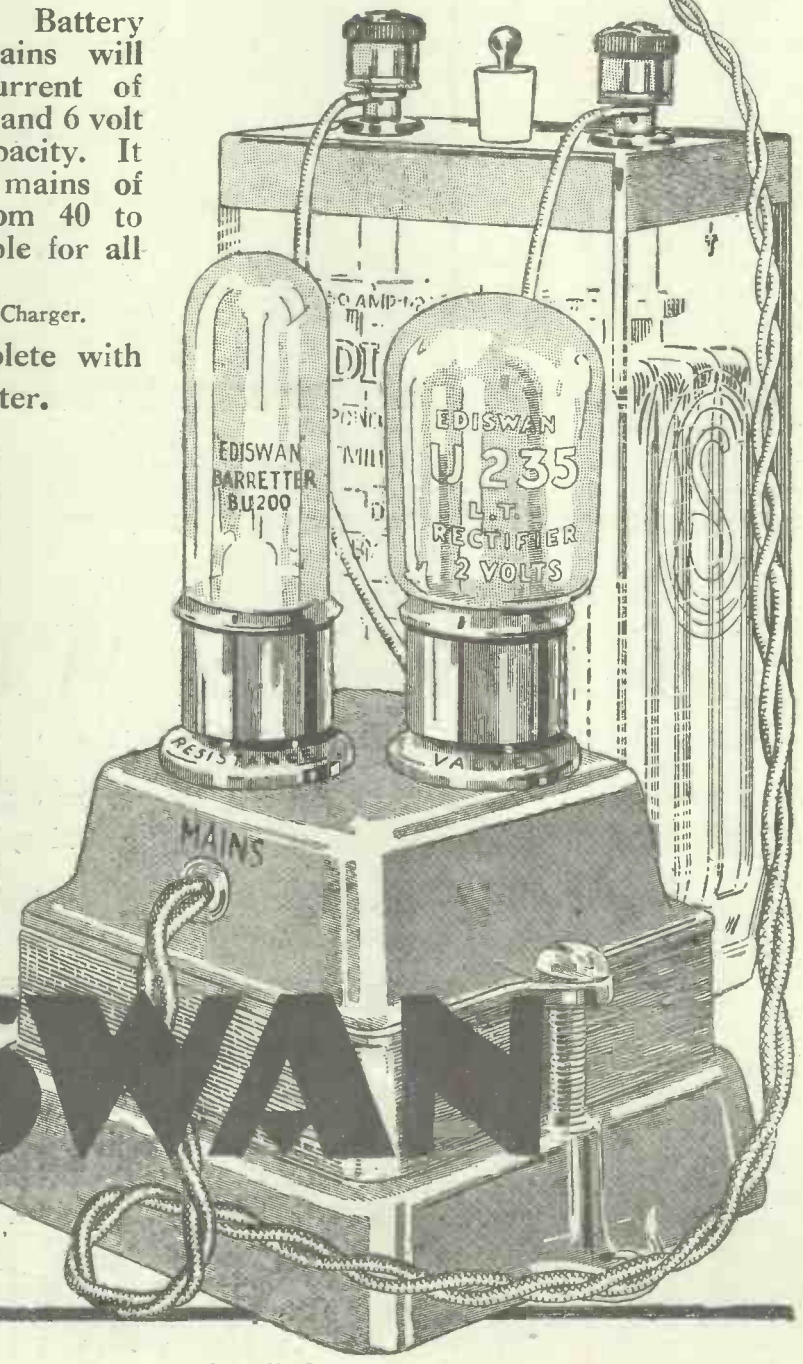
This is Captain C. Fulton, the British inventor of a system for transmitting and receiving pictures by wireless. It can be used in conjunction with an ordinary radio set, and takes only a few minutes to "radio" a really good reproduction.

# Charge your own batteries

The Ediswan L.T. Battery Charger for A.C. Mains will deliver a charging current of 2 amps. and charges 2, 4 and 6 volt Accumulators of any capacity. It will work on supply mains of frequencies ranging from 40 to 100 cycles, and is suitable for all standard voltages.

Full instructions with each Charger.

Price, £2 17 6, complete with Valve and Barretter.




**Ediswan Rectifying Valves and Barretters for use in H.T. Eliminators and L.T. Battery Charging Devices.**

Rectifying Valve U.222 for use in high tension side of Eliminator. Price 10/6.

Barretter for use with U.222, No. H.T. B.1. Price 5/-.

*Specification.*

*Fil. current at 2 volts, 2.2 amp.*
*Max. anode volts, 125+125.*
*Output on Std. Eliminator up to 30 m.a.*

Rectifying Valve U.235 for use in Battery Charger. Price 10/6.

Barretter for use with U.235, No. B.U. 200. Price 5/-.

*Specification.*

*Fil. current at 2 volts, 3.5 amp.*
*Max. anode volts, 30+30.*
*Output on Std. Charger, up to 2 amps.*

# EDISWAN

The EDISON SWAN ELECTRIC CO., LTD., 123/5, Queen Victoria Street, London, E.C.4.

# RADIOTORIAL

**All Editorial Communications to 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 and 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 receivers. As much of the information given in the columns of this paper concerns the most recent developments in the radio world, some of the arrangements and specialities described may be the subject of Letters Patent, and the amateur and the trader would be well advised to obtain permission of the patentees to use the patents before doing so.*

## QUESTIONS AND ANSWERS.

### SUDDEN SILENCES.

L. T. C. (Northampton).—"What is the cause of the sudden silences? Sometimes they are so bad that two or three sentences are missed altogether and then the set comes right again."

There are several causes which will result in such a fault, and in the absence of particulars of your set we have set out the likeliest of these below.

1. Aerial or lead-in wire touching an obstruction.
2. L.T. battery connecting bars loose.
3. A break in the earth lead, or a partial disconnection.
4. Telephone or loud-speaker leads making intermittent contact at a weak place in the lead, or making poor contact at one of the terminals.
5. Plug of the H.T. battery loose or H.T. lead faulty.

NOTE.—A very powerful set situated close to your own can wipe out the programme if tuned to the same wave-length.

### LOOSE TERMINAL TROUBLE.

"PUZZLED" (Halifax).—"Whenever I make a set I get trouble with the terminals, because no matter how tight I screw them up before soldering the wires to them, I always find after the job is done that they are loose again. Why is that?"

The screwing up tight before soldering is generally not sufficient, because when the terminal is heated for soldering this heat softens the ebonite.

Consequently the best way to overcome the trouble is to be sure that the terminal is thoroughly clean, etc., before soldering, so that the iron need only be applied for a moment. If the terminal is well tinned, and the connecting wire also, the heating up for the actual soldering only takes a moment and should not result in undue warming of the ebonite thus loosening the terminals.

But in many cases there is bound to be some little warming whilst the work is in progress, so it is a good plan to make a habit of tightening each fixing nut against the panel immediately the joint has been soldered to the terminal.

### DISTANT STATIONS AND QUALITY.

F. G. (Wallsend).—"Using a three-valver (straight H.F., Det., L.F.) I am able to rake in a lot of foreign stations on the loud speaker, but the quality of these always seems far below that of the B.B.C. transmission. Is this caused by the H.F. amplification or are the transmissions abroad not as good as those of the B.B.C.?"

Unless you have an exceptionally good set you probably introduce quite an appreciable amount of distortion in getting the signals loud enough to listen to comfortably on the speaker. Besides this, it is generally admitted that the British transmissions are of a higher-quality than those of the Continental stations, owing to the tendency of the latter to over-modulate.

### UNABLE TO OSCILLATE.

L. D. (Sheffield).—"What is the matter with my one-valve set when it refuses to oscillate?"

Provided that the circuit is all right there is no doubt that one of your components or else the wiring is the cause of the trouble. Failure to oscillate may be due to a number of factors, the likeliest being incorrect connections to the reaction coil.

Try the effect of reversing these. (To do this connect the side of the coil that now goes to the plate of the valve holder, to the 'phones, and join the side that now goes to the 'phones to the plate of the valve holder).

If possible you should try another reaction coil, as the one you have in use may be faulty or may have an insufficient number of turns. Another point that should be watched is the contact at the coil holder and at the valve sockets, and if none of these seem defective you are probably using a faulty grid condenser. (The easiest way to ascertain if this is the case is to borrow another fixed condenser and try it in place of the one you have in use.)

There are other possible causes for a fault of this type, the likeliest remaining one being the use of a dud grid leak. This, like most of the other components and accessories, is best tested under working conditions, by comparison with a similar component that is known to be O.K. in action.

### CORRECT CHARGING RATE.

O. B. L. (Lowestoft).—"What is the correct charging rate for a six-volt accumulator?"

The exact rate depends upon what type of accumulator is meant, and upon its actual ampere-hour capacity. Usually the charging rate is about one-tenth of the actual capacity of the battery; that is to say that in the case, for instance, of a forty actual ampere-hour capacity the charging rate is one-tenth of this—*i.e.* four amps. But this is only a general guide, and owing to variations in different types of accumulators it is far better to follow the makers' instructions on this matter. (If the charging rate is not known, full details can be obtained from the manufacturers of the accumulator upon application.)

### LONG LOUDSPEAKER LEADS.

F. H. B. (Lutterworth, Leicestershire).—"I have bought a good 1 to 1 ratio L.F. transformer and am going to connect it in the plate circuit of the last valve, so that I need not have the loud-speaker wiring connected to the set in any way.

"There will be three different loud-speaker points in use, and though I understand in a general way that all I have to do is to wire the loud speakers in series across the secondary of the output transformer, I should be glad of some practical details about the wiring up, as I have never seen anything of the kind before."

One of the first things to decide is the actual method of connecting the loud speakers to the house wiring. Even if you anticipate using the loud speakers continuously we should certainly arrange so that they can be cut out of circuit, because almost invariably this is desirable at times, and it can be very easily arranged.

One good method is a plug and jack, the jack being of the type arranged so that the circuit is closed when the loud-speaker plug is withdrawn from it.

Alternatively quite a good connection can be made with ordinary coil plugs and sockets, the sockets being mounted upon the skirting board and the coil plug attached to the lead of the loud speaker. Where this method is employed all that is necessary as a shorting device is another plug in which the plug and socket portions are joined together by a short wire—*i.e.* a "shorting plug."

Whatever method is employed for plugging in the loud speaker it can be easily arranged to short this by means of the ordinary on-off filament switch. If this is connected across the particular point in question or across the loud-speaker leads, the loud speaker will be working when the switch is in the "off" position, but will immediately be shorted out of circuit if the switch is pushed "on."

The loud-speaker extensions will be practically invisible if bell wire, or No. 16 D.C.C. wire is used. It is not advisable to use thin wire for the wiring, or its resistance losses will be high.

Do not use twisted wire for the long leads that run round the house, as undesirable capacity is introduced by this method and theoretically the "come" wire and the "go" wire should be separated as far as possible. One method which is very satisfactory in practice is to run one wire to all the points via the tops of the doors, the picture rail, etc., and to take the return wire from the most distant "point" along the floor, skirting boards, under carpets, etc.

Done carefully in this way the wiring of the whole house can be made practically invisible.

### PREVENTING H.T. BATTERY SHORTS.

"REINARTZ REACTION" (Nottingham).—"I have a spare ·001-mfd. fixed condenser on hand and some time ago I saw an account in 'P.W.' of how this can be used with a condenser controlled reaction set to act as a safeguard against accidental shorting. As I have mislaid the particulars I should be glad if you would tell me how this condenser can be used for this purpose; and if you think it is the sort of job I can tackle, bearing in mind that I did not make the set myself and do not know much about it?"

It is the easiest thing in the world to use the condenser in the method to which you refer, and when fitted it will completely safeguard the battery from damage caused by the reaction condenser plates becoming shorted—*i. e.* by the fixed vanes touching the moving vanes.

To insert the condenser, first of all examine the connections to the reaction condenser. You will find that one of its sets of plates is connected to the reaction coil, and the other set of plates is connected to the filament wiring. All you have to do is to break one of these leads, it does not much matter which, and connect the condenser in series. In other words, cut the lead and take one of the ends to one side of the fixed condenser and the other end to the other side of the fixed condenser.

### SUCCESSFUL SHORT-WAVE RECEPTION.

R. L. E. (Blackpool).—"I have been getting American stations with the greatest ease although it is only a one-valve set. The only trouble is that the tuning is so sharp that I am losing the stations before I fairly get hold of them, although I have a slow-motion ·0005 tuning condenser.

"I am not quite sure about what circuit it is, because I had it from a friend complete with batteries, etc., and he himself did not know the name of the circuit. It uses ordinary small basket coils, but they are short-wave ones, the primary having four turns, the secondary eight turns, and the reaction about twenty.

"Can you tell me how to make the tuning easier? The circuit connections are as follows. One end of the aerial coil is taken to aerial, the other end to earth.

"One end of the secondary coil is connected to a ·0005-mfd. variable condenser, to a ·0003-mfd. fixed condenser and to a variable grid leak. The remaining side of that fixed condenser and the remaining end of the grid leak are joined to the grid of the valve.

"The other side of the secondary coil and the remaining side of the ·0005-mfd. condenser are joined together and taken to a ·006-mfd. fixed condenser and to the wire joining the reaction coil to the telephone terminals. The remaining side of the reaction coil goes to the plate of the valve.

"The other side of the telephones, across which is a ·002-mfd. condenser, is taken to H.T. positive. H.T. negative is taken to L.T. positive and to a rheostat.

*(Continued on next page.)*

# RADIOTORIAL QUESTIONS AND ANSWERS

*(Continued from previous page.)*

" "The other side of the rheostat goes to the filament, and the remaining side of the filament goes to L.T. negative and to the other side of the ·006-mfd. fixed condenser. What kind of circuit is that ? "

The circuit described above is a modified form of the Flewelling circuit, which can be used with great success for short-wave reception. The trouble that you are experiencing appears to be due to the fact that your tuning condenser is larger than necessary, and the easiest way to overcome the difficulty is not to remove this condenser and replace it by another one of smaller capacity, but to reduce its capacity by inserting a small fixed condenser " in series " with it.

To do this, disconnect that set of vanes which is connected to the secondary coil and to the ·0003-mfd. fixed condenser and grid leak. Then rearrange these connections as follow :

First of all mount a ·00025-mfd. fixed condenser at some convenient point near the variable. Then join that side of the ·0005 variable condenser which previously went to the secondary coil to one side of this ·00025 fixed condenser.

The remaining side of the fixed condenser should be joined to the secondary coil holder, to the ·0003 fixed grid condenser and to the vacant side of the grid leak, thus restoring the original connections except for the fact that the ·0005-mfd. variable is now in series with the ·00025 fixed condenser. This will have the effect of reducing considerably the sharpness of tuning, but you will find that the wave-range covered is not so great as previously, so instead of using a four-turn basket coil to cover a certain band of wavelengths you may find it necessary to wind a four-, six- and eight-turn coil, and plug one of these in as required. (If desired the extra fixed condenser can be shorted out by means of an on-off switch, thus making the set's tuning capacity capable of adjustment from a minimum to ·0005 maximum, as formerly).

### SCRAPING AND SCRATCHING.

S. N. L. (St. Ives, Cornwall).—" The set used to be all right, but now I get scraping and scratching noises. What is the cause of it ? "

Unfortunately there are a number of things which can cause this fault. As you give us no particulars of your set we can only indicate in a general way where the source of trouble is likely to lie.

Before trying to trace the fault notice particularly whether the scraping and scratching noises are continuous ones, or practically continuous, or whether they are intermittent. If you can hear the noises every time you switch on and practically the whole time you are switched on, the likeliest place for the trouble to occur is in the primary winding of an L.F. transformer, or L.F. choke.

A fault in either of these is likely to yield scraping and scratching noises, very often combined with distortion and weak, unsatisfactory signals.

Another common source of this nearly-continuous scratching noise is the H.T. battery, which may have deteriorated badly, in which case it is quite capable of giving the trouble complained of.

If, however, the trouble comes on only at times, note particularly whether it seems to correspond with any adjustments on the set. For instance, if it only occurs when you are tuning, perhaps it is due to dirt or dust between the condenser plates.

If it comes on when adjusting a rheostat, or only when certain coils are inserted, you may be pretty sure that the component in question has something to do with it. A close inspection of the contacts may reveal that the rheostat arm is not pressing down properly upon the windings, or that there is a loose or unsatisfactory connection upon the coil.

Almost any faulty connection in the set is capable of giving scratching noises, so we should overhaul the whole of the connections as closely as possible, making sure that there are no dry joints anywhere, and keep a sharp look-out for faulty flex leads, which are common sources of this kind of disturbance.

Finally, do not forget that bad contact may exist between the valve legs and the valve pins ; in 'phone leads, or 'phone terminals ; in wander plugs as well as the leads ; and on the connecting bars of the accumulator, as well as the long leads.

### A TUNED PLATE ONE-VALVER.

" HOOK-UP EXPERIMENTER "(Basingstoke, Hants.).—" Not having too much money to spend, naturally I am chiefly interested in the one-valve circuits, and I have tried out dozens of these at one time or another, and I am always on the look-out for more. Recently I came across a very eulogistic account of a ' tuned plate ' one-valve circuit.

" It stated that it was excellent for long-distance work owing to the fact that reaction control was very smooth, and I should like to get hold of the point-to-point connections of this startling receiver. Can you tell me what they are, and if it really is a good receiver for long-distance work ? "

With this class of circuit a great deal depends upon the particular valve which is in use as detector. The " tuned plate " receiver relies for reaction effect upon the feed-back across the internal capacities of the valve, that is to say it takes advantage of the small condenser which always exists inside a valve because the electrodes are placed close to one another.

The connections are very much the same as an ordinary one-valver, and though we do not think you will find the D X qualities are anything really exceptional it is an interesting circuit for the experimenter to try.

The connections are as follow : The aerial, earth, grid and filament connections are as usual. H.T. negative is connected to L.T. negative in the ordinary way and H.T. positive is connected to the 'phones.

The remaining side of the telephones is connected to a coil of about the same number of turns as the tuning coil, and to one side of a variable ·0003 or ·0005 mfd. condenser. The remaining side of this condenser and the remaining side of the coil are joined together and taken to the plate terminal of the valve. (There is no need for this reaction coil to be coupled in any way to the aerial coil.)

It will be seen that this is almost exactly the arrangement of an ordinary one-valve set with reaction, except for the fact that the reaction coil is now tuned, and, by the way, it may be found necessary to use a by-pass condenser across the telephones, say a ·001 or ·0002 condenser, in order to assist easy oscillation.

Reaction effects are obtained not by coupling the reaction coil to the aerial but by tuning the reaction condenser so as to bring this circuit into tune with the ordinary tuning condenser. With a carefully chosen valve and reaction coil results can be very good indeed, but care is needed in operation, as the set is capable of strong reaction effects, and consequently can cause interference with other listeners unless it is properly handled.

### 5 S W IN IRELAND.

D. F. C. (Co. Mayo).—" With your ' Antipodes Adaptor ' Star Model I last night, 21 ult., at 10.35, succeeded in picking up 5 S W relaying Charlot's Hour. The reception was exceedingly clear, but suffered from fading. I thought I should let you know, as I understand that very little of this short-wave station has been heard in the British Isles. I would be pleased to know if successful reception has already been reported."

Apparently you were misinformed about the facts if you understood that 5 S W's range is limited to countries far outside the British Isles. Owing to the high power employed at 5 S W Chelmsford, the usual " skip-distance " effects which are observed upon the wave-length on which this station works are to some extent overcome, and the reception of 5 S W in the British Isles is not so uncommon as you suppose.

If a *low*-power station were situated at Chelmsford, working on the same wave-length as now employed, it is quite possible that the skip-distance effect would prevent you from picking up any signals in Mayo. 5 S W is such a powerful station that signals are apt to " break through " in a way which does not occur with a lower power on the wave-lengths with which such effects are generally associated.

### THE " LO-NOTE " LOUD-SPEAKER.

A. F. (Bristol).—" I have just constructed the ' Lo-Note ' loud-speaker horn published recently in " Our P.W.", but making it only

*(Continued on page 674.)*

## " P.W." TECHNICAL QUERY DEPARTMENT

***Is Your Set " Going Good " ?***

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 a revised scale of charges, can be obtained direct from the Technical Query Dept., " Popular Wireless," 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.

# RADIOTORIAL QUESTIONS AND ANSWERS

(*Continued from page 672*)

five feet in length instead of eight. I am delighted with the result, the tone and volume being fine.

"In fact I am so pleased with it I am wondering if it could be made in a compact form so as to make it a permanent thing. What I mean is, could it be built in a cabinet form, or have you ever published a design in cabinet form which will give as good results?

"There must be many readers who are handy at woodwork who would like to tackle a speaker on these lines. Thanking you for your many splendid circuits."

Unfortunately, with such loud speakers the actual shape has a great deal to do with results obtained, and we doubt very much whether the peculiarly good results obtainable with this loud speaker would be retained if it were compressed into cabinet form. Consequently, we have not described a design in cabinet form to give similar results, as most readers looking for a "cabinet" loud-speaker would prefer to make the type recently described under the title "How to Make a Moving-Coil Loud-Speaker."

In this instance again, the baffle-board is rather unwieldy, but it is inevitable that to produce low notes a really large instrument should be used, and *considering the remarkable faithfulness and fidelity of reproduction possible with the moving-coil loud speaker*, this instrument must be considered as being remarkably compact as well as efficient.

### THE "P.W." RANGE-STRETCHER.

A. J. B. (Darlington).—"When the description of the 'P.W.' Range-Stretcher came out I was very interested, because it was just the very thing I had been looking for. It works splendidly right from the start, but I had a little bit of trouble and instability on one place on the dial and I was just wondering how to overcome this when I saw your notice on page 604 of Radiotorial. It mentions the use of a 100,000-ohm anode resistance, and what I am wondering is must it be an anode resistance, or will a grid leak do?"

Very little current is carried across this component, so a grid leak will do quite well instead of the anode resistance.

### REVERSED REACTION EFFECTS.

E. R. (Thame).—"What I cannot make out is that although the set gives perfect reaction effects on the short waves there is no sign of reaction on the long waves. In fact, it seems as though the reaction is reversed, and it actually makes things *weaker*. Experimenting with this I find that with the long-wave coil, if I change over the leads to the reaction coil, I can get proper reaction, but as I cannot do this every time I change coils I should like to know what I can do to get over the difficulty?"

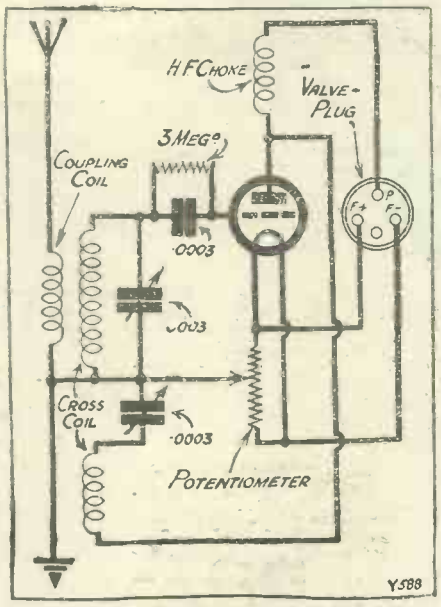
The fact that you have to reverse the leads to get the correct reaction effect indicates that in the long-wave pair of your coils the reaction coil is wound in a direction opposite to the winding of the corresponding aerial coil. (This occasionally happens in ready-made coils when they are of different makes.)

If the coils were home-made and the windings can be reversed easily, the changing-over of the leads to the plug and socket of one coil will cure the trouble. If the coils are ready-made, so that the coils' connections cannot be reversed easily, you can avoid having to buy a new coil of the same make as its fellow by arranging a switch to reverse the reaction leads when the coils are changed over. Such switches are known as reaction reversing switches, and instructions for wiring them up are given with each model. They can be of the push-pull type so as to take up very little space, and they are quite cheap.

## PHOTOGRAPHS.

**Readers are invited to submit photographs of wireless interest for publication in "Popular Wireless." Every photograph accepted and published will be paid for at our usual rates.**

### THE "ANTIPODES ADAPTOR."




This is the diagram of connections of the "Antipodes Adaptor," an ingenious and original plug-in unit which converts any ordinary set into a short-waver capable of picking up America or Australia direct. The details—exclusive to "P.W."—were published in our May 26th issue.

### BACK NUMBERS OF "P.W."

"COUNTRY READER" (Oxfordshire).—"Where can I get back numbers of 'P.W.'?"

Back numbers of POPULAR WIRELESS which are still in print are obtainable from Amalgamated Press, Ltd., Back No. Dept., Bear Alley, Farringdon Street, London, E.C.4. The charge per copy is 4d., post free.

## THE P.W. "UNI-POWER."

(*Continued from page 659.*)

resistance placed in its plate circuit. It should be a fairly high impedance valve, such as the Mullard P.M.5X, Marconi D.E.5B, D.E.H.610, etc. This type of valve will also be suitable for the first stage of the amplifier. A small power valve may, however, be used in this position with success.

### More About The Valves.

For the last stage a super-power valve is very desirable, and such a valve as the P.M.256, D.E.5a, L.S.5a, etc., will give excellent results. I have been mentioning only the 6-volt valves, since it was with valves working at this voltage that the amplifier was first tried out, but the corresponding valves in the 4-volt, and probably the 2-volt, range will be quite satisfactory.

Our H.T. supply is so arranged that the last valve will probably receive about 150-160 volts on its anode, while the first L.F. stage receives this same voltage less the drop across the 100,000-ohm resistance in its anode circuit. The voltage on the detector and H.F. stages (if the latter are used) will be, as previously stated, variable over quite a wide range.

It should, by the way, be understood that it is not advisable to add this amplifier to a set which already incorporates an L.F. stage. It is meant to follow a valve *detector*.

The value of grid bias will have to be determined by experiment. Probably it will be found that about 4½ volts on the first L.F. valve and 13½ to 18 volts on the final stages will give good results, but a study of the valve curves, coupled with a little experimenting, will soon show what is necessary.

No trouble with "motor-boating" was experienced with the original amplifier; it was to obviate any possibility of this annoying noise (arising from the natural frequency of the smoothing circuits) that fairly small L.F. chokes were used. It was also found that whereas a resistance-coupled amplifier with ·1-mfd. grid condensers could be made to "motor-boat" by mal-adjustment, it was impossible to do that with this set using ·02 condensers.

With regard to results obtained with this amplifier, it has now been in use for a considerable time in conjunction with a balanced-armature type of cone loud-speaker, which is mounted in the centre of a fair-sized baffle-board, and reproduction is extremely pleasing. Those who have never heard a moving-coil speaker absolutely at its best assert that this cone in conjunction with the amplifier and a single-valve detector gives better reproduction than one of the moving-coil type, but such statements are, of course, taken with several grains of salt.

An interesting test is often carried out in the evenings, when 2 X A D, the G.E.C.'s short-wave station at Schenectady, working on 22 metres, is audible. He is received at fairly weak headphone strength on the single-valver, but when carefully tuned in will fill the house from the loud speaker. His quality and steadiness are marvellously good, and he is every bit as enjoyable to listen to on a good night as 2 L O.

### Alternative Power Transformers.

Practically any make of power transformer may, of course, be used in the eliminator, in conjunction with a suitable valve, but there is just this one point to be noted; if it has a centre-tapped filament winding, as has the transformer shown in the back-of-panel diagram, this centre tap is taken to positive H.T., i.e. to the side of $C_5$ marked —.

If there is no centre-tap, either side of the winding is taken to this point instead. The Igranic transformer has no centre-tap, and one side of the filament winding, as will be seen in the photographs, is taken to the positive H.T.

The condensers used in the filter circuit should, of course, be chosen with consideration of the voltage developed by the transformer in use. Those shown in the set are of the 400 working-volt (D.C.) type. *Never* use condensers with a working-voltage rating below that likely to be given by the transformer. In fact, it is advisable to use these 400 working-volt type even with a 250-volt transformer.

# NEWS FROM SAVOY HILL.

*(Continued from page 656.)*

### Extension for 5 S W.

For the benefit of an ever-increasing number of short-wave enthusiasts in India who regularly listen to the London programmes as radiated from 5 S W, the short-wave station at Chelmsford, the B.B.C. has decided to begin transmitting half an hour earlier on Friday evenings. Instead of starting up at 7 p.m., 5 S W will therefore begin at 6 p.m., and close down for the half hour between 6.30 and 7 p.m. when the news bulletin is broadcast.

The earlier start has been specially asked for by Indian listeners, and demonstrates the keen interest that is being taken throughout the whole Empire in British broadcasting. And while we are on the subject of 5 S W, what about news for the outer Empire? How long will the present ridiculous practice persist of excluding from its transmissions what the Dominions and Colonies are particularly interested in?

### Harry Weldon for the Mike.

Harry Weldon, the celebrated comedian and one of the few remaining "stars" of the vaudeville stage yet to make their first appearance before the microphone, is likely to be heard by listeners in the near future. Negotiations, which have every prospect of success, have been going on between him and the B.B.C. for the last few weeks, by which it is hoped to include him in the programme on Tuesday, July 31st.

### Test Cricket in the North.

The first day's play in the second test match between England and the West Indies, which takes place on the Old Trafford ground at Manchester, on Saturday, July 21st, will be the subject of an eye-witness account by Colonel Philip Trevor, who acted as manager to the English side during one of the Australian tours. The broadcast will not take place until 7.25 p.m., and Colonel Trevor will not only describe the game (should the vagaries of our climate permit it to start), but will also have a good deal to say about cricket in general. By the way, no one seems to miss the running commentaries on cricket matches!

### A Thackeray Anniversary Programme.

Manchester Station is commemorating the anniversary of Thackeray's birth on Wednesday, July 18th, when a special programme, which will include three dramatic episodes from "Vanity Fair," will be performed by the Station Players. The episodes, which have been specially dramatised for the occasion, are "Amelia Sedley and Rebecca Sharpe bid farewell to Miss Pinkerton," "Sir Pitt Crawley's Proposal," and "Becky Sharpe."

### A Swahili Festival.

Few white men have been allowed to witness the strange ritual of the Swahili Festival known as N'goma such as Mr. Alfred Gordon Bennett saw in an East African native village during his recent 20,000 miles journey across that continent. Mr. Bennett will include a description of the ceremony in a talk which he is broadcasting from Manchester on Saturday evening, July 21st, and listeners who enjoy a thrilling narrative should make a note of the date.

## TECHNICAL NOTES.

*(Continued from page 656.)*

This shows at once that if we have a total current of 1 ampere passing and we have three valve filaments running in parallel, each will be receiving (presuming they are more or less of equal resistance) about ⅓ of an ampere. If one of the valves is switched off, the other two will divide the 1 ampere between them, whilst if all valves are switched off except one, this remaining one will have to carry the whole current of 1 ampere, which may mean the valve will be burnt out.

**Connection to Mains.**

Apart from these difficulties, which in themselves are very serious, there is also the objection that the filament circuit is connected to the live mains.

By the method which I have indicated above, however, in which a step-down transformer is used (notwithstanding that the source is direct current) the output side of the eliminator is entirely disconnected from the mains. Furthermore, as the current at the output side is supplied at approximately the correct voltage (say 6 volts) all the troubles due to constant current, instead of constant voltage, disappear and (assuming that we use a step-down transformer with good regulation) we are in virtually the same position as with a 6-volt accumulator.



**Rectifiers.**

Talking of rectifiers for use with alternating current, many readers have asked me questions relating to the copper-oxide rectifier. I should say that this rectifier is comparatively new—at any rate, it has only very lately appeared on the market—and therefore I am unable to say how it will work after extended test. I do not mean by this that I have any reason to suppose that it does not work efficiently, but I do not know.

Experiments have been made with copper-oxide rectifiers for a very great many years past, and all manner of patents have been taken out by different experimenters in various parts of the world, covering designs of rectifiers and processes for making the copper-oxide coating.

# BACK-KICKS FROM YOUR MOVING-COIL SPEAKER.

**BY G. P. K.**

PROBABLY the easiest and most generally satisfactory way of supplying the field current of a moving-coil loud speaker is to use D.C. mains where they are available, but one is apt to strike a snag here which may come as a surprise to the beginner unless he is warned.

The point is this: When current is flowing a powerful magnetic field is built up round the field coil, and when you switch off this collapses and generates a very high "back E.M.F." or back-kick voltage in the winding. This self-induced voltage may easily be high enough to do considerable damage to the windings in the course of time, and some device to render it harmless is very desirable.



One expedient which has been found fairly satisfactory is to connect a Mansbridge-type condenser of 4 mfd. straight across the field coil terminals, but this solution of the problem is a little expensive, since the condenser must be of the high-voltage type used in battery eliminators, the "1,000 volts test" rating being desirable. One of the ordinary low-voltage type is very liable to be broken down by the back-kick to which it will be subjected.

### A Cheaper Method.

A much cheaper solution is to be found in the Neon lamp, which will serve very well to absorb the spiteful kicks the field winding generates on switching off. If your mains are of 100 or 110 volts, all that you need to do is to wire-up a Neon lamp in a holder straight across the "pot" terminals. On switching off the back-kick will then cause the lamp to light up with a momentary brilliant flash. Try reversing the leads to the lamp, and choose the connection which gives the brightest flash.

If your mains are of over 150 volts, a single Neon lamp is not satisfactory (it lights up continuously) and two connected in series should be used, connected as before.

# RADIO AND THE ELEMENTS.

FOR some time after radio communication was first effected, it was thought that the wireless waves travelled in straight lines. When, however, reception was accomplished over longer distances it was realised that there existed what is now known as the "Heavyside layer." It was already known, however, that the radio waves did travel horizontally for a short distance, and the natural and correct solution was reached that the waves were transmitted in every direction and that those projected upwards were deflected by the "layer" to some spot at a great distance on the earth's surface from the transmitting station.

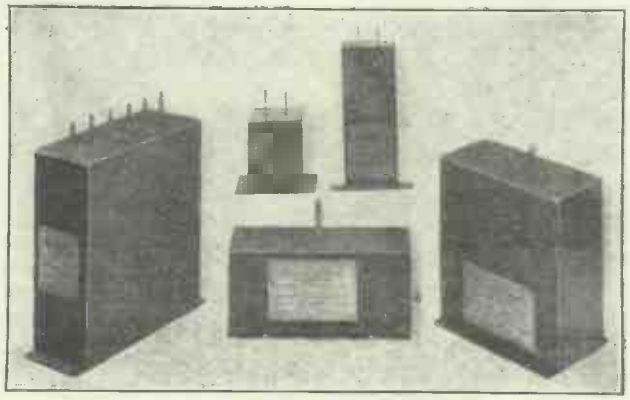
With the acceptance of this theory came two important discoveries—the obvious one, that of "skip distance," and the second, the cause of "fading," which was due, according to Prof. Appleton, to the simultaneous reception of two sets of waves, the horizontal and the deflected.

### A Notable Discovery:

The next notable discovery to be made was that the height above the ground of the layer varied according to the time of day or night, an increase of 100 per cent being apparent on some nights. This naturally makes a very great deal of difference to DX reception, for (as in the well-known optical law) the angle of incidence on the layer is equal to the angle of deflection. From this it may be seen, by a simple process of reasoning, that, theoretically, reception at night should be possible over twice the maximum "daytime" distance.

It will have been seen from these few remarks that many of what are sometimes regarded as extraordinary phenomena are really but the outcome of natural functions, and it is with the general appreciation of this idea that DX reception will grow more and more in the public favour.

An interesting H.T. unit for use on A.C. mains is the Benjamin "Majestic" which uses a rectifying valve of the gas-filled type, without filament, and gives either a "high" or a "low" range of voltages according to the position of the small switch on the front. It is capable of giving large outputs, and is very well "smoothed." The price is £7 15s.



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*Write to us giving full particulars of your proposed Eliminator, stating working voltages and whether A.C. or D.C., etc.*

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M169

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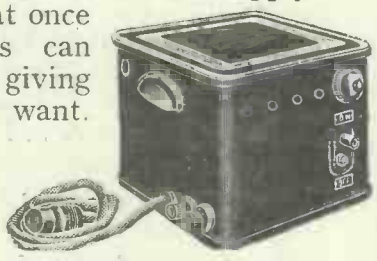
The best quality of reproduction is impossible without a liberal supply of silent power. But such power can only be obtained from the mains and then only with supply units designed by experts with every facility for research and built without stint of materials.

A glance at the generous smoothing circuit of the Igranic H.T. Supply Units tells you at once that no others can rival them for giving the power you want.



# Igranic H.T. Supply Units

| | | | | | PRICE |
|---|---|---|---|---|---|
| Model V208 | Output | 200 volts, | 30 milliamps | - | £11 5 0 |
| ,, V127 | ,, | 120 ,, | 20 ,, | | £9 5 0 |
| ,, V70 | ,, | 70 ,, | 5 ,, | | £6 5 6 |

Igranic H.T. Supply Units are also supplied with an automatic L.T. Battery Charger built in, thus making the whole power supply entirely automatic.

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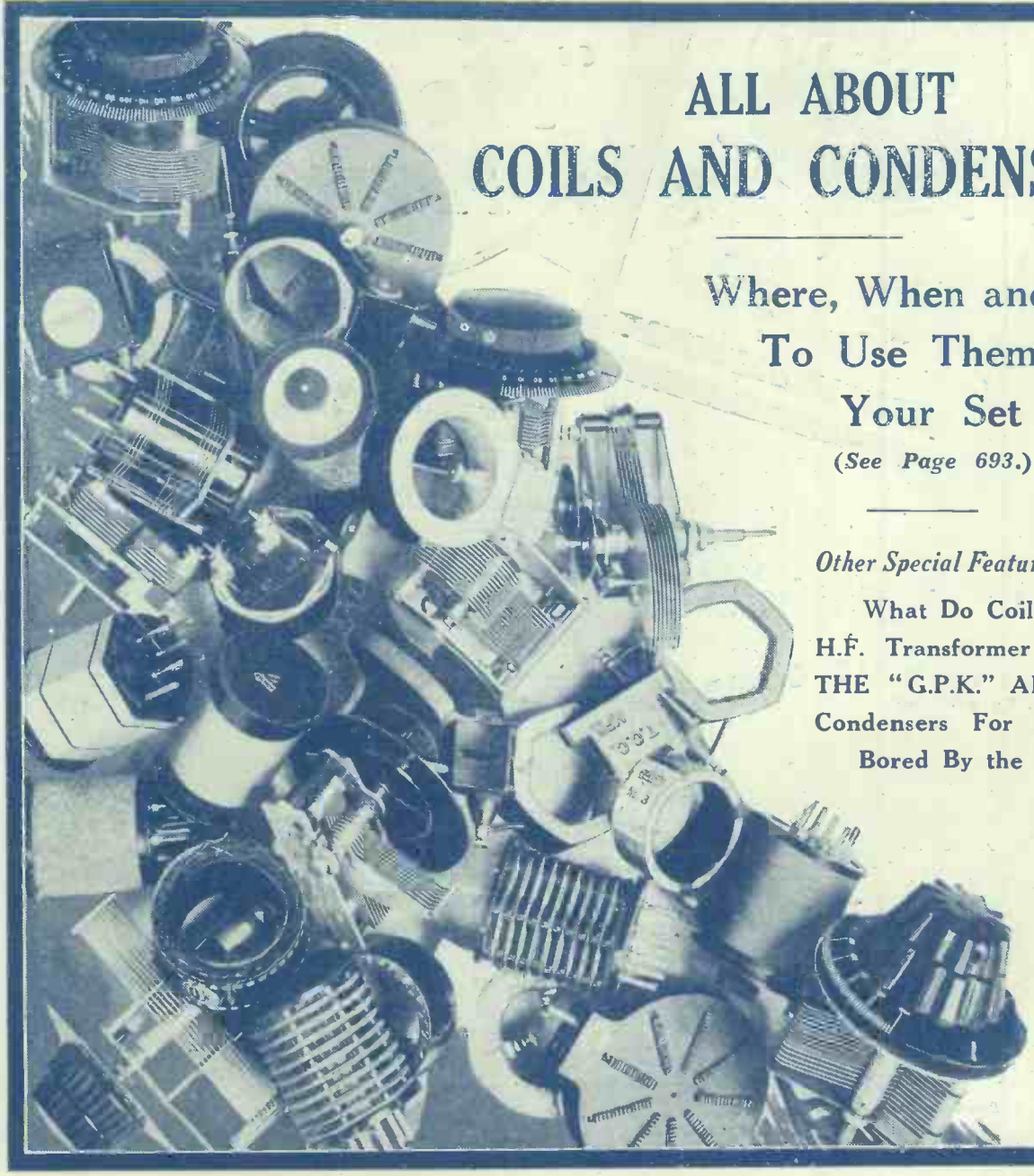
POPULAR WIRELESS, July 21st, 1928. REGISTERED AT THE G.P.O. AS A NEWSPAPER.

# SPECIAL COILS AND CONDENSERS NUMBER

# Popular Wireless

Every Thursday PRICE 3d.

No. 320. Vol. XIII. INCORPORATING "WIRELESS" July 21st, 1928.



## ALL ABOUT COILS AND CONDENSERS

Where, When and How To Use Them in Your Set

(*See Page 693.*)

*Other Special Features Include:*

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H.F. Transformer Troubles
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## RADIO NOTES AND NEWS.

### Broadcasts from Aeroplanes—B.B.C. Appointments—Melbourne's Latest—The Song of the Dynamo—Radio and the Railway—East to West Flight—The Life of a Valve.

#### A D X Tragedy.

IF you have tears prepare to shed them now. Behold the hard-working set-maker trying out for the first breathless hour the famous "Sydney" Two! Some unbelievably remote station is faintly knocking at the doors of the brain and he thinks he recognises Japan or Java. A proper knock at the front door of the house! A Boy Scout! "Please will you buy a ticket for our Cantata?"

#### The Three Vices.

JUST another story before we get down to business. An Englishman, an Irishman and a Scotsman each had a set, but only one loud speaker between them. Which do you think heard the programmes? Answer: None. The Englishman had taken his set to pieces and couldn't get 'em back; Pat had pawned his—to raise the licence fee; and Jock was saving up his battery in the hope that the licence fee would be reduced before the next "Burns' night."

#### Scottish Nights.

MENTION of the late exciseman Burns reminds me that Scottish readers may like to be reminded to remind their friends that to-night (July 19th) a "Ladies' Night" programme will be broadcast from Glasgow. Guaranteed all Eves, except the conductor, Mr. Hugh M'Clemont. Pity Dame Ethyl Smyth could not have been roped in as conductress, thus completing the perfect hen party. On July 20th Aberdeen will give the first of a series of "Scottish Nights' Entertainments," by Mr. A. Keith. Old tales and ballads of Scotland! Cry a' the neebors ben!

#### Literary Note.

I HAVE but recently laid down, with a sigh of regret that it consists only of one volume, Captain Woodes Rogers' journal of his voyage round the world (and his rings round the Spaniards!) which was first published in 1712. This little jaunt, which lasted from 1708 till 1711, was passed in the plain pursuit of plunder. Pilot, the great Dampier himself; his last voyage. If you want the truth which is stranger and better than fiction, beg or borrow this book, and marvel at and admire the hardihood of the British sea-dog, thinking meanwhile of how differently he would have fared if Marconi had been born in A.D. 1600.

#### Broadcasts from Aeroplanes.

THE U.S.A. started something new when it broadcast an eye-witness' account of New York's reception of the crew of the Bremen—from an aeroplane. The announcer occupied a commanding, but chilly and risky, position 2,000—3,000 feet up. The broadcasting station sent him instructions, by radio, of the ground to be covered, during a flight of 55 minutes. He did his eye-work through binoculars. Poor chap! What a hectic business! I anticipate that soon America will be singing, "I didn't raise my son to be an announcer."

#### B.B.C. Appointments.

A NOTE in a Welsh paper about the appointment of an assistant-director of the Cardiff station inspires me to ask whether B.B.C. posts should not now be filled by means of advertisements or examinations. As the B.B.C. advances—when it thinks fit—the fact that it is a State-controlled affair, it ought not to appoint its staff quite like a private one—a lunch here, a letter from a friend there, and so on. Perhaps this subject could do with a little ventilation. Possibly the most correct procedure is observed. I don't know, but I do know that I never see advertisements for applicants.

#### Melbourne's Latest.

THAT live station, 3 L O (Melbourne), not content with distributing flower seeds, has now turned its attention to more advanced ova, and is interesting itself in an egg-laying competition. There's something of the "Daily Mail" touch about 3 L O; the spirit of Lord Northcliffe is inspiring it. I trust that the rumour that a Scot from Woolla-Moolla is entering a prize *herring* in the competition is without foundation.

(*Continued on next page.*)

## LONELY LISTENER LOGS "LADY LINDY."

This is Mr. Wallace Battison, of Cambridge, Mass., who kept in radio touch with the seaplane "Friendship," in which Miss Amelia Earhart ("Lady Lindy") made a successful Transatlantic trip. He installed the plane's apparatus and planned to go as radio operator on the flight, but was forced to change his plans.

# NOTES AND NEWS.

*(Continued from previous page.)*

### Problems of the East.

NO. 2 of the "Ceylon Radio Times" is to hand. It is the best British overseas amateur radio organ I have seen, barring those of the great Dominions, especially when one considers that Ceylon is a very small island. Fifty-five pages of solid stuff and some real ads. Go it, young 'un! One note struck me as typical of what broadcasting in the East is "up against." "Many keen listeners are unable to understand the Sinhalese and Tamil musical programmes." My own experience of Oriental music, which ranges from Egypt to China, is that to the Western "middle-brow" ear it is not music at all.

### The Song of the Dynamo.

A CURIOUS experience of this difference in the idea of the beauty of sound befell me one day at Hongkong. An Oriental lady, a princess or something, was brought to my station. I hadn't much to show her, for it was in the pre-broadcasting days. Still, I did my best. I switched on the transmitter and the hum of the rotary converter grew to a shrill crescendo. The almond-eyed lady was entranced. "Ah, music," said she. Her suite dissolved into ecstacies at once. Now, that converter was a plain beast and sang like an asthmatic coffee-grinder. Music, eh?

### Personal Note.

IT is with regret that I have to record the resignation of Mr. W. H. Lynas from his positions of Managing-Director of Graham Amplion, Ltd., and Director of Alfred Graham & Co., Ltd., on account of ill-health; he has been ordered complete rest for a time. Mr. Lynas was an outstanding figure in the "trade," and a most active and forceful worker and writer. I believe that after the untimely death of Mr. Graham he was the moving spirit of Amplions. We wish him a speedy recovery and re-entrance to the arena of business.

### Radio and the Railway.

A COMPANY has recently been formed in Budapest with the object of providing broadcasting in railway waiting-rooms. But before a traveller wants "broadcast" he needs better beverages, softer sandwiches, politer porters, and softer seats. And "blonder barmaids," adds my impossible nephew. Not at all! I should like to see a race of brunette barmaids arise—for a change.

### The East to West Flight.

MAJOR FITZMAURICE, who had the luck to get across the Atlantic as the guest of the two German airmen on the "Bremen," admits that had the aircraft carried wireless they might have made New York. All "P.W." men will agree with the idea. "Radio is worth its weight in radium"—for safety, direction and distance. Where on earth would Nobile be to-day but for the work of the radio men?

### Revolutionary Statement

THE ingenious wireless correspondent of the "Leeds Mercury," who is at present giving his "fans" a course of atomic physics, says: "Matter is being made, and matter is being destroyed in the tremendous laboratories of the infinite." Bang go two cherished beliefs. (1) Matter is indestructible; (2) Matter, being indestructible, and therefore infinite in its existence, must be infinite in both directions, and therefore must have existed for ever. What authority is there for the statement that matter is being destroyed? And does the manufacture of new matter exactly counterbalance the destruction of existing matter? If not, which is gaining ground?

## SHORT WAVES.

**HOME, SWEET HOME!**

Jerry: "And how did you enjoy your stay in Havana?"

Carry: "Oh, it was wonderful! Why, we got Kansas City every night on our radio!"
—"Radio News."

* * *

Something new in the way of music is announced for Wednesday, when the Victorian Police Band will broadcast.

This should be an "arresting" performance.

* * *

**THE BIG IDEA.**

They were discussing the greatest inventors. The names of Edison, Lodge, and Morse were mentioned.

"Well, chentlemans," said a man from Stepney, "dose vos great peoples, but I tell you de man vot invented interest vos no fool.'
—"Daily Mirror."

* * *

Small Child: "Daddy, is there any static in an ATMOSPHERIC prologue?"

* * *

Even radio has its fashions to observe, and it seems rather appropriate that the shingle-wire aerial is now most popular.

* * *

**NEWS ITEM.**

An elaborate wireless set is to be installed at Parliament House, Canberra.

Of course, they already have the "Speaker" there.—"Popular Radio Weekly."

* * *

Fan: "I got a new radio set, Jim."

Neighbour: "Is that so? What kind is it?"

Fan: "I don't know, but I call it 'Football Radio.'"

Neighbour: "Why is that?"

Fan: "There's a lot of whistling in it."
—"Radio News."

* * *

An unsolved problem: Why should carrier pigeons be able to lay eggs when carrier waves can't?

* * *

**THE RADIO ANNOUNCER.**

Valued servant, he knows howski
People should pronounce Tchaikowsky,
Ponders deeply, forehead moppin',
On some words to say to Chopin,
Or explains to us the theme
Of the lovely La Boheme.
Though he may miss out on Thais,
His dispatch deserves our praise.
—"The Forum."

### Telepathy Again!

BLESS us! How this idea of telepathy sticks. Scientific investigators insist that it is up to the present "not proven," and yet the world seems to hanker after it. Now, 3 L O (Melbourne) is going to try it out. In fact, June 26th was the date chosen and, of course, the result is not yet known. The experiment is, "To ascertain whether or not it is possible to communicate thoughts or impressions from the minds of a group of selected people in one of the studios of 3 L O Melbourne to some of the hundreds of thousands of listeners-in, near and far." When I learn the result I will report it to you.

### Smoke With the Times.

I MAKE this offer to any enterprising tobacco firm. Take my idea and keep me in four ounces per week. My idea is that a mixture be blended which has the special quality of inducing wakefulness. Then call it "Radio Returns" or "Wireless Weed" or "Multivalve Mixture," and it will go like lottery tickets. I admit that this brainwave was set up as a result of noticing that Players' are now offering a new delight called "Airman" Verily, we smoke with the times. But surely radio is contemporary with aviation, to say the very least of it, and deserves a weed all to itself.

### The Life of a Valve.

CONSIDERING the excellence of the modern valve and its longevity, surely the manufacturers must bless the carelessness of the public, for it can be that alone which enables them to earn profits. I have just heard that Radio G 2 N H (Mr. E. A. Dedman, Malden, Surrey) has to mourn a departed valve which he bought in 1923. It was a Mullard 0/150 transmitter and had been in continual use, having assisted in communications with thousands of stations situated in 44 countries in all the continents. My 1923 receiving valves are still going "Johnny Walker."

### Note on Swedes.

NO, this is not an agricultural "talk," but an advice that Sweden, which heads the world in respect of the number of licences issued, viz., 57·8 per thousand inhabitants, is to build two new stations, at Stockholm (50 kw.) and Hoerby (10 kw.). By the way, in contrast to the lukewarm Irish Free's, who worked up 39 letters in response to the appeal of the broadcasting people for criticisms, the Broadcasting Bureau of the Swedish Telegraph Board received 140,000 letters as a result of a similar appeal. But then, the Swedes have no "wrongs" to croon over!

### "Age Will be Served."

I LEARN on unimpeachable authority that the Fulham Guardians are equipping every married couple under their charge with a radio set and two pairs of headphones. A wise and kind act! Years ago the workhouse (hideous word!) authorities used to debate about beer, baccy, snuff and Christmas puddings. Now, radio is going in as a matter of course. How long will it be before the Guardians gather round to consider "flight to the Engadine for Easter," "cocktails," "silk stockings" and "pet monkeys"? For the standard of living ascendeth for ever.

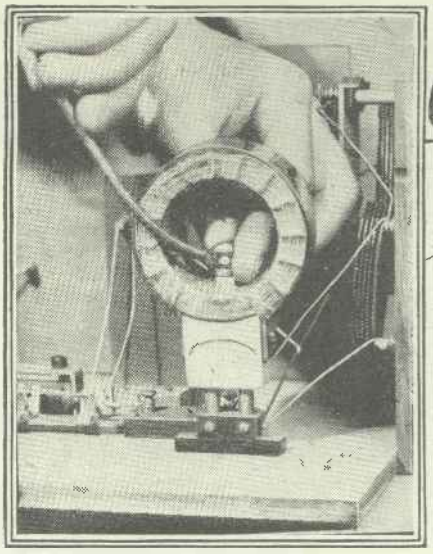
### "Au Revoir," Lady Lindy.

SHE worked her little radio till it bust.
*Linger longer, Lady Lindy,*
*For the ocean's wet and windy,*
*And the hydroplane's a cranky*
*Sort of carriage for a Yankee*
*Girl who's brave enough to fly*
*To Old England. By the by!*
*Do you think of coming back*
*On the Lusitania's track,*
*With that twinkle in your eye*
*And that fluffy hair on high,*
*Lady Lindy?*

### Publicity for Scotsmen.

AT the risk of causing a number of esteemed Scottish readers to stop borrowing "P.W" I will sneak a joke from an Australian radio weekly, which says that a Scotsman sent some chickens' egg-shells to 3 L O for them to "be relayed."

ARIEL.



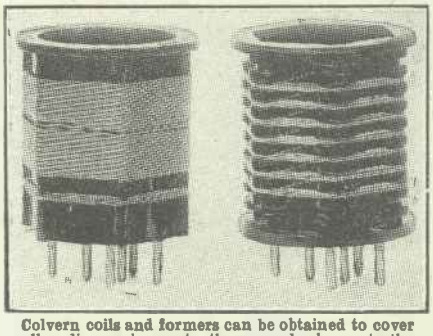
# What Do Coils Do?

**When you pull out a "Number 35" and in its place plug-in a 150-turn coil, you lose the local station but bring in Daventry 5 X X. Why? This article gives you the fundamental facts, in language easy to understand.**

**By G. P. KENDALL, B.Sc.**

WITH all the limelight which is being turned upon our old friend the tuning coil in the present issue, it would be perhaps only natural for the beginner with an inquiring mind to ask, "What is the good of a tuning coil, anyway? Why use it? What does it do?" It is in hopes of forestalling these quite reasonable queries and giving the required information in a potted form that this page is being written.

In this small space I cannot pretend to give you a proper theoretical explanation of the real functioning of the inductance in a wireless circuit, but I can give you a general idea which will enable you to feel



**Colvern coils and formers can be obtained to cover all radio requirements, the example shown to the right being of the popular slot-wound variety, for long-wave work.**

that you know pretty well what is happening when you take out the No. 35 coil which you use in the aerial circuit for the local and shove in a No. 150 to get 5 X X. Probably that is all that most of us want to know, anyway!

### Tickling the Tuned Circuit.

Well, it is this way: the ordinary tuned circuit used in wireless is something which will vibrate electrically, or oscillate, as it is called, when it is excited by the arrival of wireless impulses of the right wavelength. For example, if it is connected to an aerial system it will vibrate electrically in sympathy with the little oscillating impulses of electricity which are generated in the aerial when it is struck by passing wireless waves.

Further, it will only do so if it is tuned to the same frequency as the incoming waves, so now you see how it is possible to tune in first one station and then another; the receiving circuit is only set vibrating by those waves to which it is tuned. By the way, please be careful to avoid confusing this kind of oscillation with the sort that results from the use of too much reaction. The latter is something quite continuous, which goes on regardless of the arrival of any waves, and is a much more violent sort of business. The kind we are considering now is quite a mild sort of affair, and is the natural response of a tuned circuit to the tickling it receives from the incoming waves.

### What is Tuning?

Now, what exactly is a tuned circuit? Well, in the form in which we commonly use it in wireless it consists of two essential things, an inductance and a capacity, which means in plain English a coil and a condenser, the latter being usually of the variable capacity type.

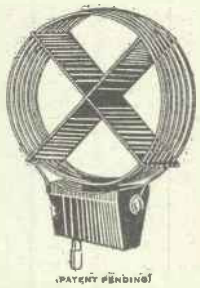
Here it is very helpful to use a water analogy to explain how a tuned circuit can be set into electrical oscillation, and the one which follows has been found to give a very nearly correct idea of what happens. No such analogy is really perfect, of course, but this one is sufficiently close to the original phenomenon to serve our purpose very well.

### A Series of Surges.

Imagine, then, two water tanks of equal size and standing at the same level, both being empty. A pipe joins the bottom of one to the bottom of the other, and in this there is a tap, so that water can be allowed to flow from one to the other at will. This system corresponds in its parts to our tuned circuit, as follows: The two empty tanks represent the fixed and moving plates of the variable condenser, and the pipe between is the equivalent of the tuning-coil. (Note that this pipe can be of various lengths.)

Now suppose that we fill one of the tanks and turn on the tap in the communicating pipe. Water will rush through into the empty tank and fill it up until the water stands at an equal height in both tanks. Now one might imagine that here matters would come to rest, but if the communicating pipe is a large-bore one the water will be flowing through with such a rush that its momentum will cause it to overshoot the point and overfill the second tank, whereupon the flow will be reversed and there will be another rush back into the first tank, again with a slight overshooting of the equilibrium point, and so on, with a gradually diminishing swing back and forth until the water gradually comes to rest.

Now, this is almost exactly what happens when the condenser in our tuned circuit is charged up by an incoming impulse. It discharges back and forth through the tuning coil in a series of surges, provided that the coil is a sufficiently low resistance one. If it is of very high resistance indeed the effect will be just as though our connecting pipe was of a very small diameter, so that the water just trickles through slowly and never gains sufficient momentum to surge back and forth.

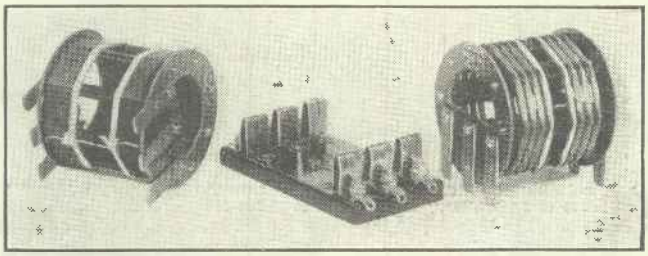



**The DX coil (John T. Nichols) is noteworthy on account of the special X type of former, which gives good air-spacing.**

Next, what about the wave-length to which our circuit is tuned? Here again the analogy will help, because the water system will "oscillate" at a definite frequency. If you think about it for a moment you will see that the speed of surging back and forth will depend on two things which closely correspond to two properties of the tuned circuit. These two things are the size of the tanks (the larger the amount of water the longer it will take to surge back and forth) and the length of the pipe (the longer it is the slower the surges.)

There are other factors governing the time period of the water system, but these are the only two we need for our analogy. The size of the tanks corresponds to the capacity of our condenser in the tuned circuit, and the length of the pipe to the length of the wire in the tuning coil—i.e. the number of turns, roughly speaking.

So now you see how you can tune to different waves by varying the capacity of your condenser, or your coil.



**Both the windings and the mounting of the A.N.P. coils present novel features, being designed by Metro-Vick Supplies, Ltd., to comply with arduous modern conditions. The coil, which covers 200/600 metres, is priced at 6s. 6d.**

# BORED BY THE B.B.C.

**Some pertinent points upon the popularity of present-day programmes.**

**By THE EDITOR.**

A CORRESPONDENT wrote in the "Evening Standard" the other day that he was badly bored by the B.B.C. Night after night, he said, he had crouched before the loud speaker in an attitude of humble expectation, but the programme plumbed the depths of dullness.

This correspondent gives an example of a programme he listened to not so long ago. At 6.20 he said there was a talk on the week's work in the garden; but he, in common with hosts of other Londoners, has no garden. He lives in a flat. He admits, however, that he is unselfishly prepared to sacrifice ten minutes to his fellow listeners who live in the great suburban spaces. But does it not occur to the B.B.C. that vast numbers of these suburban tillers live so far from the heart of London that they cannot possibly have reached their homes by 6.20, when the gardening talk begins?

### A Remedy.

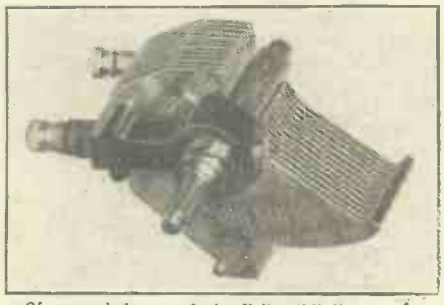
That is Point 1 scored by the correspondent in the "Evening Standard." It is a very good point indeed. A gardening talk at 6.20 must, under the conditions we live in to-day, prove of little value even to those who want to listen to it, for we all know how difficult it is to catch even an early train from the City when we live in the suburbs or even further out in the country.

At 6.30, according to the "Evening Standard" correspondent, there was another talk, this time about the weather and news. And then for fifteen minutes the B.B.C. Dance Orchestra interposed. After that, just for a change, there was a talk, the subject being "Healing Waters." (So far it would certainly seem that the correspondent in the "Evening Standard" had picked on a very bad evening!)

Plug-in coils with a centre tapping are very useful for increasing selectivity. The example shown above is an "Atlas," and to the left is one of this firm's fixed condensers.

To continue, at 7.15 there was an item entitled "The Foundations of Music," a continuation of a series of Symphony selections from the keyboard works of Bach. The bored gentleman whose selected programme I am dealing with points out that, as an ordinary intelligent middle-brow representative of the majority of 2 L O's listeners, he demands to know why he should be expected to concentrate his weary mind night after night on the tortuous trills of the most scholarly of all composers. The answer to this is that he needn't; he can switch off. But out of the two million odd listeners in this country it is quite on the cards that a reasonable proportion of them that particular night found some pleasure in listening to the "Foundations of Music."

At 7.25 he reports that Savoy Hill was "well into its stride." It was, in fact, ready with another talk—this time on the "Meaning of Good." The writer in the "Evening Standard" wished it had been the "Meaning of Good Programmes."



Of unusual shape and simplicity, this "Formo" variable condenser retails at 5s.

### "Variety."

The next section of the programme, he reports, was daringly headed "Variety," and for a moment he almost believed it. But after that, however, the announcer stated that there would be an interlude of syncopated comedy by two female singers. These two ladies began with a grave ditty called "We're two babes in a wood." And, free of all charge, the "Evening Standard" correspondent suggests to future syncopating broadcasters that if there are songs like this one in their repertoires they should forget them. Well, that, of course, is a matter of taste. Some people like inane tosh just as some people say nothing is musical unless it has a negro rhythm. But how the B.B.C. can be expected to arbitrate on a question like this we fail to see.

Later on, our critic reports, when he switched on the set again he heard a refreshing talk in full swing. It was entitled "How to Appreciate Pictures—Part 1," and the lecturer was a learned Oxford professor. To quote from the article: "For some minutes the professor told us the meaning of appreciation. He said in order to appreciate a thing one did not necessarily have to enjoy it. So I appreciated his lecture."

At this point we extend our hearty sympathy. Really, we begin to feel almost sorry for the gentleman who was badly bored by the B.B.C. However, at 9.35 he reports that a Symphony Concert began with some drowsy piano variations by César Franck, played by Miss Myra Hess. But here our critic makes a very bad break. He could not have listened to these piano variations, for they are the very opposite of drowsy. In fact, the main theme is very much like that once-popular ditty "Ginger, get your hair cut!"

The critic concludes as follows:

"I have described in detail the sort of entertainment endured by the B.B.C.'s badly bored customers, firmly hoping that something can be done about it. . . . Unless something can be done you will hear of my wireless set next in the 'articles for sale' column."

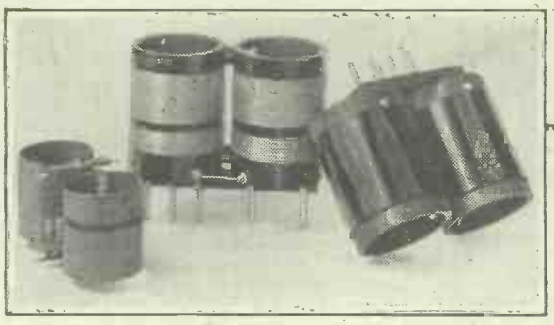
### A Cochran Wanted.

Well, that is a fair specimen of some of the broadcasting criticisms which have been appearing in the newspapers lately. There is undoubtedly a case for the gentlemen who write to the Press in this strain, and we don't wish to give the impression that we are standing up on our hind legs blindly defending the B.B.C.'s programme policy. We readily admit that there is a lot of truth in the "Evening Standard" correspondent's remarks. But it is difficult to suggest a really efficacious remedy. Possibly the best remedy would be to get on the B.B.C. Programme Board some gentlemen who are not quite so out of touch with current forms of entertainment.

It is admitted that Mr. C. B. Cochran, for example, has a world-wide reputation as a psychologist of public entertainment. Not only can Mr. Cochran entertain, but he can elevate, for admittedly he has a real sense of artistic judgment; and if the B.B.C. would only investigate his *modus operandi* they would see that they could conform to their ideals by giving the public a programme which was not only meritorious from the artistic point of view and even from the educational point of view, but which would at the same time prove of real entertainment value.

So far, the B.B.C. have only tentatively made advances in this direction by enlisting the temporary aid of Mr. Andre Charlot. But, excellent as Mr. Andre Charlot is on the legitimate stage, it must be admitted that his broadcasting efforts have been very far from successful. We hope, however, that the B.B.C. will not be discouraged. Mr. C. B. Cochran is undoubtedly the best example of what can be done in the way of public entertainment on a good, decent-class level, offering at the same time entertainment which is educational, artistic, and, above all, entertaining.

The famous "J.B." condensers are priced at 16s. 6d. for the ·0005-mfd. size, and at 15s. 6d. for the ·00035-mfd. size.



# H.F. TRANSFORMER TROUBLES

**A practical article dealing with the puzzling faults which arise when an H.F. Transformer fails to function normally.**

**By P. R. BIRD.**

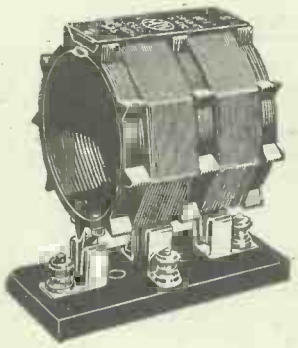
COMPARED with almost any other wireless component the high-frequency transformer is a trouble-free and blameless piece of apparatus. Being in essentials merely several coils of wire properly spaced and brought out to pins for connection to the rest of the set, it can hardly fail to work provided it is of suitable type. Yet for all its simplicity the work it carries out is of a highly complicated character, so that it is quite possible for a small fault in an H.F. transformer to make a big difference to the working of a set.

H.F. transformer troubles are best dealt with according to the way in which they affect reception. It is not very often that a fault in a transformer completely stops reception, but it will very often make a stable set unstable, give rise to flat tuning, or in other similar ways make the set misbehave. A good instance of the type of fault which a faulty H.F. transformer will cause is the one in which the symptoms are that the set will not neutralise. Generally, in such a case, the set does not fail to work altogether, but it works in an abnormal way, with peculiar symptoms.

### Why Won't It Neutralise ?

In the ordinary course of events, a receiver which contains an H.F. stage will give pretty good results, even if the neutralising is not properly carried out. Failure to neutralise probably means that when the circuits are exactly in tune with one another the set is prone to oscillate at that point ; and when the condenser neutralising condenser is readjusted to its correct position this instability disappears and the set becomes perfectly easy to handle.

Not infrequently, however, one comes across a set which simply will not neutralise properly. Adjustment of the neutralising condenser results in the most violent yells and whistles imaginable.



The well-known "Dimic" air-spaced coils (L. McMichael, Ltd.), are excellent for H.F. intervalve coupling.

Usually there is one pretty well defined point where this tendency to instability is at a minimum, but if the neutralising condenser is moved away from that point violent oscillation sets in and frequently spoils reception. In other words the neutralising condenser appears to be acting rather like a reaction condenser, except for the fact that one cannot reduce reaction sufficiently by it, and the reaction effects are altogether too lively.

Such symptoms are very often due to the fact that the connections to the neutralising windings have been reversed. If the coil is a home-made one, matters can soon be remedied by undoing it and changing over the two ends of the neutralising winding.

This is the Keystone H.F. Unit (Peto-Scott Ltd.) which, priced at 10s. 6d. affords a complete stage of H.F. coupling. Being very compact it is especially useful for portables and two types are available—No.1 for first H.F. valve and No.2 for the second stage.

Another puzzling fault is the appearance of unusually flat tuning. Generally, the aerial condenser appears to tune quite well, but the tuning on the high-frequency condenser is inexplicably broad and instead of stations being confined to one or two degrees on the dial they are spread out over quite a wide area.

### When the N.C. Goes On Strike.

Very often in such cases the set appears to neutralise fairly well at one point, but not over the whole range. (Flat tuning of this type very often occurs where a home-made H.F. transformer is employed, or it may be due to the use of a very high impedance R.C. valve.)

Such symptoms generally arise because the primary winding has too many turns for its particular valve, so in all such cases a reduction in the number of turns of the primary winding should be tried. All that is necessary is to take off a few turns at a time, say, half a dozen, until the desired degree of selectivity has been obtained.

Another rather puzzling fault that high-frequency amplifying sets are prone to develop is a general falling off in the sharpness and degree of high-frequency amplification. When the set is neutralised in an attempt to restore good amplification, it is discovered that adjustment of the neutralising condenser makes no difference whatever.

In such cases, whatever the position of the vanes—whether all in or all out—no difference to results is apparent. Very often the set is unduly lively when the H.F. circuits are in tune, and, in fact, it may oscillate badly at this point.

If you are experiencing this type of trouble you will probably find it is due to a break in the neutralising winding. Either the wire itself has broken, or is making unsatisfactory connection to the pin of the transformer, or else the pin of the transformer which carries the neutralising winding is failing to make proper contact with the rest of the set. Consequently, the set is behaving as though it were not neutralised at all, and when the connections are restored its behaviour should become the normal one of a properly neutralised receiver.

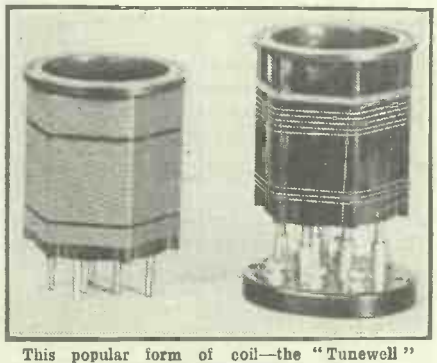
### Weak Signals and Choking.

Another peculiar fault worth mentioning has a similar cause, but quite different effect. In this case the main trouble is weak signals.

Probably the set has no tendency to oscillate at all, and it may even show signs of choking. In this latter condition, reception, which is not too good to start, seems to fade away periodically, the stations getting weaker and weaker until they disappear altogether.

Generally, one finds that if one of the wires joining the grid leak or condenser is touched the set shows signs of life again, only to "pop off" again at the shortest notice. The word "choking" seems exactly to describe this condition, for the effect is as though the set were trying to work all right, but the signals are continually choked back and suffocated.

Very often this state of affairs can be traced to the fact that there is a break in the secondary winding of the H.F. transformer.



This popular form of coil—the "Tunewell" (Turner & Co.)—is now available for all types of H.F. Transformer.

Possibly the wire is continuous throughout but is not making proper contact to one of the pins, or one of the pins is not making proper contact to its corresponding socket to which the rest of the circuit is wired.

When really satisfactory continuity is restored the set becomes normal.

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

# "FIXED" CONDENSERS

**CONDENSER LOSSES — "FIXING" THE CONDENSER — FILTERS — LARGER FILTER CAPACITY NEEDED—NO NEED FOR CHOKES?**

### "Fixed" Condensers.

IS a fixed condenser really fixed? You may be surprised to know that in many cases "fixed" condensers, of inferior make or defective construction, may be very far from fixed.

The ordinary so-called "fixed" condenser consists, as you know, of alternate layers of a conductor, such as tin-foil or copper-foil, and an insulator, such as mica or waxed paper. If the assemblage of conducting and insulating sheets is not pressed thoroughly and firmly together so as to form a solid block, the elements will vibrate in unison with an alternating voltage which is applied to the condenser.

It is true that the actual movements of the elements—or the amplitude of their vibration, as we may say—will generally be exceedingly small, but then you have to bear in mind that the total distance between the elements is also extremely small and, therefore, the percentage variation in the distance between the plates may be quite considerable. This has a corresponding effect upon the capacity, so that when the condenser is subjected to alternating voltage the capacity may be fluctuating synchronously to a considerable and quite unexpected extent.

### Condenser Losses.

Furthermore, the movement of the elements of the condenser results in a good deal of wastage of power, especially at higher frequencies, and the losses due to this cause may be a considerable percentage of the total power.

As a matter of fact, with a very loose condenser you can sometimes hear the plates vibrating, the result being a "hum" similar to that which is often heard from a transformer; in the cases of the condenser and the transformer the hum is due to precisely similar causes.

### "Fixing" the Condenser.

In order to do away with this defect in so-called fixed condensers special methods are now used by the leading condenser manufacturers to ensure that the sheets of metal and insulator shall be in thorough mechanical contact. In the Dubilier Laboratories, for instance, a pressure of several thousand pounds per square inch is used, by which the metallic electrode becomes practically fused on to the mica dielectric. So securely does the foil adhere to the mica that it can only be removed by scraping.

When a condenser is made in this way it is obviously impossible for the elements to vibrate, and therefore power losses (from this cause) are eliminated.

### Filters.

Whilst on the subject of condensers I should like to refer to the type of condensers which are used as filters in high-tension eliminators.

It is commonly realised that it is not sufficient merely for a high-tension eliminator to supply the necessary amount of plate current at the required voltage. This may render the eliminator suitable for use with certain types of set, but it does not necessarily mean that it will operate effectively with all types. When considering the universal applicability of the eliminator, the question of its internal impedance becomes important. You know that if you use an unsatisfactory high-tension battery, in which the internal resistance has, for various causes, increased to a large value, you may get "howling" with certain types of circuit. For somewhat similar reasons the eliminator may produce a low-frequency oscillation in certain circuits, this effect being popularly known as "motor-boating."

## THAT THIRSTY EARTH!

During spells of dry weather the soil round the earth-plate is apt to lose its moisture and develop a high resistance. So if your results have recently been below par, try the effect of a little liquid refreshment in the form of a few jugfuls of water.

### Larger Filter Capacity Needed.

The way to overcome motor-boating when an eliminator is used for supplying the high-tension current is to increase the filter capacity of the eliminator. It can be shown that the use of a resistance (impedance) common to all circuits is liable to set up "motor-boating," and also that if the resistance (including the taps, when a voltage divider is used) is shunted by a large capacity—especially the lower part of the voltage between the high-tension negative and, say, 100 volts positive—the effect of the impedance is overcome and the motor-boating is done away with.

The usual method of smoothing out the rectified alternating current in a high-tension eliminator is to employ both chokes and condensers, and, at first sight, you might think that these were equally important. It has been shown, however, that if a sufficient value of capacity is used, it is possible to do away with the chokes in the usual filter system altogether.

### No Need for Chokes?

The output from the rectifier is never pure D.C., and the function of the filter system is to pass the D.C. and to filter out A.C., or, in effect, to maintain the voltage level of the D.C. at as constant a value as possible.

Experiments have shown that a capacity value of about 60 microfarads across the output from a rectifier valve, from the high-tension negative to the maximum high-tension positive, was practically equivalent to the conventional type of double-section choke-condenser filter. When fairly high-capacity condensers were shunted across the various taps of the voltage-divider resistance the eliminator worked perfectly, although it was entirely without any chokes.

(*Continued on page* 708.)

NEWS FROM SAVOY HILL. FROM OUR OWN CORRESPONDENTS.

# BRITISH WAVE-BAND ENDANGERED?

**IS THE B.B.C. ABOVE ADVICE?—STUNTS: A CRYING NEED—B.B.C. PLEASES SCOTLAND.**

### The British Wave-band Endangered?

IT is confidently stated in Paris that the B.B.C. has agreed to count the 5 X X long-wave channel as one of the nine channels allotted to Britain for broadcasting. If this is true it means a complete revision of what is left of the old Regional Scheme. An uncomfortable feature of the incident is that the B.B.C. will neither contradict nor confirm the rumour, contenting itself with the now well-established attitude of always sitting on the fence, ready to make the best of all possible worlds.

It is nearly unthinkable that Captain Eckersley would let down his own show, whatever some of the internationalists at Savoy Hill might attempt against the interests of British broadcasting. But the point wants watching. Incidentally, some more of the activities of the Union Internationale de Radiophonie at Geneva merit watching.

These are too darkly guarded from the light of wholesome publicity. For instance, it is known that they are concerned with many matters outside their legitimate territory of distributing and safeguarding wave-lengths.

Amongst other new activities it is stated that they are busy on plans to exploit monopolies in programme information to the disadvantage of the newspaper and technical press. This is a dangerous tendency "in restraint of fair trade." It looks almost as if the B.B.C. is imparting some of its acquisitive qualities to the broadcasters of the Continent.

(*Continued on page* 706.)

# CONDENSERS FOR YOUR SET

**A straightforward chat about "variables" for tuning and reaction control, in which are many useful hints concerning values and the reasons why you should confine your choice to certain definite "maximums."**

**BY G. V. DOWDING, Grad.I.E.E.**

PRACTICALLY every modern radio receiver uses at least one variable condenser for tuning purposes and another for reaction control. And for the ordinary broadcast band of wave-lengths the tuning variable generally has a maximum capacity of ·0005 mfd. It would be possible to extend the range of tuning upwards by using a condenser having a higher maximun value, but a point worth noting is that for best results the inductance-capacity ratio should be as great as possible; that is to say a minimum added capacity is the ideal condition.

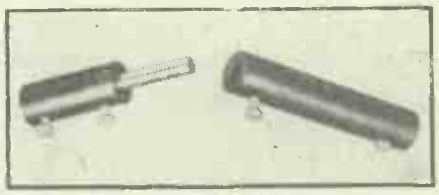
But should you use a variable tuning condenser of a low maximum capacity, then the range of adjustment is going to be small and the stations it is possible to tune in without coil changing may be fewer in number.

### Mind Your Maximums.

The ·0005 mfd. I have just mentioned is the sort of compromise we have arrived at after some years of varying from one point to another. But you should always try to keep your stations well down the scale.

If you find that you receive nothing over the lower dial readings and that 5 G B, for instance, comes in when the variable is practically "all in," a slightly larger coil is indicated and might prove useful.

The lower the band of wave-lengths the greater the number of stations you will be able to squeeze in without coil changing.

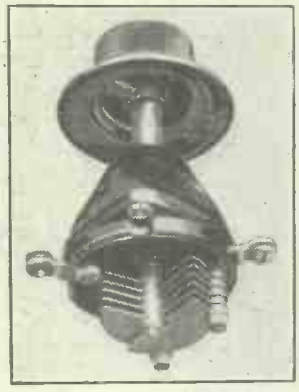


A useful coupler which enables variables to be "ganged," recently produced by the Ormond people.

Let me take for an example, in order to illustrate this, the single tuning circuit arrangement such as exists in an ordinary two- or three-valve receiver employing no high-frequency amplification.

A ·0005-mfd. variable condenser could be used for practically any wave-band. On the higher wave-lengths, such as those of 5 X X, Hilversum, and so on, only three or four stations will be tunable on any one coil, but down on fairly short wave-lengths, that is among the tens of metres, dozens of stations might be heard, one for every microscopic adjustment of the dial.

But the inductance-capacity ratio would be all wrong. There would be far too much capacity and far too little inductance. Also, for easy tuning, it is not advisable to have the stations crowded up against each other all round the dial. There is also another point, and that is that the minimum capacity of the condenser might militate against the tuning-in at all of some of the stations.



This is a small variable condenser (maximum capacity ·000038 mfds.) used for neutralising, reaction control in special circuits, etc. It costs 4s. and it is an Igranic production.

You see, it is wrong to talk about a variable condenser as having a capacity range of from zero to something. No variable condenser yet made can provide zero capacity. The average variable has a minimum capacity of about a tenth of its maximum. Thus the minimum of a ·0005 mfd. might be somewhere about ·00005 mfd.

·0002 mfd. is by no means too small a maximum capacity for a variable that is required for use in short-wave reception, but if the variable has an efficient slow-motion control or a vernier dial is available in order that more or less microscopic adjustment of the vanes can be made, then a larger maximum capacity can be used in order to increase the range of tuning. Under these conditions a value of ·00025 mfd. or ·0003 mfd. can be recommended.

### Reaction Control Variables.

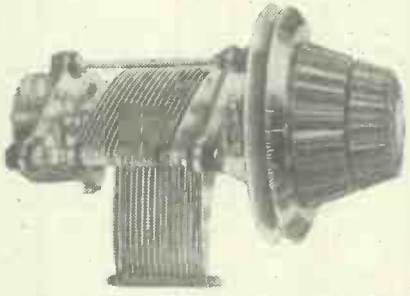
Regarding reaction control variable condensers, here again it is advisable within limits to keep down the maximum. Generally speaking the smaller the reaction variable the broader and smoother will be the reaction adjustment. But if the condenser is too small it will be difficult to confine the control to its range of movement. That is to say, it will necessitate a critical adjustment of other conditions in order to enable the condenser to control reaction over the limited capacity range the small condenser possesses.

The circuit may become a little over-vigorous and you will find it impossible to stop it oscillating, or it may go flat owing to declining H.T. or L.T. and the advantages of reaction become lost. A condenser having a larger maximum would provide greater latitude, or, in other words, introduce a margin of safety on either side. I, personally, prefer a ·0003 mfd. for reaction control, although in special designs ·00015 or even less can be quite sufficient.

And talking about special cases, I must not forget to mention that the foregoing remarks are intended only as a general guide. If you are building a receiver to a special design then you should adhere to the specification and, whatever anybody else says, do not depart from the various recommended values.

### Stick to Specifications.

If you depart from the stipulated tuning variable values then you will throw out the tuning ranges, but it is even more important to stick to the specified reaction variable. Supposing you were to use a ·0005 mfd.



One of the main requirements in a variable condenser is a smooth action. This Ediswan Precision Geared Condenser (the ·0005-mfd. model costs 27s. 6d.) has ball bearings and an excellent gearing.

instead of a specified ·00005 mfd. say. You might quite conceivably find that the receiver would not stop oscillating even when the variable was at its minimum adjustment. You see, although there might be a 0 on the dial as I have already said, a variable cannot be turned down to zero capacity. If it is not a particularly well-designed variable its minimum capacity might be more than the maximum of the component value advised.

In conclusion, you will find it to your advantage to buy variables of branded British make.

# FROM THE TECHNICAL EDITOR'S NOTE BOOK


### A Good Idea Spoilt.

I AM one of the 60 per cent of mains users who are, at home, blessed with D.C. I say "blessed" but, although it is a convenient supply for very many things, it has not the adaptability of A.C. And there is a great number of useful arrangements which I am debarred from using. For instance, A.C. valves cannot figure in my home set, nor can I use one of those handy trickle chargers of the automatic type.

And talking about trickle chargers, one of the most ingenious which have come to my notice is the "Runbaken" Auto-

This is the Runbaken Trickle Charger.

matic Charger due to the Runbaken Magneto Company. Once connected between the set, the mains, the accumulator and an H.T. unit, it quite automatically carries on with its work. You merely switch on and off your filament switch on the set in the usual way.

A relay in the charger arranges that the H.T. is switched off and the charging commenced when the filaments of the valves in the set are turned out, and that the charging stops and the H.T. is switched on when the filament switch is closed. The charger will accommodate a 2-, 4-, or 6-volt battery, and it employs a Westinghouse Dry Rectifier.

Also, it is a compact and neatly cased unit. But I regret to say that neither of the two samples we have tested operated properly; in both the relay was found to be unsatisfactory. And it should be noted that this cannot be adjusted without pulling the charger to pieces. In any case, it is not an operation that the average constructor could or would like to tackle.

The first sample "packed up" almost immediately, while after fourteen hours' use the relay of the other started to chatter badly, then went out of adjustment. There are one or two other little points which rather mar this Runbaken Trickle Charger; for instance, the connecting leads are far too short to make it easy to dispose of the unit in a tidy manner. It is to be trusted the manufacturers will remedy these faults, for the principle of the charger is excellent.

### A Grid Leak Clip.

Messrs. Brown Bros. recently sent me a neat little grid leak clip. It is sold under the well-known name "Duco." At each end of the substantial ebonite base, in the centre of which is a hole for baseboard mounting, there are two stout spring clips which securely grip the leak. This is a very good scheme and makes for good contact. I much prefer it to the end-on contact which at one time appeared to be an almost universal practice. The Duco product is fitted with neat terminals and soldering tags and retails at the very moderate price of 6d.

### New Fixed Condensers.

Messrs. Burne-Jones & Co., Ltd., recently made their debut as manufacturers of fixed condensers, and these new "Magnum" products have features which I am sure will ensure them considerable popularity. Not the least important is that their capacities are machine-engraved in bold figures on their sides. Therefore, when you screw a Magnum fixed condenser down on to the baseboard of a set, you do not lose sight of its capacity. I have often wondered why it was that some manufacturers would insist on labelling their condensers on their bases, so that once built into a set the figures were hidden for ever.

Also, no doubt many of you will remember the reprehensible earlier practice of using paper labels which inevitably came off. A second good feature of the Magnum fixed condenser is that the hexagonal nuts which are used are provided with slots, so that a screw-driver can be used for tightening them up. The prices of these Magnum fixed condensers range from 1s. 6d. for capacities between ·0001 and ·001 mfds. up to 2s. 6d. for a ·01 mfd. Their capacities are guaranteed to within 10 per cent.

### Lissen Variable Condenser.

I had often wondered why Messrs. Lissen did not include variable condensers in their otherwise quite comprehensive and I must add, attractively-priced and attractively-produced range of radio components. I do not even now really know the reason for this omission, although it was undoubtedly a good one; but the gap has at last been filled. We now have a Lissen variable condenser.

Probably a large amount of experimental work had to be carried out, for Lissens do not do things by half measures. They could at any time have set two or three dozen mechanics on the job of fitting together vanes and frames *à la* conventional unbranded variable; but this sort of procedure would not appeal to a firm of the calibre of Lissen, Ltd. Having determined to make variable condensers they would enter the field in a "big" way and, as will no doubt now happen, sprinkle the Kingdom with well-designed, well-made and *cheap* variables; products of a large and powerful plant capable of dealing with all demands.

I received my first Lissen variable condenser about two weeks ago, at the same time, as a matter of fact, as I received a Lissenola portable gramophone. Here, I really must interpolate, is about the best value for money I have ever come across: 67s. 6d. for a portable gramophone having a Garrard motor working with astonishing

**Traders and manufacturers are invited to submit radio sets, components and accessories to the "P.W." Technical Department for test. All tests are carried out, with strict impartiality, under the personal supervision of the Technical Editor, and readers are asked to note that this weekly feature is intended as a reliable and unbiased guide as to what to buy and what to avoid.**

silence appeals to me as a real bargain. How the Lissen people do these things I cannot guess. I will have more to say about this instrument later on.

However, regarding the Lissen variable, this is built throughout of bright metal, nicely moulded and cut and cleanly finished It has corrected vanes, and its design is thoroughly modern. The movement is excellent and has just that velvety action so necessary for the close tuning which real D X demands.

Another very attractive feature is that it is provided with "feet" enabling it to be screwed to a baseboard instead of or as well as to a panel. Also its spindle is

Note the spindle extension and the mounting "feet" on the new Lissen Variable.

so designed that by the aid of connecting sleeves, which are to be available, it can be ganged with another Lissen variable in a simple manner.

Our friends, Lissen, Ltd., will let you know all about their variable (price and so on) in their advertisements. They probably will already have done this by the time these words appear in print. I consider it a nice piece of work, and anticipate that the constructor who uses one in his set will agree with me.

# The "G.P.K." AMPLIFIER

**This inexpensive but highly efficient L.F. unit can be used with any set in order to produce quality loud-speaker results. It is particularly suitable for use with the "G.P.K." Two, described in our July 7th issue.**

**By the "P.W." Research and Construction Department.**

THIS two-valve low-frequency amplifier is primarily designed for use with The "G.P.K." Two, described in "P.W." a fortnight ago. The depth of the baseboard has been chosen to match up with that used in the receiver mentioned, but, of course, the amplifier can be used with any valve set It is really a perfectly straightforward unit of conventional type, and the circuit employed utilises a stage of R.C. amplification followed by a low-frequency transformer.

**COMPONENTS REQUIRED.**

- 1 Panel, 6 in. × 7 in. × ¼ in. or ³⁄₁₆ in. (Any good branded ebonite).
- 1 Cabinet to fit, with baseboard about 12 in. deep. (Note.—This is a size which has been used several times in the past for H.T. battery eliminators, and should be available from most cabinet makers.)
- 1 Single filament control jack (Lotus No. 4) and 'phone plug.
- 1 Volume control (This is a very high-resistance potentiometer. The G.E.C. 1-meg. pattern was used in the original).
- 2 Sprung valve holders (Lotus in original. Any standard make—Benjamin, Bowyer-Lowe, B.T.H., Burndept, Burne-Jones, Igranic, Marconiphone, W.B., etc.).
- 1 L.F. transformer of low ratio. (Ferranti A.F.3 in original. Any good make).
- 1 ·01-mfd. fixed condenser (must be mica type. Clarke, Dubilier, Igranic, Lissen, Mullard, T.C.C., etc.).
- 1 2-mfd. Mansbridge type condenser (Dubilier, Ferranti, Hydra, Igranic, Lissen, Mullard, T.C.C., etc.).
- 1 250,000-ohm anode resistance and base (R.I.-Varley in original. Any good make).
- 1 2-meg. grid leak and holder (Dubilier, Igranic, Lissen, Mullard, etc.).
- 1 Terminal strip, 6 in. × 2 in. × ¼ in., and 5 terminals (Belling-Lee, Eelex, Igranic, etc.).
- 3 Plugs for G.B., flex, wire for connections, etc.

The value of the anode resistance which, when the amplifying unit is connected to the set, is in series with the plate of the detector valve is 250,000 ohms, and should not exceed this figure. If a higher resistance is employed it will probably be found impossible to obtain an adequate degree of reaction, and naturally the receiver in these circumstances will not be fully sensitive. The coupling condenser is a ·01 mica and this value in conjunction with a 2-megohm grid resistance will give practically all the musical frequencies down to sixty cycles. It is important to use a mica condenser because the slightest leak will permit a positive bias to be impressed on the grid of the first L.F. valve and distortion may occur. Paper dielectric condensers should not be used.

**Control of Volume.**

Any good L.F. transformer of moderate price can be employed and the ratio chosen should not exceed four to one. That actually used in the unit is a Ferranti A.F.3, but, of course, any transformer of equivalent type which will fit the space available can be substituted.

Across the secondary terminals of the low-frequency transformer is connected a high-resistance, non-inductive potentiometer. This is for purposes of volume control. The extreme ends of the resistance strip are connected one to each secondary terminal on the transformer, and the moving-arm contact is joined to the grid of the last valve. In this way a perfect control of volume can be obtained. It is essential for this resistance to have a high value, of not less than 500,000 ohms. The G.E.C. potentiometer used has a value of 1 megohm. If an ordinary potentiometer such as the type commonly used for stabilising sets of less recent design is employed, the results obtained from the unit will be nil, because this will be equivalent to short-circuiting the secondary terminals, so please remember

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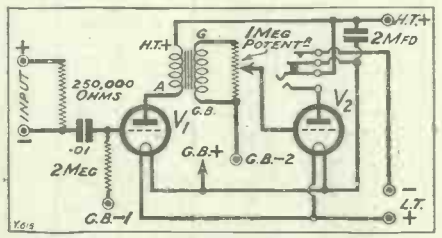
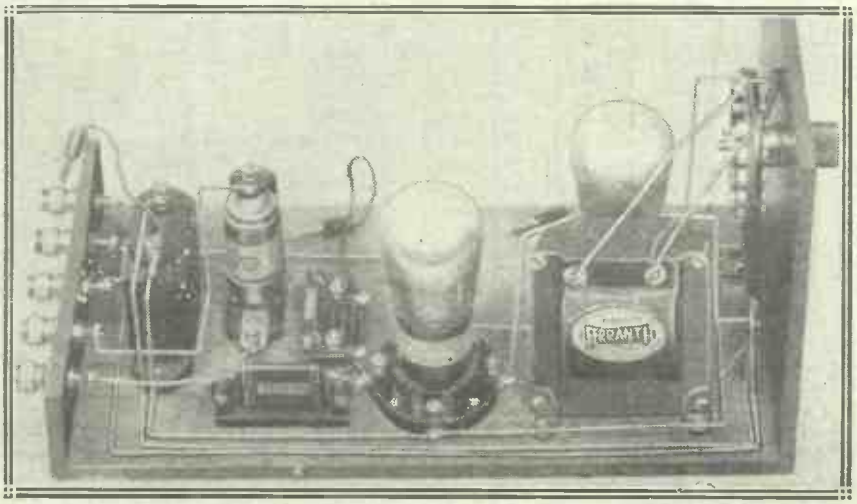



The circuit is that very popular and efficient "Resistance-Transformer" arrangement.




You will see that the amplifier is quite a straightforward, simple assembly, and that the parts needed are few in number.

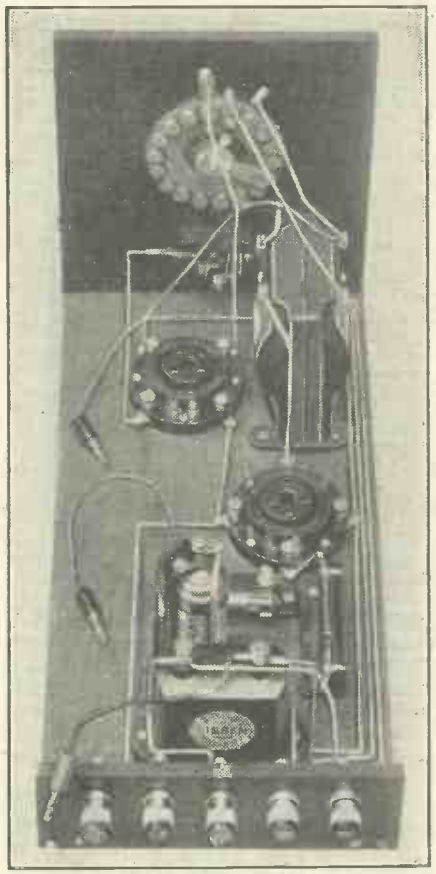
# THE "G.P.K." AMPLIFIER.

*(Continued from previous page.)*

to purchase a component of the correct type.

Since the unit is intended to be employed with loud speakers of the ordinary type, such as medium-resistance cones, or instruments of the horn type, it has not been considered necessary to use an output filter circuit, although, of course, one can always be placed between the loud speaker and the amplifier if desired.

The loud speaker is plugged into the unit by the insertion of a telephone plug into the jack, the action of switching in the loud speaker automatically lighting the filaments of the L.F. valves. The jack actually used for this work is a Lotus No. 4. and an alternative is the Igranic Pacent No. P.65.



It will help you during the wiring if you compare the above photo with the wiring diagram.

### Constructional Details.

Now for the construction of the unit. Few words need be said about this, for the layout is so very simple. The panel will need only two holes, namely, one for the high-resistance potentiometer, and the other for the jack. The components should be laid out on the baseboard in accordance with the back-of-panel diagram and space should be allowed for the grid-bias battery. In the actual unit described, there is room for a long 18-volt strip or for two 9-volt batteries connected in series. This is adequate for the super-power type of valve operated on 120 volts H.T. The wiring is very simple, but it is desirable to use some insulated form of connecting leads such as No. 18 or 16 bare tinned copper covered with Systoflex tubing.

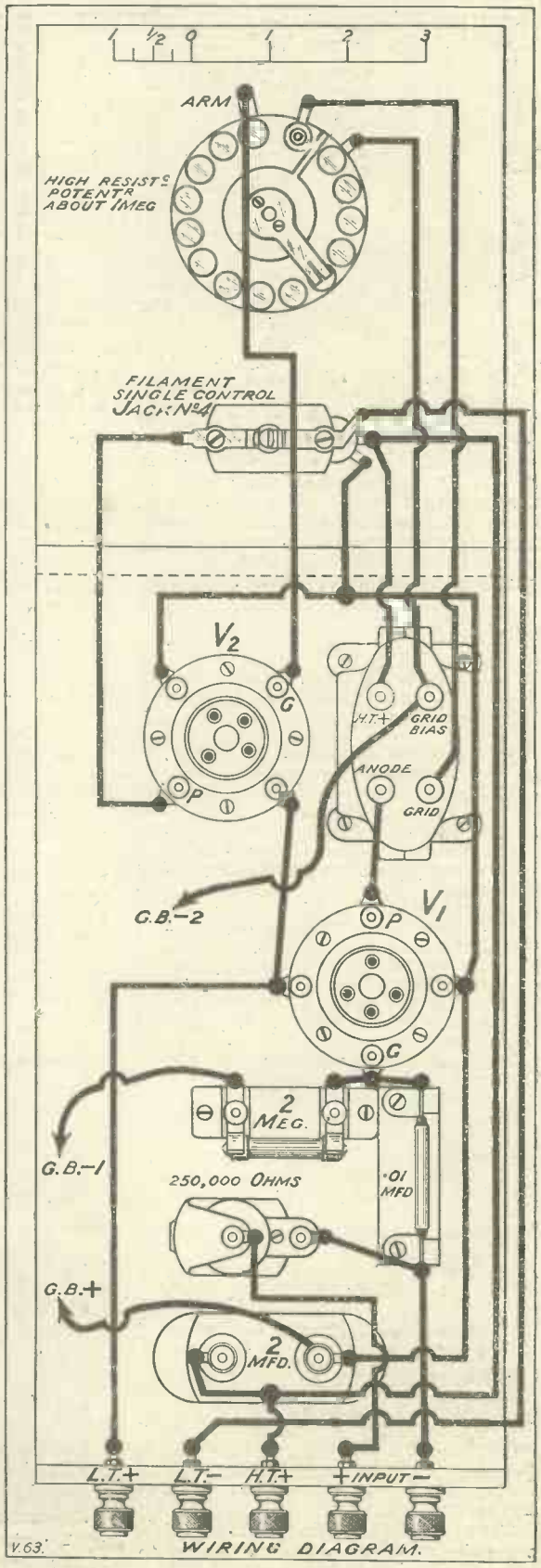
In the standard cabinet purchased, it is quite possible that the slots which are cut at the back for the terminal strip will conform to the modern standard, and will, therefore, be two inches high and two inches shorter than the width of the cabinet. This, however, does not allow enough room with so narrow a cabinet and readers will note that in this particular case the terminal strip has been taken right across the baseboard. The remedy in a standard cabinet is to take a keyhole saw and cut out the terminal slot to the correct width. This is quite a simple procedure. The connections to the "G.P.K." Two, or, in fact, to any conventional two-valve set, are as follow: Join input positive and input negative to the existing telephone terminals on the set (input positive preferably being connected to the telephone terminal which goes to H.T. positive). Join L.T. positive and L.T. negative to their respective terminals on the L.T. accumulator or to L.T. positive and negative on the set. H.T. positive on the amplifier unit will go to 120-volt tapping on the H.T. battery. There is no H.T. negative, because this is not necessary when a common H.T. battery is used. It must be remembered that there is already one H.T. negative connection from the set.

### Grid Bias.

There are three flexible connections terminating in wander plugs inside the unit. These are for G.B.—1, G.B.—2, and G.B.+. G.B.+ is, of course, inserted in the positive socket of the grid-bias battery, whilst the G.B.—1 plug, which goes to one side of the 2-megohm grid resistance is inserted in a tapping to suit the type of valve chosen. With a valve of the H.F. type, this will be at about 3 volts. G.B.—2 applies the correct grid bias to the last valve. Here, again, the actual grid bias required will depend upon the type of valve used, and will vary between 7½ and 18 volts. It is best to follow the makers' instructions on this particular point. These details are always given on the pamphlet supplied with the valve.

In the case of the first low-frequency valve, it is rather difficult to recommend any special type, because this will, to a large extent, depend upon the design of the transformer, and will therefore vary with different makes of instrument. In general, it is fairly safe to purchase a valve having an impedance of between 16,000 and 20,000 ohms, with a magnification of about fifteen, or slightly more, if possible. This will give

*(Continued on page 697.)*



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|---|---|---|
| 60 volts | (reads 66) | 7/11 |
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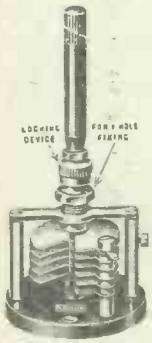
# COILS AND CONDENSERS

**Invented by Sir Oliver Lodge, the tuning coil has advanced in design almost beyond recognition until, at the present moment, it is a truly remarkable piece of apparatus and may be aptly described as the heart of every radio receiver. This article gives full details concerning the uses of coils and condensers for all radio purposes—a comprehensive guide for the set-builder that will be found invaluable to all readers.**

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

IN wireless, as in every other human activity, there are fashions, periodic changes, and cycles of popularity, some of which have appeared very puzzling to the uninitiated. For example, in pre-broadcasting and, indeed, pre-valve days, the amateur's tuning coils were, invariably, carefully wound single-layer affairs, many of which would pass with honours in a modern low-loss competition.




One of the smallest variable condensers in use in modern sets is the neutralising type, which often has a maximum of only 00005 mfd. or thereabouts. The one illustrated is the "Magnum" baseboard type, price 5s.

Following this came the many varieties of honeycomb and multi-layer windings, designed for rapid interchangeability and compactness. Seeing that in those days short waves were unknown and the experimenter ranged over all wave-lengths from about three hundred to twenty-five thousand these coils naturally became very popular.

The same form of construction retained its popularity when the band of wave-lengths to which it was desired to tune narrowed considerably, and as many of the compact interchangeable coils were very inefficient affairs, experiments and researches were undertaken with the idea of improving them. This is why the pendulum has swung again and we use carefully wound single-layer coils once more!

At the same time it must not be imagined that a multi-layer coil of the plug-in type is necessarily inefficient. Most of the modern makes are exceedingly good, and in many circuits the results obtained with them are indistinguishable from those with the most modern low-loss variety. Indeed, a careful and experienced experimenter chooses his coils according to the purpose for which they are required, knowing full well that coils perfectly good in one form of circuit may be quite hopeless in another, while losses which would seriously affect the working of one type of receiver are negligible in another owing to the fact that they are masked by losses of much greater magnitude.

### Better Coils.

Almost all the coils now used for the 250 to 600-metre band are decidedly better than those on sale two or three years ago, but, unfortunately, we have still many very inefficient coils for the 5 X X band. In order to obtain compactness, together with a single-layer winding, the standard six-pin coil has to use extremely fine wire, and personally I much prefer the type of construction where compactness is obtained by sectional windings, and a much heavier gauge of wire can therefore be employed.

Perhaps the biggest progress of all during the last year or two has been in the design and construction of high-frequency transformers, which are now vastly superior to those generally available two years ago. A good specimen of a modern high-frequency transformer with well-designed windings will give, with suitable valves, an excellent step-up together with exceedingly good selectivity.

It is about three years since there were made generally available really sound low-loss condensers. The first variable condensers available to the experimenter were crudely made by assembling zinc plates and brass washers, and mounting them on end plates of material that resembled ebonite only in its black colour and certainly in none of its electrical characteristics!


There are many points in a receiver where mica dielectric condensers should be used in preference to the paper type,—e.g., for the grid condensers in the L.F. circuits. The one illustrated is a large capacity specimen of the T.C.C. range.

Following this came some even worse types, where metal end plates were used, and wretched little washers of alleged insulating material separating the end plates (which were joined to the fixed plates) and the spindle joined to the moving plates. The losses set up either in poor insulating material of the end plates or the insulating washers just referred to, and the high resistance introduced by the bad contacts between dirty washers and the condenser

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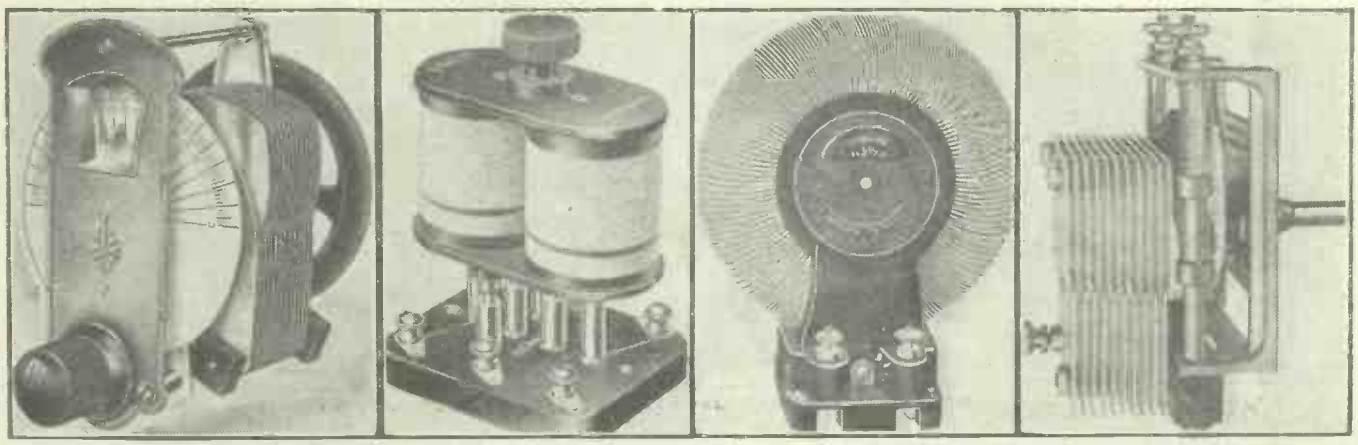
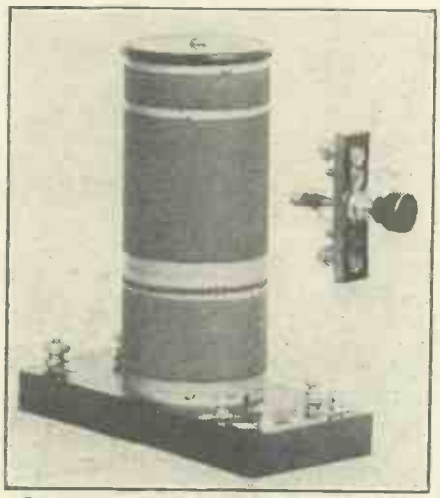


On the left there is one of the Lamplugh "Epicyclic Visor" aluminium variable condensers. Note the specially shaped plates, the slow-motion gearing and the scale. Next comes a photo of one of the Lewcos "binocular" coils, with casing removed to show windings, whose special feature is a much reduced external field. They are available in all the usual 6-pin types, at prices ranging from 12s. to 20s. To the right of the binocular coil is another of the reduced-field type, namely, the Dubilier toroidal inductance, which is made in several types and is provided with a neat interchangeable fitting. The prices are 10s. 6d. and 11s. 6d. On the right is a view of one of the Ripault "lateral action" variable condensers, in which a special cam mechanism of simple type is used to move the plates. The price of the 0005-mfd. model is 10s. 6d.

# COILS AND CONDENS



The Watmel All-Wave tuning-unit, which, together with the push-pull switch, covers wave-length ranges of 250 to 600 and 1,000 to 2,000 metres and costs 12/6.

plates, made it impossible to obtain either good signal strength or sharp tuning when using first-class coils.

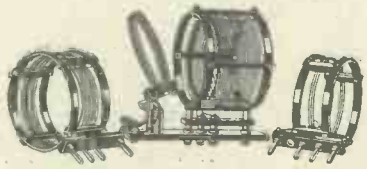
By paying much more attention to the soundness of contact between plates and spindles by connecting the moving plates and the spindle electrically to the end plates, by seeing that there was no concentration of electrostatic field in poor insulated material, and by reducing the solid insulating material and spacing it gives a relatively weak field, the efficiency of variable condensers was increased immensely, so that now it is the exception rather than the rule to find even a condenser of unknown make with faults which were so glaringly obvious to the experienced man in earlier types.

### Modern Design.

Nowadays, we rarely find the original type of variable condenser in which the capacity increased proportionately to the scale reading. Such condensers gave a great congestion of wave-lengths at the lower end of the scale and relatively wide spaces at the upper. These were supplanted by what were first known as the square-law type, in which, when a coil was connected, the separation of wave-lengths was proportional to the scale readings. Later, when stations began to be separated by kilocycles rather than wave-lengths, the "straight-line-frequency" type arrived. This type of condenser is perhaps the most logical for use in modern receivers, although it is rather difficult to design such a condenser without making it occupy rather more panel space than is generally desired.

### "Log" or S.L.F.?

Lately, there has been a vogue for what are known as "logarithmic law" condensers, but, judging by the advertising material which accompanies many such condensers, some of the manufacturers have not the remotest idea of what the logarithmic law means in relation to variable condensers! In my opinion, the logarithmic



A special set of short-wave coils (Aero) supplied by Messrs. Rothermel. They cover all the shorter waves in normal use, and cost 52s. 6d.

types have two virtues only—first, they are slightly more compact than the straight-line-frequency type, and, secondly, they make for easier "ganging."

It should not be forgotten that whatever type of condenser we use—straight-line capacity, straight-line wave-length, straight-line frequency, or logarithmic law—provided the electrical construction is sound, we shall get with any of them equally loud signals and equally sharp tuning, if by sharp tuning we mean the differentiation by signal strength of one station from another. These condensers differ from one another in results only in the distribution of stations over the scale, and this often makes it more convenient to use one type than another.

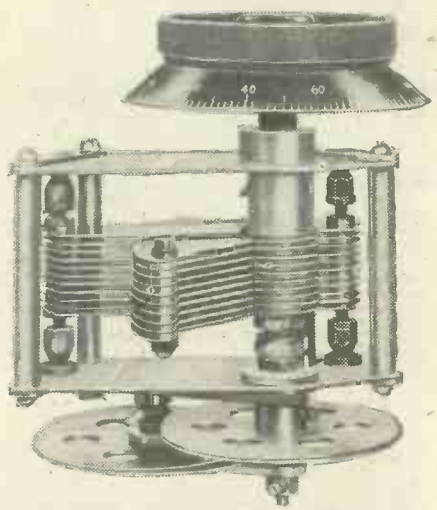
Many people confuse electrical sharpness of tuning with ease of dial control. It is true that if six stations are distributed in one condenser over the ten degrees and in another over twenty, the first is more difficult to handle than the second, but the results when both are accurately tuned to a station will be identical if both condensers are equally good electrically.

In fixed condensers progress too has been considerable, and provided the reader avoids like the plague the cheap, unbranded condensers which are still found in many small shops, he will get satisfaction in this regard. The mere fact, however, that a fixed condenser is cheap does not mean necessarily that it is a poor article.

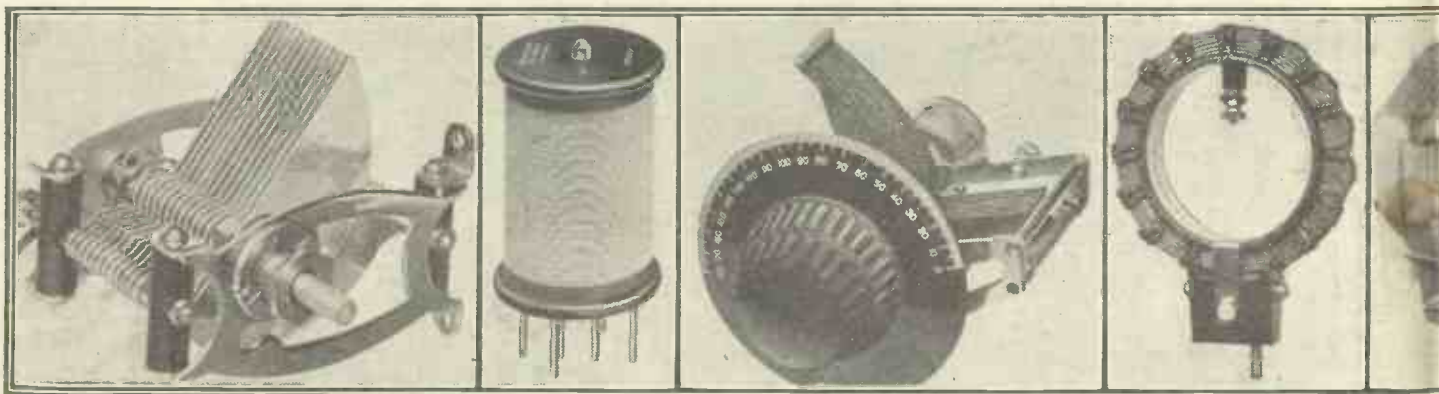
There are many excellent brands of very low price. The great point to remember is that a manufacturer of a good fixed condenser has no reason whatever to avoid placing his name upon it. If it is a good condenser he will want to see that his name, brand or trade mark is clearly marked when satisfaction is obtained with a component of this kind, for the user will be sure to buy others of the same make.

### Various Types.

While competition is keen and therefore the prices of fixed condensers have come down considerably, it must not be forgotten that individual manufacturers have their



A particularly neat form of friction drive is used in the Gecophone variable condenser illustrated here. A very smooth and accurate slow-motion adjustment is obtained. The price of the ·0005 mfd. size is 22/-.



On the left is the new Lissen variable condenser, which sells at the very reasonable figure of 7s. (·0005 mfd.). Although it is very light the method of construction is strong and rigid. The coil standing next to the right is one of the Bowyer-Lowe range of 6-pin standard coils of the type originally introduced for use in cylindrical screens. A complete series of these coils is available at prices ranging from 6/- to 14/-. To the right again is an Ormond S.L.F. condenser of the metal-frame type. The slow-motion drive here is of the friction type, a dust-cap being provided to cover the mechanism. Price £1 (·0005 mfd.). The coil which comes next is a Tangent centre-tapped model. These coils incorporate a special spaced winding, and the prices vary from 4s. 2d. to 8s. 6d. according to size. The next coil here (in the centre of the three) is one of the "Tunewell" plug-in tuning coils, this particular specimen being centre-tapped. The windings are spaced on a system which uses small separators between the layers. Prices of this range

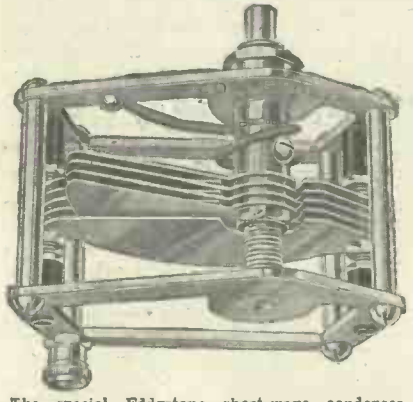
# ERS—*(continued from previous page).*

own particular styles, and one can choose the kind of condenser to suit one's purpose according to mechanical requirements in the set. For example, such makers as Dubilier and Lissen produce models which can be mounted either vertically or horizontally.

The Telegraph Condenser Company have a very ingenious three-terminal condenser which can be used for either series or parallel connections of the grid leak. The small size of the Atlas, Mullard, Magnum, Peto Scott, Raymond, and similar makes of fixed condensers make them very convenient in compact sets, while the particular and light method of making the Igranic fixed condenser enables them to be soldered directly on to leads without being secured to baseboard or panel.

**Tubular Condensers.**

Tubular condensers of extremely compact shape and small weight are available from such manufacturers as Ediswan and Silvertown, while Formo, Igranic and some American condensers sold by the Rothermel Corporation resemble in external appearance the fixed condenser, but are really adjustable in capacity and can be extremely useful in circumstances where a critical value has to be obtained once and for all and then left. A growing use for this type of condenser is for adjusting sets so that by throwing over a switch they change from one definite wave-length to another. Many constructors value the interchangeable feature of the McMichael, where it is the work of a moment to change a value.

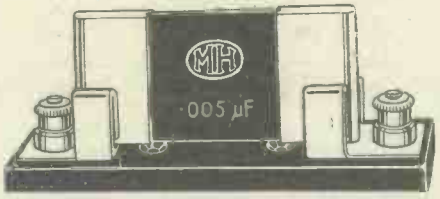


The special Eddystone short-wave condenser employ a neat and rigid all-metal frame and is provided with a flexible pig-tail connection to the moving plates.

The leading condenser makers have long realised that large-capacity fixed condensers for use in high-tension mains units must be soundly constructed with a large margin of safety, so that breakdowns of high-voltage condensers in properly designed mains units are rapidly becoming a thing of the past. Recommended makes of high-tension voltage condensers with a big safety factor for use in mains units are :

Dubilier,
Ferranti,
Hydra,
Lissen,
Polymet,
T.C.C.

these representing makes that I have personally tested with satisfaction.




The McMichael clip-in fixed condenser is a very useful component for experimental work. It fits a standardised base, and is available in a wide range of capacities. Price 2/6 to 4/-.

The delightful variety in variable condensers, all of first-class design, makes the choice of a condenser for one's pet receiver a very pleasant task, and it is possible for the builder nowadays to express a considerable amount of "personality" in his choice of components.

**Geared Control.**

Some form of geared motion is preferred by practically all users, and so the discriminating buyer will choose between condensers which in themselves carry no slow-motion action, such as the Bowyer-Lowe, Cyldon, Eureka, some patterns of the Formo, Goldtone, Lamplugh, Lissen (this being a newcomer to the variable condenser field), Marconiphone, some Ormond patterns, Peto Scott, Raymond, Trix, and Utility,

The R.I.-Varley special Interdyne transformers are very neatly built in the "binocular" (astatic or fieldless) form, and the necessary trimming condenser is fitted on the base. Price 16/- to 24/-.

adding a slow-motion dial to these, and types of condensers such as Brandes, Ediswan, General Electric, Jackson, Metro-Vick, and some patterns of the Ormond, where a slow-motion device is incorporated in the condenser itself.

Intermediate between these two types is the Ripault which, owing to the construction of the condenser itself, has a 360-degree movement instead of the usual 180°.

**Separate Dials.**

In slow-motion dials, with and without "windows," and with and without means of inscribing on the dials the markings of the different stations, there is such a variety that space does not permit of mention of them here. Suffice it to say that the user has a wonderful variety to choose from.

The experimenter who desires to give himself the minimum of trouble when constructing a set often finds it useful to purchase what has generally and rather loosely come to be known as a "tuner." This, in most cases, means a coil assembly in which both the long- and short-wave coils

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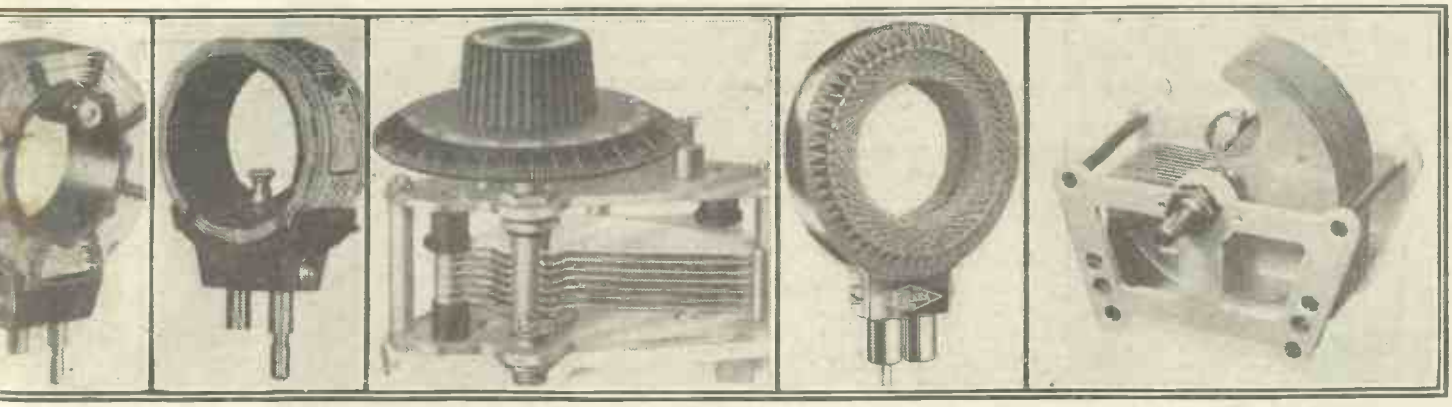
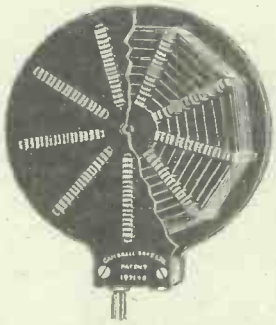


are from 1s. 6d. to 4s. 3d. according to size. The next coil (on the right) is one of Messrs. Rooke Bros.' plug-in series (again a centre-tapped example.) These are wound on an air-spacing system, and cost from 1s. 3d. to 3s. 9d. The condenser to the right of this coil is the Silvertown S.L.F. model, which incorporates very rigid metal end plates (connected to the moving plates) and is constructed on modern low-loss lines. Price, 13s. (·0005 mfd.). Taking another step to the right we come to a large specimen from the Eureka range of plug-in tuning coils. These coils are wound on a system which, to the eye, resembles the honeycomb or duo-lateral formation, except that instead of being arranged on the outside of the former the winding is inside a special type of former. Prices are from 4/3 to 9/-. The condenser on the extreme right is one of the popular Raymond range, with specially shaped plates (S.L.F.) and a very rigid and robust all-metal frame. A substantial pig-tail makes the connection to the rotor, and the price is 6s. 11d. (·0005 mfd.).

## COILS AND CONDENSERS.

*(Continued from previous page.)*

are found, together with a variable reaction coil. An excellent example of this is the R.I.-Varley tuner, which can be very simply mounted.



The Gambrell coils have long enjoyed a reputation for high efficiency. The partly cut away view above shows a good many of the details of construction. Prices run from 4s. 10d. to 17s. 6d. in this series.

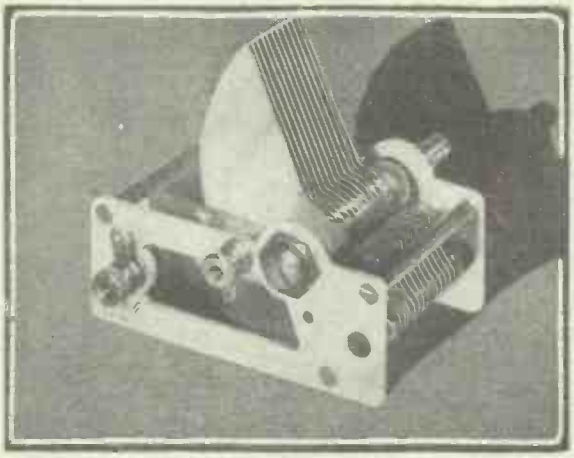
An inexpensive aerial tuner with reaction covering a wave-band of from 300 to 2,000 metres with a ·0005-mfd. variable condenser, and including, of course, the reaction control, is the Chakophone. In "quick-change" aerial coils the Efesca Duscap is notable. The London Electric Wire Company, bearing in mind the "easy-wave-change" requirements of many constructors, are selling a screened coil assembly consisting of either two or three of their screened coils assembled on a strip with a switch which projects through the front of the panel, so arranged that without lifting the lid of the cabinet one can change from the medium to the long-wave band with ease. These units are made up in all of the standard patterns of six-pin coil windings.

An increasing number of astatic or fieldless coils are available, these being produced by such firms as Metro-Vick (the astatic-non-parasitic coil), Marconiphone (the Marconi astatic coils), the Lewcos, Lissen, Magnum, Peto Scott, Wearite and other "binoculars," while the peculiar construction of the McMichael Dimic coils enables two halves of one of these coils to be connected in the astatic fashion when desired.

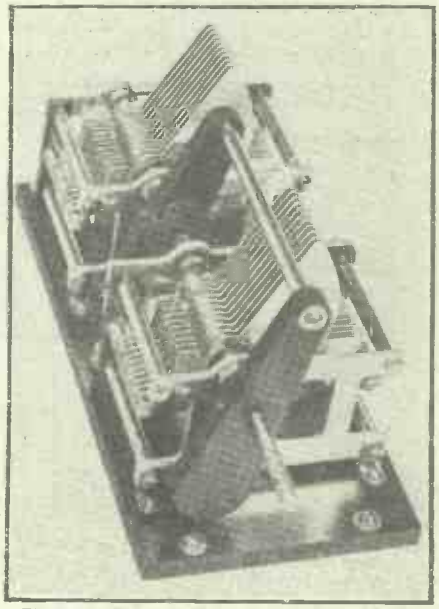
For short-wave enthusiasts, too, there is a wide range of short-wave coils available, such as Atlas, Burndept, Colvern, "DX," Igranic, Keystone, McMichael, Wearite, with special short-wave condensers by Burndept, Cyldon, Formo, Jackson, Ormond, and others. With a wealth of components made with such variety and ingenuity, what wonder that home construction is providing such a continual fascination?

### High Efficiency.

Although at one time it seemed that what is generally called the "plug-in" coil would shortly become obsolete, this particularly handy form of interchangeable inductance still holds the favour of a large part of the radio public, and not without sound reasons. While some (but not all!) of the more modern single-layer inductances have a lower high-frequency resistance, and therefore in certain circumstances give louder signals, higher efficiency, and greater selectivity, there are many



The Trix Log-condensers, made by E. J. Lever (Trix) Ltd., are obtainable in two sizes, ·0003 mfd. 7s. 6d., and ·0005 mfd. 7s. 9d. Provision is made for either one-hole or two-hole fixing.



The Cyldon double-gang condenser is a remarkably sound and rigid assembly, built on low-loss lines. The price of this model is £2 10s. 0d.

circuits, particularly those in which reaction is used, where the plug-in coil gives results which are practically indistinguishable from those of the more expensive "six-pinners" and litz wire specimens.

A new lease of life was given to plug-in coils by the introduction two or three years ago of the "X coil," with which the names of Lissen, Atlas, Gambrell, Raymond, Tandco, etc., are connected. The X coil, when used in the aerial circuit, gives two degrees of selectivity, and a sharpness of tuning which is very useful in these days of crowded etheric conditions. In anode circuits it permits of a wide variety of applications.

### Centre-Tapped Coils.

Centre-tapped plug-in coils have also proved extremely helpful to the experimenter, as by their aid he can work up a number of most interesting neutrodyne and reaction circuits. With a combination of X coils and centre-tapped coils a first-class set with H.F., detector and note-magnifiers, neutralised, with reaction on the detector and "all modern conveniences," can be built up easily, inexpensively, and efficiently.

Much of the condemnation which was showered upon plug-in coils a year or two ago in certain quarters was due to the admitted inefficiency of one or two makes

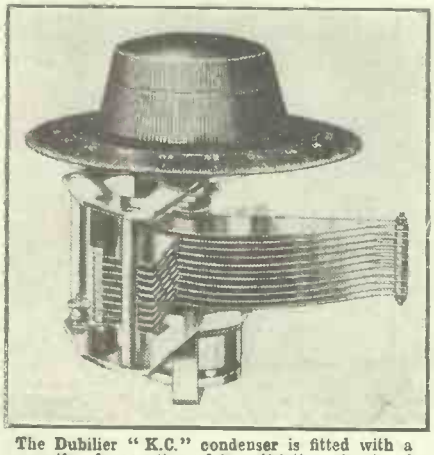
The "Hydra" Condenser handled by Louis Holzman is a particularly compact and robust component.

then sold. Some of the earlier makes were atrocious from the point of view of high-frequency resistance, while others, good in themselves, were mounted on plugs of such inferior material that the goodness of the coil was lost in the badness of the plug. Nowadays there are a number of makes having a high-frequency resistance for the No. 60 type between 6 and 8 ohms, which is strictly comparable with that of a single-layer "six-pin" coil wound with solid wire. I have measured several of the older coils of the same number in my laboratory, and have found the resistance to be in the neighbourhood of 50 ohms in one specimen and 35 in another! Some of this was due to bad material in the plug.

### American Invention.

High-frequency transformers can be made up from pairs of plug-in coils, one acting as the primary and the other as the secondary; but the efficiency of such arrangements is not high, one reason being that it is very difficult to get correct inductive coupling without at the same time introducing unwanted capacitative coupling.

It is not generally known that the first plug-in coils on the familiar plug and socket holder were introduced by that pioneer of many radio inventions, Dr. Lee de Forest.



The Dubilier "K.C." condenser is fitted with a smooth slow-motion drive (friction type) of low ratio, and sells at 12s. (·0005 mfd.). It is of the S.L.F. type.

# SHORT-WAVE NOTES

By W. L. S.

AN enormous number of the British amateur stations that operate regularly on the short waves are now using crystal-controlled transmitters, and may be picked out with ease by their clear, bell-like notes. So great has the interest been in crystal control during the past few months that Great Britain must now have a higher proportion of crystal-controlled transmitting stations run by amateurs than any other country in Europe, or possibly in the world.

One of the reasons for the sudden rise to popularity of "C.C." is the fact that many old-established opticians about the country have been found to have stocks of old quartz lenses which have excellent oscillating properties. They are little used by opticians nowadays on account of their hardness and the great difficulty in working them (one optician told me that quartz lenses "get through" a complete set of grinding tools in about a month), so other kinds of glass are now used.

### Optical Opportunity.

Several transmitters apparently made the discovery simultaneously, and opticians in several of the big towns have been relieved of fairly large stocks of quartz "pebbles" which they confess were not the slightest use to them. The prices for them have, therefore, been quite reasonable, and as the chief drawback to crystal control was the price formerly charged for a good crystal, this has given a distinct fillip to the enthusiasts.

Stations now to be heard using crystal control are: 6 O O (Bridlington), 6 U J (Driffield), 6 V J (Hull), 6 D R (Howden), 6 W O (Rugby), 5 Y K (Cambridge), G W–11 B and G W–17 C (Irish Free State), 5 M U (Dorchester), 5 I S and 6 Q B (London), and 6 M U (Belfast). Many others are using it in the experimental stages, but all the above have it going permanently and regularly.

### Heard the "Thalatta"?

A Norwegian boat, the "Thalatta," is now to be heard on the air regularly on about 44 metres with an interrupted C.W. note and the call-sign A W V. The "Thalatta" normally plies between Norway, Hamburg and Lisbon, but is now, I believe, bound for the Far East, and therefore makes a good "range test" night by night for those whose transmitters have good ranges of this wave-length band.

Amateur transmission does not seem to have attracted many enthusiasts of the feminine gender hitherto, but those who do hold licences apparently make very good use of them! I believe the only active lady transmitter in this country at present is 6 Y L, operated by Miss Dunn, at Stock, Essex, but in Europe we have now E P–1 B E, E C–1 Y L, E F–8 P P P, E F–8 Y D and quite a few others, all "Y L-operated and owned." In the States I believe the feminine operator is still regarded as a nine-days' wonder, and most of those holding licences do not divulge the fact until it is absolutely necessary, on account of the rush of correspondence that they receive immediately!

American short-wave broadcast is quite disappointing at the time of writing on account of "dead" conditions and severe atmospherics. When conditions remain poor or bad for such long periods during the summer the D X man almost begins to agitate for the return of winter. At all events, our winter weather (barring the spell of frosts last year) has of recent years been so mild that one does not notice the passing of summer! Let us hope that next winter will combine good conditions with good weather, to the joy of all the radio-fans.

# FROM FAR AND NEAR.

The Mauritius short-wave station is now experimenting with short-wave transmissions on low power, using wave-lengths between 20 to 38 metres.

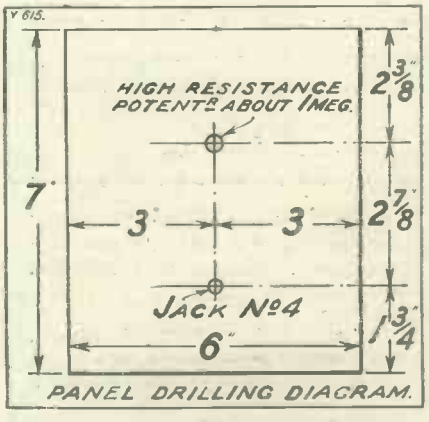
* * *

There has recently been a marked increase in the interest of amateurs in summer radio. Several radio societies decided to hold weekly meetings during the summer months, and these have been very successful.

# THE "G.P.K." AMPLIFIER.

(*Continued from page* 690.)

maximum signal strength. This class of valve is usually known as the "H.F." type, because it is commonly used for high-frequency amplifying purposes. In the last stage, an ordinary small-power valve with an impedance of 6,000 to 8,000 ohms




can be used for signals of moderate strength, and such a valve with 7½ to 9 volts grid bias and 120 volts H.T. will give good room-strength with a horn-type loud speaker. For loud speakers of the cone type or for large volume, a super-power valve with an impedance of 3,000 to 4,000 ohms will be preferable. In this case, with 120 volts H.T. about 16 or 18 volts grid bias will be needed. If the first valve is one of the "H.F." type, 3 volts grid bias will usually be correct, with an H.T. voltage of 120. Telephones should not be used with the amplifier when a super-power valve is employed, owing to the heavy current flowing and the possible damage to the delicate magnet windings. It is better to connect the telephones direct to the existing 'phone terminals on the receiver, thus cutting out the amplifying unit.

# TABLOID TIPS.

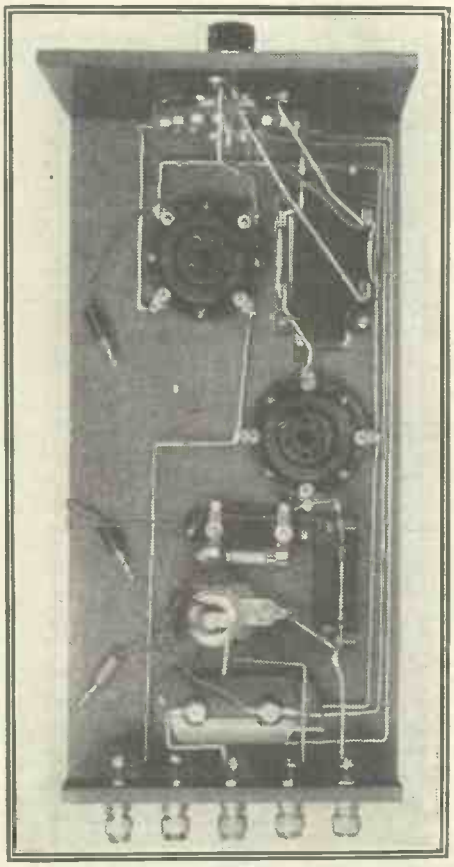
When connecting up an L.T. battery make sure that its leads are properly connected *to the receiver* before the other ends are connected to the battery. (Serious damage may result if this warning is neglected).

* * *

If a coil is connected across a condenser this forms a rejector circuit, but if the coil is in series with the condenser an "acceptor" circuit is formed. (The efficiency of a wave-trap often depends upon whether the rejector or acceptor is better suited to local conditions.)

* * *

Plug and jack contacts should be examined occasionally, as not only is the spring liable to weaken a little in the course of time, but the efficiency of the component may be greatly impaired by specks of dust, dirt, etc.



Space is left on the baseboard for a large type of grid-bias battery. Into this are plugged the three plugs which can be seen in the photo.

### EMPIRE SHORT-WAVE BROADCASTING.

The Editor, POPULAR WIRELESS.

Dear Sir,—In connection with Empire short-wave broadcasting, may we be permitted, as S.W. enthusiasts, to offer a few suggestions that we believe would prove satisfactory.

1. That station 5 S W transmit on a wave-length of about 30 to 32 metres, as this seems the most suitable wave-length for the present time of broadcasting. Comparing 5 S W with P C J J, tests carried out by us show that the latter station comes over with 50 per cent more volume, less fading, and in every way more stable. Even though the above is a fact, we must say that 5 S W is beautifully modulated.

2. That if the present wave-length is adhered to we would suggest that test transmissions be carried out by commencing transmission at about 7 or 8 a.m. (G.M.T.); by so doing it would be more effective to the extent that reception in Australasia would be at a more convenient time. Not only would the hours be more suitable, but our experience is that the lower wave-length would suit the above conditions better.

From information we have gained we believe that 2 F C Sydney is heard successfully in England during your evening, using a wave-length below 30 metres.

We believe that a reciprocation of 2 F C's service would not only be more efficient but also more popular to short-wave enthusiasts in the Antipodes. Winter is now upon us, and we are afraid that during the early hours of the morning, and owing to the fact that most listeners leave for work at about 8.30 a.m. here, there would be about three hours of reception wasted, whereas if reception commenced about 7 p.m. here most people would be at home to enjoy it.

Believing we are voicing the opinions of S.W. enthusiasts, and there are many in this part of the world and who have the Old Country at heart, we hope that the suggestions outlined may bear fruit.

We have every confidence in Captain Eckersley and his efforts to establish Empire broadcasting, and it may be possible that the above or similar ideas have occurred to him.

We are regular subscribers to your valuable paper, and wish you every success in the future.

We take the liberty of forwarding you, under separate cover, copies of two New Zealand radio journals which may be of interest to you, and hoping to hear from you in the near future.

Yours sincerely,
"D.X."

Rotorua,
New Zealand.

### RADIO VALVE PRICES.

The Editor, POPULAR WIRELESS.

Dear Sir,—There is no doubt that readers of POPULAR WIRELESS are interested in the above, and there is little doubt that the majority consider it high time there was a considerable reduction in the prices fixed by the B.V.A.

As it is now possible to purchase a British-made valve at 3/9 (power 4/9), it is obvious that the companies included in the combine are making huge profits at the expense of the patriotic consumer. It is further obvious that the valve manufacturers concerned have not passed on to the British Public that portion of the profit which is due to them in return for their support in the past.

Generally speaking, there are no better valves than the B.V.A., but the average wireless fan who a few years ago consistently purchased these valves does not now replace when necessary from the same source; but in four out of five cases, to my knowledge, such replacements are made with either non-ring types of valves of Dutch, French, German or Austrian origin.

Putting it briefly, isn't the attitude of the B.V.A. absolutely asking for foreign competition?

Whilst realising and appreciating the valuable services rendered by the B.V.A. in the matters of advice, circulars and new and improved circuits, one feels that such work can safely be left in the hands of the experts connected with such competent journals as POPULAR WIRELESS, and the saving thereby effected passed on to gladden the hearts of our listeners (and experimenters).

In conclusion, judging from the increasing sales of cheap valves, it is clear to all who but think which way public opinion drifts, and it is therefore to be hoped that the B.V.A. will alter their course in the direction of that safe port—"Quality and reasonable price are the best advertisement."

Yours fathfully,
J. W. BELL.

Darlington.

### THE "SYDNEY" TWO.

The Editor, POPULAR WIRELESS.

Dear Sir.—I feel I must write to you and let you know of my success with the "Sydney" Two, adapted to take three plug-in coils. I brought in W G Y at such strength that I could easily hear it all over an eighteen by thirty-foot room. The time was about 3.20 a.m. This was about five weeks ago, when I was on my holidays in Dorset. The aerial is badly screened by trees, and there is the Dorchester Beam station less than a mile away.

On the long waves I can get any number of stations which seem to be falling in in cartloads, it being easy to tune in at least a dozen without using the vernier of the condenser.

I notice with interest the letter from "Very Puzzled," who seems to think a microphone is necessary before speech can be transmitted. I was troubled with hearing someone speaking when I had turned out the valve filaments and disconected all batteries. I asked several authorities about this, and they seemed to think it was a joint rectifying.

I have now proved this to be incorrect by a repetition, and hearing voices I could recognise.

I have been a reader of POPULAR WIRELESS since the first number. Wishing POPULAR WIRELESS the success it deserves.

Yours truly,
F. M.

### "SHIELDED GRID LEAK."

The Editor, POPULAR WIRELESS.

Dear Sir,—The trouble experienced by A. J. W. is probably due to the fixed condenser in series with his aerial. I came across a similar effect when overhauling a friend's 3-valver (2 transformer coupled), and removing the series condenser and fixing a bypass condenser between the primary of the first transformer and L.T., soon remedied matters.

Yours faithfully,
J. A. PANGBORN.

Leytonstone, E.11.

### THE WORK-WELL ONE.

The Editor, POPULAR WIRELESS.

Dear Sir,—I write to express my appreciation of the "Work-Well" One. It is a magnificent circuit, and I have tested it at two places west and south of London, each about twelve miles away; 2 L O comes in very loud and 5 G B at a good strength.

I can nearly always get one German station (after dark) at good audible strength without excessive reaction. Sometimes it is Hanover and sometimes Cologne.

I have persuaded a friend, who knows nothing about wireless, and has hitherto been deterred by the expense of constructing a set, to build a "Work-Well" One, and he is more than satisfied.

My favourite aerial is the sheet lead on a roof or dormer window, with the sheet lead over a porch, or another dormer window, as a counterpoise. I fasten a 24 D.C.C. wire to the lead by a clip, and the results are as good as on a 70-foot aerial with a good earth, which I have also used. The signals are perhaps stronger with the wire aerial, but the difference between it and the sheet lead is hardly noticeable, and the sheet lead gives rather more selectivity. It also obviates the unsightliness of an aerial, and as most houses have some sort of sheet lead about them I can take my set on visits. A gutter, if not directly connected with the earth, is as efficient. With a dry battery for L.T. as well as for H.T., the set becomes practically a portable. It might be thought that a piece of sheet lead on a roof or a gutter would not be properly insulated, but apparently the brick is quite adequate.

Yours faithfully,
ALFRED MASTER.

Middlesex.

### DIVING FROM DAVENTRY TO DENMARK.

The Editor, POPULAR WIRELESS.

Dear Sir,—The writer's risibility was roused on reading the remarks re the diallist who did the "Dance of the Hours"—and bluffed the B.B.C. into the bargain. I also read the report originally in a certain "authoritative" publication, but had not the courage to send a criticism to that Olympic official organ. The bright and breezy banter of brother "Ariel," however, encourages me to inform him that this fictitious feat of fishing is far from feasible, for the reason that the Copenhagen clock is a speedier striker than Big Ben. If they start striking simultaneously, they are out of step by the third stroke. Copenhagen canters through the chime and puts out part of its pretty little postlude on the bells before the last boom of Big Ben has sunk into silence.

There is just one way in which the twenty-four strokes can be heard at one "go"—provided one's set is sufficiently un-sclective! Kalundborg (being a long-waver) is frequently heard with a background of 5 X X—hence the pyramids. BUT, unfortunately for the recent remarkable record, the timing of the strokes does not tally throughout the twelve.

The electric clock at Radio Paris reveals a like result: except, of course, at 1 p.m. The writer has often amused himself by tuning in the two timepieces together, and noting the astonishingly accurate agreement between them. They are seldom more than a split second separate on the single stroke of one o'clock.

Yours faithfully,
WILL HOLLIS.

Northampton.

### A "SHOCKING" SPARK.

The Editor, POPULAR WIRELESS.

Dear Sir,—R. A. C. asks for an explanation of the phenomenon of a momentary visual flash when receiving a shock through faulty headphones. This is really very simple. The retina of the eye is sensitive to any other stimuli besides that of light entering through the lens. For instance, if R. A. C. has ever had a sharp blow on the eye, he will be acquainted with the phenomenon popularly known as "seeing stars." A steady pressure on the eyeball through the closed lid will also give rise to astonishingly complex phosphorescent designs upon the retina, which are translated by the brain in terms of light. And, as in the present instance, electrical stimuli are well known to cause momentary optical reactions. Eight or ten volts transmitted through the tongue—with the other electrode applied at any convenient spot—will cause a flash on the retina at make and break. No, it is not an optical illusion, R. A. C. but a very real and comparatively well-known, phenomenon. Anyway, interesting though it may be, get those headphones attended to!

Piezo-electrical phenomena, although not coming under the same heading as the above physiological effect, are also interesting. Try rubbing or striking together two lumps of sugar in the dark. Another curious luminous effect may be noticed when unrolling a length of "sticky-tape."

Yours faithfully,
WILL HOLLIS.

Northampton.

CORRESPONDENCE.

# EMPIRE SHORT-WAVE BROADCASTING.

## RADIO VALVE PRICES—THE "SYDNEY" TWO.

**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.**

# SOME INTERESTING ITEMS.

The B.B.C. sets listeners a good example in the matter of overhauling aerials; in no station is the aerial permitted to be up longer than six months without being overhauled for the removal of dirt, etc.

* * *

The Daventry aerials are closely inspected by the station engineers every fortnight, by means of the ladders with which the masts are fitted.

* * *

The Paris Station Radio L L is now sending out short-wave programmes on 47·5 metres on Mondays, Wednesdays, and Fridays between 9.30 and 11.30. (The normal wave-length of Radio L L is 370 metres).

# THREE USEFUL TIPS.

The prefix "micro" means "million," so one microfarad is a millionth part of a farad and one microhenry is a millionth part of a henry, etc.

* * *

Celluloid such as is used for coil formers, etc., is extremely inflammable, and great care should be taken if any of this material is lying on the work bench when soldering, etc.

* * *

If it is desired to alter the shape of a celluloid coil covering or similar celluloid article, remember that this material may be dropped in hot water and then bent into the desired shape, which it will retain when cool.

# RADIOTORIAL

**All Editorial Communications to 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 and 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 receivers. As much of the information given in the columns of this paper concerns the most recent developments in the radio world, some of the arrangements and specialities described may be the subject of Letters Patent, and the amateur and the trader would be well advised to obtain permission of the patentees to use the patents before doing so.*

## QUESTIONS AND ANSWERS.

### FITTING A POTENTIOMETER.

L. G. (Blackpool).—"Some time ago in the 'P.W.' 'Radiotorial' I saw details (in words) for fitting a potentiometer to steady an H.F. stage which refused to stop oscillating. Would you mind telling me how this is done, as I am now experiencing this difficulty with a two-valve set I have bought, and I have on hand a potentiometer which I could use to hold the valve down."

Sets employing one stage of H.F. amplification which are inclined to be unstable may be stabilised by the addition of a potentiometer as follows:

Examine the grid of the first valve. You will see that it is connected to one side of a coil and one side of a variable condenser. The other sides of these two components are joined together and connected either to earth or to the filament circuit.

Disconnect the wire making this connection and, (still keeping the condenser joined to the coil), take a lead to the centre or moving arm of the potentiometer. The remaining two contacts on the latter must now be connected across the filament terminals of the H.F. valve holder.

If the set now tends to howl or oscillate, it may be stabilised by moving the potentiometer arm towards the *positive* end. A point will be found where the set stops oscillating, and the best position for general reception is one such that the set has *just* ceased to oscillate.

### THE RECTIFYING REFLEX.

O. L. M. (Merton Abbey, S.W.19).—"Being in the Merchant Service I go abroad for long periods, and in fact I have been out of England over two and a half years. I cannot hope to keep pace with wireless changes, but I still have my old original 'P.W. Combination Two' in the simplified form, and it gives me perfectly pure and good reception from London and Daventry, which is all I want.

"The only thing that appears to be wrong with it is that even when the crystal is off it goes on just as well as before, and this seems to point to the fact that the crystal is not working properly. Is there anything I can do?"

Your valve is detecting, and as there are several ways in which this can happen it may not be an easy fault to cure. The first thing to try is another crystal, if possible of a different type.

In fact, whilst you are about it you might try several pieces, as the use of a different specimen may completely cure the fault. For this particular trouble of the valve detecting, it is important that both the filament voltage and the H.T. voltage should be correct for the valve used; otherwise the valve may start "anode bending," and nothing you can do to the crystal will stop it detecting.

Another important item is the potential on the grid of the valve. Very often a reversal of the leads from the L.T. battery to the set alters the bias sufficiently to cure a tendency of the valve to rectify.

Failing this, potentiometer control of the grid is sometimes efficacious in removing the tendency to detect.

### HEARING THE NEIGHBOURS.

R. J. M. (Nuneaton, Warwickshire).—"I am only a miner, so consequently my house is a pretty small one with a lot more small houses around it. But I put up the 'P.W. Lo-Cost' crystal set, and got A1 results, and the only thing that puzzles me is that my neighbour can hear me talking. Is this something new, or is something wrong with the set?"

Such freak transmissions have often occurred before and are probably due to re-radiation. What happens is that when your aerial is accurately tuned

(*Continued on page* 702.)

# RADIOTORIAL QUESTIONS AND ANSWERS

(*Continued from page* 700.)

to your local station, it is energised by the carrier-wave from that station, and the current not only oscillates backwards and forwards in your aerial, but some of its energy is actually re-radiated, i.e., sent out again.

The same sort of thing applies to your neighbour's aerial, and if they are quite close to each other there will be a certain interaction existing between them.

If you now speak up close against your telephones the diaphragms of these will vibrate in sympathy with the sound waves, and these vibrations will affect not only the 'phones but the whole circuit of which they form a part. The exact actions and reactions are somewhat complicated, but the effect is to alter the volume of the re-radiated energy from the aerial in accordance with the sound waves striking the telephone diaphragms.

In other words, the telephones act like a microphone and the "transmission" is modulated. As your neighbour's aerial is receiving some of the modulated transmission, and as he has a sensitive crystal and telephones in circuit he can hear this in just the same way that he hears the modulated transmission from the local station.

### CONNECTING UP AN AMPLIFIER.

E. R. S. (near Swindon).—"But when I tried to add the amplifier to the set I found that as soon as the L.T. was connected up the leads started to get warm in my hands and there seemed to be a smell like burning rubber, so I disconnected it, and now I do not know what to do. What do you think is wrong?"

Your whole trouble is due to the fact that in the set the H.T. negative terminal is connected to one side of the L.T. (say to L.T.−) and in the amplifier it is connected to the other side (say to L.T.+). Consequently when you join the two together the accumulator is being shorted.

As this should not be allowed under any circumstances, you must *not* join the amplifier to the set whilst it is in its present condition. You can, however, modify it very easily in the following manner.

Open the amplifier case and note the wiring to the H.T. negative terminal. If it goes direct to one of the L.T. terminals, cut this wire so as to *leave the amplifier's negative terminal without any internal connection at all.* Then try connecting up again.

If, however, you cannot open the case, or if the internal wiring appears too complicated for you to alter, you will find that the set will work properly *provided you do not connect up the amplifier's H.T. negative to the H.T. battery.*

## "P.W." TECHNICAL QUERY DEPARTMENT

***Is Your Set "Going Good"?***

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 a revised scale of charges, can be obtained direct from the Technical Query Dept., "Popular Wireless," 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.

It is through this H.T. negative lead to the amplifier that the short circuit is taking place.

As a matter of fact the amplifier does not require a connection to the H.T. negative at all. (This may seem rather puzzling at first, but the fact is that H.T. negative is already connected to the L.T. circuit in the set, so there is no need to connect it again because the amplifier L.T. wires are carried through to the set.)

### "THE NEUT. NUISANCE."

B. K. (Tenby, S. Wales).—"I was interested in the article on the 'Neut. Nuisance' in 'P.W.' for June 23rd, but could not reconcile the author's description with the diagram Fig. 2. Was this diagram the correct one?"

No, we regret that the wrong diagram was reproduced with this article. The correct Fig. 2 was very similar to Fig. 3 on page 568, and if Fig. 3 is redrawn leaving out the variable inductance $L_2$ it can be used as "Fig. 2," and the references will become clear.

The "bridge" connections will be understood if on the new Fig. 2 the symbol for a valve's grid is drawn at the top point of the diamond (formed by A, B, Cp—g and NC), the symbol for a filament at the left-hand point, and that for an anode at the right-hand point of the diamond.

### APERIODIC AERIAL COUPLING.

J. H. (Grays, Essex).—"He says that aerial aperiodic coupling would increase the selectivity. Would it, and if so how can the set be altered?"

The use of what is generally termed "Aperiodic Aerial Coupling" is often beneficial in increasing selectivity, cutting out unwanted noises, etc., and old sets can be converted as follows:

Mount another coil socket by the side of the existing aerial coil, so that the coupling between the new coil and the existing one will be as tight as possible. From one of the terminals on the new socket take a wire to a new terminal on a panel or terminal strip; this will be the new aerial terminal.

Connect the other terminal on this new socket to earth. The coil sizes used will now be slightly different, and, in general, will be as follows:

In the old aerial socket, which now becomes the *secondary* coil, for the broadcast band a No. 60 or 75 coil. For Daventry, a No. 200 or 250.

In the new socket, for the broadcast band, a No. 25, 35 or 50 will be needed, and for Daventry a No. 75 or 100.

In the case of sets employing a stage of H.F. amplification, this improvement may sometimes have the effect of rendering the set a little unstable, in which case a potentiometer should be added.

(*Continued on page* 704.)

# RADIOTORIAL QUESTIONS AND ANSWERS

(*Continued from page* 702.)

### A HALE CIRCUIT HINT.

S. E. W. (Preston).—"Back in the spring I purchased from a friend a receiver which I understand is called the 'Hale.' It is a one-valve set with a crystal, and although I frequently heard it working at my friend's house last winter, I had never tried to operate the set myself.

"The other day, however, I had a chance, and took it out and connected it up to try what it would do. The results were really very good indeed, but there were one or two minor difficulties which perhaps you can help me to solve.

"For one thing, unlike my old one-valve set, the 'Hale' will not oscillate at all readily, and sometimes it can hardly be made to oscillate at all. I find I have to keep the reaction coil close up to the other, and even then it breaks off oscillating suddenly at times.

"Can you tell me what I can do for this?"

In cases where the Hale receiver cannot be made to oscillate at all well, or when it will only oscillate with tight reaction and then stops suddenly, the best plan is to try a lighter adjustment of the cat-whisker or of the permanent detector.

It is the exact degree of pressure upon the contact which is so important in its effect upon the control of reaction.

The permanent detectors which are used nowadays (consisting of two crystals, or what is known as a "perikon" combination), or something akin to it, might be expected to be specially suitable for the Hale. And, in fact, experience goes to show that the perikon type of detector is better in the Hale circuit than the cat-whisker type, especially if the degree of pressure at the contact can be varied, or has been correctly set by the makers.

Reversing the connections to the crystal detector often effects a considerable improvement in results, particularly in this question of smoothness of reaction, and in general it will be found that the finding of a good spot on the crystal or the finding of the correct adjustment of pressure for the detector is more important in the Hale circuit than with the ordinary set.

### FITTING A FILAMENT SWITCH.

N. W. R. (Letchworth, Herts).—"I am going to fit a filament switch so as to cut the set on and off without having the trouble of breaking the lead to the accumulator every time. Does it matter whether I put the switch in the lead from L.T. negative or L.T. positive?"

No, it makes no difference to results, so it is usual to place this switch in the filament lead which happens to be situated most conveniently for the purpose.

### RESISTANCES FOR H.T. UNITS.

B. C. F. (Huddersfield).—"Which is the best kind of H.T. battery eliminator—that in which one long resistance is placed across H.T. negative and maximum H.T. positive and tappings taken from this, or one which has separate resistance for every H.T. positive tapping?"

There are several advantages in the separate resistance method, the chief one being that there is less unwanted coupling between the respective plates of the valves obtaining H.T. from the unit. This results in less tendency to oscillate, and consequently in smaller likelihood of popping noises.

### CRYSTAL-SET RESULTS.

E. L. W. (Erdington, Birmingham).—"It is only a little crystal set which I built up from the description in 'P.W.' over a year ago, but it gets long and short waves very well indeed, and on one occasion I heard a foreign station on the long waves. Now my father has got a job near Chesham in Buckinghamshire, and we are moving there soon. Will my little crystal set be any good there, or shall I be right out of range?"

You will find that the set will work very well indeed in Buckinghamshire. As your distance from the nearest station will probably be greater than it is now, you may not find any one station so loud as you do at present, but, on the other hand, you may be able to put up a better aerial, and thus, under good conditions, hear a greater variety of stations than previously.

INVALUABLE TO EVERY AMATEUR & CONSTRUCTOR

"POPULAR WIRELESS"

# BLUE PRINTS

OF TESTED CIRCUITS 6d. EACH

| "P.W." BLUE PRINT Number | |
|---|---|
| 1. | DETECTOR VALVE WITH REACTION. |
| 2. | OUT OF PRINT. |
| 3. | 1-VALVE L.F. AMPLIFIER. |
| 4. | CRYSTAL DETECTOR WITH L.F. AMPLIFIER. |
| 5. | H.F. (Tuned Anode) AND CRYSTAL WITH REACTION. |
| 6. | H.F. AND CRYSTAL (Transformer Coupled, without Reaction). |
| 7. | 1-VALVE REFLEX WITH CRYSTAL DETECTOR (Tuned Anode). |
| 8. | 1-VALVE REFLEX AND CRYSTAL DETECTOR (Employing H.F. Transformer, without Reaction). |
| 9. | H.F. AND DETECTOR (Tuned Anode Coupling, with Reaction on Anode). |
| 10. | H.F. AND DETECTOR (Transformer Coupled, with Reaction). |
| 11. | DETECTOR AND L.F. (With Switch to Cut Out L.F. Valve). |
| 12. | OUT OF PRINT. |
| 13. | 2-VALVE REFLEX (Employing Valve Detector). |
| 14. | OUT OF PRINT. |
| 15. | OUT OF PRINT. |
| 16. | H.F. (Tuned Anode), CRYSTAL DETECTOR AND L.F. (With Switch for Last Valve). |
| 17. | CRYSTAL DETECTOR WITH TWO L.F. AMPLIFIERS (With Switching). |
| 18. | 1-VALVE REFLEX AND CRYSTAL DETECTOR, with 1-VALVE L.F. AMPLIFIER, Controlled by Switch. |
| 19. | OUT OF PRINT. |
| 20. | OUT OF PRINT. |
| 21. | THE 2-VALVE LODGE "N." |
| 22. | "THE GUARANTEED REFLEX." |
| 23. | THE 1-VALVE "CHITOS." |
| 24. | THE "SPANSPACE THREE." Three-Valve Receiver employing 1 Neutralised H.F. Valve, Detector with Non-Radiating Reaction Control, and 1 L.F. Valve. |
| 25. | OUT OF PRINT. |
| 26. | A "STRAIGHT" 4-VALVER (H.F., Det. and 2 L.F. |
| 27. | OUT OF PRINT. with Switching). |
| 28. | A "MODERN WIRELESS" 5-VALVER (H.F., Det. and 3 L.F.). |
| 29. | AN H.T. UNIT FOR DIRECT-CURRENT MAINS. |
| 30. | A REINARTZ ONE-VALVER. |
| 31. | A STANDARD TWO-VALVER (Detector and L.F.). |
| 32. | THE "CUBE SCREEN" THREE (H.F., Det. and L.F.). |
| 33. | A "KNIFE EDGE" CRYSTAL SET. |
| 34. | AN H.F. AND DETECTOR TWO-VALVER. |
| 35. | THE "UNIVERSAL THREE" (Det. and 2 L.F. stages resistance-coupled). |
| 36. | THE "SPANSPACE FOUR" (H.F., Det. and 2 L.F.), |
| 37. | THE "LONG SHORT" CRYSTAL SET. |
| 38. | A TWO-VALVE L.F. AMPLIFIER. |
| 39. | THE "SYDNEY" TWO. |
| 40. | THE "SUPER SCREEN" THREE. |
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## NEWS FROM SAVOY HILL.

*(Continued from page 686.)*

**Is the B.B.C. Above Advice?**

Friends of George Grossmith are saying that the famous "G.G." is not altogether happy with the way he is being treated by the B.B.C. His side of the matter is as follows: For the past two and a half years he has worked very hard building up the programme service at Savoy Hill, attending their programme board meetings, and generally fighting the amateurish element so strongly entrenched there.

He has done all this because of interest in broadcasting itself, not for the miserable fee he has been getting. Now, apparently, the B.B.C. think they have about milked G.G. dry, so they tell him they are not going to have advisors any more, but that as a special favour to him they may keep him for a few months at a fee still smaller than he has been getting.

Mr. Grossmith has not yet announced his intentions about this proposal; but on the face of it he would appear to have a just grievance. Nearly everything that is of any entertainment value in the programme is due to his work and influence. Is the B.B.C. so perfect now that it can do away with all specialist advice?

**Stunts: A Crying Need.**

The dead level that has come over the B.B.C. programmes seems to obliterate all stunts. The time has come for a change in policy. This autumn we must have features, peaks, surprises, anything to vary the monotony of the dead level. It is understood that the B.B.C. is alive to this need and is working on it now.

**A Loch Lomond Relay.**

Glasgow has no opportunity such as comes to London each year on the occasion of the University Boat Race to do a broadcast from mid-stream. The only thing to do, therefore, was to provide one, which has been done by accepting the loan of a house-boat on Loch Lomond. From this an entertainment by the Radioptimists will be relayed on Tuesday evening, July 24th, which besides possessing novel technical features will afford Scots an opportunity of hearing their favourite ballads while they are sung from the actual "bonnie" spot they profess to love so much.

## NEXT WEEK

**SPECIAL**

**COUPLING DEVICES NUMBER**

dealing with L.F. Transformers, L.F. Chokes, R.C.C. Units, Coupling Resistances, etc.

Special illustrated articles will tell you how to choose and use these components to the best advantage.

**ORDER YOUR COPY NOW**

# AIR AND ETHER.

FROM A SPECIAL CORRESPONDENT.

NOT the least interesting of the thrilling events which figured in the recent Royal Air Force Display at Hendon Aerodrome were those in which the outstanding feature was credited as much to the ether as to the air.

Perhaps one of the most impressive features of the whole display was that in which a squadron of Siskin IIIa's, in combination with two similar squadrons, performed aerial drill to the orders given by radio-telephony from the wing-commander, who was also aloft in a Siskin IIIa. For half an hour the 150,000 spectators were able to hear by radio the commands which were given high above their heads, and to watch the answering changes in the formation of the 160 m.p.h. 'planes.

**Forty-three Loud Speakers.**

The equipment that enabled this instructive demonstration to be accomplished was partly the usual R.A.F. radio gear and partly, of course, the wonderful public-address system of the Marconi Company. Fitted with standard R.A.F. telephony transmitters and receivers, the whole of No. 56 Squadron was in direct communication with the wing-commander. Naturally, however, only the wing-commander's 'plane did the transmitting; since, if each aeroplane had started talking at the same time in reply to orders, the crowd beneath would have heard nothing but chaos from the loud speakers.

On the ground an Air Force receiving station was situated about a mile away to pick up the spoken messages from above and to relay them to the Marconi Company's amplifying room, which was actually in the aerodrome. This amplifying room, together with an accumulator room, a control-tower and 43 moving-coil loud speakers, comprised one of the largest and finest public-address systems ever established. Although only a temporary affair, it took the engineers three days to fit it up, and when finished it had a "here for good" appearance.

**The B.B.C. Transmission.**

All over the aerodrome an arrangement of plug-in portable telephones permitted of a connection with the amplifier-room with a minimum of delay in case of a breakdown. The Air Force, for their part, insured against breakdown by installing an emergency receiving station at some distance from the one actually in use. The 25-feet-high control-tower, which was placed in a position that commanded a good view of the aerodrome, was connected up with the amplifiers, so that running announcements could be made to the crowd by way of the loud speakers. Music, too, was broadcast to the public during the intervals.

Many who did not go to the display were enabled to hear a very realistic broadcast by the B.B.C. of the roaring of the engines as machine after machine flew over the microphone. Bombs and machine-gun fire were also quite clearly heard. For this transmission the B.B.C. had one of their special Outside Broadcast vans stationed near the public-address amplifier-room.

# TECHNICAL NOTES.

(*Continued from page 686.*)

**High Cost.**

The difficulty about the use of large filter capacities (when made in the ordinary type condenser) is that the bulk and the cost of the condenser both tend to become prohibitive.

The electrolytic condensers, however, permit great economy both in space and cost, and these are rapidly coming into use for this purpose. Oscillograph observations upon the output of eliminators using this type of condenser have, in many cases, shown extremely good results.

When chokes are used in conjunction with condensers the values of capacity are limited because of the possible resonant effect of the choke-condenser unit. Since we must bypass the A.C. it is most logical to use a high value of capacity which will afford a path of very low resistance to A.C., but of high resistance to D.C.

The use of large value condensers, since it permits the elimination, or at any rate the reduction in the value, of the chokes necessary in the circuit, is specially valuable where the circuit has to provide a comparatively heavy output. For example, a double-section filter-choke system designed to pass 200 milliamps, and the condensers (if of the ordinary type) suitable for use with these chokes, form quite an expensive unit, and it is in this connection that the electrolytic condenser is finding great favour.

# There's one good point about buying "Mullard"

—*it is Security.* The position they hold to-day is unassailable. They have achieved it by quality of production and by intelligently fostering the popular development of radio.

Now, I look at it this way. These people wouldn't take the risk of selling anything which would weaken their reputation, and apart from this it is obvious that their manufacturing and research organisation is second to none. In short, I make the name MULLARD a guarantee for all my radio purchases.

The wonderful Mullard P.M. Filament remains the fundamental basis of Mullard Valve construction and the secret of the improvement effected by Mullard P.M. Radio Valves in any receiver. The qualities of this filament are understandable—length and strength of filament, greater emission surface, low current consumption. The improvement is apparent the moment they are fitted into the valve holders.

Radio dealers are gradually increasing their range of Mullard products, the latest addition being the Mullard "Permacore" Transformer. It pays to keep an eye on new Mullard products.

# Mullard

## THE · MASTER · VALVE

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R/R

POPULAR WIRELESS, July 28th, 1928. REGISTERED AT THE G.P.O. AS A NEWSPAPER.

ALL ABOUT TRANSFORMERS, CHOKES, R.C.C. UNITS, ETC.


# Popular Wireless

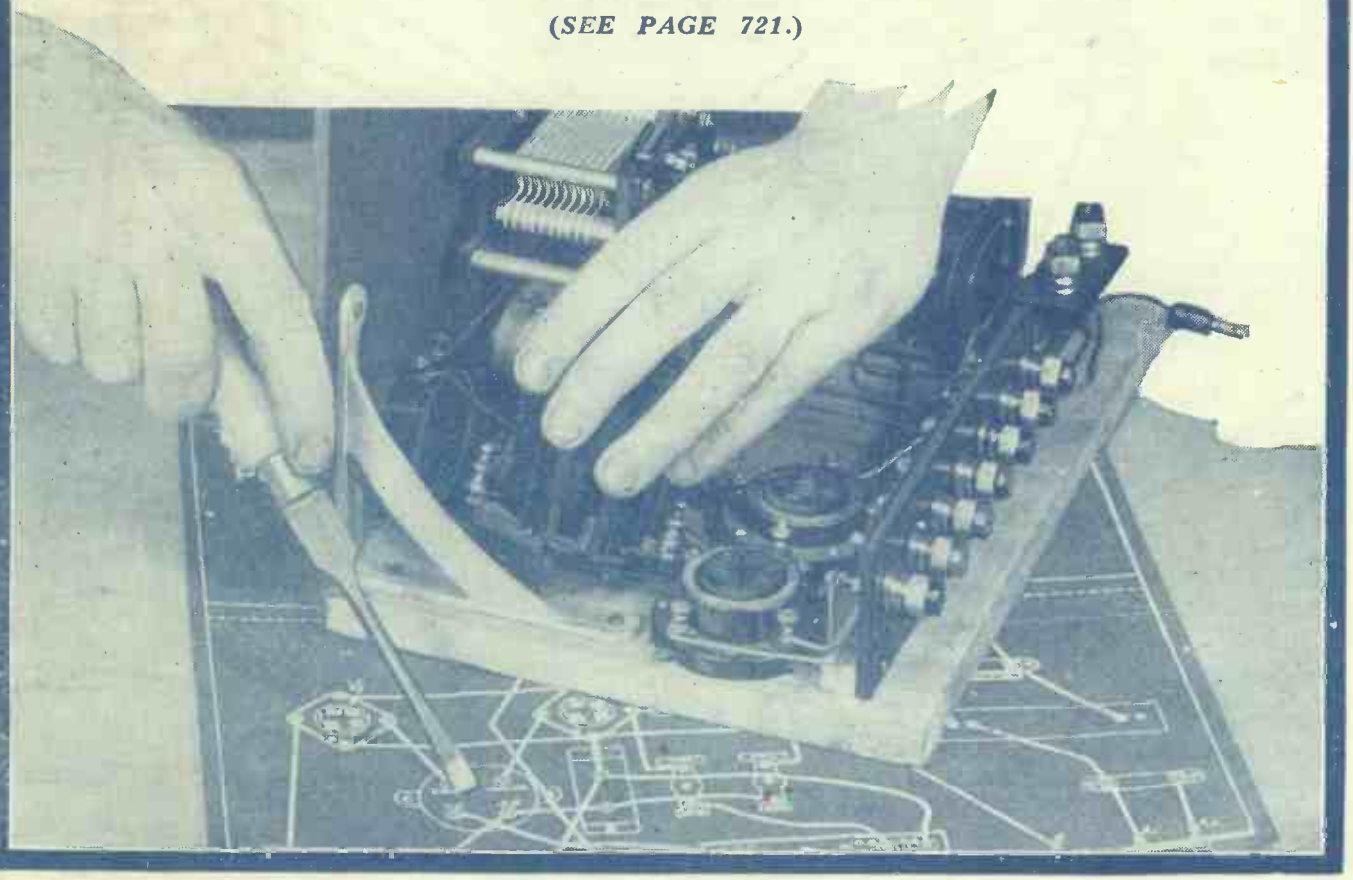
Every Thursday PRICE 3d.

No. 321. Vol. XIII. INCORPORATING "WIRELESS" July 28th, 1928.


# COUPLING DEVICES

## A VALUABLE GUIDE FOR THE AMATEUR

(*SEE PAGE 721.*)



# Popular Wireless

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## RADIO NOTES AND NEWS.

### "Hamlet" Up-to-Date—Silk Stockings—Multum-in-Chicago—The Coral Strand—Hale! Ceylon—Announcers in Glass Cases—A Japanese Fan!

#### Summer Lessons.

NOW is the time when all good journalists print notes about how to leave the set while you go away for the holidays. Just as I gave you spring-cleaning hints in the spring (if any), I will see you safely through the summer vacation. I will first adopt the Sunday newspaper style. (*Hem!*) Earth the aerial. Twice. Once for luck; once for safety. Fill the accumulator, *with distilled water*. No acid need apply. If the set is portable, take a trailer with the car; if not portable, insure heavily and shove it on to the lawn. (Lawn="grass" in Hoxton.) Disconnect the "earth." U.S.A. may want it while you are at Broadstairs.

#### The Essential Acts.

NOW to be serious. If you are already away from home don't read this, or you'll spoil your lunch. First, disconnect the accumulator, charge it, "top" it up with water, and stow it in the cellar with a cover on it; but not a cover which touches the terminals. Disconnect the H.T. battery, leaving its leads on the set, and stow it out of range of heat, damp, and sunlight. Chuck a cloth over the set. Earth the aerial or lower it. That's all. But it is also advisable to turn off gas and water taps, and to cancel milk and newspaper orders.

#### Hamlet Up-to-Date.

ALL this fuss about "Hamlet" over the radio inspires the following soliloquy. "To hear or not to hear! That is the question. Whether 'tis nobler in the 'fan' to suffer the squawks and whistles of outrageous nightingales or to take 'phones against a sea of stations and, by good tuning, hear them. To hear, to writhe, to writhe, perchance to twist; ay, there's the rub, for from that dread fowl's note what dreams may come when we have laid us in our little beds must give us fits."

#### Silk Stockings.

AS you know, Schubert and Mendelssohn and Sousa are in American broadcasting embellished with advertisements of merchandise. But, then, there is no licence fee to pay. One U.S.A. firm boasts that by means of radio ads. it sold, between February and April, sixty thousand pairs of silk stockings. Rotten! For *we* can sell twice that in a week over here. They simply *will* have them, from cook to countess. It's worse than bobbing. (Tell us another! Right!) Same firm sold 24 carloads of prunes. It's a shame! American manhood martyred. Rice as well, I suppose.

#### Multum-in-Chicago.

THE Second Annual American Radio Trade Show, held last month in Chicago, was quite a brisk affair. Here are a few facts about it. Occupied 30,000 square feet and 25 floors of rooms, 155 of the rooms being used for demonstrations. Exhibitors numbered 205, of which 48 were set makers, 43 of whom showed "mains" sets. Moving-coil loud speakers were predominant.

#### "Who Told You That One?"

BEFORE we hop from America to India do just listen to this. The Chesapeake and Ohio Railways use trains so long that they have had to install radio transmitters, receivers, and loud speakers at each end of 'em, so that the guards can keep in touch with the drivers. This is not an American joke, but a fact. Some of the goods trains are almost a mile long. Mighty slick boys, the Americans! I heard of one who could blow a candle out and jump into his bed before it was dark!

#### Said the Alderman.

THE alderman intervenes between U.S.A. and India. I want you to know that, as reported by the "Daily News," Alderman Robson, of Bournemouth, has made a great discovery. The Corporation has (it seems) a radio set installed in a Corporation café. I shudder at the thought of a Corporation café. But who cares? Said the alderman, "The programmes are unsuitable and the transmission very unsatisfactory." The programmes, perhaps. But, as to the transmission, I fear that the

(*Continued on next page.*)

### "OH KAY" FOR LISTENERS!

Miss Gertrude Lawrence, who took a leading part in "Oh Kay," photographed in the studio at 2 L O, from which she sang "Someone to Watch Over Me."

# NOTES AND NEWS.

(*Continued from previous page.*)

alderman is laying the vices of a corporation receiver at the B.B.C.'s door. N-no!

### The Coral Strand.

"HAVEN'T noticed much coral around India myself, but if the hymn-book says it's there—I pass." J. N. (Bangalore)—I think it is an N—says that after a period of doubt he now considers that 5 S W is oozing out the real stuff and reception is "topping," and he takes off his topee to that station, which, he adds, will be a great cementer of the Empire if it continues. My private opinion is that the B.B.C. runs 5 S W only as a sop to public opinion. Blind, blind, blind! If the B.B.C. liked it could give the British Empire a new lease of life. It's time the Government took a hand.

### Colombo Recollections.

DO Ceylon sahibs reckon themselves India? I suppose not! Anyway, it's near enough to the Peninsula for my notes—and I didn't see any coral strand there, either. It has some remarkable native salesmen, and well I know it. Moonstones, opals, and wooden elephants! The grub at the Galle Face Hotel is the equal of that at Raffle's, Singapore, but I thought it was not so well served. I don't like Chink waiters. Too Pussyfoot! But this is not radio. I wander into my hectic past when, on radio business bent, I tried half the hotels between Port Said and Shanghai)

### Hale! Ceylon.

F. V. H. (Colombo) weighs in with four pages of foolscap, complete with illustrations, which I have passed on to the technical Johnnies for digestion. Much obliged and gratified, F. V. H. My correspondent, who says that he has read us since 1925 and feels all the cooler for it, works with our "Reflex" Hale, and therewith can get Bombay (900 miles) any night. He gets X's also, and I believe him. If I were living East I should go for the short waves and leave X's to meteorologists. Have you tried the "Sydney" Two? That's your proper game.

### Armistice, Please!

YES, I've a goodly batch of letters in a clip, mostly from India, South Africa, and sich. Give a fellow a chance! I have only about one-and-a-half pages per week. I'm a poor man with ten children and a tax-collector to maintain! I chortle when I get your letters, firstly, because it proves that "P.W." gets there, and, secondly, because it proves you like us. What with news of radio and what with current topics, I find it hard to work you all in. But Ariel goes to sleep (if any) with all your letters under his pillow, dreaming of Notes to come. Dream thou likewise!

### Radio and the Book Trade.

THERE is no doubt that broadcasting has stimulated the sale of books of many kinds, which is good for publishers and public alike. Perhaps some of you who have listened to Mrs. Marion Cran's delightful talks about gardening will like to know that she has published a book called "The Joy of the Ground." My gardening activities, apart from shoving the lawn-mower, consist of smoking on the veranda and giving advice to the workers below—and smelling the flowers—and paying all expenses. But I bar the practical side; I always want to estimate a worm's inductance!

### Announcers in Glass Cases.

AN excellent idea! *Forced* pronunciation! Birmingham has been treating itself to a new studio, as a result of which its announcers are relegated to a glass case. Now, mummies and fossils and all sorts of interesting things live in such places, but as announcers are live humans one can but suppose that the idea is to preserve them from contact with the outside world, so that their pronunciation may remain unspotted. "Ladies and gentlemen, walk up and hear 'Uncle Bimbo,' who never called a spade anything but an 'excavatory implement'! And never said 'toot onsomble'!"

## SHORT WAVES.

'Mongst all the ships that sail the B.B. sea,
I trust that none of them will hardship be;
Your only "wrecks" be of the "Palmer" sort,
Your course "Star"-strewn till you are safe in port.

L. E. Naylor, "Evening News."

* * *

Mrs. Jones: "So you have two radio sets at your house?"
Mrs. Brown: "Yes, the one my husband repairs himself, and the one we get our music on."—"Radio News."

* * *

Extract from an essay on wireless: "Atmospherics are things which you hear when you invite your friends to listen-in and are caused by severe disturbances in the air, such as barrackers at football matches, and volcanoes."

* * *

The boy stood on the burning deck,
The wireless was in flames.
He couldn't send an S.O.S.
So he prayed for heavy rains.

"Popular Radio Weekly."

* * *

"Why, when President Coolidge delivered a radio speech, did the announcer declare that it would be heard all over the United States, 'as well as over a large part of the civilised world?'" we read in an American journal. Maybe he's heard some of the language used by radio fans out there.

* * *

When constructing a wireless set, we are told, the thing to remember is to get the relative connections right.
We quite agree—especially if they happen to be rich maiden aunts.

* * *

Agony Column Extract: "Darling Amelia, come back to your heart-broken hubby—I miss you awfully, especially now that I've sold the loud speaker."

* * *

Little Percy: "Our garage man has a fine radio set, mamma."
Unsuspecting Mamma: "What makes you think that, dear?"
Little Percy: "Why, I heard him say he would get hades when he got home to-night."—"Radio News."

RADIO GYMNASTICS.

No man with any sense denies
The need for healthy exercise.
It's not for me to criticise
This novel proposition.
Let every listener-in who will
Forsake his bed when dawn is chill,
And do his daily "broadcast drill,"
'Twill keep him in condition.

Yet I, for one, shall not obey
Those brusque commands at break of day.
Upon my virtuous couch I'll stay,
Sunk in a sleep seraphic.
A sedentary life I lead,
But, where the 'buses swerve and speed
I get what exercise I need—
Dodging the "one-way traffic."

"Daily Herald."

### "The Saveloy."

THE few remaining human beings in the B.B.C. staff have amused themselves by producing a "house organ" called "The Saveloy," which contains about as much entertainment and wit as the B.B.C. broadcasts in six months. I cull one gem herewith, and on the strength of it I call this my Scottish number. "What is the difference between an accumulator and an Aberdonian?" Answer: "The accumulator can be overcharged!"

### A Japanese Fan.

I DO not refer to those bamboo and paper things covered with pictures of Fujiyama and storks, but to Mr. K. Kusama (J X A X), who is a Japanese gentleman with a very business-like transmitting station and a lovely Occidental crease in his trousers. I've a photograph to prove it, sirs. According to C.C.F. (Dewsbury) there is in Japan a small but select and hard-working body of amateurs, very keen to work DX with any country, especially Great Britain.

### Give 'em a Shout!

PERHAPS you have not met any Japanese. I have—plenty, and I tell you they are real nice people, as brainy as the dickens, and as smart and clean as new paint. I have also a picture of Mr. Shima Shiego (J I S H) of Tokio. He wears Japanese garb, but his receiver is a walloper. I have before me another photograph of thirteen amateurs, one of them a lady, or I'll eat my hat! They seem to be taking tea, or perhaps *saké*. A jolly crowd! Why don't some of you write? Mr. Kusama's address is Hirano Mikagecho, near Kobe, Japan. He will arrange DX tests or pass letters around the gang.

### The "Antipodes Adaptor."

H. B. (Retford) has had an ear-opener. He states that he "threw the set together" with odds and ends, at the cost of a bob, and that stations "poured in." He uses the "Adaptor" with a three-valver (det. and two transformer-coupled stages) and finds that 2 X A D and 2 X A F come in like thunder on the speaker. His list of stations received during one week includes 3 L O (Melbourne) on two pairs of 'phones; 2 X A D, on loud speaker; 2 X A F, on 'phones; K D K A, on 'phones; Copenhagen, on loud speaker; Doberitz, on loud speaker; and P C J J. (The "Adaptor" was described in "P.W." No. 303.)

### Answers to Correspondents.

PERHAPS *this* method will clear off enough letters to enable me to see the surface of my table—when possibly I may find the pipe I lost in 1925. C.H.R. (Scunthorpe).—Thanks! You and I appear to be twin-fans. Write again. F.D. (Acle), J.N. (York), S.T. and L.M. (Leeds).—No, I have *not* been "sacked" by the B.B.C. But I know who needs "sacking" there. P.P. (Rome).—Yes, chamber music is considered by leading medical authorities to be inimical to the public health. T.N. and forty others.—No, I do *not* know what station played "tum tee tum tum" in A minor on strings on June 14th at 11.40 p.m. I was in a taxi, S.S.W. of Charing Cross, then.

ARIEL.


**A clear and comprehensive chat on chokes**
**By PERCY W. HARRIS, M.I.R.E., who has recently carried out considerable research work on the uses of this important component.**

THE ideal low-frequency choke, in practically all cases, is one which offers an impassable barrier to alternating or pulsating currents of any frequency while allowing a steady current to pass with complete freedom. It is, of course, impossible to build such a choke, but one may still fall far short of these ideal requirements and yet produce a practical and perfectly satisfactory choke for general use. Just what falling off from the ideal can be permitted depends upon the particular use to which the choke is to be applied.

### Effect on Quality.

Disregarding the "eliminator" uses of low-frequency chokes, there are three leading ways in which they are used in radio circuits. Firstly, we can use a low-frequency choke in an L.F. coupling device between valves. Here the choke allows the passage of the direct plate current, but offers a high impedance to the audio-frequency pulsations which we wish to pass on. The low-frequency voltages set up across the terminals of this choke (one side being connected to the plate of the valve and the other to the filament through the high-tension battery) are applied, through a stopping condenser which offers a relatively low impedance to these potential fluctuations, to the next grid.

Now a poor choke will offer a fairly high impedance to frequencies of a thousand or more, but will not satisfactorily choke the lower frequencies which are so important for faithful reproduction. A set made up with a poor choke will give a rendering which is "thin" and lacking in quality, resembling an old and cheap gramophone. Again, a low-frequency choke may offer quite a high impedance to the low frequencies we want to transmit, but may be so badly made as to have a large self-capacity.

### The Voltage Drop.

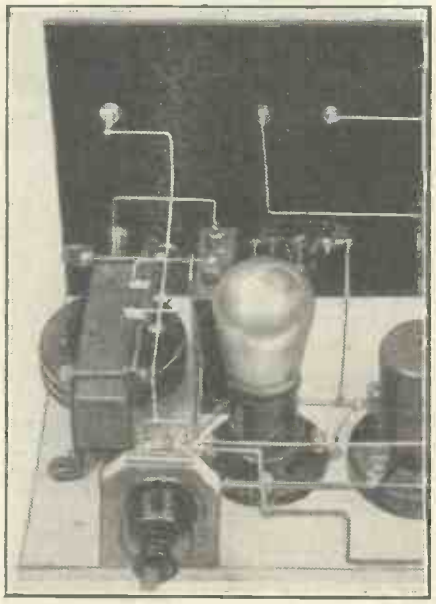
Self-capacity in a low-frequency choke has almost the same effect as shunting this choke with a condenser of a value equal to the self-capacity of the windings, and as a condenser will allow a passage of high-frequency pulsations better than low, it can happen that the choke will offer a high impedance to the low frequencies but will not choke back the high frequencies. Reproduction with such a choke will be "woolly" and lacking in clarity and in that "definition" which is characteristic of receivers giving faithful reproduction.

When a choke is used for intervalve coupling, the steady current which will have to pass to supply a modern high-impedance valve suitable for choke coupling is quite low, being rarely more than a couple of milliamperes. The wire in such a choke can thus be fine, and the D.C. resistance can be in the neighbourhood of two or three thousand ohms without any disadvantage, as this resistance will form but a small proportion of the total resistance in circuit.

The voltage drop, through 3,000 ohms, at a current of two milliamperes, is but six volts, which is negligible when a voltage of 120 or 150 is being used. High inductance and low self-capacity are the virtues sought in a choke used for this purpose. Excellent low-frequency coupling chokes are now made which give results, in properly designed circuits, indistinguishable from those given by resistance-capacity coupling.

### Separating the Direct Current.

The second use of low-frequency chokes is in loud-speaker coupling devices. Here the function they fulfil is to separate the direct current for the plate supply of the output valve from the alternating current which we desire to pass through the loud-speaker windings.



Here is a choke being used for coupling the loud speaker to the set, which, by the way, is the "Suburban" Two, described in "P.W." No 317 (June 30th, 1928).

The requirements of an efficient choke used for loud-speaker coupling are somewhat different from those of a choke used for intervalve coupling. For example, whereas in intervalve coupling chokes the D.C. resistance can be as high as three or four thousand ohms without any apparent disadvantage, a choke with this D.C. resistance would be almost useless in a loud-speaker coupling device.

The reason is, of course, that the plate current required for the output valve is considerably higher than that required by the relatively high impedance valves which precede the choke in choke coupling. The plate current of an ordinary power valve (assuming correct grid bias with 120 volts on the plate) is generally in the neighbourhood of five or six milliamperes and with a super-power valve eight to ten milliamperes or more.

### Power Valves in Parallel.

If, as is frequently the case, output valves are run in parallel, then the current rises to a still higher figure, but assuming a current of ten milliamperes through a choke of three thousand ohms resistance, we find a drop of no less than thirty volts. Furthermore, so large a current as this would probably cause a breakdown in many chokes designed for intervalve coupling.

Thus, while we still require high inductance and low self-capacity we need further, in loud-speaker coupling chokes, the lowest possible direct-current resistance. While it is comparatively easy to make a high-inductance choke which does not carry much current, to obtain the same inductance with six or eight times the current requires a much bigger choke with more iron and heavier wire.

The third use of L.F. chokes is for the purpose of preventing unwanted battery coupling where the high-tension supply is common to several valves. By inserting a low-frequency choke between the coupling device and the battery, and by connecting a high-capacity condenser between the point of the choke nearest to the valve and the low-tension negative lead, we can keep pulsating currents out of the battery and thus prevent a good deal of back-coupling trouble, particularly when very strong signals are being obtained.

### A Use for Old Chokes.

Such chokes in series with high-resistance valves such as those used for resistance-capacity or choke coupling can be of quite high resistance without any noticeable loss, but in cases where these chokes are used with power valves a fairly low resistance is needed. A choke which will give horrible quality of reproduction when used for coupling, can serve quite satisfactorily as a "stopper" in the battery leads, so that it is not a bad plan when one has inferior chokes on hand, to use them for this purpose instead of throwing them away.

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

# L.F. TRANSFORMERS

GUIDING THE FLUX—A BAD DESIGN—DISTORTION—SECTIONED WINDINGS—PICTURE TRANSMISSION, ETC., ETC.

### L.F. Transformers.

ALTHOUGH a low-frequency transformer, whether an intervalve transformer or a small power transformer, is apparently a very simple appliance, some curious misapprehensions exist in the minds of many constructors and experimenters on fundamental points of design.

For example, I have several times had letters from readers describing their attempts to make small transformers, more particularly small power transformers, but without very much success. I have a letter before me at this moment in which my correspondent shows, by the aid of a diagram, that he has wound the primary of his transformer on one limb of the core and the secondary upon the other limb; he finds that the transformer is of such low efficiency that it practically does not work at all.

### Guiding the Flux.

This will serve as rather a useful example to illustrate one very important point which must always be borne in mind when designing and constructing small transformers. The point in question is that the magnetic flux produced in the core by the current in the primary winding of the transformer should, as far as possible, be made to pass through the secondary winding.

A theoretically perfect transformer—from this point of view—is one in which the secondary winding embraces the whole of the flux produced by the current in the primary winding.

### Magnetic Leakage.

In practice this ideal state of affairs is never realised, and there is always a greater or less percentage of leakage of the magnetic flux, this being known as "magnetic leakage." It is obvious that the voltage developed in the secondary will fall short of the theoretical voltage to an extent which depends upon the amount of magnetic leakage which takes place.

If the magnetic leakage is very large, the voltage and the power developed in the secondary may be only a small percentage of what they should be, according to the simple and well-known calculation. Everybody knows that theoretically the relation between the secondary and primary voltages should be the same as the relation between the secondary and primary numbers of turns. This simple and well-known relation is, however, as I have indicated, never true in practice for various reasons, the principal reason being the magnetic leakage.

### A Bad Design.

Now if you design a transformer in which the primary winding is all upon one limb and the secondary winding all upon the other limb, it is obvious that the magnetic flux which is to produce the voltage in the secondary winding can only reach the secondary winding by travelling a considerable distance along the iron core from the region of the primary winding.

If you were able to see the distribution of the magnetic field—you will remember the pictures in elementary electrical textbooks, showing the distribution of the "lines of force" surrounding a permanent magnet as indicated by sprinkling iron filings in the region of the magnet—you would see that by far the largest proportion of the magnetic lines of force produced by the current in the primary winding wander off in various directions, only a small proportion of them eventually finding their way along the iron core and into the secondary winding. This accounts for the extreme inefficiency of a transformer designed and made in this way.

### Distortion.

No one experienced in transformer design would place the primary and secondary windings as far away as possible. As a matter of fact, one of the principal aims of the transformer designer is to get the secondary and primary windings into as close proximity as possible—that is, if his object is to make the transformer as efficient as possible in the power sense.

I should interrupt the argument, perhaps, to explain that in certain cases of small transformers—for example, in "speech"-transformers, such as are used for telephone work, intervalve transformers, and so on—the power-efficiency consideration is not always the most important; it may be comparatively unimportant, the vital consideration in such a case being the purity of the reproduction or absence of distortion.

### Small Power Transformers.

However, at the moment I was thinking more particularly of small power transformers, where power-efficiency is the prime objective. In such cases, as I said, the primary and secondary windings should be got as intimately together as possible, so that as little as possible of the magnetic flux produced by the primary escapes acting upon the secondary.

This brings me to a simple reply to the query which so frequently crops up from readers as to why the bobbin of a transformer is made in slotted or partitioned sections.

The most obvious way to get fairly near to the proper conditions is to wind the

(*Continued on page* 736.)

## BRITISH BANDMASTERS BRING BRIGHTER BROADCASTING

Jack Payne and (right) Lieut. W. B. O'Donnell, the two popular B.B.C. Bandmasters, to whom is due so much of the brightness which finds its way into the summer programmes.

NEWS FROM SAVOY HILL. FROM OUR OWN CORRESPONDENTS.

# LORD CRAWFORD TO BROADCAST

THE LIBERAL MOVE—P.M.G. AND THE REGIONAL SCHEME—CENOTAPH BROADCAST ON ARMISTICE DAY, ETC., ETC.

### Lord Crawford to Broadcast.

ALTHOUGH the Earl of Crawford and Balcarres was Chairman of the Government Committee which practically created the new B.B.C., he has been careful to avoid the microphone. Savoy Hill taxed its ingenuity to create suitable occasions; but Lord Crawford was adamant; it was, in fact, rumoured that he had made a solemn vow never to broadcast.

No reason was given, but it was presumed by those in a position to know that this reluctance did not arise from any sense of superiority but from personal diffidence and dislike of publicity. Now the call of the Council for the Preservation of Rural England has proved irresistible. Lord Crawford will appeal for funds for this movement on Sunday, August 5th.

### The Liberal Move.

It had been planned that the Liberal Party would move a reduction in the salary of the Postmaster-General because of the B.B.C. programmes. This was to have been the great surprise of the debate on the Post Office estimates. In the event, however, the attack on the B.B.C. did not take a party form.

For the first time, members of all parties expressed more dissatisfaction than satisfaction with the programmes, and tried to fasten the responsibility on the Postmaster-General. Old Parliamentarians were aware that Sir William Mitchell Thompson was ill at ease and anxious to "get out from under."

It is an open secret in the lobby that he yields to no one in his impatience with the present state of affairs at Savoy Hill.

(*Continued on page* 734.)

# The "VERSATILE" ONE

**This very simple, inexpensive and easily made little set has many possibilities, for you can change over from one circuit to another with extreme rapidity.**

**Designed and Described by C. P. ALLINSON, F.Inst.P.Inc., A.M.I.R.E.**

WHICH is the most efficient circuit, the Hartley or the Reinartz? Do you know? Have you ever tried?

I am not going to tell you which I think is best, for the simple reason that the result which may be correct on my aerial may be quite different on yours. I am going to tell you, however, how to make up a single-valve receiver which can be changed over from a modified Hartley to Reinartz within a matter of seconds, so that you can try out for yourself on the same aerial the relative merits of these two circuits.

Apart from the fact that you can change over from one circuit to the other with extreme rapidity, the receiver further allows of variations in the aerial coupling and reaction coupling being made, giving control both of selectivity and of the amount of capacity required to give reaction.

**COMPONENTS REQUIRED.**

- 1 ·0005 Log mid-line variable condenser (Formo, Lissen).
- 1 ·0003 Log mid-line variable condenser (Lissen, Formo).
- 1 Sprung valve holder (Bowyer-Lowe, or other standard make).
- 1 Baseboard-mounting single-coil holder (Burne-Jones, Lotus, Peto-Scott, etc.).
- 1 ·0003 grid condenser and 3-meg. leak (Clarke, Dubilier, Igranic, Lissen, Mullard, T.C.C., etc.).
- 1 Filament resistor and base (Cyldon in set. Any standard type of filament control).
- 1 H.F. choke (any standard choke, R.I.-Varley, Burne-Jones, Bowyer-Lowe, Climax, Cosmos, Igranic, Lissen, etc.).
- 1 Wooden baseboard, 12 in. × 8 in.
- A number of terminals and strips of ebonite for the terminal strips.

The question of selectivity is frequently a very important one, and is so in my case in particular, in view of the fact that I reside within a mile of 2 L O. A single-valve circuit which will cut out the station and get 5 G B clear of interference without the use of a wave-trap, is therefore indicated as being a pretty selective one.

This feat I was able to perform with the receiver which I am describing by choosing suitable aerial and earth connections.

It was certainly necessary to reduce the aerial tap to a very small number, but this was to be expected in view of the fact that I was using a plug-in coil, which it is generally accepted is not so efficient as a carefully wound single-layer solenoid.

The use of a plug-in type of coil enables different wave-bands to be covered, and I have therefore incorporated this coil in the receiver. Those, however, who wish to build the set for the reception of B.B.C. wave-lengths only are well advised to make up a special coil for use with this set rather than employ a plug-in coil. At the same time, if you happen to have a suitable coil handy it will save a certain amount of work and enable you to try out the set with the least amount of labour.

### "Free-Grid" One.

If you have made up the "Free-Grid" One you will find that this set can easily be converted to the present circuit by the alteration of a few leads.

If, however, you have not done so, why not make up this set now, and when you have tried it out turn to the June 23rd issue of POPULAR WIRELESS and try the exceedingly interesting circuit described in the article referred to above?

The theoretical circuit of the present receiver is shown in Fig. 1. $L_1$ is an inductance which is provided with two tappings near one end. This is tuned by a variable condenser $C_1$, which has the usual capacity of ·0005, while rectification is obtained by the usual leaky grid condenser $C_2$ and $R_2$.

An H.F. choke and variable condenser $C_3$ are connected as shown in the plate circuit, so as to allow of reaction being obtained; while a resistance $R_1$ in the positive filament of the valve allows the valve to be switched on and off.

### Smooth Reaction.

The lead Y to the moving vanes of the variable condenser $C_1$ is actually a flex lead which may be disconnected from its present point and connected directly to the earth lead. When connecting up as shown in Fig. 1, however, we have the Hartley circuit modified in that the L.T. return is not taken from the centre of the coil, but from a point well down this inductance.

This enables a far smoother control of reaction to be obtained, though at the same time it requires a reaction condenser larger than the midget condenser which is usually employed in the Hartley circuit. At the same time, a greater proportion of the signal voltage generated across the tuned circuit is applied between grid and filament of the detector valve, thus resulting in an increase in signal strength being obtained as against the centre-tapped circuit.

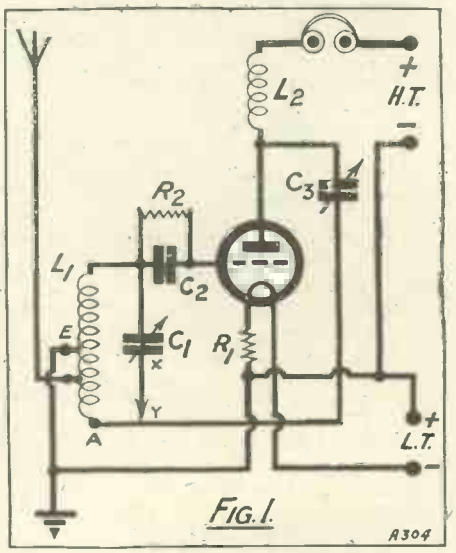



FIG. 1.

A304

By transferring the lead marked Y from the bottom of the inductance $L_1$ to the

(*Continued on next page.*)

## THE "VERSATILE" ONE.

(Continued from previous page.)

earth terminal we get the Reinartz circuit shown in Fig. 2.

It will be seen that both in the Fig. 1 and Fig. 2 circuits the connections shown give the greatest degree of selectivity, since the number of turns lying between the aerial and earth taps on the coil is very small.

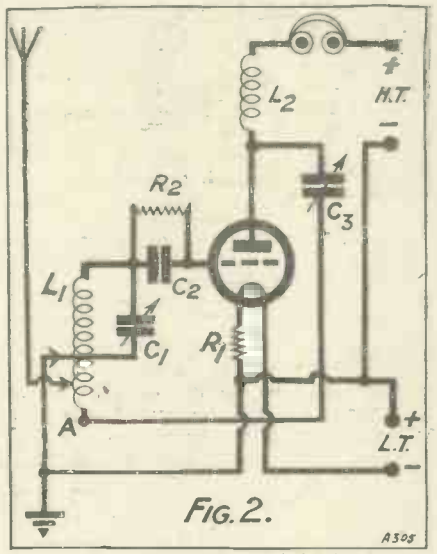


FIG. 2.

In order to increase the signal strength therefore from distant stations, or in cases where such a high degree of selectivity is not required, the aerial lead may be transferred to the bottom of the coil—that is, the point marked A in each case—which gives tighter aerial coupling, and therefore enables an increase in signal strength to be obtained.

The method of doing this in the case of the Fig. 1 circuit is shown in Fig. 3B, and Fig. 3A shows another aerial-earth arrangement which not only gives a different degree of aerial coupling, but also a different degree of reaction coupling.

### Improving Operation.

Should it be found that with the connections shown in Fig. 1 reaction is somewhat fierce, the use of the connections given in Fig. 3A will give a much smoother control.

It will be seen that the set allows of two or three further variations as to aerial and earth and reaction connections being employed, and I think, therefore, that it fully merits the title of the "Versatile" One.

Having decided to make up this receiver, you will probably find that the components you need are lying about in the workshop. If, however, you do not happen to have them to spare at the moment, the accompanying list gives you the ones used in the original set, with a few suggestions for alternatives.

The photographs of the finished set show that I have not used an ebonite panel, and the baseboard type of construction which I have employed is greatly facilitated by the fact that the variable condensers which I have used are provided with drilled lugs or feet, by means of which they can easily be fitted to the baseboard with small brass screws.

If you are using other condensers you will probably have your own idea on how to fix them.

The wiring diagram also shows the positions in which the various components are placed, as well as giving the connections which need to be made.

### Changing Circuits.

It should be noted that three of the leads are flexible leads provided with spade tags (or, if you like, spring clips) at the ends, by means of which the circuit can be changed over from one to another. You should make sure that these leads are left long enough so as to enable them to reach the various points to which you may need to connect them in order to make the necessary alterations as regards the circuit arrangement you want to use.

If you build the set so as to allow of a plug-in coil being used, the correct type of coil to employ will be an X coil, which is provided with two tappings. The size of this coil should be a No. 50 or 60, and two coils which I have found very satisfactory in use with this are the Lissen and Lewcos.

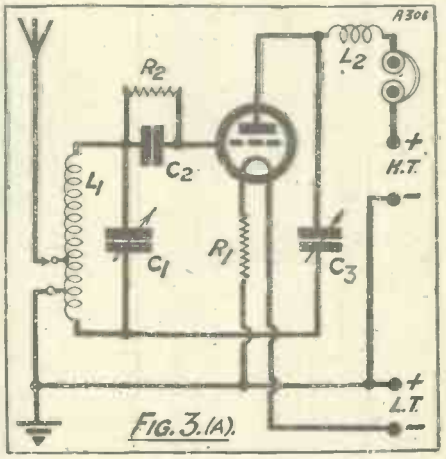


FIG. 3.(A).

It should be noted that the No. 60 coil is correct for use in the Fig. 1 circuit. If, however, you intend to connect the set up as shown in Fig. 2, then it will be advisable to use a No. 75 coil, in view of the fact that the whole of the inductance is not tuned by the variable condenser.

If you want to make your own coil for use in this set, instead of having an interchangeable coil, Fig 4. gives the details as to the inductance. This is suitable for use with the Fig. 1 circuit as regards the number of turns given. The connections to the coil are marked according to the theoretical circuit given in Fig. 1, and the various numbers of turns at which the aerial and earth taps are taken are indicated.

If, however, you want to make the coil so as to be suitable for use with the Fig. 2 circuit, the total number of turns A should be increased to 63, the other numbers of turns remaining the same. In this case, however, the tuning condenser, instead of being connected between the two ends of the coil, will be connected between the grid end and the earth tap only.

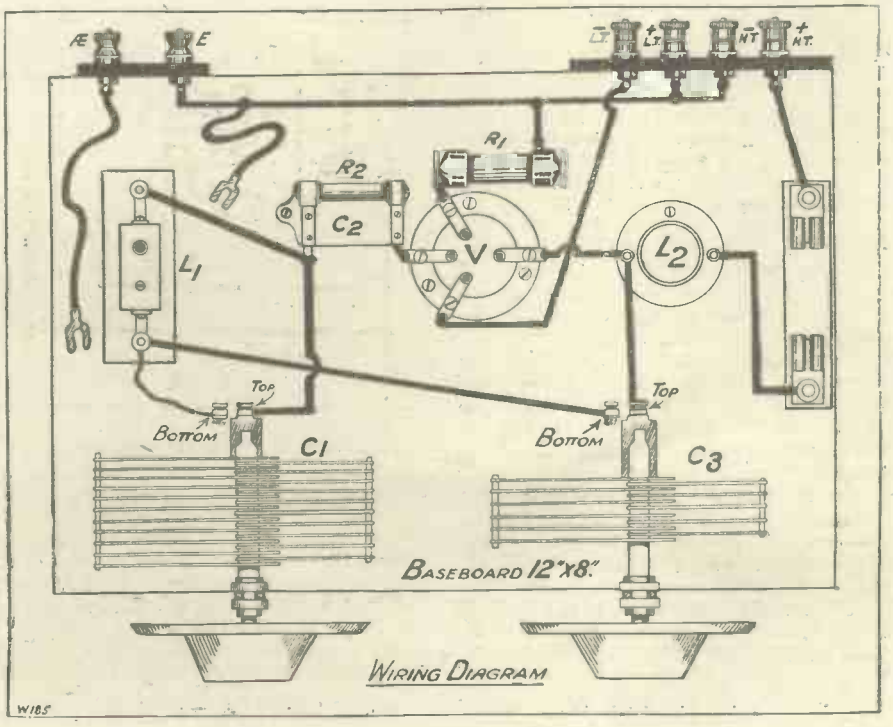
### Results Obtained.

The following extracts from my note-book will give you some idea as to the results given by the set and the conditions under which it is working.

*A. Used as a Reinartz Receiver.* Valve used was alternatively an H.F. valve or an R.C. valve. The latter was found to give somewhat smoother reaction, but required more high tension. Very little difference in signal strength was noticeable between the two. If anything, the H.F. valve gave slightly louder signals. This circuit was found to be very sharp-tuning, and a No. 75 coil was found satisfactory to cover the broadcast wave-band.

By shifting the aerial lead to the bottom of the coil it was found possible to obtain a marked increase in signal strength on

(Continued on next page.)



## THE "VERSATILE" ONE.

*(Continued from previous page.)*

distant stations, though, of course, the selectivity of the receiver fell off. For the reception of 5 X X the correct coil to use was found to be a Lissen 250 X, or Lewcos 200 X. Valves used will be found in the list given at the end of the next paragraph.

*B. Modified Hartley Circuit.* The correct type of valve for use with this circuit was found to be either an H.F. or R.C. valve. Two valves which were found to

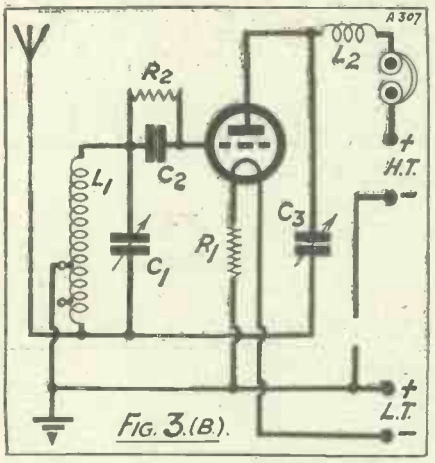



FIG. 3.(B).

give exceedingly smooth reaction with it were the Burndept H.512 and the Cosmos 50 B. There was very little to choose between the two as regards signal strength, though on the whole the H.F. valve was found to give the best results. The wavelength range with a No. 50 Lissen X coil was found to be from 175 to 520 metres, and with a No. 60 Lewcos coil from 180 to 580 metres.

### Suitable Valves.

For long-wave reception, the same coils as mentioned in the previous paragraph were used and found satisfactory. The control of reaction was found to be a little more critical than with the Reinartz circuit on the aerial-earth system, on which the test was carried out. Other valves found satisfactory: Cossor 610 H.F., P.M.5 X., P.M.5 B., S.P.18 B., D.E.H.L.210, D.E.H.210, P.M.3 A., D.E.5B., etc.

*L.T. and H.T. voltages.* In the case of the Hartley circuit I found it an advantage with some valves to work with a slightly lower filament voltage than that specified by the makers. Instead of using a 4-ohm filament, for instance, a 7-or 8-ohm resistor would enable smoother reaction and better signal strength to be obtained. With the Reinartz circuit the normal voltage was found to require no modification.

As regards H.T. the Reinartz circuit would allow a fairly high voltage to be employed without any signs of backlash, and thus the greatest efficiency was to be obtained; with the Hartley circuit the value of H.T. was inclined to be a trifle more critical, but with a fairly high value grid leak, between 3 and 5 megohms, no actual difficulty was experienced.

### Stations Heard.

Among the various stations which were picked up with this set the following were heard at excellent strength on the headphones, taking into consideration their power and distance away from the receiver. 2 L O, Bournemouth, Frankfurt, Münster, 5 G B, Manchester, Nuremburg, Karlskrona, Langenberg, Stuttgart, French transmission on about 275 metres, one or two others unidentified.

The set can also be used for short-wave work by the construction of a suitable coil. It would probably be necessary, however, to insert a small fixed condenser in series with the aerial lead to prevent the aerial damping from swamping the set, so making it impossible to get it to oscillate. For the 20–40-metre band you will require a 4-turn coil, taps being taken at 2 and 3 turns from one end.

In some cases it may be that the particular valve used in conjunction with the aerial to which the receiver is attached will cause better results to be obtained if the taps are taken at 1 and 2 turns from the bottom end instead of at the 2 and 3 turns mentioned above. These turn numbers are approximate only and depend on various factors. They refer, further, to the Hartley circuit.

### Reaction Turns.

For the Reinartz circuit, the turn numbers will, of course, have to be modified according to the number of turns required

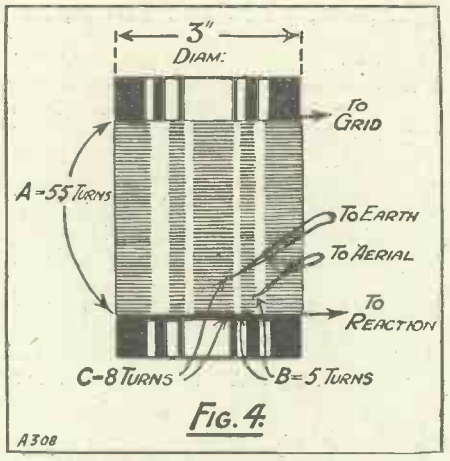



FIG. 4.

for reaction. For the 20–40-metre band 4 turns will be tuned, and 3 or 4 extra turns will be needed for reaction, the aerial being tapped on at 1 turn or even half a turn from the earth tap on the coil.

### POINT-TO-POINT CONNECTIONS.

**Connect E terminal to one side of $R_1$, to L.T. + and to H.T. —. Other side of $R_1$ to filament +. Socket terminal of $L_1$ to one side of $C_2$ and to fixed vanes of $C_1$.**

**Plug terminal of $L_1$ to moving vanes of $C_3$.**

**Filament — of valve holder to L.T. —.**

**Anode of valve holder to one side of H.F. choke and fixed vanes of $C_3$.**

**Other side of H.F. choke to 'phone clip.**

**Other 'phone clip to H.T. +.**

**Connect a piece of flex with spade tag to Æ.**

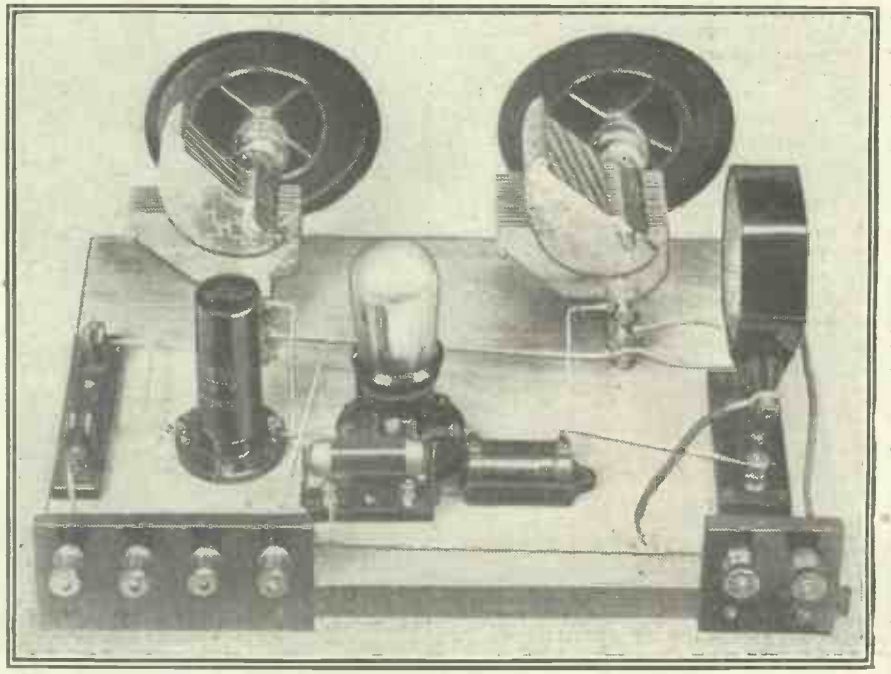
**Connect a piece of flex with spade tag to moving vanes of $C_1$.**

**Connect a piece of flex with spade tag to E.**

**This completes the wiring.**

## A BALLOON BROADCAST.

THE Lille Station, France, recently broadcast a "balloon" transmission, the impressions of a voyage in the air being relayed to the Lille station and rebroadcast. (A severe thunderstorm brought the broadcast to an unexpected close, but a repeat performance is promised.)



**Here you see the finished set wired up in accordance with one of the circuits described. The terminals from left to right are: H.T.+ H.T.— L.T.+ L.T.— and, on the small strip, Earth and Aerial.**

# A BROADCASTING PARADOX

**An examination of the recent statements attributed to the P.M.G., of the programme criticisms made in Parliament, and of other matters bearing on the radio fare provided by the B.B.C., reveals a curious state of affairs.**

**By THE EDITOR.**

AS a result of the "Bored by the B.B.C." campaign, some pertinent questions have been asked in the House of Commons with regard to the Government control of broadcasting, and in particular the control of the programmes which are regularly broadcast by the B.B.C. This debate must have opened the eyes of many listeners, for it was quite clear from the Postmaster-General's replies to the questions put to him that listeners' likes and dislikes are no concern of his. In fact, the Postmaster-General declared that broadcasting in this country has been established on a foundation which was the envy of other countries.

### Peculiar Position.

Up to a point, Sir William Mitchell-Thomson was right, for, undoubtedly, from the technical point of view, British broadcasting leads the world, and no doubt other broadcasting concerns abroad are envious of us because of the advantage the Government obtains through having a monopoly of British broadcasting. Other Post Office officials abroad no doubt wish they could acquire the large sums our Post Office derives from its share in broadcasting licences; but although the Government, through the Postmaster-General, officially exercises supreme control over British broadcasting, and although the B.B.C. exists purely on the goodwill of the public, the Postmaster-General does not seem inclined to concern himself in the slightest degree with the quality of the fare broadcast by the B.B.C. Consequently, it is rather paradoxical that a department over which the Postmaster-General exercises arbitrary control should incline him to express the opinion that the programmes were no concern of his.

Officially, however, the Postmaster-General has supreme control. If he liked to ban dance music he could do so. We have already seen the ridiculous effect of one ban imposed by the Government—the ban of controversy—and we have seen how Mr. Churchill, himself a member of the Government, has called this ban "idiotic," with such good effect that he was responsible for its removal, although the removal of that ban resulted in another debacle when the various political parties tried to come to an agreement as to the allocation of programme time for the broadcasting of political controversy.

### "Dismally Failed."

But the situation to-day is really rather ridiculous, for where can the listener find another channel (except through the columns of the press) to voice justifiable complaints? If the Postmaster-General disclaims all responsibility for the conduct of the B.B.C.'s programme department, then we have the interesting spectacle of a Government concern denying that it has an official channel for dealing with complaints.

Scotland Yard is a Government department, and recently allegations against the conduct of Scotland Yard officials led very quickly to an official investigation. But the conduct of the B.B.C., except on red-tape matters, cannot be questioned officially through the Postmaster-General. The matter has been brought up in Parliament and one member declared that the B.B.C. had dismally failed. He went on to say that simply to take a collection of ex-politicians, ex-schoolmasters, and any citizen who had nothing to do but was willing to render service in return for a salary, and put them in charge of a new invention full of great possibilities, was wrecking the invention from its inception.

Sir E. Hilton Young also attacked the system, for he pointed out that this resulted in a Government monopoly but admitted of no ministerial responsibility. But the Postmaster-General, like Pilate, seems to be inclined to wash his hands of the whole matter.

What is really wanted is an investigation into the programme methods of the B.B.C. Everybody admits that the officials at Savoy Hill are conscientious and do their very best to serve what they consider to be the best interests of the public. But are their methods the methods which best appeal to the public? There is never any smoke without a fire, and the recent outburst of complaints about programmes, whether justified or not, certainly indicates that there is a good-sized section of the listening public which is very far from satisfied with Savoy Hill's efforts.

### P.M.G.'s Responsibilites.

That the B.B.C. will never please everybody is now a definite and obvious fact, but that they should please the majority is necessary if broadcasting is to continue to be a successful undertaking in this country. Undoubtedly there is justification for the complaint that there are far too many talks, and that the B.B.C. lack experienced people who understand what is meant by the phrase "Catering for public entertainment."

But if the Government, having decided to establish a monopoly over broadcasting—over which it very properly gives itself full control—decides to deny responsibility for that side of the B.B.C.'s activities which chiefly concerns the public, and which is entirely responsible for the licence revenue, then it is creating for itself a paradox which can only lead to ridiculous disaster.

We sincerely hope that the ventilation which has been given to this grievance in the House of Commons will result in a clearer understanding of exactly what responsibilities the Postmaster-General must bear, and we hope that in the near future some definite scheme will be undertaken whereby listeners' views may, from time to time, be investigated.

It has been suggested that a plebiscite should be taken, and although this method is rather cumbersome and expensive it certainly would do a great deal of good in clearing up a situation which to-day results in continual newspaper squabbles as to what does and what does not constitute a satisfactory broadcast programme.

A delightful photograph of a meeting between two of the most popular people in the country, the Duchess of York and Sir Oliver Lodge. It occurred during the visit of the Duchess to Lady Margaret Hall at Oxford. It will be remembered that Sir Oliver was the first Professor of Physics at Liverpool University, and was later appointed by the Crown as the first Principal of Birmingham University, from which post he retired in 1919.

# L.F. TRANSFORMER TROUBLES

**Practical Notes regarding the radio problems which may arise owing to a breakdown in this important component.**

**By P. R. BIRD.**

DESPITE the recent great improvements in transformer design the commonest trouble with this instrument is still the "burn-out." This term—which, by the way, is a misleading one—is generally used to indicate a break in one of the windings.

If the break is in the primary winding, the anode supply to the valve in whose circuit it lies is automatically cut off, thus placing this and the succeeding valves *hors de combat*. If the break is in the secondary winding the results are almost equally disastrous.

### Testing the Primary.

When the primary winding is fractured the usual result is not merely an interruption of the transfer of signal impulses to the following valve, but there is often a puzzling fluctuation in the fault as well, combined with weakness and distortion. Even without the transformer being touched in any way there is an irregular contact at the point of fracture which gives rise to scratching and scraping noises, so that a broken primary often means that snatches of distorted music or speech come through, much weaker than the usual signals, and puzzling by virtue of their inconstancy.

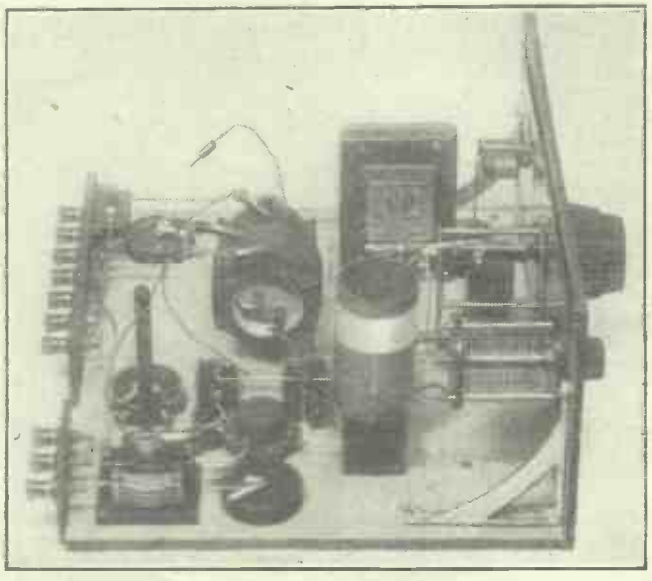
If the transformer can easily be moved from the set the continuity of its windings can be tested by means of the 'phones and dry-cell method. All that is necessary is a small battery to give the tell-tale double click when the 'phones leads are connected across it.

Then, if one end of the 'phones cord is connected to one side of the battery, the remaining side of this to the terminal of the winding under test, and the remaining transformer terminal is connected to the other 'phone tag, a loud click will be heard in the telephones if the winding is O.K. If however, the winding is broken the click will either be quite a soft one, or else no click at all will be heard. The primary is the likeliest winding to "burn out," but if this appears to be O.K. the secondary winding should be tested in the same manner.

### Under Working Conditions.

If the L.F. transformer cannot easily be removed from the set for test, it can be tested for breakdown under working conditions by means of a pair of telephones. If the two or more wires which go to the primary are removed and a pair of telephones are connected across this point in the circuit, the output of the receiver to the transformer can be checked. Good results in the 'phones indicate that the primary terminals when connected will be getting their correct input. If now one side of the 'phones is connected to one of the primary terminals and then the remaining side of the telephones goes to the wire which previously went to this terminal, the telephones will be in series with the primary. (The remaining side of the primary should be connected to its ordinary lead, thus restoring the set to its original form except for the fact that the telephones are now linked in as well.) Weak or negative results will, of course, indicate that there is no connection through the primary. The shorting of the two primary terminals by a piece of wire and the consequent 'phone signals will prove without a doubt that a fault lies between these points. If, however, under this test the primary winding appears to be O.K. and the 'phone results are still good when connected in series with the primary, the 'phones should be taken out of circuit and placed across the transformer secondary terminals instead. Failure to get results here will be a clear indication that the fault lies in the transformer itself.

Not only can the continuity of the primary and of the secondary winding be tested by means of the 'phones and dry cell, but this method can be employed also to make sure that there is no fault in the insulation between the windings. For this test, disconnect all wires from both primary and secondary. Then join one side of the battery to one of the primary terminals, one side of the 'phones to one of the secondary terminals and then listen in when the circuit is completed by attaching the other side of the battery to the other side of the telephones. If the insulation is as good as it should be, the fact that there is no current flowing in the circuit will be indicated by the absence of a click. But if a loud double click is heard on touching the battery and telephone terminals together it will prove that the insulation between these windings has broken down.



For short-wave working the importance of the L.F. transformer can hardly be exaggerated. This set is the famous "Sydney" Two, with which many "P.W." readers have picked up Australia direct.

### Investigating Insulation.

On some transformers it is the practice to provide an extra terminal by means of which the metal case of the instrument may be connected to earth. As both the primary and the secondary windings should be insulated from the earthed case of the transformer, the 'phones and dry-cell method affords us an opportunity of testing whether this insulation is correct. In this instance the test is carried out by connecting the battery to the earth terminal on the transformer, the remaining side of the battery to the telephones, and the remaining side of the telephones to the winding under test. When this final connection is being made no sound should be heard in the 'phones, but a loud click will indicate that the winding in question is not properly insulated from the frame of the instrument.

### "Saturation."

Finally, there are several troubles associated with the use of unsuitable L.F. transformers. For instance, a particularly objectionable form of distortion occurs when an ordinary small transformer with a rather "tishy" core is expected to carry a plate current of 4 or 5 milliamperes, and to respond to the signal variation handed to it by, perhaps, preceding H.F., Det. and L.F. stages. In such a case, the magnetic load upon the core is practically at a maximum before signals are fed to the valve and, consequently, its magnetic variations cannot correspond with the signal's impulses, but can only be varied in a limited degree. The distortion effect is similar to that of an overloaded valve unable to respond faithfully to variations of its grid voltage.

# Choosing Coupling Resistances

**Resistance Coupling is not an "Open Sesame" to pure reproduction — unless care is taken in the choice of resistance values and the valves with which they are to be used.**

**By K. D. ROGERS.**

IT is difficult to write anything about resistance coupling without bringing in the valves with which it is being employed, and so my readers must forgive me if I wander, or appear to wander, from the title a little now and again and begin to talk about valves.

The main idea of resistance-coupling being to provide even amplification—via voltage drop across the resistance itself—it stands to reason that both valve and resistance must be well chosen if maximum results are to be obtained.

Many constructors seem to think that resistance coupling is bound to give pure results. It isn't and it *doesn't*, if care is not taken in the design of the stages.

Let us think a little as to what might happen with bad matching of resistances and valves—one of the great faults in some resistance-coupled amplifiers.

### Distortion Caused.

The signal comes along from the detector valve, is amplified by the valve and then the amplified impulses are passed to the grid of the next valve, which we will say, for the sake of argument, is of the 8,000-ohm type, and which is also resistance-coupled to the next stage.

Now that valve has a certain magnification factor, and is a good type of valve to use in this position provided the rest of the circuit is in keeping with it.

We will assume that distortion is noticed from this set and that the owner cannot understand why, because he is not trying for loud signals, and is sure his last valve—a real super-power—is not overloaded.

A little examination shows that the circuits are O.K., *but* that the resistance in the anode circuit of the 8,000-ohm valve has a value of 500,000 ohms—the H.T. voltage applied being 120 volts and the grid bias "that recommended by the makers" for "120" volts.

### Anode Potential.

That is all very well, but in the first place the valve is not getting 120 or anything like it at the *anode*. Let us see what it is getting. The total resistance across the 120 volts of the battery consists of the resistance of the valve plus that of the resistance unit. That is, it consists of 8,000 + 500,000 ohms.

Now if the voltage drops by 120 across 508,000 ohms, how much is the drop across the first portion, and how much across the second—the valve?

The answer is that of the 120 volts approximately only $\frac{8,000}{508,000}$ of it is applied across the valve, and the rest is *lost* in the resistance. So we have

$$\frac{8,000}{508,000} \times 120 \text{ volts}$$

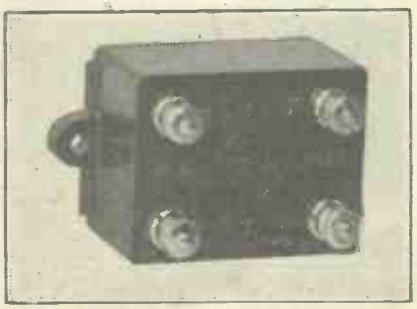
applied to the valve itself, instead of the full 120. In other words, our H.T. *anode* voltage is 1·9 volts only.

### Effect of Lower Resistance.

Not a great amount—and no wonder distortion occurs. This, of course, is very approximate, but as a rough guide it shows how fallacious it is to imagine that 120 volts are available across the anode filament of the valve.

Now let us assume that the resistance is of the order of 100,000 ohms—a more reasonable value. Here we see that the *anode* voltage is $\frac{120 \times 8,000}{108,000}$ = nearly 9 volts, a much better figure and one that can really be used in practice.

This limitation of H.T. means a less grid voltage swing, for the valve has a shorter curve and so more easily overloads. Thus it will be seen that if high values of resistance are used the H.T. must be increased considerably, and, moreover, a compromise between a high- and low-impedance valve must be made in order that the voltage drop across the *resistance* shall not be too much.



A good example of a compact R.C. unit is provided by the above instrument by Eric J. Lever (Trix), Ltd., who sell it in two types for medium- or high-impedance valves.

In actual practice the resistance can well be ten times that of the valve, but the writer prefers that it shall not exceed five times when low-impedance valves are used, for these need a considerable anode voltage if good results are to be obtained.

Too high a resistance and a corresponding high value of valve impedance mean loss of high notes as well as poor reproduction of low notes. Moreover, the coupling condenser should be large, and this also means the resistance must not have too high a value.

Useful values are about 100,000 to 200,000 ohms for the resistance, ·5 to 1·5 meg. for the leak, and about ·01 to ·1 for the coupling resistance. With these values valves of 8,000 to 20,000 ohms can be employed with success, the valve being chosen to suit the amount of input with which it has to deal.

### Wire-wound Reliable.

Wire-wound resistances are almost universally employed nowadays, and are very reliable as a rule. Occasionally they may come adrift just where the resistance wire is attached to the terminal or soldering tag, but this can easily be remedied if the component is carefully dismantled.

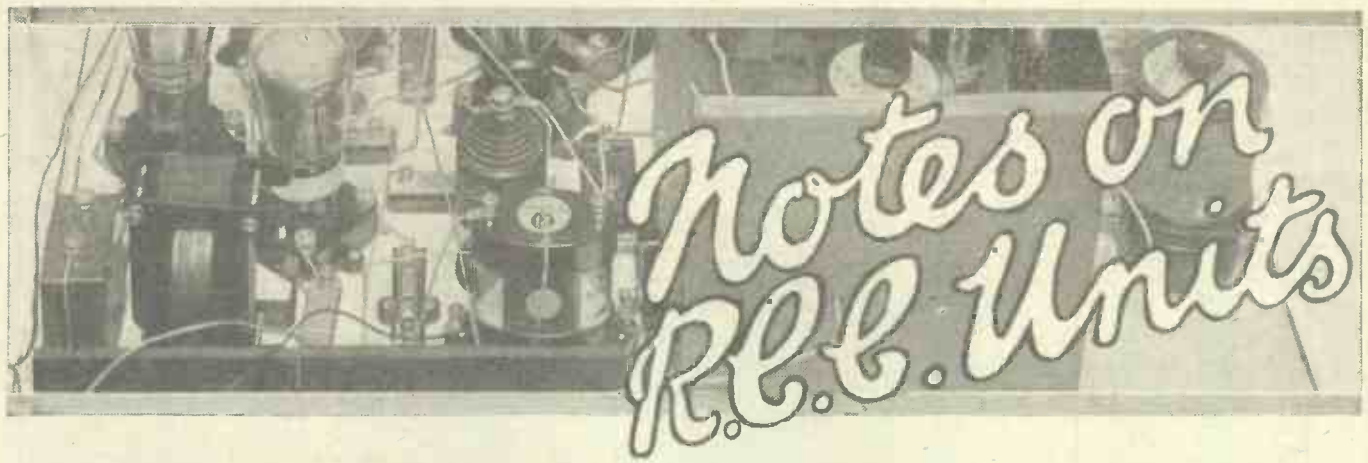
Leaky-grid condensers also form a cause of intermittent signals or crackling, and these should be examined as well as the resistance if such troubles are experienced.

In many-stage resistance-coupled amplifiers it is often found advisable to use small-value grid leaks on the latter stages—about ·25 megohm being suitable, as this tends to stop tendency to "motor-boat."

### Unwanted Coupling.

"Motor-boating" is often caused by poor H.T. batteries, and other forms of resistance which may be situated in the plate circuits of the valves in such a position as to be *common* to two or more circuits. This causes a form of resistance-coupling between the two circuits and interaction therefore occurs. By-pass condensers of high value (2 mfd.) assist here, but the best "remedy" is to remove the cause and make sure that no "dud" batteries or other high resistances are used (such as in mains H.T. units) in such positions without suitable by-passing.

Finally, where resistance-coupling is used in L.F. circuits, do not forget to employ H.F. stoppers in the form of chokes, or ·25 meg. leaks in the grid circuits of the L.F. valves, for H.F. let loose among resistance-coupled L.F. stages will cause no end of trouble.



# Notes on R.C.C. Units

**Some useful hints on the selection and use of these components are included in this eminently practical article.**

**By G. V. DOWDING, Grad.I.E.E.**

AN R.C.C. unit comprises all the elements necessary for coupling together two valves. It sometimes takes the form of a small black box-shaped object having four terminals. These four terminals are connected in the circuit much in the same way as are the four terminals of an L.F. transformer.

There will be a P terminal for connection to the plate of the first valve, an H.T. positive terminal which is taken direct to a tapping on the H.T. battery, a G terminal for connection to the grid of the second valve and a grid-bias terminal to which is joined a grid-bias battery lead.

### Sealed Elements.

I am not too much in favour of these sealed-up units for more than one reason. First of all, one cannot easily gauge the quality of the concealed elements while, unless external marking is provided, one is left in the dark as to their values. I must say I prefer those units which have interchangeable components, although there are undoubtedly cases where the constructor is never likely to find it necessary to change either the grid leak or the anode resistance. But it does not do to lay down hard and fast rules in regard to any radio component, and in regard to the choosing of an R.C. C. unit one must first of all take into consideration exactly for what purpose it is required.

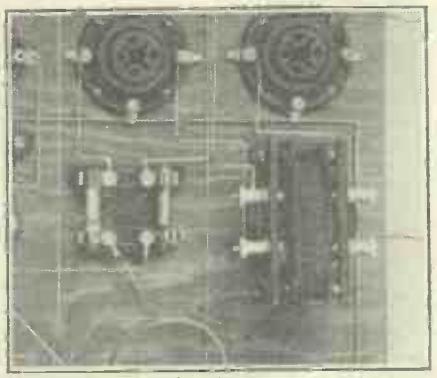
It could be used for H.F. coupling, but as such an arrangement is not particularly efficient on the broadcast band of wave-lengths few are employed for this purpose. On the low-frequency side the R.C.C. unit may be used for coupling the first or second, or even the third L.F. valve, should such be used. Where only one stage of L.F. amplification is employed it is usual to use a transformer. For two stages the most popular arrangement is resistance coupling followed by a transformer.

### The Anode Resistance.

The anode resistance embodied in an R.C.C. unit used in such a circuit will be in series with the anode of the detector valve. In most cases, therefore, the current which will pass through it will be of the order of only a milliamp or so. Nevertheless, even this comparatively small current needs a reliable path if efficient results, free from noises, are to be obtained.

If the unit were used to couple a second L.F. valve the anode current might be appreciably greater. Therefore, one is inclined to recommend constructors to employ units having wire-wound resistances, although undoubtedly perfectly reliable and satisfactory results are possible with other types. Nevertheless, it is important that the component should be of a reliable branded variety. Whatever the composition of its anode resistance, it must be electrically sound. No current should flow through the grid leak, so here the historical pencil line would suffice were it safely protected from atmospheric effects.

But the coupling condenser is a key item. If you trace through the circuit of a resistance-coupled amplifier you will see that if you short-circuit the coupling condenser the whole of the H.T. voltage of the one valve will be impressed on the grid of the other. You will also deduce that a leaky coupling condenser is going to upset matters. This is the reason why we always stipulate a condenser having a mica dielectric for this position.



This photo of a section of a set clearly shows the similarity of connections of an R.C.C. Unit (it is a Lissen and has clip-in resistances) and an L.F. Transformer.

There are perfectly sound paper dielectric condensers—the T.C.C. is an example—but it is a safe generalisation to say that mica is needed.

There are no standard values of components for resistance-capacity coupling for all purposes, from the point of view of the average constructor. Unfortunately, the greatest possible amplification does not run parallel with the greatest purity of reproduction. One has to make a compromise between the two.

You see, one can force up the amplification by employing a very high value of anode resistance and using it with a valve having a high magnification, but this tends to spoil the reproduction curve. There are, of course, some people who put volume before quality, but I hope that in these days they form a small minority.

### Quality and Volume.

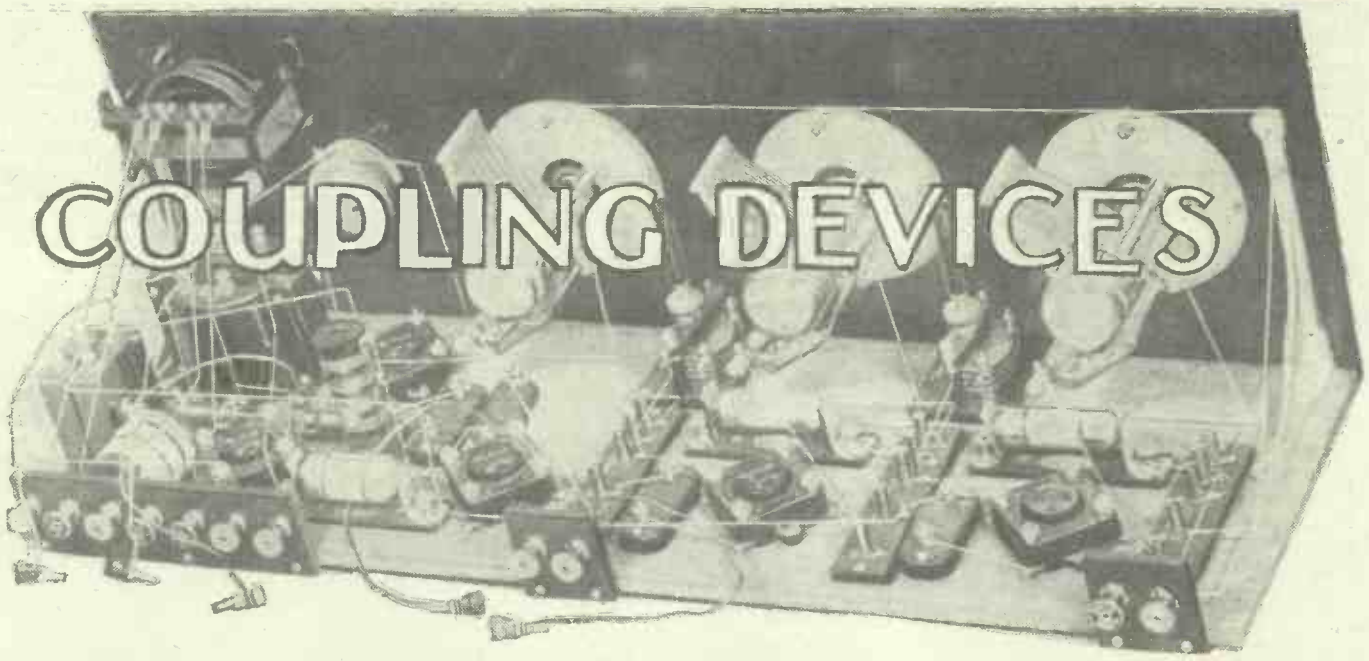
Therefore, in choosing your R.C.C. unit you must make up your mind exactly how far towards perfect quality you are going to go at the sacrifice of volume.

You can go pretty well down the scale of magnification if you have two stages of low-frequency magnification with the last stage transformer coupled. In any case, you will get quite good magnification with an anode resistance of 250,000 ohms, while if you are out for real purity then go down to 100,000. Needless to say, a great deal depends upon the valve you are going to use, and you should make up your mind about this and the R.C.C. unit simultaneously. No doubt Mr. Johnson-Randall, in the special supplement in this issue, will give you hints regarding this point.

### H.F. Stopper Resistances.

I must not forget to mention that some R.C.C. units incorporate other components than those I have already dealt with. An item that can be found in some is what is known as an H.F. Stopper Resistance. This is an additional grid leak placed in series with the grid of the valve for the purpose of preventing H.F oscillations getting through into the L.F. side of the receiver and causing distortion. This item is not going to upset any circuit that I can visualise, but I know at least one R.C.C. unit which incorporates a small condenser in parallel with the anode resistance. This is to enable reaction to be obtained in certain circuits. It is quite unnecessary in some arrangements, and could possibly be harmful.

There are cheap British and cheap foreign R.C.C. units of unbranded varieties available which sell at very low prices indeed. There are others quite cheap bearing the names of reputable manufacturers. Pay at least the little extra and buy one of the latter type. The resistances may be millions or thousands of ohms in the case of a unit emanating from an obscure source.



# COUPLING DEVICES

**A comprehensive review in simple language of all the commonly-used methods of intervalve coupling for L.F. amplification purposes.**
**By A. JOHNSON-RANDALL.**

THERE is an art is coupling together two or more low-frequency valves. Anybody can achieve results of a sort, but to produce good reproduction allied to high magnification requires some knowledge of the elementary principles governing amplifier design.

There are two main points which have to be borne in mind in the construction of any L.F. magnifier.

The first, and in my opinion the more important, is the desirability of obtaining the best possible reproduction. This is essential if one is to listen to the broadcast programmes with enjoyment.

### Quality and Volume.

The ideal amplifier should give perfectly uniform magnification of all musical frequencies from, say, 16 to 10,000 cycles. In practice, however, it would be scarcely worth while, because the modern loud speaker is not yet quite so good as this, and would not reproduce all the frequencies which the amplifier passed.

We are on the safe side if we aim at fairly uniform amplification between 50 and 6,000 cycles. This will result in a low-frequency side which is probably better than any loud speaker that we are likely to possess.

The second point to remember is that each valve must do its job properly of stepping-up the signals.


The Watmel transformer, which sells at the moderate price of 15s. 6d. This firm also markets a tapped L.F. choke, and an auto-choke, which includes a coupling condenser and leak.

It is not very difficult to obtain perfect quality with practically no step-up in volume per stage. Such a procedure is not economical and would not suit the average enthusiast, who naturally wishes to get the most out of each valve. An efficient design should give both good quality and high amplification, that is to say, each L.F. valve should magnify the signals many times. A valve that fails to do this is a passenger, and is simply wasting the precious "juice" from the H.T. and L.T. batteries.

### Two Popular Methods.

Now suppose we consider the various methods of coupling together our L.F. valves in order to achieve these results.

The two most popular schemes at present in use are transformer and resistance-capacity coupling.

Transformer coupling has many attractions, and a single stage will give splendid results. The modern low-ratio instrument is a very fine piece of work, will reproduce frequencies below 50 cycles, in conjunction with a suitable valve, and gives high amplification.

One of the troubles with transformer coupling is the difficulty of coupling two or more of them together in a stable manner.

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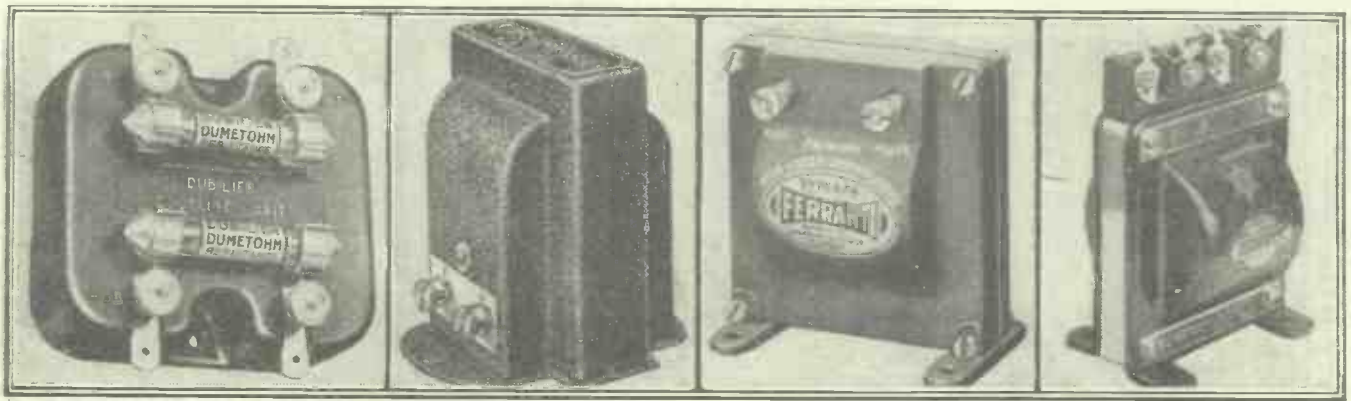



On the left is the Dubilier R.C. unit. The resistances are readily detachable, and the values can be chosen to suit the valves used. The unit is also available in a form which incorporates a valve-holder. The prices of the units are 7s. and 8s. 6d. respectively. Second from the left is the G.E.C. transformer, which is made in ratios of 2- and 4-1, and is of the completely enclosed type. The prices are 17s. 6d. and 20s. respectively. Next, reading from the left, we see the Ferranti A.F.4 transformer, a soundly-designed instrument selling at the popular price of 17s. 6d. On the extreme right is shown the Igranic L.F. choke, type F (price 15s.). This component has two windings, which may be placed either in series or parallel, as required.

# ALL TYPES OF L.F. COUPLING


The new Ediswan L.F. transformer (price 22s. 6d.) has a ratio of 3·5–1. The curve prepared by the N.P.L. shows that the amplification obtained is substantially constant from 200 to 3,000 cycles.

Experienced listeners can do this quite easily, but two really efficient transformer stages are not safe in the hands of the beginner. The reasons for this are as follows:

With two stages, even if low-ratio instruments are employed, the overall magnification is very high, and if there exists the slightest tendency towards low-frequency reaction, it is probable that distortion will occur. This effect may only take place on certain musical notes. For instance, certain high notes may be amplified out of proportion to the remainder of the musical scale, and the result will be a nasty jarring sound whenever these particular notes are reproduced.

### L.F. Howling.

In bad cases the L.F. side may oscillate at a frequency above audibility, and distortion will occur at all portions of the musical scale. Sometimes the set will howl continuously, and it will not be possible to receive intelligible results at all.

In nearly every case the trouble is due, not to the transformer, but to some external coupling effect such as an H.T. battery of high resistance or to bad layout.

A sulphated cell in an H.T. accumulator, an unsuitable mains unit, or a partly run down dry H.T. battery will all produce the necessary coupling required to bring about L.F. howling in its worst form.

It is partly because of the possibility of L.F. oscillation taking place when two transformers are employed in the average home constructor's set that designers have preferred to combine resistance-capacity and transformer coupling.

With a stage of resistance coupling followed by a transformer one can obtain high quality, and a magnification only a little less than with a couple of low-ratio transformers.

In my opinion the most desirable ratio for all purposes where quality is not to be sacrificed for sheer "beef" is between 2 and 3·5–1.

For maximum quality it is necessary to have a very large number of turns on the primary winding, and commercially this essential feature can only be obtained by the use of a low ratio.

There are certain technical difficulties which prohibit the combining of a high-ratio with a high-inductance (large number of turns) primary. One of these difficulties is that if the secondary winding is very large, in spite of the modern methods of section winding, capacity effects tend to lower the amplification of the higher musical notes, and some of the brilliance in the music is lost.

If the loud speaker to be used is of the type employing a short horn it is not so necessary to choose a transformer with a *low* ratio. This is because the average horn loud speaker does not respond to frequencies much below middle C on the piano scale, and one can therefore purchase a higher ratio transformer, thus obtaining greater magnification. In these cases a ratio of between 4 and 6–1 would be suitable.

There is a wide choice of well-designed low-ratio transformers on the market at the present time, and amongst these may be mentioned such well-tried makes as the R.I.-Varley, Ferranti, Marconiphone Ideal, Pye, Brandes, G.E.C., Gent & Co., Mullard, Igranic, Ediswan, B.T.H., etc.

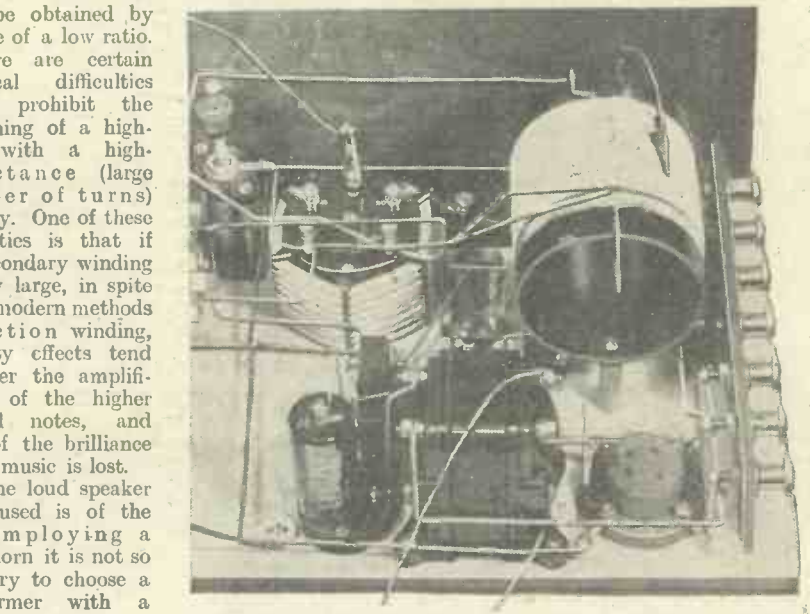
In order to ensure maximum results with a modern transformer one should follow the maker's instructions concerning valve impedances very closely.

### Low Impedance Valves.

With a view to obtaining high quality listeners sometimes place a valve of low impedance in series with the primary winding of a low-ratio instrument.

Fundamentally this is quite correct when the aim is to reproduce the bass notes, but there is one point which must be remembered. When a low-impedance valve is employed with an H.T. voltage of 100 or more and the correct grid bias, the anode current may be six or seven milliamps.

With a transformer having a high inductance primary the effect of this current may be to reduce the working value of

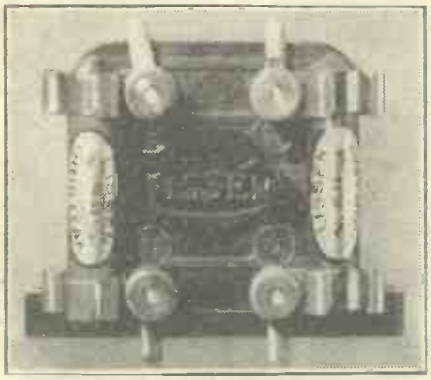


In sets such as an H.F., det., and L.F. the common practice is to use transformer coupling on the L.F. side. In larger receivers it is usual to use at least one stage of resistance or choke coupling.


Left: The Burndept 40-henry tapped auto-choke is capable of carrying 50 milliamperes, and is tapped so as to give six ratios, varying from 1–1 to 10–1. The price is 37s. 6d. Centre: The Cosmos resistance-capacity coupling unit type "O," which sells at 8s. 6d. These units can also be obtained complete with valve holder and in types which have resistance and condenser values to suit all purposes. Right: The B.T.H. R.C.C. unit, incorporates a valve holder of the sprung type, and the whole assembly is contained in a neat moulded case. The units are made in five types, the anode resistance values ranging from ·25–2 megohms. The price is 10s. 6d.

# G DEVICES—*(continued from previous page).*

the primary inductance. Thus the efficiency of the transformer will be reduced and, moreover, a certain degree of amplification



In the Lissen R.C. unit the resistances are readily detachable. The coupling condenser is neatly enclosed in the moulded case. The price complete is 4s.

will be lost, owing to the fact that a low-impedance valve has also a comparatively low amplification factor.

It is, therefore, usual for manufacturers to specify a valve of the "H.F." type for use with a two or three to one ratio transformer. Such valves are those which have an impedance of about 15-20,000 ohms and an amplification factor of 15-20. Hence the transformer is enabled to operate under its most suitable conditions.

### R.C. Coupling.

I mentioned previously that it was common practice these days to combine resistance capacity and transformer coupling so that good quality, high magnification and stability could all be obtained without the need for special precautions against external effects.

Resistance coupling has many desirable features which at times makes one think that it is the ideal method of amplifying at low frequency.

In theory, if one places a pure resistance in the plate circuit of a valve, and couples this valve to a second by means of a suitable coupling condenser and leak, uniform amplification can be obtained over an enormously wide band of musical frequencies.

In practice, there are several "snags." For instance, there is no such thing as a pure resistance (commercially). Anode resistances have capacity but, fortunately, this has been reduced to a negligible amount by the modern methods of winding.

Capacity, however, does play its part in R.C. coupling, as will be seen later.

Unless one employs high-value anode resistances and special R.C. valves, the total magnification per stage is not very high. It is perhaps 16 with an "H.F." type valve and a 250,000-ohm resistance, and 30 with one of the R.C. valves and a much higher anode resistance. With a good transformer and a suitable valve the magnification may be as high as 60-70.

### Coupling Condenser and Leak.

The "snag" in using resistances of high value, such as 1 megohm or so, is that small external capacities (inter-electrode capacities, capacity of wiring, etc.) begin to exercise a by-passing effect upon the high musical frequencies, and the brilliance tends to disappear from the music.

Thus, in order to gain in amplification we must be prepared to sacrifice quality to some extent. How far we can go before

The R.I.-Varley Multi-balancer (price 11s. 6d.) is intended for use in conjunction with the maker's L.F. transformer. It consists of two resistances, two mica condensers and two 3-point switches, and is a valuable accessory for the experimenter.

this becomes noticeable depends upon the loud speaker and individual tastes. If the loud speaker is high-pitched this loss of the higher frequencies may make it more pleasant to listen to.

Apart from the anode resistance itself, the values of the coupling condenser and leak are important. These values decide how much bass will be reproduced. The coupling condenser must not be too large, otherwise grid choking may occur. On the other hand, if it is small the bass will

The popular Lissen L.F. transformer, which sells at the remarkably low price of 8s. 6d. The ratio is 3-1.

not be reproduced unless the grid resistance has a suitable value. It is essential for the insulation of the coupling condenser to be perfect, because the slightest leak is liable to produce distortion.

For this reason it is usual for manufacturers to use mica-dielectric condensers in preference to the paper type.

If suitable values are chosen, R.C. coupling will provide an L.F. side capable of giving almost perfect quality. It is, in addition, cheap, and is not likely to give trouble when two or three stages are used. With mains units certain difficulties known as "motor-boating" do sometimes crop up, but these are avoidable if proper precautions are taken.

### Different Types.

As regards values, manufacturers have carried out a considerable amount of research work in order to find out a combination suitable for all-round work.

In many instances makers list two types. One is intended for valves of the H.F. class, whilst the other is designed to fulfill the requirements of listeners who need high amplification, and who prefer to use the special R.C. valves.

*(Continued on next page.)*


Left: One of the R.C. units listed by the Carborundum Co., Ltd. The grid and anode resistances are made of Carborundum, and can be obtained in all standard values. The unit sells at 8s. 6d. Centre: An R.I.-Varley resistance-capacity coupler. Two types are made, one being suitable for use with valves of medium impedance and the other with valves of the special R.C. type. The prices of the units are 20s. and 22s. 6d. respectively. Right: One of Messrs. Wingrove & Rogers' coupler units.

# COUPLING DEVICES.

*(Continued from previous page.)*

The choice of types depends upon the circuit used and, in general, one may quite safely purchase any of the complete R.C. units sold by reputable firms, with the knowledge that the values are quite O.K., and there is no fear of dissatisfaction provided the circuit is suitable.

### Choke Coupling.

There are so many first-class units on the market at the present time that it is practically hopeless trying to enumerate all of them. Amongst those manufacturers who are listing well-tried units may be mentioned: Messrs. R.I.-Varley, The Marconiphone Co., Messrs. Lissen, The B.T.H. Co., Mullard, H. Clarke & Co., Dubilier, Metro-Vick, McMichael, Ediswan, A. H. Hunt, Eric J. Lever, Peto-Scott, Ward & Goldstone, Lamplugh, etc., etc.

Messrs. R.I.–Varley, Dubilier and Mullard also specialise in wire-wound anode resistances, and list values to suit every purpose.

In addition to transformer and R.C. coupling there are also other methods of L.F. coupling, which, although perhaps not so popular, nevertheless have their special advantages.

There is, for instance, choke-capacity coupling, a scheme which is very similar to our old friend resistance-capacity.

The anode resistance is replaced in this case by an iron-cored choke, and the rest of the circuit remains the same.

The D.C. drop across a choke is much smaller than that across a resistance, and by reason of its construction a choke will carry a heavier current.

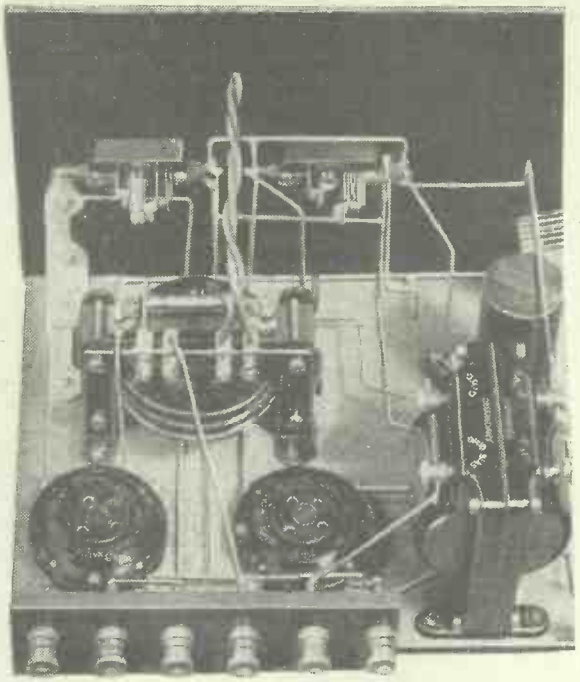
This factor alone makes it suitable for use in special circuits where it is necessary to employ low-impedance valves in the L.F. stages.

If one desired to handle a very large volume it is quite possible that the valve preceding the last stage would become overloaded unless it was of the low-impedance type.

The Igranic tapped output unit is intended to be used as a filter device between the set and the loud speaker. The winding is tapped, enabling one to vary the output load conditions. The unit is priced at 21s. 6d.

Now, the average anode resistance is not designed to carry currents much in excess of 2 milliamps for any prolonged period, hence, in such a case as this, a choke would be a suitable alternative.

Generally speaking, choke coupling will give slightly greater amplification than R.C. coupling, but its chief advantages are probably in cases where the final L.F. stage has to be fed with an output sufficient to load up two or three valves in parallel.



When two stages of transformer coupling are employed it is necessary to use care in spacing the wiring and the components. In this photograph the transformers have their cores at right angles, and the first instrument is of the shrouded type. The transformers shown are a Ferranti A.F.3 and a Pye 4–1 ratio.

Messrs. Burndept Ltd., have designed a special tapped 40-henry choke to meet these requirements. Messrs. Ferranti also list a number of different types of medium and heavy duty chokes.

One cannot complete an article dealing with L.F. coupling methods without mentioning dual or double-impedance coupling. With R.C. and choke coupling there is sometimes a certain tendency for choking to occur on loud sustained passages.

### Double Impedance Coupling.

In an effort to overcome this, the Formo Co. and the Igranic Electric Co. have produced special dual-impedance units. In effect, one replaces the existing anode and grid resistances of an ordinary R.C. amplifier with these special chokes, and the makers claim that any tendency towards grid choking is thus eliminated. The curves which the manufacturers publish are certainly very good, and bear comparison with the best R.C. and transformer curves.

Lastly, there is push-pull amplification, which is really a glorified form of transformer coupling designed to achieve distortionless amplification at moderate anode voltages. One would use a push-pull transformer in conjunction with a special split output transformer in the last stage.

Two output valves are employed in parallel, and each valve handles one half of the total grid swing. It is thus possible to obtain sufficient volume to operate a loud speaker with an H.T. voltage lower than usual.

Those who owing to circumstances are compelled to use low H.T. voltages, would do well to consider this method of L.F. coupling. Amongst the firms who market these transformers are Messrs. Ferranti, R.I.-Varley, and the Rothermel Radio Corporation.

Push-pull amplification is also a very suitable scheme where large volumes are required. For instance, one may desire to fill a dance hall or to give an open-air demonstration. In these cases it is possible to deal with very large volumes without overloading.

### Suitable Valves.

It is, of course, advisable to employ low-impedance valves having impedances of about 3,000 ohms in the output stage and high anode voltages.

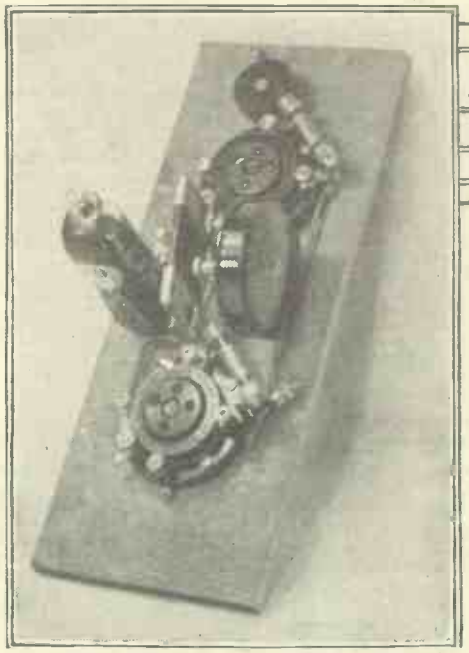
A good push-pull stage used in conjunction with one or two stages of resistance coupling should give no trouble from the point of view of instability, but a certain amount of care should be taken in laying out the components and in eliminating any external effects likely to produce coupling.

In a push-pull stage the first transformer has a centre-tapped secondary winding. The centre-tap goes to grid-bias negative and the ends of the winding to the grids of the output valves, which should be of similar type.

The output transformer also has a centre-tapping on the primary winding which is taken to H.T.+, the two ends of this winding going to the anodes of the two output valves. The loud speaker is joined to the two secondary or output terminals.

Push-pull output transformers can be obtained in two types. One has a ratio of 1–1 and the other a ratio of approximately 25–1.


The Ferranti L.F. choke, type B1, sells at 21s. It has an inductance of 20/40 henries, according to the D.C. load, and a D.C. resistance of 500 ohms.



The complete unit with anode resistance in position.

# AN EXPERIMENTAL COUPLING UNIT

**A cheap and easy-to-assemble unit, which is, in effect, a complete amplifier.**

**By H. J. BARTON-CHAPPLE, Wh.Sch., B.Sc.(Hons.), A.C.G.I., D.I.C., A.M.I.E.E.**

When trying out various receiving circuits in a more or less temporary fashion the most frequent need seems to be for a detector valve followed by a stage of resistance-capacity coupling which, in the case of the latter, will permit various values of anode resistance, coupling condenser, and grid leak to be tried out with the minimum of trouble.

Fig. 1 portrays in the usual theoretical fashion the scheme employed. A detector valve $V_1$, with a grid leak and condenser included, is coupled to a second valve $V_2$ through the medium of a stage of R.C. A high-frequency choke is included in the plate circuit of $V_1$, but it can be put in and out of circuit by means of the switch $S_1$. The valve filaments are in parallel, with a switch $S_2$ in the L.T. — side, while $R_2$, $C_2$, and $R_3$ constitute the anode resistance, coupling condenser, and grid leak respectively, all being interchangeable.

### Simple Construction.

The small amount of constructional work involved will be made clear by studying the two photographs shown of the components mounted on a small baseboard, it being used in this fashion with external connections to the other components necessary for completing the receiving circuit. Viewing the unit from the front (the anode resistance being at the front and the high-frequency choke at the back), we have the detector valve on the left-hand side, and the grid leak, in its clips, is joined direct between the grid and the L.T. + terminals, as described previously.

A small fixed condenser is held at one end under the grid terminal, a small terminal nut and screw being placed at the other end for outside connections. A switch identical in character with the filament one illustrated is made up to operate from the plate terminal of this same valve, this being the switch $S_1$ of Fig. 1 for short-circuiting the high-frequency choke.

Coming to the next valve, $V_2$, we see another grid leak, $R_3$, for the R.C. stage mounted between the grid and L.T.+ terminals in a similar manner to the other valve holder, but instead of a direct metallic connection to L.T. + being arranged, it should be noted that a Dubilier insulated series clip is employed. Obviously, a negative grid bias has to be given to the grid of this valve, and, in consequence, while using the filament terminal as a support for one end of the leak via the insulated clip, actual connection is made to the metallic clip terminal when joining up to the grid-bias battery. A filament switch ($S_2$ of Fig. 1) has been included on the second valve holder from the L.T. — terminal, and when joining up the low-tension supply the negative battery lead should be taken to this fifth terminal point, and not to the valve-holder terminal.

The plate of $V_1$ and the grid of $V_2$ are linked by means of the R.C. coupling condenser $C_2$, and our direct connection policy is made possible by using a clip-in condenser. One clip is held under the grid terminal of $V_2$, while the other clip is gripped by the extra terminal provided on $V_1$ when making up the switch $S_1$.

### The Last Two Items.

Thus, when $S_1$ is opened, the condenser is joined to the plate of $V_1$ via the high-frequency choke, and with $S_1$ closed, of course, we have a direct connection. The distance apart of the two valve holders is fixed by the length of the clip-in condenser, and constructors of this little unit are advised to carry out the construction so far in the steps as detailed, then insert the condenser, position the valve holders accordingly, and screw them to the baseboard.

It now remains to add the anode-resistance and high-frequency choke, and the two components actually included having been chosen primarily for their adaptability to the space available. With the R.I. & Varley vertical holder, connection is made between the terminal at the base and the condenser clip on $V_1$ by means of a small link, but ordinary wire will serve equally well.

Screw the high-frequency choke to the baseboard between the two valve holders and, with short lengths of wire, connect its terminals to the plate of $V_1$ and the base terminal of the anode-resistance holder, i.e. across the $S_1$ switch.

To avoid any confusion for future use, since there are no indicating terminals, two short lengths of red and black covered wire bridge the filament terminals of the two valve holders, red on the side where the detector grid leak is joined to LT. + and black for the filament switch side. Incidentally, these two wires were the only soldered connections made in the unit.

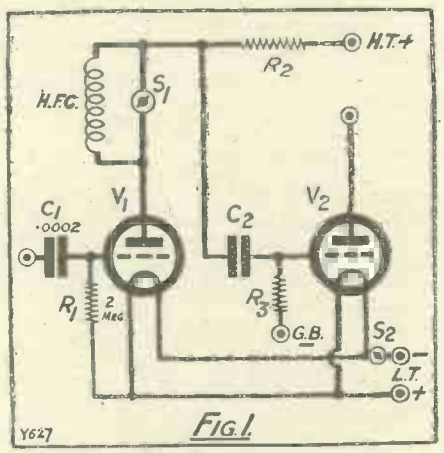
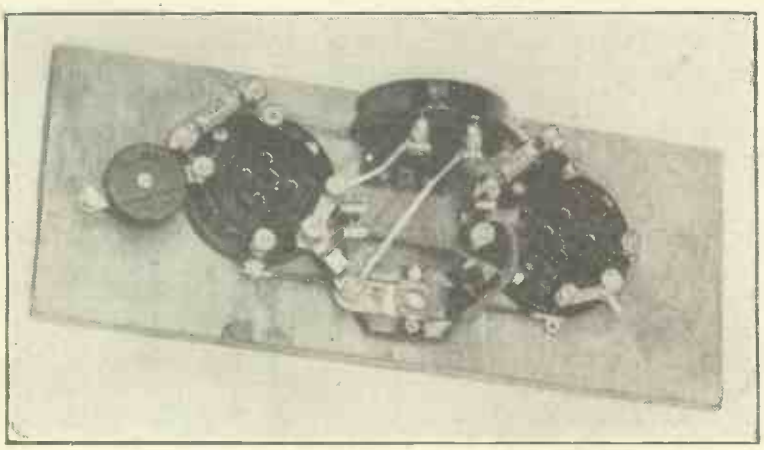



FIG. 1.

The theoretical circuit of the experimental unit.



Here is the completed unit. The H.F. choke is right at the back of the small baseboard.

This completes the construction, and, as can be gathered from the photographs, the arrangement is both neat and effective, proving an efficient and valuable time-saver on divers occasions when quick tests have to be made, and it should be always kept to hand on the test bench.

### USELESS PORTABLES.

The Editor, POPULAR WIRELESS.

Dear Sir,—Having constructed a portable set to one of your excellent circuits for use during the summer when passing the time along out of doors, at picnics, etc., it becomes rather disappointing to find that the British Broadcasting Corporation lack sufficient enterprise in wireless development by overlooking the requirements of portable users when fixing the commencing hour of their programme in the afternoon at 4 p.m., and then including in their programmes items which are very unsuitable for the summer season.

It is hoped that if you accept this letter for publication many portable users will confirm these views to the B.B.C., and then it might be possible for programmes to be provided during the summer at more suitable hours, and this assistance from you would render a great service to your readers.

Yours faithfully,

Huddersfield. H. T.

### "THAT FLASH."

The Editor, POPULAR WIRELESS.

Dear Sir,—R. A. C.'s letter in a recent issue raises a nice point. It is known that any chemical, physical or electrical disturbance in the optic nerve (which I suggest might be affected) will be received at the brain cortex as a sensation mentally projected as a light. A boxer receives a blow which is transmitted to his optic nerve and so he "sees stars." Possibly the shock from the 'phones is transmitted to the optic nerve. So that not only do the "pain" nerves produce a sensation of pain, but the "light" nerves produce "lights" or a flash.

I should be pleased if any other reader of "P.W." has any suggestion on this subject.

Yours truly,

H. E SLATER.

Blackpool, Lancs.

### "ANTIPODES ADAPTOR" IN INDIA.

The Editor, POPULAR WIRELESS.

Dear Sir,—I feel I must add my appreciation to those of countless others, of your excellent publications: POPULAR WIRELESS and "Modern Wireless," of which I have been a reader for a considerable time.

The details of the "Antipodes Adaptor," published in the issue of "P.W." dated March 24th, 1928, was the very thing I wanted, but as the arrangement struck me as being rather crude, as admitted, I modified the arrangement on that of the "Universal Short-Wave Set" described in the February, 1928, issue of "M.W." using Igranic short-wave coils, and I must say results far exceeded my expectations. Incidentally, I am glad to find that the "Star Model" of the "A.A." is much on similar lines, and I must thank Mr. Kelsey for his topping idea of an adaptor to plug into an ordinary broadcast set.

I use my adaptor in conjunction with a straight four-valver, 1-v-2, and the following is my bag since I constructed it two weeks ago: 5 S W, P C J J, Radio Paris (?), A N E, A N H, 2 X A D, and countless Morse stations which might be anywhere, as I do not know the code.

The strength and clearness of 5 S W is simply astonishing; he comes through every night at 11.30, Indian Standard Time, quite as loud as what I term my local station, i.e. 7 B Y (Bombay), which is about 1,200 miles from here. Fading and distortion on 5 S W seems to be the exception, and having heard so much of P C J J from friends (my adaptor being my first short-waver) it is refreshing to find a station in the old country excelling him. On the 11th instant I dropped on an interesting test between 5 S W and 2 X A D, the former was calling and informing the latter that a thunderstorm was right overhead, and the latter replied he would try again in ten minutes' time; this was at about 10.20 I.S.T. A little later I heard the two stations calling each other again, when 2 X A D asked 5 S W if the latter's power had been decreased lately. The latter replied in the negative, and asked if Mr. —— was speaking (I did not catch the name). 2 X A D replied in the affirmative, and a conversation went on until 5 S W closed down at 10.33 I.S.T., and I also lost 2 X A D.

I tuned in 5 S W at 11.25 last night, heard his announcement that he was "going over to London for the evening programme," and I listened-in to a talk on camping, apparently for Boy Scouts, and an opera announced as "The Girl of the Golden West," every word and note being perfectly clear.

The coils used were Igranic 2, 4 and 6-turn for aerial, grid and reaction respectively.

Of all the stations enumerated 5 S W whacks them all into a cocked hat, and in my humble opinion there is nothing "experimental" about this station, and I, for one, hope the B.B.C. will carry on with the good work, and not leave Britishers overseas to be content with uninteresting programmes emanating from foreign stations, as there is nothing quite like a programme from the dear old country when one feels "homesick."

Thanking you once again for your informative and interesting publications and for the "A.A." which has made it possible for me to add my "pat for 5 S W."

Yours faithfully,

"KELSEYITE."

Simla, Punjab, India.

### THE "ANTIPODES ADAPTOR."

The Editor, POPULAR WIRELESS.

Dear Sir,—Re the "Antipodes Adaptor" de luxe version. Having built it up to specification two weeks ago, I feel I must write and tell you of my success, at the same time thanking you for publishing the particulars of the same. After one week getting the hang of the receiver I have received P C J J, 2 X A L, W G Y, 3 L O on two occasions, readable for about forty minutes on both occasions; K D K A on 625 and 43 metres, two German and two French (the last two mentioned on the loud speaker). All this is without an aerial. My aerial is an indoor one, and quite by accident I found I got twice the volume without it, also better reaction. I also discovered my aerial makes a better earth than the one I use—the gas bracket. I couple the adaptor to a two-valve amplifier transformer coupled.

Wishing "P.W." continued success.

H. MOORE.

Battersea, S.W.11.

The Editor, POPULAR WIRELESS.

Dear Sir,—I feel I must write and thank you for the details for constructing the "P.W." "Antipodes Adaptor" (Star model), as it is a very wonderful circuit.

I have just finished making it up, and have had very good results indeed. I have already been able to receive P C J J at very good strength; 3 L O (Melbourne) faint but clear; also 5 S W, as loud as I receive 2 L O on the higher waves. I have also received a large number of amateur stations. I might say that 5 S W comes in on about the sixth turn of the twelve-turn coil. I use the adaptor plugged into a straight three-valve receiver. I think it well worth anybody's time to construct the adaptor.

Yours truly,

Herts. E. J. WALKER.

### THE "SCEPTIC'S" THREE.

The Editor, POPULAR WIRELESS.

Dear Sir,—I thank you again for giving us another excellent circuit, the "Sceptic's" Three.

The coils were quite easy to wind, for the long-wave former I used one of Colvern's six-pin formers, and cut the eight slots in for securing the wire.

I have put a three-point switch in in place of pull-out kind, as that enables me to switch over to London when I have finished with 5 G B without re-tuning. It does in no way interfere with the long-wave band.

The selectivity of the set is good; the high wave-band seems a little flatter than the medium. I use power valves in last two stages.

I trust to see many more letters of thanks from various readers who have built the set up. It would be worth their while to start and build to-day.

Wishing your paper every success, I am

Yours truly,

P. E. GRIFFIN.

London, S.W.11.

### THE "LO-NOTE" LOUD SPEAKER.

The Editor, POPULAR WIRELESS.

Dear Sir,—Hearty congratulations to Mr. B. Munn for his article on the "Lo-Note" Loud Speaker. It carries out all that he said it would, and brings stations in rather louder than the ordinary speaker. I have made one improvement on the flare by putting ⅞ strips of very thin 3-ply over the outside joints, and find it looks a more finished job. I am using it in conjunction with the unit from my Amplion Model Radiolux R.S. 10 speaker. Wishing your valuable paper every success.

Yours faithfully,

E. SHUTT.

Bradford, Yorks.

## CORRESPONDENCE.

# USELESS PORTABLES!

**"THAT FLASH"—THE "ANTIPODES ADAPTOR."**

**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.**

# SHORT-WAVE NOTES.

**By W. L. S.**

THOSE who lose interest in short-wave reception during the summer and leave their sets alone for the less strenuous business of listening to broadcast on loud speakers will be well advised to think about getting their sets in order again before the autumn, for we very often find an extremely good period of conditions at the end of July and beginning of August.

It is a good plan, if you feel sufficiently interested, to "modernise" your short-waver year by year, casting out components that may not, perhaps, be doing all that they should be. All the older types of variable condenser, for instance, become noisy in the course of time.

**Noisy Grid Leaks.**

Two or three are now available which can be mounted six inches or more behind the panel, a long ebonite spindle coming through the panel, passing through a bush of the usual kind, and terminating in a short length of the standard ¼ in. metal spindle to which any of the standard makes of dial, slow-motion or otherwise, may be fitted.

Grid leaks sometimes start making mysterious noises, and another should be tried if this happens. Sometimes the offending leak will behave itself perfectly well in a broadcast receiver, so that if you run a separate short-wave set all that may be necessary is a change-over of the grid leaks in the two receivers.

Although this does not by any means apply exclusively to short-wave fans, it is so important for all that there is some excuse for "rubbing it in." *Have your aerial down and clean it.* Scrub the insulators well, and, if possible, clean the wire.

If you really feel like making a good job of it, put up another wire. I myself was considerably surprised at the difference in reception occasioned simply by putting up a new aerial wire. I thought I was sufficiently "hardened" by now not to be surprised at anything, but I confess to a distinct shock on this occasion!

The old wire was only six months old, and the situation is fairly open and out of London, and yet it is certainly not overstating matters to say that an increase of 33 or 50 per cent in signal strength on distant stations resulted. On the broadcast receiver, as usual, no difference was noticeable! There is certainly some difference noticeable, however, on this set after one year's use, so that as I imagine very few will feel disposed to make a change of aerials at more frequent intervals than once a year, I will leave it at that!

**Kenya Broadcasting Station.**

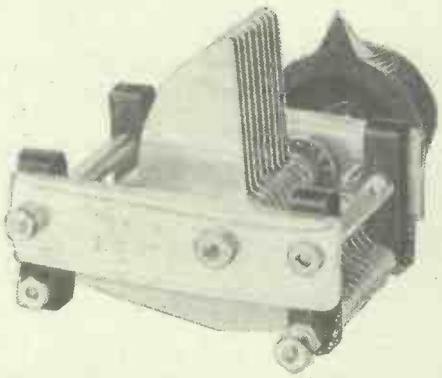
The few amateur stations in Kenya Colony have been coming through remarkably well during the past few weeks. F K-4 M S is the strongest, with 2 M S as runner-up. They both use quite low power (I believe their H.T. supply is derived from M-L converters), but put a very good signal into this country. The Kenya broadcasting station, 7 L O, is also going ahead, and I believe that tests will shortly be made on short waves by this station.

# FROM THE TECHNICAL EDITOR'S NOTE BOOK


**The Bowyer-Lowe Elfin.**

A VARIABLE condenser in these days is almost a common object, but I wonder how many readers know exactly how it works. For all practical purposes the capacity existing between the terminals of such a component depends upon the area of the overlap between its two sets of vanes and the distance separating them. The greater the total overlap of plates the greater the capacity, and this is the reason why larger capacity variables mostly have greater numbers of plates.

And a variable condenser provides a variation of capacity by a variation of vane overlap. This is accomplished by making one set of vanes intermesh with the other.



This is the little Bowyer-Lowe component referred to in this column.

With any variable condenser it would be possible to increase the maximum capacity and still use the same number of vanes, by reducing the distance between them. But there is a limit to this, as you can see. A clever instrument-maker could reduce the separation to a thousandth of an inch, but the ordinary mass-produced variable could not achieve this without the possibility of the vanes scraping and shorting.

You will now no doubt see the reason why some of the very cheap, slovenly-assembled condensers are cumbersome affairs with wide vane spacing. Also, you will be in a position to appreciate the new Bowyer-Lowe Elfin variable condenser. This is claimed to be—and I think without exaggeration—the smallest and lightest condenser ever made. The ·00015-mfd. model weighs only 2½ ounces, and with fully extended vanes occupies only 2¾ in. by 1¾ in. by 2 in. back-of-panel space.

It is an excellent piece of real instrument work. In view of its compactness, it could not be otherwise and operate with reliability. It is fitted with ball bearings and its vanes are logarithmically corrected. It is particularly suitable for reaction control, or for tuning in sets where space is limited. It is, in fact, an ideal portable set component.

It is one of the neatest little bits of radio gear I have seen for a very long time, and I am sure that if there were a yearly award for manufacturers Messrs. Bowyer-Lowe would be very well in the running for it with their "Elfin." There are four sizes available, each of which is supplied complete with pointer, knob and drilling plate. These are ·0001 mfd., 5s. 9d.; ·00015 mfd., 6s.; ·0002 mfd., 6d. 3d.; ·00025 mfd., 6s. 6d.

**"Ekco" Trickle Charger.**

For the last week or two we have had under test the new "Ekco" Trickle Charger. This is a product of our old friends, E. K. Cole, Ltd., of Ekco Works, London Road, Leigh-on-Sea, who are veritable pioneers in mains units. The particular model sent us is the T 500 for A.C. mains, which can be supplied to suit any of the usual voltages and frequencies. Its output is half an ampere for 2- 4- or 6-volt accumulators.

It incorporates the new patent Westinghouse metal rectifier, and will therefore last indefinitely without attention and without necessitating any expensive renewals. It is contained in a neat metal case having a bronze oxidised finish, and its overall dimensions are 6¾ in. by 4 in. by 4 in. A satisfactory length of lead and a plug socket adapter are provided. Four neatly but safely disposed terminals provide the output connections, according to whether 2, 4 or 6 volts are required.

We have found this latest Ekco product perfectly satisfactory. Indeed, we consider it a uniquely attractive proposition. It is certainly "safe, silent and sound," and at its price of 52s. 6d. it appears to be unusually good value for money, more especially in view of the fact that the whole outfit has the lasting qualities of an iron box, or something else equally simple and strong in character!

**Interesting Instruments.**

There is, to me at least, something fascinating about an electrical measuring instrument. Regarded from the point of view of volts and amps., as recorded by the delicate needles of meters, electricity is made by the practical engineer to assume something of the tangibility of a flow of water or something equally real, but when all is said and done, electricity still remains as great a mystery as ever.

But, reverting to measuring instruments, I think the most fascinating of all are the combination types. For instance, I recently received one which has no less than six ranges. These are 0 to 5, 0 to 10, 0 to 20 and 0 to 250 volts; and 0 to 10 milliamps and 0 to 10 amps. It is a product of the Park Royal Engineering Co., Ltd., of Cumberland Avenue, Park Royal, London, N.W.10.

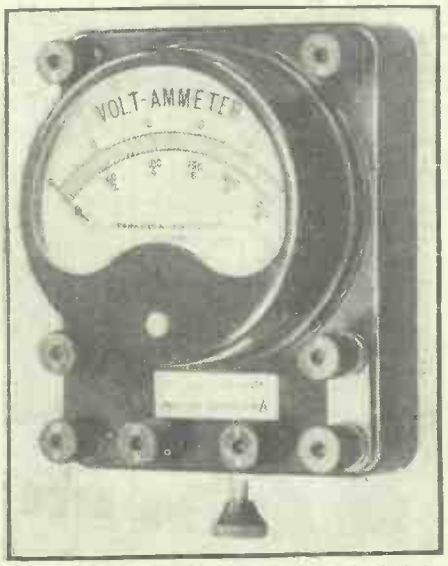
At one time, a good many years ago I must quickly add, I had the idea that a combination electrical meter was a very tricky thing to produce. It was my impression that there was a great deal of luck in its production, and that it was, in fact, made on the trial-and-error scheme. Actually, of course, this is far from being the case. Broadly speaking, an instrument of this nature need only be designed for "mechanical" accuracy on the one range, which can then be calibrated. To achieve the other ranges with similar accuracy it is necessary only carefully to arrange various resistance shunts, and so on.

Thus I find the Park Royal meter has an equally useful accuracy through its whole half dozen ranges. And these ranges are extraordinarily useful from a radio experiments point of view, and I do not remember having seen them embodied in another instrument of this kind. I particularly like the high voltage and high ampere ranges.

**Traders and manufacturers are invited to submit radio sets, components and accessories to the "P.W." Technical Department for test. All tests are carried out, with strict impartiality, under the personal supervision of the Technical Editor, and readers are asked to note that this weekly feature is intended as a reliable and unbiased guide as to what to buy and what to avoid.**

The instrument is a large, robust affair, although it has a delicate knife-edge needle operating over a wide and bold scale. It is classified as the Model 10 Volt-Ammeter.

I also received from the same people a type 2½ in. M C projecting-type milli-




The "Park Royal" measuring instrument, which has no less than six ranges.

ammeter, 0 to 20 milliamps. This can be mounted on a panel by means of the very substantial terminals provided at the back. It also has a wide, bold scale and a light, responsive needle, and is equally accurate. Both instruments appear to me to be of the highest class of manufacture.

# RADIOTORIAL

**All Editorial Communications to 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 and 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 receivers. As much of the information given in the columns of this paper concerns the most recent developments in the radio world, some of the arrangements and specialities described may be the subject of Letters Patent, and the amateur and the trader would be well advised to obtain permission of the patentees to use the patents before doing so.*

## QUESTIONS AND ANSWERS.

### A CURIOUS ELIMINATOR FAULT.

H. G. (Ilford).—"I have purchased an H.T. battery eliminator, but am unable to use it because it always blows the main fuse, although it is fitted with a large fixed condenser. Before connecting it to the house lighting (220 volts D.C.) the earth wire of the set was moved, and taken to the unit, the other terminal on this being earthed according to the printed instructions.

"Yet no sooner was the plug connected than the main house fuse was blown. This appeared to me to indicate a direct earth, so I had the unit carefully tested by the makers.

"It was passed as O.K., the insulation of the condensers being perfect. The set is a three-valve one which gave normal results on the H.T. battery.

"Everything on it after careful examination seemed perfectly normal except for the fact that it is impossible to get H.T. from the mains without blowing the fuse. And, as a chum of mine is already using an eliminator of the same type with great success, I should be glad to know what can possibly prevent my own set from doing ditto.

"His house lighting and mine are precisely alike, the houses having been built and fitted at the same time."

Yours is an unusual and interesting case, because, if the eliminator itself has been found O.K. there is no doubt that the fault lies in your set, or the insulation of something connected to it. One fault which might cause such a failure is the incorrect connection or faulty insulation of any earthing device, by means of which the aerial is joined to earth outside the house whether the eliminator fixed condenser is joined in series with the earth lead or not.

Naturally, if the set is earthed in two places like this, it is necessary to break both the earth leads to prevent a short circuit blowing the main fuse. In your own case, as you have made a careful examination which failed to find any fault, the fault is probably a tricky variation of the above.

You may not have a direct connection to earth via a switch, but we have no doubt that if you trace same carefully you will find a place where the voltage of the mains can cause an earth-path. Even with the condenser in series a voltage of 220 may cause a breakdown in insulation which hitherto was quite sound and this in effect will short the mains to earth, thus blowing the fuse.

For instance, if you employ an earth arrestor you should take this to pieces and examine it internally. Very often there is a very small air gap in an instrument of this type such as might break down if subjected to a high voltage.

### TAPPED RESISTANCE AS VOLUME CONTROL.

H. Y. C. (Eastbourne).—"I have a tapped resistance the total value of which is about 2 megohms, with a switch arm and studs by means of which the total resistance can be tapped off at eight intermediate points. Can I use this as a volume control?

"My present set (Det.-two L.F.) consists of a rectifier followed by resistance-capacity coupling. I should like to use the volume control as a sort of potentiometer on the grid of the first L.F. valve.

"The connections to this at present are as follow:—Grid of the first L.F. valve to a 1-mfd. mica condenser, the other side of which is connected to a 100,000-ohms fixed resistance, a ·0003-mfd. fixed condenser and the reaction coil. The other side of the reaction coil goes to the plate of the first valve in the ordinary way.

"The remaining side of the ·0003 fixed condenser and the 100,000-ohms resistance are joined together and go to H.T. positive. For the purpose of getting the correct grid bias on the grid of the fixed low-frequency valve there is connected also to this one end of a 2-megohm leak.

"The other end of this leak goes to grid-bias negative and it is in the place of this resistance that I hope to use the volume control. What are the correct connections?"

All you have to do is to take out the present grid leak resistance and replace it by the two ends of the variable tapped resistance. In effect, this will merely be replacing the present grid leak by the new one, and there is only one further alteration to make in order to obtain a satisfactory volume control.

This is to break the lead which goes from the grid to one end of the new resistance and the 1-mfd. fixed condenser, and, leaving the latter still connected together, join the grid itself to the switch arm on the tapped resistance.

The final connections for the stage will thus be: Grid of valve to switch arm, one end of the resistance to grid-bias negative, the other end of tapped resistance to a 1-mfd. coupling condenser.

The other side of the coupling condenser to the 100,000 ohms, to the ·0003-mfd. fixed condenser, and to the reaction coil as before.

The remaining connection to the reaction coil and also to the remaining sides of the fixed resistance and fixed condenser are allowed to remain unaltered, and volume control is obtained merely by varying the position of the switch on the switch arm.

### RINGING NOISES.

L. F. (Clacton-on-Sea).—"What causes a ringing noise when the set or the valve is tapped?"

Such a noise is caused by small vibrations of the filament which cause corresponding variations in the flow of plate current. To cure this, use anti-microphonic valve holders, or mount the whole set on shock absorbers such as rubber pads or cushions.

### THE "SPANSPACE" FOUR.

"SPANSPACE" (Cheltenham).—"What alterations do I have to make to the "Spanspace" Four in order to receive long waves?"

To receive Daventry and other long-wave stations it is only necessary to change the split-primary transformer for one of the higher wave range and to put a larger size of home-made coil in the first socket (the unscreened one). This coil has a secondary winding of 250 turns of No. 28 D.S.C. wire, while the primary contains 100 turns of No. 32 D.S.C. wire with a tapping at 75 turns.

### VOLUME FROM A CONE LOUD SPEAKER.

"INTERESTED" (Epsom).—"Does it matter much which way the ordinary cone loud speaker (small cone type, not moving coil) is placed? That is to say, does it give most volume when the pointed side is facing towards you, or when it is pointing away from you?"

This question was thoroughly investigated in America not very long ago and, according to the results obtained there, it appears that the majority of single-cone types of loud speaker on the market produce greater volume of sound to a listener directly in front of the loud speaker when the point of the cone is *away* from the listener.

The explanation probably lies in the fact that the cup-shaped inside of the cone is more effective in transmitting sound-wave motions to the surrounding air than the slanting outside surface of the cone. Consequently stronger waves are set up on the inside of the cone, than are set up on the outside.

From the point of view of volume, it is often advantageous to place the cone fairly near to a hard blank wall (not a draped wall or a wall covered with any sort of a soft, absorbent material), as this ensures that the sound from the back of the loud speaker is projected forward and so helps the sound which comes directly from the front of the instrument. (The effect is rather similar to placing a reflector behind an electric lamp, although, of course, the advantage gained in the case of a sound wave is not so apparent as in the case of light.)

### THE IMPORTANCE OF WIRING.

"INTERESTED" (Matlock, Derbyshire).—"On two occasions lately I have been very surprised at the important part the wiring of a set plays in its performance. In the first case, it was a set (which came under my notice in the way of trade) which would persist in howling and oscillating, in fact it hardly seemed as though it ever would work properly.

"When a little alteration was made to the wiring at the suggestion of a local expert (the alteration only involved the moving of one of the components and the shortening of two wires) the set became perfectly stable, and is, in fact, working well to-day.

In the other case I know of, the long-distance results of a two-valve set were enormously improved by a very simple alteration to the first valve's grid circuit. Here, again the wiring was shortened and one of the aerial leads was taken away from where it ran beside an earth lead.

(*Continued on next page.*)

# RADIOTORIAL QUESTIONS AND ANSWERS

*(Continued from previous page.)*

"How is it that such simple alterations make a great deal of difference to the results given by a receiver?"

The importance of spacing will readily be recognised if it is remembered that spaces between wires act like small condensers. If, for instance, two parallel wires in an H.F. circuit give a stray capacity of this kind, the condenser effect between these two wires may offer an impedance of perhaps 500 ohms to the high-frequency currents flowing. Obviously it would be useless to expect these H.F. currents to properly actuate a tuned circuit or similar device having an impedance of many thousands of ohms, when a stray capacity between the other wires is providing a comparatively easy by-pass.

## TROUBLE WITH A MAINS UNIT.

S. L. M. (Belfast).—"Not a bit of trouble have I had with this eliminator until about a fortnight ago, when it started giving out crackles and crashes. Although I have taken it adrift several times and had a good look at it, I cannot find out what can be the matter with it.

"A friend of mine who knows a bit about wireless, has helped me with it, and all we can find out is as follows.

"Whenever it is in use at my house it crackles and makes these awful noises. Taken round to my friend's house, and used on his set (which is quite free from troubles of this kind), it gives the same sort of results. But when I use his H.T. battery on my set the crackles cease, and all is O.K. again, so the fault must be in the H.T. unit. Where shall I look for it?"

We think that, without doubt, there is a faulty connection somewhere, as this would account for the type of noise produced. But do not forget that such a faulty connection may not be inside the H.T. eliminator itself.

Some time ago we traced a similar trouble to a break in one of the high-tension leads. This was one of four leads in a cable, and it looked perfectly sound, but the flex at one point of the lead had broken, and was making intermittent connection.

Probably one of your leads on the unit is playing the same trick, and only needs replacing to remove the fault.

## BAFFLE-BOARD DISTORTION.

H. J. E. (Pontefract, Yorks).—"Before I made up the moving-coil loud speaker I did not really know what really good reception was like. Listening to a band now seems an entirely different thing to what it used to be, and instruments which I do not think I ever heard before are now a continual delight.

"I might say that the greatest care has been taken in building the set to stick exactly to the specification and all the components are exactly as specified.

"As I am going to make the whole thing up into a cabinet shortly, I have not yet put the baffle board on to the speaker, but I am working it without. I have been wondering since I have heard it whether a baffle board is really necessary, because frankly it seems absolutely perfect to me now and I cannot imagine that I shall notice any improvement if I proceed with my plans for the big cabinet.

"Do you think the baffle board is really worth while?"

Yes, we think that you would be spoiling the ship for a ha'porth of tar if you stop now and do not get the baffle board as was your original intention. Although you are absolutely delighted with the loud speaker because it is so far in advance of anything you have heard previously, we feel sure that you would in time detect that without a baffle board it is not giving you the perfect reproduction of which it is capable.

If you will take our advice you will make the baffle board exactly as recommended—i.e. of large dimensions, etc.—and we feel sure that you will then find that the quality of your reproduction is an unending delight.

## THE KNIFE-EDGE CRYSTAL SET.

"SELECTIVITY" (Shanklin, Isle of Wight).—"Where can I get details of the Knife-Edge Crystal Set which, I understand, was published in POPULAR WIRELESS some time ago? A friend of mine who owns a crystal set of this type is able to cut out Morse interference where he lives, and I should like to try the same set, as I am troubled with interference from the wireless station near here."

Details of the Knife-Edge Crystal Set will be found upon the "P.W." Blue Print No. 33. This is obtainable from the "P.W." Queries Department, The Fleetway House, Farringdon Street, London, E.C.4. to which application should be addressed.

A sixpenny postal order should be enclosed to pay for the blue print, and it is important to note that a large stamped envelope, addressed to yourself, should also be enclosed with your application.

## A USE FOR OLD BRIGHT-EMITTER VALVES.

R. G. A. (Watford).—"Right from the first I was interested in wireless, and although I have spent a lot of money on it one way and another, I must say that it has been the cheapest and best investment I ever made. I have not properly started on short-wave work yet, but when I went round to a friend's house the other night, it made me think that I have got a long way to go in that direction also.

"Before embarking on yet another receiver. I want you to tell me something about my H.T. supply. Is it a fact that I can use my old bright-emitter valves as rectifiers in a mains unit?

"Being of a careful disposition, I hate throwing things away, and I have several valves that I should be glad to use if I could be sure that they would be successful. A young friend of my son's tells me that he is sure I could use them as rectifiers in an H.T. unit, and as he seems so positive about it, I thought I would write and ask you, although it seems too good to be true.

"Is it a fact, and, if so, can you draw up the diagram for me?"

Yes, it is a fact that you can use old bright-emitter valves as rectifiers in an A.C. mains H.T. unit. We feel sure that you will find such an instrument satisfactory in every way, and we shall be pleased to draw you up a diagram upon payment of our usual charges (see enclosed rules of Query Dept.).

## USING REACTION.

G. L. W. (Bristol).—"Me and my friend put the set up from the blue print. We had never done wireless before, but we got Cardiff straight away, and when we tried the long waves Daventry was that loud that it fair put the wind up us. And now we want to try for foreign stations. What coils do we get?"

We are glad to hear that the set is going well, but if we were you we would not be in too much of a hurry to try and get Continental stations. You will not stand much chance of doing this unless you understand the set a little. Why not "go slow"? You will find that there are numbers of things about it that are both interesting and well worth learning from an entertainment point of view.

One mistake that you appear to be making already, for instance, is that you assume that different coils will be required for the foreign stations. The coils that you have now for both the long and the lower bands will do.

But because they will "tune" to certain Continental stations it does not necessarily follow that you will be able to hear these stations broadcasting programmes. The reason is that although your receiver may "tune" to the correct wave-length of a foreign station, the signals may be so weak (owing to the long distance) that it will not be possible to hear them.

To overcome this extra valves would have to be used. Nevertheless, even with a one-valve set you will probably be able to hear foreign stations, especially on the long wave-lengths (Daventry 5 X X band), when you are accustomed to handling the set.

At present you are probably using the reaction wrongly, which generally spoils your own reception and very often that of other people as well. This is an important point, so we advise you to write to the B.B.C., either at Cardiff or 2, Savoy Hill, London, W.C.2, for their free booklet dealing with anti-oscillation.

The booklet is sent free on request to anyone who forwards a stamp for return postage, and you will find it of great assistance in helping you to use reaction properly. When once that important art is learned you stand a much better chance of getting the foreign stations, and of enjoying the British programmes.

# NEWS FROM SAVOY HILL

(*Continued from page* 712.)

All the evidence, therefore, points to a growing Parliamentary storm, which will come to a head at the next General Election, when the Liberals will make a "free ether" part of their official campaign policy. Much of this trouble is due to the failure of Savoy Hill to placate Mr. Lloyd George.

### P.M.G. and the Regional Scheme.

Sir William Mitchell Thompson's new-found enthusiasm for the Regional Scheme will reassure many listeners. It looks now as if the permission for the erection of all the new stations is about to be granted; in which case the scheme will be in operation in two years' time. One wonders what Captain Eckersley said when he read the P.M.G.'s speech in the House.

### Cenotaph Broadcast on Armistice Day.

Permission has been given for the broadcasting this year of the Cenotaph Service from Whitehall on Armistice Day. A permanent underground cable has been installed between the Cenotaph and a secluded control-point a little distance away. The British Legion service, the other day, provided a good opportunity of testing these arrangements. This ends a long and bitter controversy.

### The Duke of York in Camp.

The Duke of York will be present at his Scout Camp at New Romney on Thursday, August 9th, when part of a sing-song by the boys will be relayed from London and other stations.

### Maria Marova at Manchester.

Maria Marova, the famous singer of Russian character songs, who comes of Don Cossack lineage, is taking part in a concert arranged by the Manchester Station for broadcasting on Monday, July 30th, in memory of George Borrow, the author of "Lavengro" and "Romany Rye." The programme will include gipsy melodies and orchestral music, as well as readings from Borrow's own works.

### B.B.C. Announcement.

The B.B.C. has notified us as follows: "Various statements have been published in connection with the development of Television and rumours are current of the part which the B.B.C. is likely to play.

"In order that its listeners may not suffer disappointment by anticipating the possibility of seeing as well as hearing its performances, the B.B.C. wishes to make it plain that it has not so far been approached with apparatus of so practical a nature as, in the opinion of the Corporation, to make Television possible on a service basis.

"It should be noted that the Postmaster-General, in replying to questions in the House of Commons, has indicated that in the opinion of his officers, Television is still in the experimental stage and that the time has not yet come to make arrangements for the provision of a public service. When the development of the science has reached the stage where some form of service which will benefit listeners may be guaranteed, the B.B.C. will be prepared, subject to the approval of the Postmaster-General, to co-operate in the matter."

# TECHNICAL NOTES.

(*Continued from page* 712.)

primary upon the top of the secondary—or vice-versa. This is a method which is very simple and, for small transformers, it works quite well. It has the disadvantage, however, that the outside winding, whether it be the primary or the secondary, is apt to be rather far removed from the magnetic core and therefore leakage occurs; and furthermore, the magnetic reluctance of the air space—or, if you prefer it, of the non-magnetic material of the inner winding—reduces the efficiency.

### Sectional Windings.

In a sectioned bobbin it is sometimes the practice to wind the primary in sections 1, 3, 5, and so on, and the secondary in sections 2, 4, 6, and so on. This brings both of the windings very close to the iron core and distributes the two windings over virtually the same region of the core. This method, as a matter of fact, is a very efficient one and would be considered generally a good design.

Sometimes, however, the sectioned bobbin is employed for rather a different reason, especially in speech transformers—such as intervalve transformers—and that is, in order to keep down the self-capacity of the windings as low as possible. A sectioned bobbin, for instance, may have the secondary wound equally in the various sections and next to the core, whilst the primary is then overlaid upon the secondary and again distributed equally in the different sections.

### Low Self-Capacity.

The reason this arrangement keeps down the self-capacity is quite easy to see. Imagine that we do not use a sectioned bobbin, but that we start winding the secondary from one end of the bobbin along to the other end for the first layer and then back for the second layer, then again for the third layer, and so on.

You will see that there may be quite a considerable potential-difference between the commencement of the first layer and the end of the second layer and, of course, a correspondingly greater difference of potential between the commencement of the first layer and the end of the fourth layer, and so on.

### Distributing the Potential.

If a sectioned bobbin is used—let us suppose there are six sections—the first sixth of the winding is laid in the first section, the second sixth is laid in the second section, and so on, with the result that the winding finishes up at the opposite end of the bobbin from that at which it commenced.

By this arrangement the *ends* of the winding—which are the parts at the greatest difference of potential—are kept as far away as possible, and a fairly uniform potential gradient is established from one end of the winding to the other. This method has been adopted in successful intervalve transformers where, as indicated above, considerations of freedom from distortion are much more important than considerations of power-efficiency.

### Picture Transmission.

Great advances are now rapidly being made in the transmission of pictures by radio—not to be confused with television—and in the talking film.

Excellent examples of pictures transmitted by wire and wireless are to be seen daily in the newspapers. Many people seem to be under the impression that these are transmitted by television, but, of course, that is not the case. Television aims to transmit *moving* pictures, and therefore, for successful television, a considerable number of "still" pictures per second must be transmitted.


Two interesting "Goltone" contributions to intervalve coupling—an H.F. choke and a wire-wound resistance.

In the transmission of "still" pictures, as used in newspaper work, there is a very much longer time allowable for sending each picture, and a single picture may take several minutes to transmit and receive. This, of course, enormously simplifies the problem and permits the excellent detail which is observable in the transmitted pictures in the various newspapers.

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