

MORE ABOUT THE GREAT INVENTION.

# Popular Wireless

## and Wireless Review

PRICE 3d.

EVERY FRIDAY.

No. 102. Vol. V.

SCIENTIFIC ADVISER: SIR OLIVER LODGE, F.R.S., D.Sc.

May 10th, 1924.



Miss Mary Pickford and Mr. Douglas Fairbanks introduce themselves to British listeners via 2 L.O.

RECEPTION WITHOUT H.T.  
 THE POPULAR WIRELESS "UNIDYNE" RECEIVER.  
 UNIVERSAL INTEREST IN AN EPOCH-MAKING  
 DISCOVERY.  
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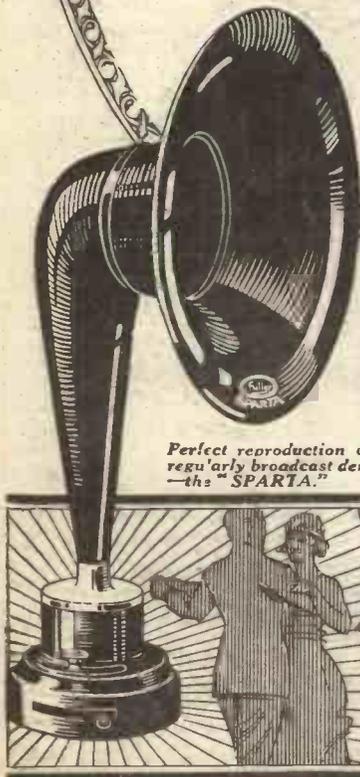
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Perfect reproduction of the excellent dance music regularly broadcast demands a perfect Loud Speaker —the "SPARTA."



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# TUNGSTALITE'S TRIUMPH

## ANOTHER RECORD

(Copy.) The Outlook, Carew Road, EASTBOURNE.  
Messrs. Tungstalite, Ltd., 47, FARRINGTON ROAD, LONDON, E.C.1. April 21st, 1924.

Dear Sirs,  
I, having heard reports concerning your wonderful crystal Tungstalite, wrote to you for a sample tube. I have often tried with other crystals to get Bournemouth and London, distances 80 and 50 miles respectively, but have never yet succeeded. Last night I tried with your crystal, and heard Bournemouth and London at once. The night was not a very good night for reception, and I was naturally very surprised at the result.

You may make what use of this letter you like.  
Yours truly,  
G. HUBBARD.

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# POPULAR WIRELESS

AND WIRELESS REVIEW.

May 10th, 1924.] THE RADIO WEEKLY WITH THE LARGEST CIRCULATION. [Every Friday, Price 3d.

Technical Editor:  
G. V. DOWDING, Grad. I.E.E.

Editor:  
NORMAN EDWARDS, A.M.I.R.E., F.R.O.S.

Scientific Adviser:  
Sir OLIVER LODGE, F.R.S.

## RADIO NOTES AND NEWS OF THE WEEK.

### The "Unidyne."

THE two technical editors of "P.W." who have created a stir in wireless circles by their invention have decided to name the discovery the P.W. "Unidyne," meaning "one force," which is, of course, the accumulator. At the Press demonstration the other night they burned out five valves to show the Pressmen the various ways in which H.T. can ruin a valve. Two of those present were from Scotland, and after they had multiplied twelve-and-six by five, I had to 'phone for a doctor—well, nearly!

### The Busy Inventors.

MR. DOWDING and Mr. Rogers are very busy just now in building special receiving sets embodying their new invention. Full details for the construction of these receivers will be given in "P.W." in due course. I can see a busy time ahead for amateurs!

### P. P.'s Brother.

A RECENT addition to the staff at the London office of the B.B.C. is the brother of Captain Eckersley, who is to act as the Chief Engineer's assistant. Mr. Eckersley is a technical man himself, and was employed for some years in the Marconi Company.

### The Modern Child.

IT may shock 2 L O to know that a friend of mine, age 2, has a great contempt for one feature of the programme. Daphne, blasé and modern, put on the 'phones the other day, listened for a few moments, then removed them, cocked her head to one side and remarked: "It's no use, mummie, only Children's Hour. I must ask daddy to write to 'Ariel' about it." She sighed and turned to read a book on wild animals.

### The Geneva Conference.

THE preliminary conference at Geneva for the drawing up of an International Wireless Telephony Agreement has been concluded. The members recommend that certain wave-lengths should be exclusively reserved for wireless telephony, and that those allotted to wireless telegraphy should be clearly differentiated, while certain wave-lengths should be allotted to experimental amateurs. A resolution was adopted proposing that all stations should broadcast a short programme in Esperanto at least once a week.

### Brandes' 'Phones.

I WAS present at the recent inaugural luncheon held at the Engineers' Club, and given by Brandes Limited. After the lunch we proceeded to visit the works

of the company at Slough. Brandes are making 'phones in this country on the American principle of mass production, giving employment to many hands. The 'phones are equal in every respect to those lately imported from Canada by the same company. One useful tip I learnt from my tour of inspection was that the efficiency of the 'phones is impaired when anyone opens the caps. I advise readers who have purchased Brandes' 'phones and have unscrewed the caps to have them tightened by the makers.

**The P.W.  
"Unidyne" Principle.  
Universal Interest Aroused.**

With the public announcement of the invention of the new Unidyne principle by the Technical Editors of "Popular Wireless," a great wave of enthusiastic interest has swept the country, and letters and telegrams of congratulation have poured into the "P.W." offices.

The fact that this journal has secured the exclusive copyright of the inventors' articles has also created great interest, and so great was the demand for last week's issue that readers are strongly advised to place a standing order for "P.W." with their local newsagents, and so make sure of securing a weekly copy.

In this issue appears another article by the inventors, giving final details of the theory of the new principle. Next week they will describe the construction of a one-valve set which will operate without high tension. All the B.B.C. stations, Brussels, New York (W G Y) have been received with crystal purity by this receiver.

**Order next week's  
copy of "P.W." NOW.**

### Dan Godfrey, Jun.

THE London Wireless Orchestra will now be under the conductorship of Dan Godfrey, Jun., the son of Sir Dan Godfrey of Bournemouth. The Dan Godfreys have held the distinction of being famous conductors since the Battle of Waterloo, when a Dan Godfrey was present at that battle in 1815. I feel sure 2 Z Y listeners will miss their station director, as he is extremely popular among them, which was very evident when I made a visit to that station some time ago.

### His Policy.

MR. DAN GODFREY tells me that he is going to specialise on English composers, and English music generally. This is a good policy, but I hope we shall

have the benefit of a few foreign composers as well; I feel sure many will agree with me that much of the popular music to-day is composed by German and Italian composers.

### A Troublesome Aerial.

A MILKMAN, going his rounds in an American suburb, unknowingly came into contact with the loose end of a wireless aerial which had collapsed and fallen across a power line. The milkman was knocked senseless. A spark from the aerial caused the hedge close by to catch fire, which necessitated the fire brigade's assistance. The chief fireman attempted to cut the aerial with insulated pliers, but the wire came into contact with his wrist and he was instantly killed. Another fireman going to his rescue was also killed. The aerial was finally cut.

### Mr. Hardy and the B.B.C.

IF Dorset listeners have their way, Mr. Thomas Hardy will draw up a broadcasting programme for them. The famous novelist and his wife are keen listeners-in, and Mr. Hardy has offered some of his works for broadcasting. 6 B M have asked him to compile a programme on his own lines. So far, he has neither accepted nor refused.

### The Largest Station.

THE largest station to be erected in the world at Vancouver, British Columbia, is to cost £400,000. It has been decided by recent experiments that this station would be able to transmit direct to London, China, Australia, via Fanning Island, and South Africa.

### The Art of Talking.

THE educational talks from 2 L O seem to be very popular, especially with schoolboys and girls, who enjoy the novelty. French talks are one item, and we have heard a Swedish composer address us in his own language; and Americans have said a few words, including one or two English sentences. Now we have Esperanto. I think I shall take up Japanese.

### 2 Q C.

CONSIDERABLE mystery has surrounded the transmissions of 2 Q C. This station appears to be the most powerful of all amateur stations, if it can be listed as an amateur, because it is operated by Captain Eckersley. I asked him the reason for the erection of this station, and he replied that he used it for the purpose of furthering his developments for the benefit of the B.B.C. The station is situated near his home at Hampstead.

(Continued on page 370.)

## NOTES AND NEWS.

(Continued from page 369.)

## A Mine Owner's Fears.

I WAS highly amused in the studio the other day when Mr. Frank Hodges, broadcast "A Day in the Life of a Miner." Before he was announced, Mr. Philip Gee, secretary of the Mine Owners' Association, arrived at 2 L O and demanded to see Mr. Hodges' manuscript, fearing it might contain propaganda.

Mr. Hodges said he did not see why the mine owners should want to censor a non-political article, but suggested that Mr. Gee should be asked to broadcast the story. The B.B.C. made this offer to Mr. Gee, who declined.

## Technical Talks

CAPTAIN ECKERSLEY'S technical talks are proving extremely popular. Recently we were interested in the little experiment which he demonstrated to give listeners the effects of echo. Next week, Captain P. P. has promised us another experiment, one which, I am sure, will meet with general approval. The experiment will illustrate "tuning in." Captain Eckersley will have a set in the studio for this novel feature.

## A New Loud Speaker.

I RECENTLY heard a new loud speaker in operation, invented by a well-known research engineer, and it is the finest I have yet listened to. Its working principle and general appearance are both totally different from any other loud speaker at present on the market. Reproduction is perfect and one can easily imagine that the singer or orchestra is in the same room as the loud speaker. I am compelled to withhold the name of the inventor and all details, but I can assure readers that when this new instrument is on the market, they will agree with me that it constitutes a wonderful advance in loud speaker design.

## Reports from America.

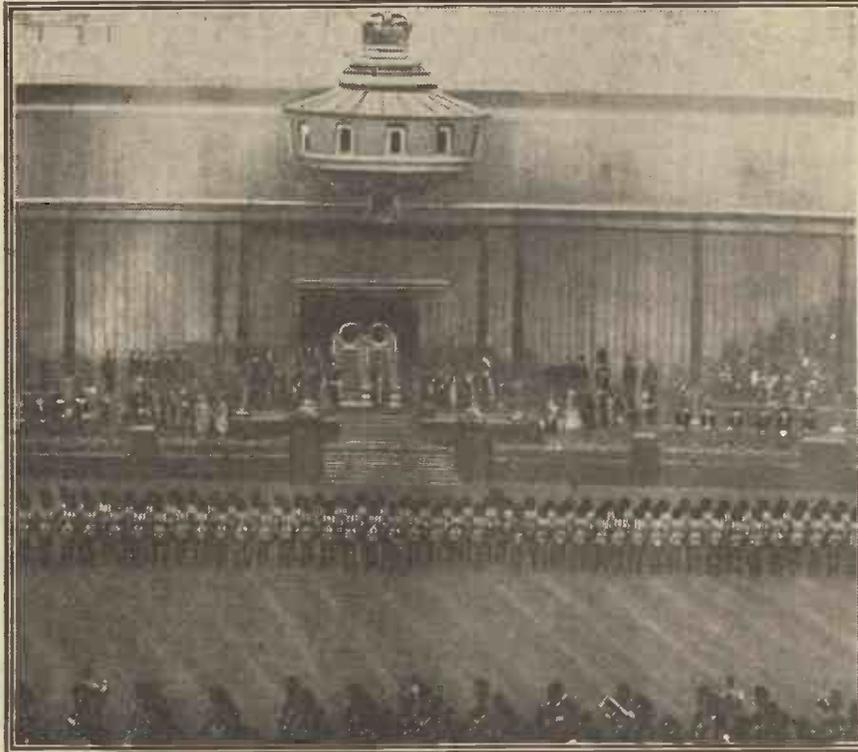
ALTHOUGH thousands of American radio "fans" attempted to listen to the King's speech, not one heard it really well. I have just received a letter from a well-known radio society in America which states that no one reported that they heard the King's or any speeches by those who took part in the opening of the B.E.E. at Wembley. The conditions, it is reported, were very poor for any long-distance reception.

## The Howlers.

A MEMBER of the "silent staff" tells me that the wide publicity given to "howling" during the King's speech resulted in the absence of complaints on that auspicious occasion. But, strange to relate, two days afterwards, the usual complaints began to arrive! It is, therefore, evident that listeners can stop oscillating when they want to.

## "Wireless Boots."

I FOUND it necessary to purchase a pair of boots the other day, and for this purpose went to a well-known store. The attendant tried on a few pairs, and when I had decided on one pair, he



The King broadcasting his speech from the throne dais at Wembley.

asked me if I would have the laces in "series" or "parallel." This is evidently the new term for "cross lacing" and "straight lacing."

## Sheffield's New Engineer.

MR. A. BIRCH, the new engineer who has been appointed to succeed Mr. Harry Lloyd at the Sheffield wireless relay station, has taken up his new position. Mr. Birch was at one time in command of the wireless plant of a steamer which set out on an expedition in an effort to locate the whereabouts of a tribe of lost Indians. He did not find the Indians, but his trip up the Amazon was one which he is not likely to forget.

## Direction Finders.

A GIRDLE of wireless direction-finding stations is to be placed round the British Isles for the assistance of mariners. A skilled navigator will be in charge of each station, and when a wireless message is sent from any vessel, no matter what distance, the station will be able to give its exact position.

## 2 L O's New Station.

THE P.M.G. stated in Parliament that the B.B.C. proposed to construct a permanent London station on the roof of a West End store in place of the existing temporary station at Marconi House. No details are yet to hand.

## Congratulations.

SENATOR MARCONI celebrated his fiftieth birthday last week. Thirty years of his life have been devoted to the perfection of wireless. We tender our hearty congratulations.

## An Important Announcement.

A YOUNG man rang up Mr. Dodgson, the announcer of 2 L O, the other evening, asking him to broadcast a message. Mr. Dodgson asked if it was very important. "Yes, very," replied the young man. "My brother has borrowed one of my cuff-links and I want you to ask him to return it immediately, as I am going to a dance tomorrow night."

## A Popular Item.

THE broadcasting orchestra from the Piccadilly Hotel seems to be extremely popular. Mr. Arthur Burrows has decided to continue this item fortnightly.

## Diversity of Titles.

THE broadcasting programmes of the B. B. C. stations have a variety of titles for the hour reserved for the young. 2 L O uses the title of "Children's Hour," 5 I T "Kiddies' Corner," 2 Z Y "Children's Hour," 5 S C "Children's Corner," 6 B M "Kiddies' Hour," and 5 W A is to be complimented upon being different by using the title "Hour of the Kiddiewinks."

## Changes at Brussels.

BRUSSELS broadcasting station was closed from May 5th until May 8th. Transmission began again to-day, May 9th, on a new wave-length. This is between 220 and 280 metres, the exact length depending upon trials which are yet to be made.

## An Interesting Book.

THE dramatic critic of 2 L O tells me that he has written a book entitled "Hallo, Playgoers!" This is the first book written of its kind, and I am sure it will interest all listeners, as it contains interesting facts of plays and the broadcasting of them. The cover of his book was designed by "P.W.'s" Art Editor.

ARIEL.

# THE NEW ERA IN WIRELESS.

## "UNIDYNE" INVENTION HAILED WITH ENTHUSIASM.

By the EDITOR.

The demand for last week's "Popular Wireless," containing the first of a series of articles by the inventors of the "P.W." "Unidyne" Principle, exceeded all expectations. Congratulations from all parts of the country have poured in, and there is little doubt that the achievement by the Technical Editors of "P.W." has aroused universal interest.

ON Tuesday, April 29th, the daily Press of this country made known to the public the fact that two members of the staff of POPULAR WIRELESS had discovered a revolutionary method of wireless reception. In another article "Ariel" tells the story of a big demonstration given to the Press, and quotes extracts from various newspapers; and last Friday this journal published the first of a series of exclusive articles by the inventors, who have decided to make a gift of their secret to readers of POPULAR WIRELESS.

In this issue readers will find their second article, in which the final explanation of the theory of the invention is given. The ground is now prepared for the publication of a series of articles describing in detail the construction of various types of valve receivers.

### In Great Demand.

At my request the inventors will commence in next week's issue an article giving details for the building of a one-valve set with reaction, on the lines of their original and now famous model. The construction of the L.F. amplifier will then be dealt with, and later on details for converting the "P.W." Combination Set into a "no H.T." receiver will be given.

Last week's announcement in POPULAR WIRELESS to the effect that this journal retained the exclusive publication rights of the inventors' articles created no small sensation in the world of wireless, and the demand for last week's issue was beyond all expectations.

I would like to advise readers to give an immediate standing order for "P.W." to their local newsagents, as the demand is likely to prove so great that this procedure cannot be ignored if many thousands wish to avoid disappointment by not securing a copy of "P.W." every week.

Both the inventors are working hard on the preparation of articles for "P.W." dealing with the application of their invention to existing sets, and I can assure amateurs that it will be a comparatively simple and cheap matter to effect the necessary alterations.

### Sir Oliver Lodge's Opinion.

The great boon this invention confers on people using valve sets is almost too big to realise at once. Especially will it be appreciated by amateurs living in the country and by listeners who, having no knowledge of the operation of valve sets, will now find it possible to install a loud-speaker set which will prove as easy to handle as a crystal receiver.

Our scientific adviser, Sir Oliver Lodge, who is at present in the country and who has not yet had an opportunity of testing out the new Unidyne receiver for himself, has been informed of the invention, and in

a letter to me he writes: "Judging from what you told me in your letter, and with no other information, I certainly think your statement very remarkable, viz., that a set has been devised which works and gives good results, and apparently amplifies without any high-tension battery—that is, I suppose, without any relaying high E.M.F. If it is successful it must surely be an invention of considerable importance.

"I do not pretend, at this juncture, to express any considered opinion on the subject beyond saying that your statement about it is surprising, and that it is pretty clear that the inventors must have devised something of great interest to all amateurs, and probably wireless experts, too."

I hope that very shortly the inventors will be able to actually demonstrate their invention to Sir Oliver when he returns to

town, but in the meanwhile readers can see that our scientific adviser is of the opinion that such an invention is of great value.

### Experts Interested.

Senatore Marconi has also expressed his great interest in the invention, and arrangements have been made to demonstrate its possibilities to him very shortly. Probably by the time these lines are read both Senatore Marconi, Dr. Fleming, and Dr. Eccles will have had the opportunity of thoroughly examining the invention, and I hope that in an early issue of POPULAR WIRELESS I shall be able to publish their considered opinions on the invention.

In the meantime, I think enough has been said to show readers that the invention has been demonstrated to the technical experts of the trade and the Press with complete success, and that the "P.W." Unidyne principle may truly mark the commencement of a new era in wireless.



The inventors of the "P.W." "Unidyne" Principle—Mr. G. V. Dowding (left) and Mr. K. D. Rogers (right) with the original "Unidyne" set.

## PRESS PRAISES INVENTORS.

By "ARIEL."

THE invention made by two members of the technical staff of POPULAR WIRELESS has now been acclaimed by the experts of the trade and the Press.

The name of the invention—The P.W. "Unidyne" Principle—is very appropriate. "Unidyne" means "one force"—which is, of course, the accumulator.

On the evening of Monday, April 28th, a

large Press demonstration of the invention was given at the house of one of the inventors, Mr. K. D. Rogers, at Radlett, some seventeen miles from London, and the result, as shown in the newspapers the following morning, set every wireless man alive with interest.

(Continued on page 372)

## PRESS PRAISES INVENTION.

(Continued from page 371.)

Invitations were sent to all the leading daily newspapers, and every editor accepted. Three large six-seater cars met the representatives of the Press to convey them to Radlett.

### Watching the Loud Speaker.

Our guests were astounded at the wonderful results which came through the loud speaker. Birmingham was very distinct; everyone in the room was silent as the station was tuned in. In fact, if anyone had entered the room at that moment, they would have thought that they were at Madame Tussauds'. Everyone was watching the loud speaker, as if expecting the owner of the singing voice to make himself visible.

A flash, and we were all astir again, another flash, and yet another, and we all made for the little lattice window, and it became obvious that nature was transmitting waves of its own, waves known to us as atmospherics, for the lightning flattered continuously.

But the loud speaker still reproduced music, without distortion, ignoring the opposition outside.

At the conclusion of the demonstration the representatives of the Press admitted that they had been astonished by the results obtained in spite of the bad atmospheric conditions which prevailed at the time. In spite of the late hour when they left Radlett, we were able to read in the next morning's papers their opinions, some of which are as follows:

### "Clarity of Tone."

"An important invention that will appeal to everyone interested in wireless was shown at work yesterday by two young radio engineers, Mr. G. V. Dowding and Mr. K. D. Rogers, at Radlett, Hertfordshire, about 18 miles from the centre of London. Wireless reception was carried out by them with a single valve set without the use of a high-tension battery and on an entirely new circuit," says "the Daily Mail."

"The elimination of the high-tension battery and the mysterious noises, fizzling, and disturbances, which are so familiar to those who listen in with valves, is the essence of the invention. One single accumulator supplies the whole of the power used in the reception, so that the valve receiver becomes as simple to handle as a crystal set.

"The clarity of tone and absence of distortion when listening-in with the new arrangement was very marked.

"Employing only one valve, London was brought in with considerable loudness. Birmingham was also easily picked up, and so was Brussels.

"With two valves employing the same principle a sufficient volume of tone was obtained to work a loud speaker in the ordinary villa room."

### "Bugbear of H.T."

"Broadcatching, without the bugbear of high-tension batteries, is now a reality, constituting the most important discovery

since the advent of wireless," says the "Daily News."

"It was demonstrated to me 17 miles from London by the device "Unidyne," the invention of Messrs. G. V. Dowding and K. D. Rogers, both on the technical staff of POPULAR WIRELESS. I heard a song and a pianoforte solo from 2 L O transmitted with clearness and absence of distortion and outside noises on an amateur set equipped with a detector valve and an amplifier valve. The aerial was 70 ft. long, less than normal, and the items were heard at sunset, when atmospherics are particularly troublesome."

### "Eliminating Atmospherics."

"This invention dispenses with the necessity for high-tension batteries in valve receiving sets and improves reception. It cures sound distortion in loud speakers and largely eliminates atmospherics," says the "Daily Herald."

The inventors are two young members of the staff of POPULAR WIRELESS, Messrs. G. V. Dowding and K. D. Rogers."

### "A New Problem Solved."

"Many accepted wireless theories were exploded at Radlett last night, when Mr. George Dowding and Mr. Keith Rogers, two wireless experts, demonstrated their new invention already referred to in the "Daily Express."



Major Armstrong operating his new and improved super-heterodyne receiver.

"It is called the "Unidyne Receiver," and it successfully operates without a high-tension battery.

"Last night's demonstration showed that several of the greatest problems for amateurs have been solved. It proved that a valve set can now be handled as easily as a crystal set. Results achieved were equal to those from ordinary receivers employing an expensive high-tension battery, and in some respects they were better.

"Loud speaker reproduction was certainly clearer, and "atmospherics" were greatly reduced.

"The feature which will appeal most to the radio enthusiast is the great economy effected. Not only are the initial expenses of wireless reduced, but the risk of burning out the valve has been entirely removed.

"The invention brings the day of the pocket valve set appreciably nearer, as only one dry-cell is now necessary.

"The only source of power is an accumu-

lator, which is used to light up the filament of the valve."

### Exit a "Frequent Trouble."

"In a house here to-night, 17 miles from London, I have heard 2 L O as clearly as in the studio itself, and Birmingham satisfactorily, on an amateur two-valve loud speaker set which entirely dispenses with high-tension batteries," says the "Westminster Gazette."

"Two young men, the inventors of this revolution in wireless, demonstrated it to me exhaustively under perfectly normal conditions. They are Mr. K. D. Rogers, age 23, who started with the Marconi Company, and Mr. G. V. Dowding, age 26, for five years a wireless officer in the R.A.F., both at present on the technical staff of POPULAR WIRELESS.

"Apart from the fact that the high-tension batteries, which cause valve-set enthusiasts frequent trouble and expense, were not used, the set employed had four-electrode instead of three-electrode detector and low-frequency valves, and a high radio step-up telephone transformer, the wiring for which could be adapted to any ordinary set. The low-tension accumulator was doing only its usual work."

### Points in Favour.

"A successful demonstration was given to a party of Press representatives last night of a new invention designed to dispense with the need for the high-tension battery in a valve set.

"The high-tension battery is a frequent source of trouble and expense. Not only are the batteries themselves very unreliable, but unless great care is taken in their use valves are often spoilt. The new device is the outcome of six months' research work by Mr. G. V. Dowding and Mr. K. D. Rogers, who are

both connected with POPULAR WIRELESS. It can be adapted to any existing valve circuit without any deterioration in the quality of the signals. In fact, it is claimed that the reception is far better because the distortion which the high-tension often introduces is no longer there.

"The points claimed in favour of the new circuit are that it will greatly simplify wireless receiving sets, and reduce expenses and the danger of "burning out" valves. Another important consideration is that it will render wireless sets much more portable." The "Morning Post."

### A United Opinion.

I think the above extracts from some of the leading daily papers will give readers of P.W. an idea of the importance the Press as a whole attaches to the "Unidyne" invention. Next week I hope to publish further opinions, including those of some well-known wireless experts.

# MORE ABOUT THE P.W. "UNIDYNE." DISPENSING WITH H.T. SUPPLY.

By G. V. DOWDING and K. D. ROGERS  
(Technical Editor and Assistant Technical Editor, "Popular Wireless").

The inventors of the now famous "Unidyne" principle, whereby the valve can be utilized for wireless reception without the aid of an H.T. battery, continue in this article to explain in detail the theory of their invention. Next week they will commence a series of practical articles telling amateurs how to construct apparatus embodying the new principle.

## PART II. Final Theoretical Details.

IN our first article we described how, after certain preliminary experiments, we obtained promising results with a circuit in which was incorporated an additional plate external to the valve, without using any other H.T. than that which was obtained by means of a high ratio step-up transformer in the anode circuit. These results, however, although they appeared to be promising to us, would have raised but little enthusiasm in others; they were, in fact, little better than those obtainable with any valve receiver with its H.T. terminals shorted. Almost any valve will act as a very inefficient rectifier without H.T. in any ordinary detecting circuit. This, readers, who are quite close to broadcasting stations, will be able to prove for themselves.

### The Double Grid.

The use of an electrode outside the exhausted globe of a valve is not a new idea, but to our knowledge, it has not proved, up to the present, to be of any great value. Also the use of a strong permanent magnet has frequently been advised as a powerful "electron diverter," but although we tried this expedient also, we did not consider that progress was anything but rather slow, working on those lines. We therefore turned our attention to the internal construction of the valve, desiring to try the effect of an additional plate in close proximity to the existing anode in a three-electrode valve.

We constructed such a "double-plate" valve, and in a circuit very similar to that shown in the accompanying diagram, we obtained some really first-class results—at least, we thought they were first-class at the time; in comparison with the results now obtainable with the perfected Unidyne circuits they would, of course, appear to be very third-rate.

Exactly how we jumped from the

"double-plate" to the "double-grid" is difficult to remember. We think the idea occurred to us that it would be worth while trying two grids instead of two plates because we were rather "fed-up" with the obvious inefficiency of our "home-made" valve, and as two-grid valves were quite easily obtainable at a reasonable

price, we very quickly acquired "half-a-dozen." It is an interesting fact, and perhaps rather amusing, but the particular four-electrode valves that we obtained first were designed to operate in conventional valve circuits with fairly low H.T. That this

### Cutting Out Risk.

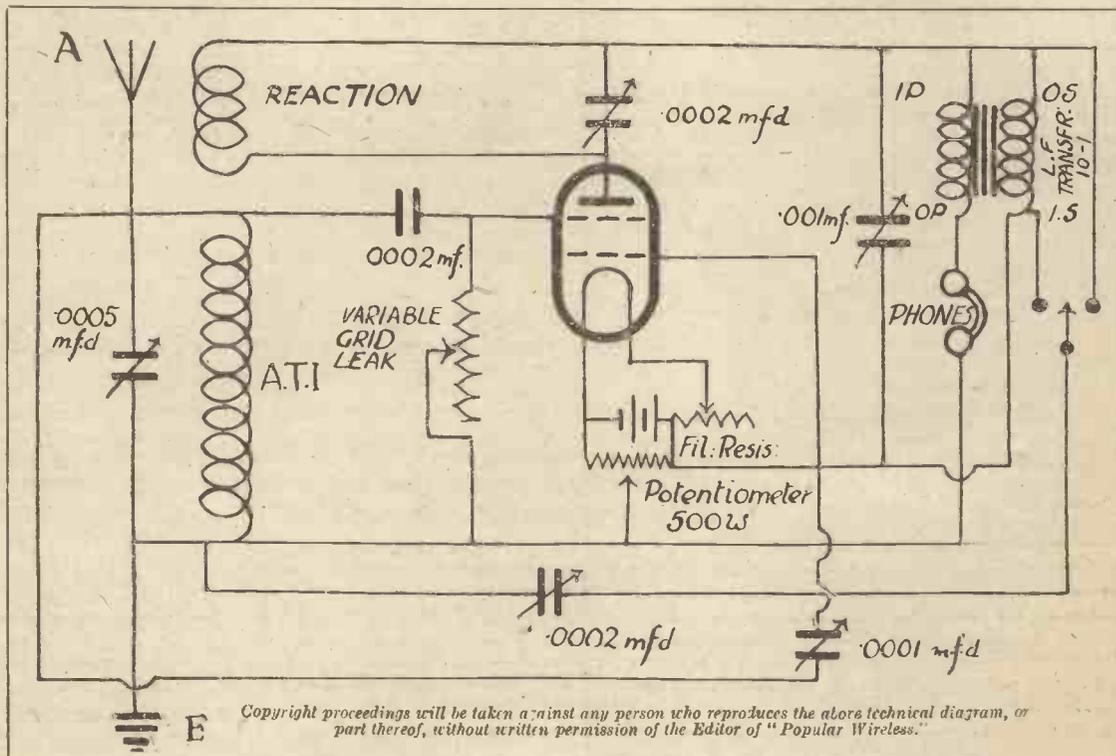
was a creditable but not too successful attempt to attain a useful end is proved by the fact that there has been no demand for these valves. As a matter of fact, demand for any type of four-electrode valve has not hitherto been anything but very small, but we believe that several of the valve companies in this country have in hand large stocks that can be released when the demand for them increases.

Therefore, the elements of our invention are that we insert an extra grid in the valve and eliminate the H.T. battery or supply. It must be admitted that the exchange is a good one, even only from the point of view of economy, for a four-electrode valve may cost a few shillings more than a three-electrode valve, but by employing the Unidyne principle there is no risk of accidental "burnings-out." As a matter of fact, amateurs will not fully realise what a nuisance and what an expense the H.T. battery is until they have constructed Unidyne receivers or have modified their own sets in accordance with the instructions that will be given in future articles.

The circuit shown in the diagram accompanying this article is the first Unidyne

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## MORE ABOUT THE P.W. "UNIDYNE."

(Continued from page 373.)

circuit with which we obtained really excellent results. As a matter of fact, it is almost a "super" in its capabilities, but like all other "supers" it is unstable and difficult to control.

Examining the circuit in detail, it will be seen that every possible means of coupling the anode circuit to the main grid circuit has been introduced both magnetically by means of the reaction coil and electrostatically by means of two variable condensers.

### How it Works.

The theory of the circuit is not difficult to follow. The small anode current due to the electron emission from the lighted filament of the valve passes through the reaction coil which "feeds-back" to the main grid circuit in the usual way, the primary of a step-up transformer, through the telephone receivers and then back again to the filament of the valve. The electron stream passing from the filament to the plate inside the valve is interposed by two grids. The first of these, which we will call the additional grid, is primarily made positive by connecting it directly to the positive terminal of the L.T. battery. This, in itself, tends to assist the electron stream or, as it were, tends to reduce the resistance of the vacuum of the valve. But the additional grid is assisted in its work by having impressed upon it the stepped-up voltage from the anode circuit due to the transformer, the secondary of which is in direct connection with the additional grid.

Thus a "building-up" process is introduced, every possible "electron" of current primarily due to the electron emission of the filament of the valve being made use of and ultimately passing through the telephone receivers to be reproduced in the form of audible signals. The main grid functions in the usual manner, except that this, too, can be made to help the additional grid as well by giving it a strong positive bias.

### Use Hard Valves.

We would like to point out that the valves used are hard, "all-purpose" valves, and are quite as useful in amplifying capacities as they are as detectors. As we mentioned in our first article, fairly interesting results can be obtained in detecting circuits using very soft valves without H.T., and even reaction has been possible with extremely

soft four-electrode valves; but, besides being very unstable in operation, such valves cannot amplify with the slightest degree of efficiency.

It is a very short-sighted policy to endeavour to achieve a creditable end at the expense of inefficient units or by introducing complications. That is why we were not satisfied with our invention until its keynote was SIMPLICITY and the use of HARD VALVES was possible.

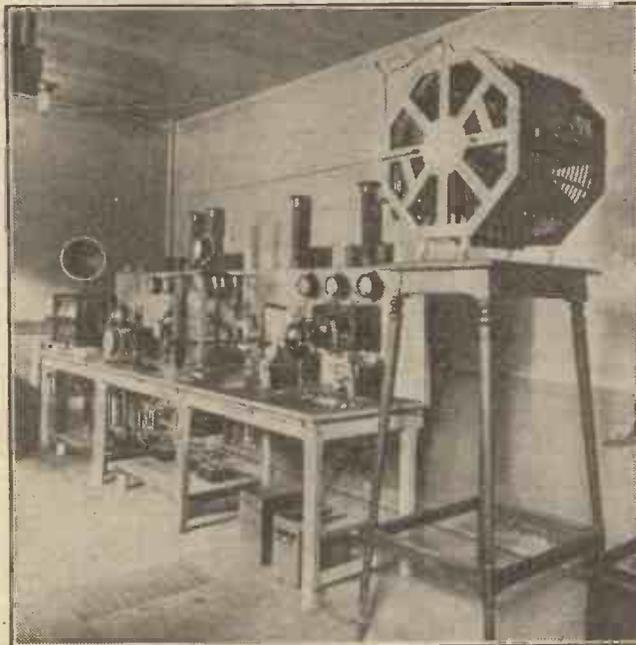
### "Howling" Eliminated.

The placing of the extra electrode close to the filament rendered this latter possible, and with a little thought it will be seen how great a part this plays in our circuit.

To revert to this circuit shown in the diagram. Advanced amateurs will find it well worth while to try this circuit out. It is difficult to handle, more difficult than a "Flewelling," we think, but it is capable of "super" results without the "super" whistle, but there is only one combination of the eight variable controls for each particular wave-length.

The two-way switch is not essential, but a curiously great increase of signal strength is obtainable at times when it is in the left hand position and the variable condenser is brought across the potentiometer.

In our next article, we propose to detail the construction of a simple one-valve



Transmitting apparatus at the Radiola station.

regenerative Unidyne receiver, which is as stable to handle as an ordinary one-valve set, provides as good a range of reception and volume of signals but greater clarity of tone, and requires but one variable condenser and no potentiometer.

*The Reader is now in possession of the facts concerning the theory of the "Unidyne" principle. Its essential simplicity has been clearly shown, and with next week's issue the inventors will give full and practical details for the construction of a one-valve set. Readers are urged to order their copies in advance and so avoid disappointment*

## SHEFFIELD AND THE B.B.C.

Captain Eckersley Replies to Critics.

SINCE the opening of 6FL, the new Sheffield relay station, the B.B.C. has been receiving a very large correspondence from wireless enthusiasts in that neighbourhood. A good many of the letters were congratulatory, but a large number voiced complaints from disappointed people who were unable to hear broadcasting from Sheffield as easily as they had hoped. The B.B.C. wisely decided that a personal talk from their Chief Engineer would be better than any other form of reply.

Rising from his sick bed and wrapping himself up in a blanket, Captain P. P. Eckersley spoke by landline to Sheffield, where his talk was broadcast.

### 5 P Y's Power.

When the news came that the Leeds-Bradford station was to have a power of 500 watts, and the rumour was circulated that Plymouth was using 200 watts, the critics got busy, and it was to them that the Chief Engineer addressed his bedside remarks.

Plymouth, he said, had only used 200 watts on certain experimental occasions. It was normally using 100 watts, no more and no less. When they placed a station four to five miles from a town it was essential that they should allot it a higher power than when it was in the town. This they had to do in the case of the Leeds-Bradford station in order that it might serve both cities.

### Sheffield's Gain.

The B.B.C. were thinking of Sheffield listeners just as much as Leeds listeners; they understood their responsibilities as the broadcasting authorities.

They were going to install new apparatus at Sheffield, apparatus capable of dealing with a higher power. They hoped to obtain the Postmaster-General's permission to use a power of 200 watts.

Some listeners, he said, had complained that they could not hear the station's transmissions well farther than ten miles away. Relay stations were intended to serve highly populated areas; the Sheffield station was for Sheffield and not for surrounding places.

### Considering Others.

The murmurs of discontent, now it is to be hoped silenced, did not of course refer to the quality of Sheffield's transmission. That, it is agreed, is excellent. The trouble is that some listeners do not appreciate the fact that the power of a broadcasting station cannot be increased *ad lib.* The B.B.C. has to consider the owners of valve sets in the district, who, if the station used a high power, would be unable to tune it out. The engineers have come to the conclusion that the power of relay stations, except in exceptional cases, should not be increased beyond 200 watts.

# THE B.B.C. SUPER STATION.

By "ARIEL."

A few opinions of well-known wireless manufacturers upon the new high-powered broadcasting station proposed by the B.B.C.

SINCE it was announced by the B.B.C. that a 25 kw. broadcasting station would be erected, providing experiments proved satisfactory, manufacturers have been preparing to make stocks for the anticipated rush for sets and component parts. It is the general opinion that the B.B.C. 25 kw. station will prove another advance in broadcasting and of great advantage to manufacturers.

### "Rush for Crystal Sets."

In connection with this project, I made recently a few visits to leading manufacturers, and persons generally interested, who are well known to the world of wireless. My first visit was to Mr. McMichael, the head of the well-known firm of Leslie McMichael and Company. I asked him if he thought the new station would have any real effect on his business.

"I should think so," he replied. "It is a splendid proposal of the B.B.C.'s, and certainly deserves encouragement."



Mr. Leslie McMichael.

"Do you think, Mr. McMichael, that there will be a rush for sets and parts, like the great rush of 1922 and 1923?"

"In some respects, yes. But, on the whole, I don't think it will be felt so much, because firms in the wireless trade are better equipped now than they were two years ago, and more experienced in the new industry, and

they would therefore have sufficient stock to meet the anticipated demand.

"I think that at first the rush will be for crystal sets, but valve sets will follow when the first enthusiasm slackens, and leaves room for more individual enterprise. The English amateur is not unlike the nation as a whole, progressive, full of experiment, seldom satisfied, and always wanting more. It is this spirit, which is alive in all Englishmen, that has brought wireless, and many other discoveries, to the high pitch of advancement which we have attained, and are still developing.

"Then you are of the opinion that the trade will have a boom. How long do you think it will last?" I next asked.

### Waiting for New Station.

"Personally, I think it will result in a steady all-round business, and will not vary up and down, touching high and low extremes, like some trades. I am very happy about the future, and I think others are too."

As I had to call on many other manufacturers, I had to cut short my interview. But I was pleased to leave Mr. McMichael so contented with life in general. I next

called on Radio Instruments, Ltd. Mr. Josephs, the manager, was, not unlike Mr. McMichael, very optimistic about the future.

"Oh, yes, I most decidedly think that the new station will benefit us and everybody in the wireless profession generally," was his reply to my first question about the station.

I asked him if he would have to make any fresh stock or gadgets, as regards loading coils, etc., to suit the new wave-length.

"Well," replied Mr. Josephs with a smile of satisfaction, "I am glad to say that, with some foresight, we made our crystal sets to meet the 1,600 metre wave-length from the beginning. Thus our clients could tune in the continental stations, should they at any time add valves to their sets. We will not, therefore, require any new gadgets—as you call them."

"Do you think that the announcement of the B.B.C. regarding this new station has helped trade?" I next asked.

"No," was his reply. "I think that if the B.B.C. had waited until the station was nearly ready, things would have been better. We felt the decline in business almost the same day as the announcement was made, because people thought that, if this station was to be erected, they would wait till it was ready, and then get a crystal set, having previously contemplated buying a valve set. Then, as summer is not far off, many are quite prepared to wait till next autumn."

### Some Interesting Opinions.

I called next upon the manager of the Marble Arch Pavilion, Mr. Basil Davis. He is well known to early experimenters in wireless, as he was one of the first to own an amateur transmitting station, 2 B Z. It may also be remembered that he made use of this station to book a film by wireless, while the assistant manager was on his way by air to Paris.

I asked him if in his opinion the new station was likely to help the film trade or cinema theatres.

"Yes," he replied, "it may bring us a step nearer perfection in the matter of sending music and speech over greater distances. But as regards the theatres, I cannot see that it will help us just now. It may do so, of course, in the future, but it is rather early to talk of this."

"I have found broadcasting extremely useful. Many of my ideas and schemes have been inspired by listening-in, and I may say that one or two schemes which were recently carried out with great success

were due to some items I read in POPULAR WIRELESS. Wireless is, of course, in many ways specially suited to the needs of a cinema theatre. It gives an interesting variety to our programmes.



Mr. Basil Davis.

"As I expect you may know, we have arranged with the B.B.C. to broadcast items from our Shepherd's Bush Pavilion. The reason why that place has been chosen is that the organ is in an ideal position for transmitting, as the music, instead of pouring in from all quarters, as is usual with most organs,

comes through a single hole, under the stage. I expect the first transmission will take place very shortly.

As it was time for the theatre to close, the manager had to go. We parted, and next morning I called on the Marconiphone Company. Major Hardinge, the manager, and his chief engineer, Mr. A. S. Agate, were of course responsible for the successful reception of wireless items on Pullman cars.

I asked Major Hardinge whether he thought that the new station would benefit trade.

"In a sense, yes," he replied. "As it is a high-powered station, such as is likely to be received widely throughout Europe, it will no doubt increase the prestige of British broadcasting, and tend to make wireless more universally known and approved. Then, as a development likely to make for progress and to demonstrate further possibilities in the field of broadcasting, it would, of course, be generally welcome."

### Effects Upon Prices.

"Do you think," I inquired, "that, should a boom occur as a result of this new station, the price of sets will be materially reduced?"

"If it operates successfully," said Major Hardinge, "it may possibly, in the long run, tend to cheapen certain types of apparatus, to everyone's satisfaction, and it will certainly—this being a most important point—greatly increase the range of ordinary two-valve receivers operated on indoor aerials, which will do a great deal towards convenience and quality of reception."

"Of course, owners of Marconiphone receivers, or people about to get our sets will be quite unaffected by the advent of the 1,600 metres station, except for enjoying any additional benefits it may bring about; as the well-known system of range-block tuning makes all the models in our range suitable for wave-lengths of this nature."



Mr. Josephs.

# THE FLEWELLING CIRCUIT.

Some practical advice concerning this interesting circuit, by Mr. E. T. Flewelling, its inventor.

MR. E. T. FLEWELLING, writing in the current issue of the "Wireless Age," says:

"There is so much in radio that many of us do not know or understand that such actions, as this circuit exhibits at times, are responsible for the almost world-wide interest it has aroused. We are all of us most interested in that which we do not understand, and I would be the last to make the claim that I understand the entire story of the Flewelling circuit. What I have observed, however, is presented with the feeling that it may be of help in cleaning up some bits of the haziness about the circuit.

## Control of Coupling.

"First, let me state that the Flewelling circuit may, by control of coupling of the feed-back coil and the grid leak, be used either as a plain regenerator of unique and substantial capabilities or as a super-regenerator.

"With grid and plate coils at approximately close coupling and grid leak properly set, as found by trial, regeneration is increased beyond the familiar spill-over point. Ordinarily this means silence or a loud, raucous howl. This howl may be introduced into any receiver of the type by grid-leak adjustment, etc., but in the Flewelling circuit it is controlled and shaped to our ends by the capacity of the filament lead condensers and the grid leak. The greater the capacity of the condensers the louder the howl and incidentally the greater the power of it, up to .012 mfd., or perhaps even greater, but .006 mfd. is found to offer about the correct value for general use. The howl in the Flewelling circuit is caused in part by the blocking and freeing of the grid of the tube, and in a correctly built set it may be so lowered in pitch that it is nothing but a series of thumps occurring about once a second.

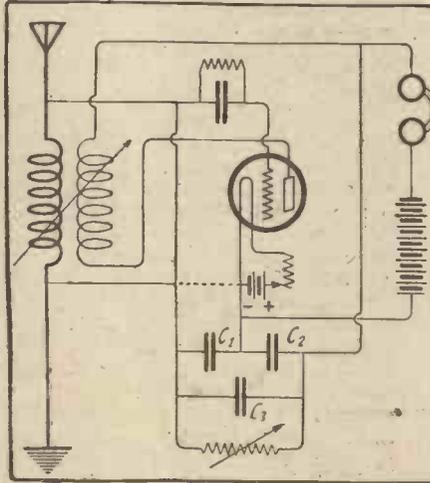
## Action of the Grid Leak.

"Now, as the grid leak is varied we allow the accumulated charge on the grid to leak off faster, and the thumps occur so fast that they merge into a continuous roar, increasing in pitch as the leak is changed until the note is so high as to be practically inaudible. Note that each time we allow the tube to block and free itself we are charging the .006 condenser and discharging it back into the grid circuit, thus utilising these things to our end: Excessive regeneration, plus the added discharge of the .006 condenser into the grid circuit, plus the grid leak to keep the circuit from running away by starting and stopping it at correctly timed intervals.

"It is conceded that the circuit is tricky, so much so that a barrel of monkeys is tame in comparison. For instance, note such results as these and note also at the same time that reception without antenna

loop or ground has been found reliable day in and day out only up to distances of about forty miles.

"Boston to Los Angeles on a 16-inch



Circuit diagram of the Flewelling receiver

loop reception for an hour or more steady without ground or other antenna.

"Audibility on 400-mile station with plain regenerator of excellent type on good antenna and ground, 150; but at same time on super circuit without loop or ground, 700.

"Consistent audibility on 25-mile broadcaster with antenna loop or ground such that music is heard 35 to 40 feet from loud speaker.

## Some Final Hints.

"If I now say that I would not guarantee what the receiver would do about a station 50 miles away, one can form one's own opinion about how very interesting such a circuit is.

"As a super it is inclined to be extremely noisy and tricky, a scientific novelty; but open your coupling, adjust the grid leak properly and you find that you have not wasted a bit of time in building the circuit, because it will then work as a plain regenerator, exceedingly sharp in its tuning, capable of real distance work, as shown by hundreds of letters I have received.

One of the chief reasons for the popularity of this circuit is the ability to control considerable power upon only one valve. When properly adjusted, loud speaker reception up to a distance of 20 miles is quite common; but these candid opinions by its inventor show that, in order to get the best results from the circuit, a certain patience and skill in handling is necessary.

Finally, Mr. Flewelling adds this instructive remark: "There is only one tube in the Flewelling circuit, so let's take pity on it."

# Technical Notes



CONDUCTED BY J.H.T. ROBERTS, D.S. F.Inst. P.E.

## A Simple Rotor.

IT is often difficult to know how to make a rotor in the spherical shape. An old tennis ball will be found quite suitable for this purpose, since it is of about the right size and comparatively rigid. Two slices may be carefully taken off, at opposite ends of a diameter, and cardboard discs or rings affixed, forming flanges for the windings. The cardboard may be secured by means of glue, or rubber rings may be fixed with rubber solution instead. The ball should then be shellacked and the windings laid on not too tightly. In cutting the slices off the ball, a sharp knife should be used, wetted with water occasionally, and the edges of the hole may afterwards be trimmed with scissors.

## Protecting the Valve.

Talking about filament fuses reminds me that there is a very useful little accessory on the market, which many experimenters do not seem to have heard of, consisting of a wander-plug for the high-tension battery, with which is combined one of those little 4-volt electric lamps which are used with pocket flash-lights. The lamp is rated to carry about one-quarter or one-fifth of an ampere, and so is well able to carry the anode current for an ordinary receiving

valve, but if the H.T. happens to get across the filament, through making surface contact with wrong sockets, the little lamp "goes," and a new one can be put in for a few coppers. I am referring here to bright emitters, of course.

## Cheaper Valves.

Anything which has the effect of reducing the cost of valves will have the hearty approval of all wireless experimenters. It is believed that a new method which has recently been patented, and is concerned with the mounting of the electrodes in the glass "stub" of the valve, will go a long way towards this desirable end.

Instead of sealing each electrode support and leading-in wire directly into the stub, these are first secured to four short tubes which are then mounted on a jig and held within the stub, the latter being heated and pinched so as to hold the electrodes and make a perfect seal. Although the advantage of this may not be apparent to the amateur, it is one of those manufacturing tricks which make for great saving of time, and enables the operation in question to be performed by unskilled, or comparatively unskilled labour.

(Continued on page 402.)

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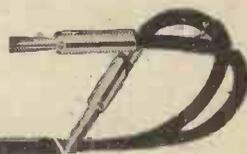
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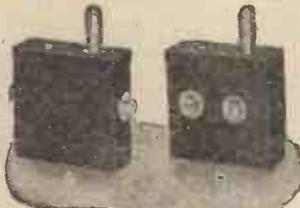
I am more than delighted with this excellent performance, and you are at liberty to use this letter in any way you may wish.

Yours faithfully,  
ARTHUR O. MILNE.



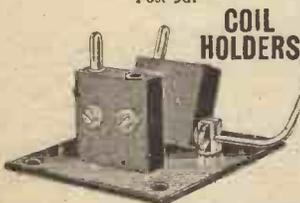
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# A THREE-VALVE RECEIVING SET.

By LAURENCE J. PRITCHARD (Technical Editor of Harmsworth's "Wireless Encyclopedia").

## PART II.

This article continues the description of this useful receiver with details of the construction of the variometer.

HAVING prepared the case and panel the next step is to construct the two variometers. The finished article is shown in Fig. 15, from which it will be noticed that the variometer is built up from flat sheet ebonite, brass stretchers, and ordinary standard screwed rod. The first process is to make up the two outside, or fixed end plates for the stator.

### Making the Stator.

These plates are shown in Fig. 11, and measure 3 in. in length and  $1\frac{1}{8}$  in. in width. A hole is drilled in the centre of each plate, and from this centre is described an arc of a circle  $2\frac{1}{8}$  in. in diameter, and notches are cut in the two ends of each plate by filing away the ebonite exactly to a radius of  $\frac{1}{16}$  in.

which serve to separate the two plates and hold them in their proper positions. The holes should be ordinary clearing holes and not tapped, otherwise it is difficult to put the plates together.

A brass bush should be obtained and fitted into one of the plates to act as a support for the No. 2 B.A. screwed rod, which serves as a temporary spindle for the rotor. This bush may be screwed into the ebonite plate and secured with a thin lock nut. Alternatively a flanged bush can be used and screwed to the outer faces of the end pieces. The appearance of the stator when connected by the four brass rods is shown in Fig. 12, which will make clear exactly how these parts should be shaped.

### The Rotor.

The rotor is similar in construction, but is made up from ebonite plates  $2\frac{1}{8}$  in. long and  $1\frac{1}{2}$  in. in width and  $\frac{1}{4}$  in. thick. A central hole is drilled in this to take a No. 2 B.A.

screwed rod, and the ends of the two side plates are carefully filed to a radius of  $1\frac{1}{8}$  in. The tie bars,  $2\frac{1}{8}$  in. long, which connect the two plates together are secured by countersunk screws passed through holes drilled in the corners of the ebonite plates and screwed into holes tapped in the ends of the four plain brass rods  $\frac{1}{8}$  in. in diameter. The positions of these parts are clearly visible in Fig. 13, which also shows the temporary screwed spindle in position.

This also shows how these parts are connected together. First fit the lower two ties bars and then the upper two, screwing the screws up as tightly as possible. It is very important that these four rods should be exactly the same length, otherwise the rotor will not be square and true. The screwed rod is then fixed through the centre holes and secured with lock nuts on the inside parts of the two end

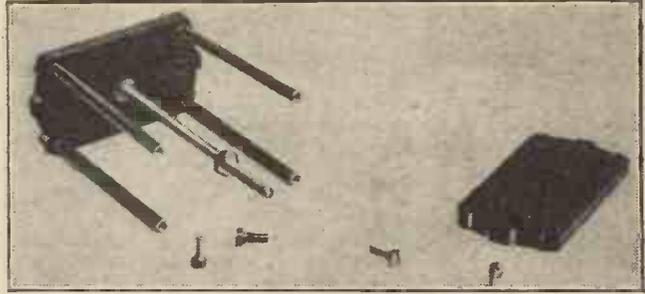


Fig. 13. Assembling the rotor of the variometer.

plates, in the usual way. The rod may be screwed into one of the ebonite plates, but should pass clear through the centre hole in the other one.

### Assembling the Variometer.

It will be noted that shallow depressions are filed in the ends of the rotor in a similar manner to that adopted for the stator. The

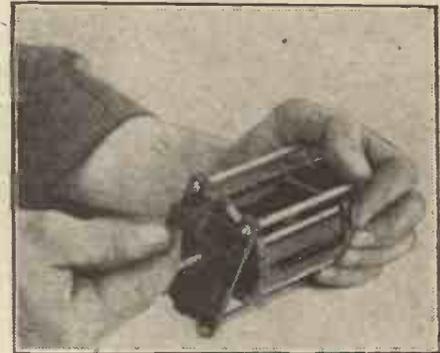


Fig. 14. Winding the stator.

next step is to assemble the stator and rotor and see that the latter can turn freely within the former, if this is the case, the winding may proceed. The rotor should be wound first with No. 24 gauge wire. This can (Continued on page 380.)

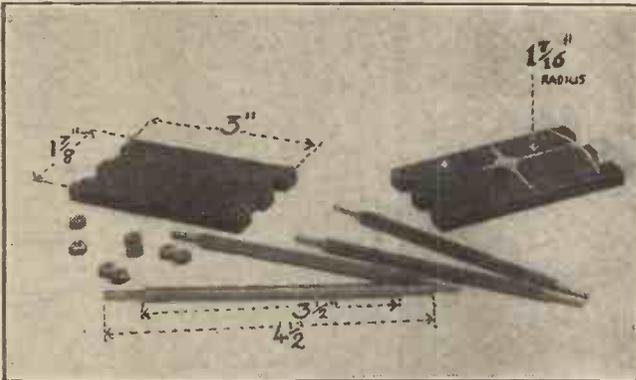


Fig. 11. The stator plates and rods.

This leaves two gaps at each end of each of the ebonite plates, and are intended ultimately to receive the stator winding. It is consequently very important to keep the bottom of these slots at the proper radius.

The next step is to drill holes in each of the corners of the two plates. These holes are intended to receive the shouldered and screwed ends of  $\frac{1}{8}$  in. diameter brass bar

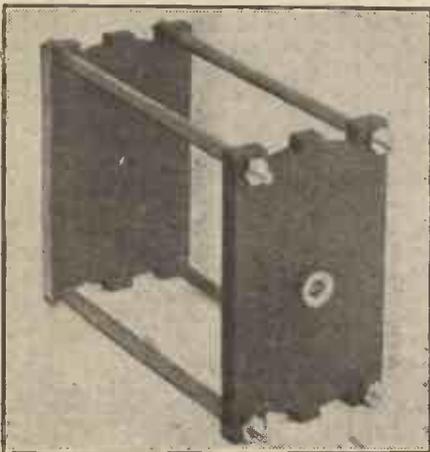


Fig. 12. The rods and plates assembled.

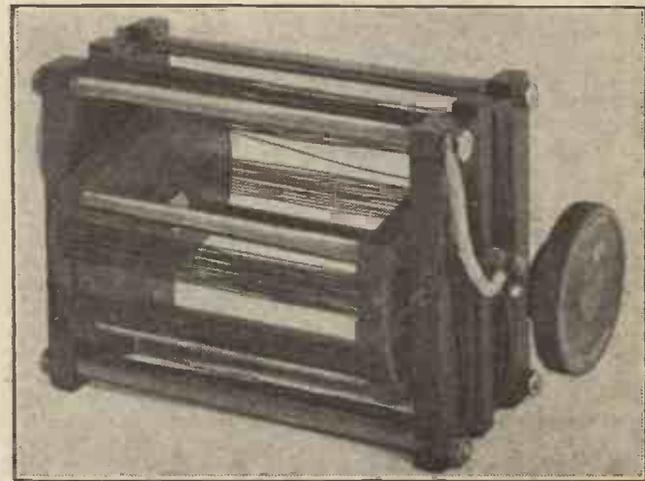


Fig. 15. The completed instrument ready for mounting.

# REACTION AND OSCILLATION.

By Capt. P. P. ECKERSLEY (Chief Engineer of the B.B.C.).

Some lucid remarks upon a subject which the writer has made peculiarly his own.

I SHOULD like to try and explain exactly and in simple words, what reaction means.

1. The terms reaction, oscillation, heterodyning, howling, mean the same thing.

2. Any valve receiver may be made to oscillate, and so cause interference by reaction, oscillation, heterodyning, howling, etc. A crystal set can never offend. When a valve receiver is handled in this way, it may cause a howling noise in every receiver in an area of 75 square miles around the offender.

3. If a howling noise is heard in your own receiver, it may be you, or it may be someone else. To test if it is you, perform the following operation:

Alter the tuning of your aerial and listen to the howl. If the howl changes its note sympathetically with your tuning, it is you. If the intensity only of the note changes, it is not you.

The tuning adjustment must not be confused with the reaction adjustment; the tuning adjustment means probably altering a condenser or variometer in the aerial circuit.

4. Reaction occurs on a set by the following means:—

## A Single-valve Set.

A coil is connected in the lead from the high-tension battery to the anode of the valve via the 'phones. This coil is coupled variably to the aerial circuit. The tighter the coil is coupled, the louder the signal up to a

point (provided the set is working properly).

After a certain degree of coupling is obtained, the set will oscillate and cause howling, and the signals will be distorted. It is useless to use too much reaction, both from your point of view and that of your neighbour's.

## A Two-Valve Set (Tuned Anode).

Use reaction on the second valve, if you must use it. The reaction-coil is coupled to the tuned anode circuit inductance. This circuit can interfere just as badly as any other if the reaction coil is too tightly coupled. It can also oscillate without a reaction coil. Keep down the

coupling between stray leads to avoid this, and avoid stray wiring everywhere.

It is not in the scope of this article to go more fully than this into the subject, but if from the above you find you are oscillating, please, for the sake of the enjoyment of hundreds of others around you, take steps to stop it.

If in trouble, consult your local radio society.

## Don'ts for Listeners.

Don't do it.

Don't think that a two-valve set with reaction on the second valve will not interfere. Without special precautions, it will.

Don't tune in a station by receiving its howl first, tuning to the silent point and then relaxing the reaction coil.

Don't have a set that can only be adjusted in this way, unless it is guaranteed by the makers not to offend.

Don't have a home-made set that has not got an adequate factor of safety, and therefore requires intense reaction.

If you have a manufactured set stamped B.B.C. bought before October, 1923, you have less chance of interfering, but it is unwise even then to let your set oscillate.

If you have a manufactured set stamped B.B.C., or a home-made set, you should experiment with your adjustments until the howling note (changed sympathetically with your tuning) vanishes. If you hear howls over which you have no control, it is someone else. If you know who it is, a personal call armed with this pamphlet might do some good, but great tact is obviously required.

Once more, if the note of the tuneful howl varies with your tuning adjustments, it is you. If broadcasting is not on, you can't howl, but you can tell if you are oscillating by tapping the aerial with your finger and you will hear a loud "plop" if you are.

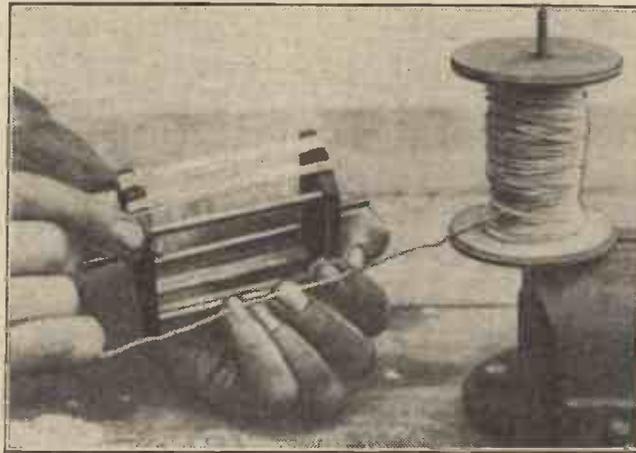


Fig. 16. Completing the winding of the rotor. (See below.)

## A THREE-VALVE RECEIVING SET.

(Continued from page 379.)

easily be accomplished by placing a spool of wire on a support, such as a piece of  $\frac{1}{8}$  in. diameter rod held in a vice, as shown in Fig. 16. The wire is simply wound around into the grooves until they are full, but it is important that the wire should run constantly in the same direction and that there be the same number of turns in each. When the first groove is filled, the wire is carried across to the second groove which is then filled with wire.

At the commencement, a loose end of about 6 in. should be left free for connection purposes and the finishing end also left in a similar way. The winding may then be finished by drilling a small hole through the ebonite, passing the wire through it and drawing it up tight.

The stator has next to be wound in a similar manner, or preferably, the rotor may be assembled in its place after it has been wound and the stator windings be put

on afterwards, as this facilitates the assembly of the rotor which would otherwise be in a somewhat inaccessible position. The operation of winding the stator after assembling the rotor is illustrated in Fig. 14. It is very important during the winding process to take care that each turn of wire is quite tight and to see that the wire is perfectly free from kinks or bulges, otherwise there will be a liability for the windings to touch each other when the rotor is moving, which would be fatal to a successful result. At the same time too much should not be allowed or much of the value of the coupling will be lost.

## Connecting up Rotor and Stator.

To enable the wire to lie smoothly, it is necessary to round off the outer edges of the grooves so that the wire can make an easier bend than would be the case if the edges were left perfectly square.

Connections between the stator and rotor may now be made. To do this, it is only necessary to take the finishing end of the stator winding and connect it to the brass bush through which the rotor spindle passes.

The temporary 2 B.A. screwed rod, which has so far been left in position, should now

be removed by slacking off the nuts and unscrewing it, and is replaced by two short spindles of similar material. At the back, the spindle need only be long enough to connect the rotor and stator end plates and allow room for two lock nuts wherewith to lock it to the rotor end plate. At the other end, the spindle should be left about 2 in. long to provide ample spindle length whereon to fix the ebonite knob and dial.

It can be cut to its correct length after it has been fitted into the case. Spring washers are interposed between the end plates to fill up the gap and keep the rotor in place. The purpose of using the continuous temporary spindle is to give stiffness to the variometer while the winding is in progress, and to keep the whole in perfect alignment.

The starting end of the rotor winding is then connected to the front spindle, the finishing end of the rotor winding to the back spindle. There are thus two points for connection to the variometer. First the commencing end of the stator winding and secondly the back spindle. The rotor connections are made from the latter by soldering flexible wire to the end of it.

(To be continued.)



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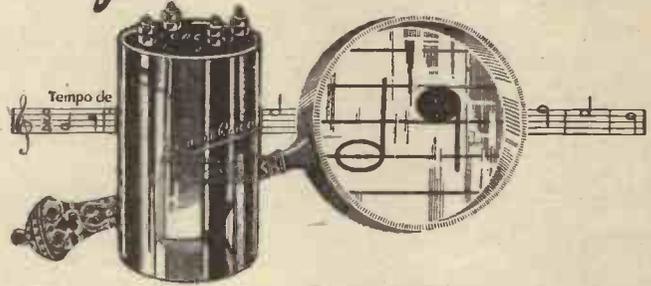
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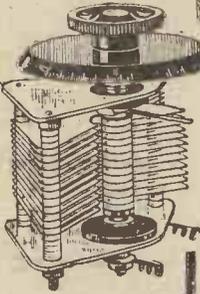
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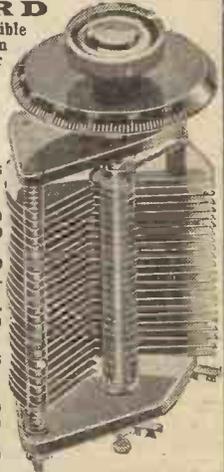
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# WILL THE ETHER REVEAL PAST HISTORY?

By G. H. DALY.

"Buried away in the ether is a record, complete to the minutest detail, of the earth and everything that has happened on the earth's surface since the world began."

**S**HALL we see the past history of the world unfold before our eyes like a film play at the cinema? It is not impossible. Just imagine what this means—to see with our own eyes great personalities of former times and historic scenes such as the Napoleonic wars and the French Revolution—our civilisation steeped in the darkness of medieval times—the rise and fall of other mighty civilisations, Rome, Greece, Babylon, Egypt; and so on right down through the ages to the period when life was just beginning on earth—even to the time when our earth was forming out of nebulae.

It is almost beyond our imagination to conceive such a wonderful possibility. Yet

earth, and the astronomer who to-night examines the stars of the Milky Way through his telescope is, not seeing them as they are to-night, but as they were 25,000 years ago. The light waves by which we see the Milky Way at the present time left there before the dawn of our history, and should any star of the Milky Way cease to exist at this moment it would still be visible on earth for another 25,000 years. Thus we can actually see light waves which have been travelling for 25,000 years.

### A Stupendous Journey.

Now and then the astronomers at the Mount Wilson Observatory in America, when examining the heavens through their gigantic 100-inch telescope—the largest in the world—catch the barest glimpse of some tiny star hardly the size of a pin-point. It has been estimated that the light from this star takes at least one hundred thousand years to reach the earth. The tiny pin-point of light in the telescope, which is the image of a star, has been travelling for a hundred thousand years or more.

Similarly, light waves must be arriving on the earth which have been travelling for millions of years, and even for longer periods than we can possibly imagine—only our telescopes are not, as yet, powerful enough to detect them. Therefore it can be said that light waves are eternal, as we understand the word.

Now if beings happen to exist on some distant star on, say, the frontiers of the Milky Way, these beings, if they are equipped with super telescopes, will be seeing the world as it was 25,000 years ago, for light waves from the earth take 25,000 years to reach the Milky Way. Therefore, what happened on earth 25,000 years ago is not lost, and if we were on that star equipped with super telescopes we should see the earth as it was at that time.

### History in Space.

It is just the same with earthly events which took place a thousand or a million years ago—nothing is lost—for a picture of the earth and everything that has appeared on the earth is travelling through space at the present moment. It is indeed possible to work out mathematically exactly whereabouts in space any historic incident of the past, such as the burning of Rome or the assassination of the Archduke of Austria, happens to be.

It is not possible, however, to travel to some distant star faster than light waves, and examine these waves as they arrive like the soul of the man in Flammarion's book "Lumen." So how are we to get hold

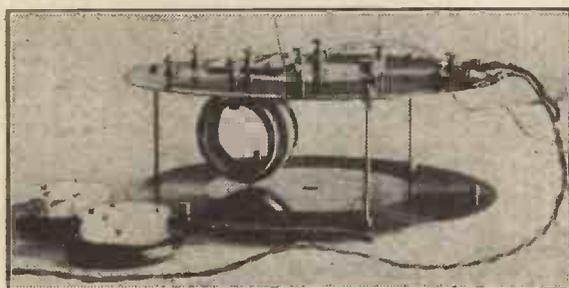
of the light waves which left the earth these hundreds and thousands of years ago, and to see the past over again?

The answer to this is that possibly, in fact quite probably, light waves which have left the earth, whether it was yesterday or a thousand years ago, will return to the earth some time or another. This is because recent investigation tends to show that light waves follow a circular path, just as the earth follows a circular or elliptical path round the sun. A picture of the young earth or some interesting event in history may even now be flowing past your back door in the form of ether waves which are invisible to your eyes, but which only require some instrument to make them visible, like the wireless receiver in the case of reception of broadcasting.

### Travelling for Ever.

The above statements also apply to wireless waves which are of the ether, similar to light waves. Every concert which has been broadcast—every S.O.S. which has been sent from a sinking ship, from the powerful, hurried cry of the "Titanic" to the urgent call of the ill-fated "Egypt"—all are travelling through the ether of space and will travel for ever, even after this earth is cold and dead.

Wireless waves, it should be added, have the speed of light, namely, 186,000 miles per second, and are subject to the same laws as light waves, so that if the latter are proved conclusively to follow a circular path and return to the earth, the same fact will apply to wireless waves.



This receiver is built on two gramophone records, which make very good insulation. Constructed by Mr. E. H. Williams, "Homefield," Fayland Avenue, Streatham Park, London, S.W.16.

one day science may enable us to see it all by unlocking the secrets of the mysterious ether in which the earth and all other worlds are floating like a number of ships on a vast ocean.

### The Ether Record.

Buried away in the ether is a record, complete to the minutest detail, of the earth and everything that has appeared on the earth's surface since the world began. This record is in the form of light waves which are waves in this mysterious ether somewhat similar to waves in the sea. Every object on the earth, animate or inanimate, upon which light has fallen has reflected its image into space, and this image travels in the form of light waves for all time—for light waves are eternal, as we can see to a certain extent with our own eyes.

For instance, the light waves from the sun take about eight and one-third minutes to reach the earth, and for this reason the sun is not visible to us for eight and a third minutes after it has actually risen above the horizon. The sun is merely 93 million miles away—a very short journey for light waves which travel at 186,000 miles per second. But take some really distant star, such as one of those in the Milky Way, which on latest measurements is about one hundred thousand billion miles away from the sun.

The light from the nearest star in the Milky Way takes 25,000 years to reach the



A wireless set and gramophone combined is one of the latest German inventions.



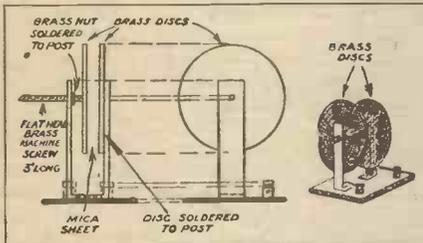
Conducted by J. H. T. ROBERTS, D.Sc., F.Inst.P.

### A Simply-made Vernier Condenser.

THE condenser illustrated herewith can be made very cheaply, and when used in conjunction with a larger variable condenser, acts as a fine tuner or vernier.

The two plates may be made of brass or zinc, one being soldered to the head of a brass screw-bolt about 2 to 3 in. long. A hole is drilled through the supporting strip so that the bolt passes through loosely.

A nut is then obtained which makes a close fit with the bolt; this nut is soldered centrally over the hole in the supporting strip, and the screw-bolt passes



through it. The two supports are then secured, in the position shown, to a suitable base of ebonite or other insulator. The action of the vernier will be evident from the illustration. The screw acts as a micrometer, and the plates may be very slowly moved closer together or further apart. The plates may be 2 to 3 in. in diameter.

### A Tuning Hint.

Fine tuning can be obtained by connecting a coil of one turn of wire (or a few turns) in series with one of the tuning coils. This may conveniently be carried out by using a three-coil holder for the two main coils, primary and secondary, a single turn of wire being mounted upon the third mount and connected in series with the secondary coil. This third single-turn "coil" should be made from stout copper wire, and should be of about the same diameter as the other two coils. It will be found that by this means vernier tuning is readily obtained. In some cases you may happen to be using a three-coil holder for the two coils, and the method given above indicates a handy way of utilising the idle mount.

### The Public Wireless Demonstration.

A wireless society which has not an occasional public demonstration is only half alive, and needs jolting up.

And yet who has not been to a demonstration which has had half a dozen captains in the team of wireless experts, besides others of a minor calibre who positively cannot keep their itching fingers off some important regulating knob?

Now this is not advancing the wireless cause, and it really need not happen. It is not cricket. It is not team work at all. Choose your captain and obey him when

chosen, but for goodness' sake don't all be captains. How can one secure the best which a set can give if three people are simultaneously altering different parts of the same circuit?

### Wireless Advice.

Josh. Billings, the famous American humorist, is reported to have said, "When a man comes to me for advice, I find out what advice he wants and give it to him."

There is no reason to suppose that Josh. Billings was ever consulted in the matter of the wiring or components of a wireless receiving set, or that he was a recognised authority on the matter, but he might have been judging by the appositeness of his dictum to the tribe of wireless amateurs nowadays.

It would not be good otherwise, for are they not all experimenters? And when they come for the advice after having bought all the components, and nearly wired the set, what can the man do who is appealed to and desires to retain his popularity?

### Vernier Rheostat.

A vernier rheostat is very desirable with any type of filament, but particularly with dull-emitter filaments and with soft detector valves. The vernier principle consists in providing a coarse-adjusted resistance in series with a fine-adjusted resistance.

In a simple device for this purpose, the main resistance is wound upon a circular former in the usual way, and the low resistance for the vernier adjustment is shaped into semi-circular form, but about a different centre of curvature. Two contact-arms and knobs are provided, one for each of the resistances. The two resistances, the high and the low, are connected in series. After the coarse adjustment has been made by means of the high resistance, the fine or vernier adjustment is made with the low resistance.

### A Simple Bushing.

It is sometimes desired to mount a piece, for example, a dial, on to a shaft, the diameter of the hole in the dial being greater than the diameter of the shaft. In such a case, bushing is the obvious method of getting over the difficulty. A satisfactory bush may be quickly and easily made in the following way.

Take some bare copper wire whose diameter is a shade less than the difference in radius of the shaft and the hole, in other words, the copper wire must just slip easily into the annular space between the shaft and the dial.

This copper wire should be wrapped snugly and tightly around the shaft, for a sufficient length, and should then be carefully removed by slipping off. The "spring" thus formed should be fixed by soldering (or dipping in molten solder, if this is convenient), care being taken not to distort it in the process. When cold, any irregu-

larities or solder spikes may be removed by means of an old file. It will be found that this will make an excellent bushing, and will form a very nice fit on the shaft, the latter turning true and evenly in the bushing.

### Novel Crystal Detector.

The crystal detector described herewith has the evident advantages of neatness and compactness, as well as freedom from contamination by dust, and in addition it is claimed by the inventor (M. Billington, Pat. 212,076/23) that once a sensitive spot has been found, this is maintained in spite of shocks and vibrations.

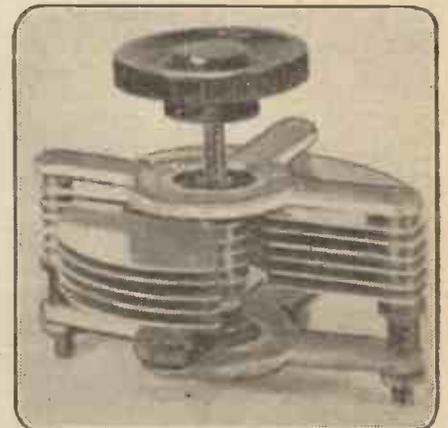
The device consists essentially of two concave metal plates, which are fitted together to make a lens-shaped chamber, within which the crystal is loosely contained. The two metal plates are separated by a ring of insulating material, such as ebonite, the outer surface of which is knurled or milled, so that it can easily be turned by the fingers.

This circular or cylindrical capsule has two small depressions in the centres of the two metal plates, and is pivotally mounted between two supports of springy brass, which complete the electrical circuit through the crystal. When it is desired to find a new "spot," all that is necessary is to turn the cylindrical capsule round on its axis, the crystal rolling loosely inside at the bottom.

### Those Headgear Telephones.

An advertisement in an American contemporary recently was very eloquent on the subject of rating wireless headgear telephones by their resistance, and stated that that method was entirely misleading, suggesting that the impedance of the telephones to alternating currents of a frequency of 1,000 cycles per second was a much better test of their suitability for general wireless work.

If impedance alone were taken as a guide to selection, a pair of 60 ohm 'phones would romp in an easy winner, but you would not



A neat variable condenser that takes up a minimum of space.

be able to do much wireless work with them on a crystal set unless a step-down transformer were used.

On the contrary, a manufacturer who wound his 'phones with copper wire of a fineness of gauge which totalled 8,000 ohms resistance for the windings, would be likely to put pretty good work into their construction, and in other details also.

# A FIVE-VALVE SET.

By LIEUT. W. ISON, R.E.

This second and concluding article describes the construction of a very useful receiver on the unit system.

**B**ARE tinned copper wire should be used for wiring the centre panel and the diagram supplied by the makers of the anode coil will show the method of connection. This is shown in the diagram, but the former will no doubt be clearer. Do not hurry over the work. A good plan is to do one circuit at a time—i.e. wire up all the low tension circuits first, then the high tension, and so on.

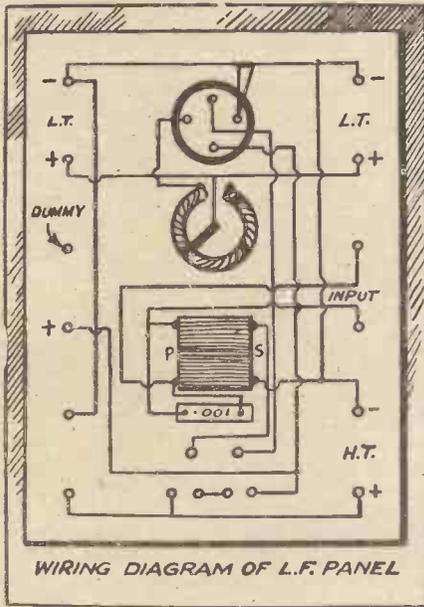


Fig. 5

Again, the places for the known components are not arbitrary. The switches enable 1, 2, or 3 valves to be used at will when used as a separate unit.

### The Low-Frequency Panel.

The size of this panel may be 12 in. by 7 in. by 5 in., and thus uniform with No. 1 panel. The low-frequency transformer in this panel is a well-known transformer, which is found to be remarkably efficient. Again, a separate filament resistance is provided for the valve. Fig. 5 is the wiring diagram. Terminals are provided

for the use of two pairs of 'phones if required. It will be noticed that two extra high-tension battery terminals are provided, and their use will be explained later, as also the two terminals on the opposite side provided for the grid battery.

Before pro-

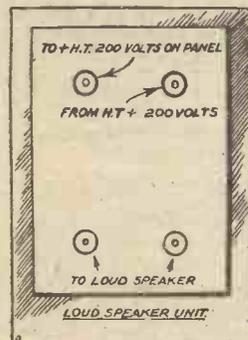


Fig. 6

ceeding to describe the various methods of using the panels it is proposed to describe a small additional unit which the writer uses for power amplification with a loud speaker. In the writer's case this unit is applied with current from the house main at 210 volts, direct current, the negative pole being earthed. Fig. 6 is a sketch of the unit which simply consists of four terminals mounted on a sheet of ebonite fixed in a case 8 in. by 5 in. by 3 in.

Inside the case is a 2 microfarad condenser of the Mansbridge type, which can be purchased for about 2s., and the secondary of an old spark coil. Fig. 9 shows the method of wiring up. As will be seen by using this method no actual H.T. current passes through the loud speaker, so cannot damage it.

### Methods of Using the Set.

First of all, the No. 2 panel may be used as a separate unit, and in this case it will be found amply sufficient for reception with telephones of all the English broadcasting stations as well as several of the Continental. The method of connecting up is shown in Fig. 7. If one pair of 'phones only is used, they must be connected to the two outside terminals. If two pairs are used, the first pair is connected to the first two terminals, and the second pair to the second two terminals. If preferred, low-resistance 'phones of 60 ohms may be used, and this is always to be recommended if the life of the 'phones is to be preserved.

In this case a telephone transformer must be used, and the high resistance winding connected to terminals 1 and 4 and the 'phones to the low resistance winding of the transformer. Some makers of these

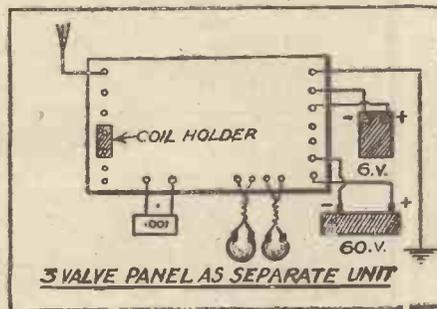


Fig. 7

winding as primary, and some makers the reverse, but the dealer will tell you which is which.

A six-volt battery will be required for the filaments, having not less than 40 actual ampere hours capacity. When buying an accumulator, see that the capacity is "actual." The writer frequently sees accumulators in dealers' windows marked "40 amp. hours" without any statement that this is an "intermittent" rating which is double the actual rating. Such a battery

is only 20 amp. hours actual rating. The high-tension battery should be of 60 volts, and those of the accumulator type now sold are excellent, and overcome the troubles of noisy high-tension batteries of dry cells caused by faulty cells.

### The Extra H.F. Panel.

The aerial tuning condenser should be of a capacity of .001 fitted with an extended

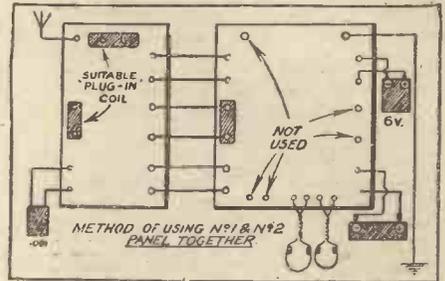


Fig. 8

handle. Coil No. S.4 of the Burndept make is the best size for the Broadcast. The anode coil goes up to 4000 metres by adjusting the switch. The switch, which is supplied by the makers, has two contacts and makes contact with two studs at a time.

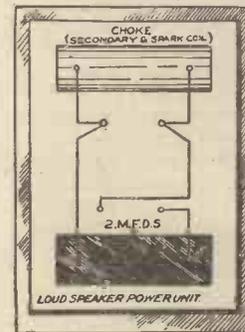


Fig. 9

This is not always required, and it is useful to fit an extra "dud" stud so that the switch arm can rest on No. 1 stud, and the "dud" stud when required to use only the first stud.

The method of connecting the additional high-frequency panel is shown in Fig.

8. It will be noticed that the aerial terminal on the 3-valve panel is not used, nor the condenser terminals, and the tuning coil sockets are now used to plug in from the output of No. 1 panel. The correct anode coil to use must be found by experiment. A No. 50 or 75 Burndept will usually suit. The method of connecting No. 3 panel is shown in Fig. 10. This diagram shows No. 1 panel also in use, but of course, No. 3 can be used with No. 2 without No. 1. Any ordinary valve will do for No. 3 panel.

(Continued on page 386.)

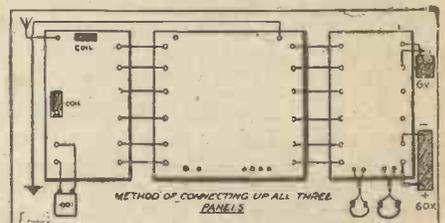


Fig. 10

# GETTING IT "PERFECT."

By EDWARD WOODWARD.

"Improve the Tone of your Reception. Get it Perfect!"

I READ that heading to an article the other day. Came across it quite casually whilst looking for something to light my pipe with, and was thrilled to the core. Why on earth hadn't I thought of doing that before?

Here was I with a beautiful three-valve receiver set, capable of "picking up" any country as though it was nothing at all, and I had never taken the trouble to improve it! It was ridiculous! I was a fool!

## "Silent Reception."

I took that article to pieces; I learned most of it off by heart. Then I took my receiving set to pieces, and did to it all the things I had learned. What a difference!

There was no more faulty reception. There was not a note I could find fault with. Not one! I had got "Perfection"—perfect silence!

So I took it to pieces again, and assembled it a new way, a way I'd read about in another article, tested it. Again I got a perfect reproduction of the Sahara at midnight.

By this time I was getting a bit mixed, so I sent for an expert. He spent a long time with my instrument, and in the end said that if I really wanted perfection I must have a new set!

I told him to put it together again in the way first thought of, and leave me in peace. There are times when something short of perfection is good enough for me.

What I mean is that these keen-eyed perfection-merchants carry things too far; metres, and metres too far. I know of one man who carried his passion for perfection so far that although he lived in the north of Scotland, he finished up in Broadmoor through killing a man who found a better way of adjusting the detector valve rheostat before he did.

## The True Experimenter.

That's terrible, isn't it? Sort of thing which causes the wrecking of homes and the splintering of nations through civil war. Of course, the results some of these people get are simply too marvellous. I've listened in on ordinary receiver sets which have been "touched up" by an enthusiast which have made me gasp.

For instance, only the other evening a friend of mine, George Smith by name, told me he'd tried the "Ultra Audion" circuit, and asked me to go round and give him my opinion on it.

Now I'd always had a great opinion of George Smith. He is one of those "thorough" fellows. Gets to the bottom of everything quicker than anyone else. He's been given up by five different swimming instructors as hopeless, so you can tell.

Well, when George asked me to go and pass judgment on his "Ultra Audion" stunt I accepted readily, expecting to hear something out of the ordinary. I did.

Being so "thorough," George always puts on evening dress to listen-in to a

broadcast concert; he says it adds to the charm of the thing; and when we were all artistically arranged, George, his wife, myself and some other friends, George tuned in, and we heard Peter Dawson just starting a song.

Now I'm very fond of Peter Dawson, and forgetting the discomfort of my boiled shirt, I settled down to enjoy myself.

But George wasn't going to let Peter Dawson have it all his own way. Oh dear L.O.!

"Ah," he gritted, screwing up his eyes into a searching expression. "He's throaty. Perhaps if we just adjust the L.T. a trifle we shall get rid of that."

We'd only heard two lines of the song, and by the time George had finished his adjustment Mr. Dawson had finished as well, a good deal better, as it turned out.



A variometer crystal set constructed in a Jacobean oak cabinet by Mr. A. J. Kernick, 19, Claude Rd., Cardiff.

"Never mind," beamed George. "Our reception will be much better now."

As we'd only had twenty words of the song, we all said we hoped so.

It was Miss Diana Webster who challenged George next. Miss Webster has a beautiful voice, but it didn't suit George.

"Muffled!" said George when Miss Webster had sung a couple of notes.

"What I mean is that although I've adjusted things for Peter Dawson's tone-quality, it doesn't suit a lady."

Before any of us could find suitable words to express our feelings in the matter George had done something sinister and cruel to his perfectly docile "set." I'm not sufficiently advanced to say what it was he did, but Miss Webster's voice was a very different thing when he had finished.

Talk about volume! We thought he had switched us on to a woman's political meeting, or remnant-day at Selfridge's!

## Irritating "Adjustments."

"That's a bit off!" said George, and did several quite unnecessary things to the gadgets. Heaven alone knows what, but before he had finished, Miss Webster had, and by this time George was so worked up that he forgot all about the programme, and plunged into a discourse on Perikon detectors.

We listened with a show of respect to George's evening dress. He enjoyed himself thoroughly. In the heat of the moment he sometimes so far forgot himself as to tune in and let us catch a snatch or two of what

the B.B.C. were offering us; but he soon pulled himself together and tried further improvements.

The only time when he couldn't think of anything fresh to try, or speak about, was during the intervals. Then he kept silent; but as soon as the programme started again so did George.

Then at last, when 2 L.O. closed down, he beamed on us, and expressed the hope that we had enjoyed it!

We all went away hating George Smith. We should have had a much better time with our own instruments at home, "imperfect" as they were, no doubt, from George Smith's standpoint.

The lust for perfection is a very painful disease, if you let it go unchecked. The programme we had been invited to listen to was the best the B.B.C. ever broadcast, and thanks to George Smith's "thoroughness" we'd hardly heard a note of it.

## A FIVE-VALVE SET.

(Continued from page 385.)

Now if it is desired to use a high voltage on this last valve for a loud speaker the small additional panel should be used as shown in Fig. 11. If the house mains are used and provided the negative pole is earthed only the positive pole need be connected to this last panel, and the negative pole ignored for reasons that will be sufficiently obvious. If, however, the positive pole is earthed (which may be so in a few places) then a separate 200-volt high-tension battery must be used. Using the panel with this voltage on the last valve, a small power valve must be used. The terminals for the grid battery will require a couple of flash-lamp cells connected across them to prevent distortion.

## Excellent Results.

A set made as described, and with a little time spent on obtaining proper adjustment of the various parts, will produce most excellent results. It is obvious that it would be an improvement to design the panels so that the reaction could be

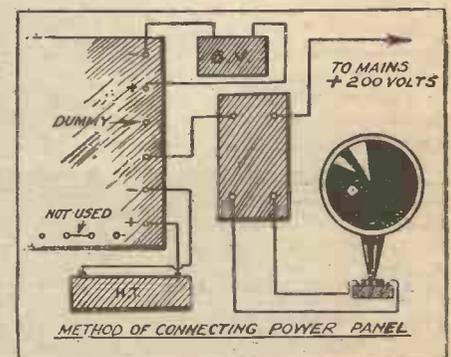


Fig. 11.

taken from the first anode coil, but this would involve a further complication, and as the second panel is intended to be used mostly by itself, the writer has not in this article attempted to introduce this further refinement.

# Mainly About Broadcasting

by The Editor

I WONDER how many readers of this journal have ever devoted a few minutes of their time to the analysing of the meaning and significance of the word "popular"? It is a word which is indeed pregnant with meaning, and it is a word which forms part of the title of this journal in such a way that it is an index to the contents and policy of the paper.

Here is a definition of the word popular—"pertaining to the people at large; common

work does not attain a high level of art; it is not so expressive of beauty and culture and genius as the art of Duse; but compare the effect of their work, of their individual personalities, and the benefits they conferred on the human race, and who shall say that Duse stands above Corelli?

### The Difference.

Marie Corelli's works were read by thousands—nay, millions! She did more for religion, for the scourge of evil and cant, than a thousand sermons, and because she did it in a "popular" way her name will be lost to posterity when Duse's will be revered.

It is always so: popularity, in the sense that one commands the attention and respect of the masses, is considered deleterious to one's claim to greatness, because the artistic level is usually low. The moral good accomplished by Miss Marie Corelli far exceeds that accomplished by Duse, and for that reason she is, in my opinion, a greater woman.

Now, all this seems to have little to do with wireless, nothing to do with broadcasting, and hardly anything to do with the title of this journal—but perhaps you see my object?

### The B.B.C.'s Appeal.

Popularity, which, in the *real* sense of the word, can only be attained by appealing to the populace, is apt to be sneered at by the high-brows and by those whose superiority makes their circle of appreciative admirers necessarily small. Compared to Marie Corelli's appreciative public, Duse's admirers were small in numbers (but remember we are dealing with very big numbers), and because her art was not for the masses, even if they could pay the price necessary to appreciate it, the moral effect caused by Miss Corelli's romances, when written in a way to appeal to that public, was all the greater.

And this same argument can be applied to broadcasting, to this journal, and to many other things besides.

Broadcasting would not be popular for long if it did not appeal to the public, and POPULAR WIRELESS would not be popular for long if it did not appeal to the public.

### A Greater Mission.

Once the B.B.C. start concentrating on one particular section of the public, away goes their popularity. That they won't you can rest assured; but don't take any notice of the minority who sneer at the B.B.C.'s "menu." Their programmes cannot possibly appeal to *all*, but they appeal to the *majority*, and that is the target to aim at.

They might do an awful lot of good by catering for a more advanced public; they would possibly earn more superior criticism; they would be regarded, to use a bad word, as "classy," and, perhaps, "high-brow," and the "Times" and other intellectual organs would treat them with more serious respect.

But their mission is a greater one, and the benefit they can confer on humanity by being "popular" is tremendous.

And so I come back (at long last) to the word "popular" in our title. Do I think "P.W." is "pertaining to the people at large"? Yes, I do, or else I have failed in my job. It has been my aim to cater for the public and not the experts—not the chosen few but the "unchosen many."

Popularity we have attained—over one hundred thousand people regularly "buy us" every week—and the fact that we have adopted a popular policy has not prevented two members of the staff from contributing something of great benefit to the world of wireless.

In every sense of the word their invention is "popular"—it "pertains to the public." The public will benefit by the fact that sets will be cheaper, less complicated, and more efficient. It is not a discovery over which learned formulæ can be strewn; it is not an invention of philosophical origin—it is practical, it is for the masses, it is—well, it is "popular"!



Mr. L. Stanton Jefferies, musical director of the B.B.C. at 2 L O's studio piano.

among or carried on by the masses; held in esteem by the people in general."

That is what the New Standard Dictionary says of the word "popular," and it is a word which, I think, may be justifiably included in the title of this journal.

That, you will say, sings high to heaven of a most colossal conceit. "What!" you cry. "Do you mean to say that 'P.W.' is 'common among or carried on by the masses'—that it is 'pertaining to the people at large'?" Well, that is "P.W.'s" aim.

### A Popular Point of View.

The other day two great women died—Eleanora Duse, a world-famous actress, and Marie Corelli, a world-famous novelist. The "Times" devoted a leader to Duse, and pointed out that, as far as art went, she was miles above the novelist. Indeed, practically every newspaper exalted the actress and spoke, if not slightly, at least with condescending tolerance of the novelist.

And I have no doubt that most people think of Duse as a far greater woman than Marie Corelli. But was she?

Look at their careers from a *popular* point of view—that is, the point of view of the people, of the masses, if you like.

Duse was known and revered by a small public compared to the public which revered Marie Corelli's work. True, that



A twelve-valve super-heterodyne receiver as constructed by an American amateur.

# SOME DISADVANTAGES OF REACTION.

By SIR OLIVER LODGE, F.R.S., D.Sc.

In this article our scientific adviser points out that the use of reaction is technically objectionable, besides proving audibly objectionable to other listeners.

WHEN two coils are coupled inductively together, they react on each other, with the result that the inductance of each is diminished and the resistance of each is increased. Resistance is never wanted; it is always a nuisance, though unavoidable. That is why coils are wound so as to give as much inductance as possible for a given length of wire—that is, for a given resistance.

Inductance confers inertia on the current, like adding a mass of lead to a pendulum bob. It makes the oscillations persist, and it enables accurate tuning. Hence anything that diminishes the inductance and increases the resistance is to that extent deleterious. But there is more objection to reaction than that.

### A Three-Legged Race.

A coil and condenser circuit, if free and uncoupled, has a definite period of oscillation of its own, and is capable of precise tuning. When coupled up to another similar circuit, its oscillations are not free. It is rather like coupling two pendulums together; they are both hampered, one tries to share its frequency with the other.

The result is you get a kind of double vibration, something like a three-legged race. Two men run much better when their legs are not coupled together; they interfere with each other. Neither has any longer an effective will of his own, and anything like tight coupling is manifestly a disadvantage.

In ordinary transformers all this had to be put up with. What is wanted then is a transmission of energy from the primary to the secondary coil. And to get the maximum transmission, the coupling must be tight. The two coils become in a sense one. And the connection thus obtained is rather like direct connection, without a coil at all. It is, in fact, simply a mode of effecting connection and at the same time giving the option of increasing the voltage by what is called "transforming up"; which is attained when the secondary coil has a great many more turns than the primary. This is not a case of reaction in the technical sense.

### Why a Set Howls.

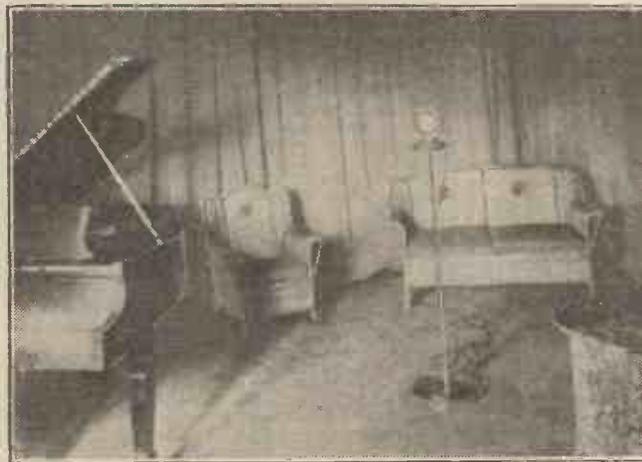
Indeed, in the technical sense, reaction has a still more objectionable significance. A current magnified by a valve and high-tension battery is made to react upon some other non-magnified part of the circuit, and thus excite magnified vibrations in that, which once more increases the vibrations in the magnified part, and these react again; and soon, backwards and forwards, until you get a howl.

Just as when an ordinary telephone and a transmitter, short-circuited together through a single cell battery, are made to talk to each other; the slightest disturbance in the telephone then affects the transmitter through the air, this affects the tele-

phone through the wire and battery, and once more it reacts on the transmitter through the air, and that again acts through the wire. So that in a short time—which need be only the fraction of a second—the two set up a howl or scream of some kind, the pitch depending on the tone or tones of the telephone diaphragm.

Of course, this magnified kind of reaction gives more power; and if the coupling is fairly loose, so that you are only on the verge of a howl, the arrangement is very sensitive. But it is not a good arrangement, and does not conduce to good tuning.

What it does conduce to, if the coupling in any way reaches the aerial, is to increase the oscillations in the aerial, turning that into a transmitter, instead of only a receiver—a transmitter, moreover, which is



The studio of the broadcasting station controlled by the Canadian National Railways at Ottawa.

approximately of the right frequency, for it is its own vibrations which are worked up to a greater amplitude.

Hence the result is oburgations on the part of your neighbours, who are receiving from you instead of from the distant station they want to listen to, receiving not only the right note, but other notes near by, excited by your coupling arrangements. They cannot well tune these out because they are so near the right pitch, but it spoils their tuning; and if you press the coupling a little they will receive further howls.

## A "VERNIER" VARIOMETER.

By "MILLIGRAMME."

PROBABLY most experimenters have used a vernier condenser in parallel for the final fine adjustment, but it

occurred to the writer that equally satisfactory results might be obtained by the use of a small or "vernier" variometer.

The general design is shown in the accompanying sketches, which are almost self-explanatory.

Two discs, each 3½ in. in diameter, were cut out of tough wood, ⅜ in. in thickness, by means of a fretsaw. Four flat "D's," 3¼ in. × 1⅜ in., were similarly cut from ⅛ in. wood, and by means of small screws, attached to the discs in the manner indicated (Fig. 1). The windings

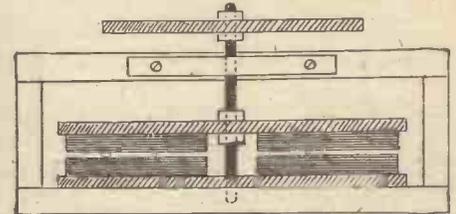


Fig. 1. The complete variometer.

on the "D's" consist of six turns of 24 S.W.G. double silk-covered wire, care being taken that the two "D's" on each disc were wound in opposite directions. In assembling, the "D's" are placed face to face, as by this means the closest coupling is obtained.

The windings on the two discs are, of course, connected in series. In order to avoid possible losses due to rubbing contacts, the leads to the upper and moving discs are wound for a few turns in a loose spiral round the spindle. The two ends of the winding are brought to terminals, and all joints are soldered.

The centre spindle consists of 4 B.A. threaded rod, to which the upper moving disc is clamped by means of two nuts. The lower bearing consists

merely of a hole sunk in the wood base. The upper consists of a shallow notch in a wooden cross-piece, the spindle being kept in place in another piece of wood, held down by two screws (Fig. 2). This provides a very simple form of adjustable bearing, which, after some considerable experience, has been found to be most satisfactory.

To the upper end of the spindle can be fixed, by means of two nuts, another disc, to which a scale is attached, for the purpose of rotating the moving coil. A diagrammatic elevation of the completed variometer is shown in Fig. 1.

In use, the "vernier" variometer is connected in series with the main tuning appliance.

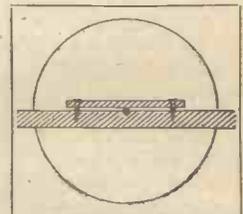


Fig. 2. Showing how the simple adjustable bearing is constructed.

# AN AMAZING WORK

FOR THE AMATEUR  
AND THE EXPERT.

HERE at last is the book you have been waiting for—the most complete and comprehensive work on Wireless ever published. It is a perfect gold-mine of information, of the utmost value to every broadcasting enthusiast.

## WIRELESS TELEPHONY AND BROADCASTING

By H. M. DOWSETT.

The Contents include detailed chapters on :

- A Record of Wireless Achievement.
- The Initiation and Early Stages of Broadcasting.
- The Work of the Amateur.
- Component Parts, Faults, Calibration and Testing.
- Glossary of Technical Terms, etc.

Some of the questions answered in the fullest manner in the volumes are :

- In what way was interference avoided between ground stations in the British army during the war?
- How does an air pilot obtain his bearings by wireless?
- Do you know the meaning of all the electrical terms used in wireless?
- How are valves made?
- What is retroaction?
- What do you know about microphones?
- Can you sketch out the circuits of a valve telephone transmitter?
- How does one obtain direct current from alternating current for the plate voltage of transmitting valves?
- How does radiation leave the aerial as ether waves?
- Can you describe the component parts of a wireless receiver?
- How can house wiring be used as a receiving aerial?
- How can you rectify by means of a simple resistance?
- What is Langmuir's theory of the atom?
- Do you know the circuits employed by the leading manufacturers for their crystal receivers?
- What are the sunrise and sunset effects?
- How can one obtain L.T. and H.T. from the house-lighting mains?
- How can one detect faults in a receiver?
- Do you know how to test your receiver?
- What is the best aerial to erect for broadcast reception?
- How should one treat accumulators?
- What testing instruments should be used when overhauling your receiving and aerial circuit?
- If you are in doubt about any wireless terms consult the glossary.

For nearly 30 years the author of this wonderful work has been intimately associated with every aspect and development of Wireless Telegraphy and Telephony. He has "demonstrated" in all parts of the world and, apart from his services to various Governments and to the Marconi Company, since 1915 he has been editor of the **Handbook of Technical Instruction for Wireless Telegraphists**, the standard handbook for training ships' operators. Mr. Dowsett is thus thoroughly equipped, not only because of his scientific training as an electrical engineer, but also by reason of his extraordinary *practical* experience, to produce a work of the highest authority. A glance at the contents of these volumes will show their wide scope, but even a cursory examination of the books themselves would prove they contain a mass of information, of photographs, and of diagrams unequalled in any other work yet produced.

Every page is clearly and fascinatingly written. Every part of each subject is carefully and convincingly explained so that the merest amateur can follow the most intricate description with the ease of an expert. As for the expert himself, he will find hundreds of practical suggestions for improving his own apparatus. Photographs and working drawings abound to elucidate difficult combinations, and the most complicated wiring systems are easily unravelled by means of superb coloured diagrams. Mr. Dowsett has produced *the Wireless Vade Mecum*.



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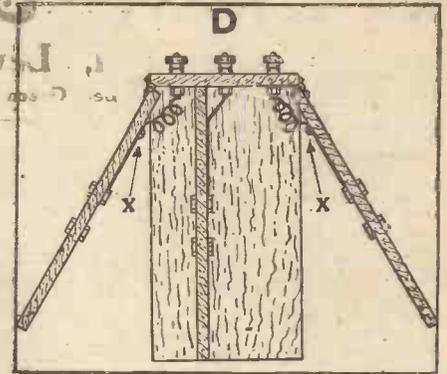
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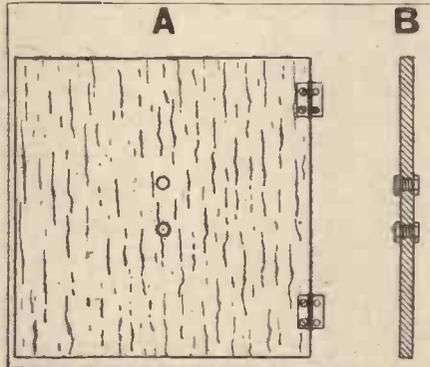
A Section Devoted to the Interests of the Younger Constructor.



### AN EFFICIENT LEAD-IN TUBE.

THE lead-in tube about to be described has been designed with the view of obviating the necessity of having any outside contacts whatever, which are, owing to corrosion, etc., caused by the atmosphere, very undesirable.

The construction can easily be followed from the sketches. A (Fig. 1) is a piece of ebonite rod, 1 in. long, the diameter of which

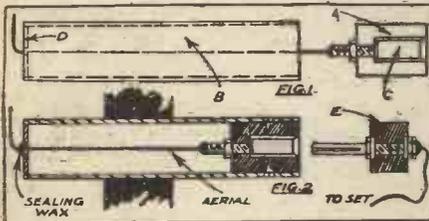


be easily understood. The sockets on the stationary support are connected direct to the two centre terminals by means of ordinary single 18 copper wire.

The sockets on the two movable supports are first connected to small wood screws, X, which are connected up to their respective terminals by pieces of coiled flex. By taking the rigid wire from the sockets to the wood screws the inconvenience of dangling flex is obviated.

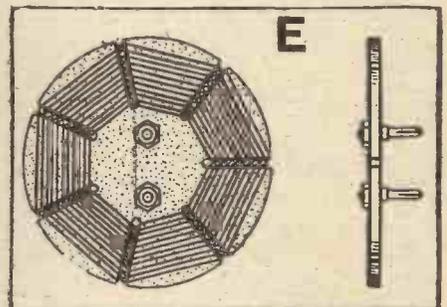
#### Variable Couplings Possible.

The coils shown in the photograph are of the commercial type, and it was necessary



from three-ply wood, about  $\frac{3}{16}$  in. in thickness, these being arranged as follows. Three pieces  $5\frac{1}{2}$  in. by  $5\frac{1}{2}$  in., as shown at A, one piece  $5\frac{1}{2}$  in. by  $2\frac{1}{4}$  in., as shown at C, and another piece (not shown)  $5\frac{1}{2}$  in. by  $2\frac{1}{4}$  in.

These are smoothed up with some medium glasspaper and given two coats of shellac varnish. The three square pieces are then drilled as shown at A and fitted with plug sockets as indicated at B. The sockets used by the writer were taken from old radiator fittings, but these may be purchased,



allows of a fairly tight fit inside B, which is a piece of  $\frac{3}{8}$  in. diameter ebonite tubing, 9 in. long. A hole is drilled through A and countersunk to take an ordinary valve socket, C, the top of which should lie flush with the end of the rod. D is an ebonite disc,  $\frac{1}{8}$  in. thick, cut from a piece of the same diameter rod as A; a hole is drilled in the centre to take the aerial wire used, and the disc fitted in one end of the tube with a couple of small screws.

#### Prevents Moisture Entering

The plug, E (Fig. 2), is constructed from a piece of rod,  $\frac{3}{8}$  in. long, and a valve pin, and should need no further explanation. The aerial wire is now led through the hole in D and connected to the valve socket as in Fig. 1, for preference a soldered joint being made. The wire is then pulled back, and the socket, etc., drawn into the tube and fixed similarly to D (Fig. 2). A spot of sealing wax should be dropped around the aerial wire where it enters the tube, to prevent any moisture gaining access.

with the pins, very cheaply.

Two of these pieces are provided with small brass hinges, which are fitted in the approximate position shown. The piece C is drilled and fitted with six small terminals, and the piece which is  $5\frac{1}{2}$  in. by  $2\frac{1}{4}$  in. is the base, to which is attached the back, C, and the stationary square piece, the position of this being clearly indicated in diagram D, which represents a top view of the completed device.

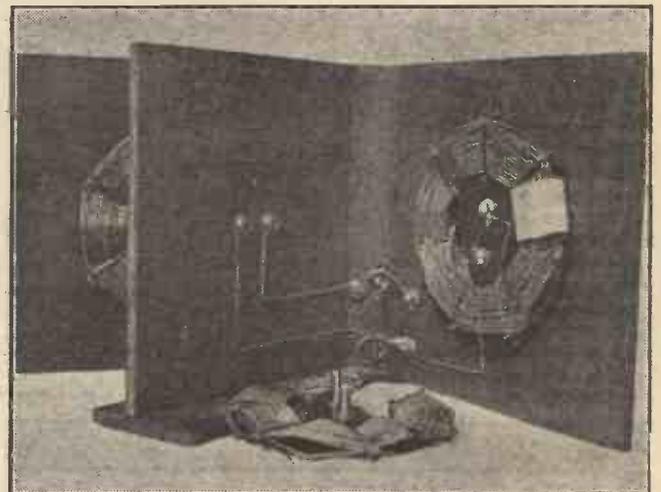
From this and the accompanying photograph the assembly of the parts should

to adopt the mounts to the coils. Although this has proved a success, it is suggested that the coils should be adopted to the mounts and arranged as shown in diagram E, where slotted discs are fitted with the plugs and wound in the usual way.

Two or three coils may be used as desired, the coupling between them being varied by opening or closing the two hinged supports in book fashion.

### A "BOOK-CASE" COIL HOLDER.

THE cost of constructing this simple basket coil holder is practically negligible, and therefore the idea should appeal to any beginner with a limited purse. The main parts are cut out



Showing the completed "book-case" coil holder.

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  - MARCONI VARIABLE CONDENSERS. Ebonite dielectric, capacity .0005 and .0003. Price 10/6 each, post 1/3.
  - MARCONI FIXED CONDENSERS. Three in case, all mica dielectric, polished teak case, brass bridge, three plug-in tapings and two terminals, all mounted on ebonite. Capacity of condensers, .001, .002, .006. Price complete, 5/- each; post 1/-.
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  - FULLER BLOCK ACCUMULATORS, 2 volt 80 amp. capacity, all brand new, designed especially to hold their charge for long periods without sulphating, highly suitable for dull emitter valves. Price each cell, 25/-, post 1/-. Set of six accumulators in teak carrying case, brass bound, £4 5s.
  - EBONITE KNOBS. Real ebonite Government knobs, 1/6 per doz., post 3d.
  - PORCELAIN INSULATORS, BROWN, bobbin type, 1/- per doz.; post on 1 doz., 5d.
  - 1,000 OHM CHOKES wound with 47-gauge wire, silk, 1/- each.
  - WORKSHOP FLEX, heavy V.I.R., and braided Government flex. 3d. per yard; 220-yard coil, £2 10s.
  - LEADING-IN WIRE, V.I.R., 3d. per yard; 2/6 per doz.
  - 500 OHM-CHOKE COILS, wound 1 1/2 oz., 42-gauge wire, 1/- each.
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**INCREASE THE RANGE OF YOUR SET** by using an additional H.F. Vario-Transformer Unit R.B.3 with Valve Unit R.B.5.

**VALVE SET USERS** Now that Summer Months and longer days are approaching, you will need more amplification. Add another R.B.7 to your set. OR add H.F. Stage by connecting to your Set R.B.4 and R.B.5 Units, H.F. Variometer Transformer with Reaction.

**CRYSTAL SET USERS.** Add R.B.7 Amplifier Unit to increase your signal strength. Add two R.B.7 Units to work Loud Speaker.

**USE YOUR VALVE OVER AGAIN** by fitting a dual amplification circuit using R.B.8 Unit.

**HEAR THE CONTINENTAL STATIONS** by substituting for your Broadcast Wave Band Tuner a Plug-in Coil and Condenser Unit R.B.9. PREPARE FOR NEW HIGH-POWERED STATION in same way.

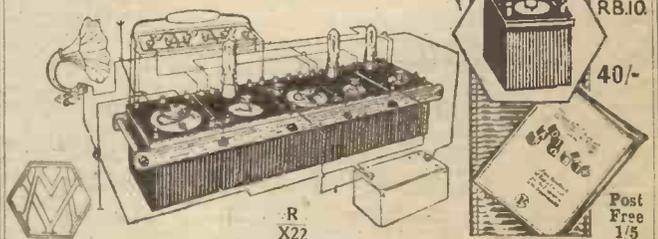
**FOR REACTION OR LOOSE COUPLING** fit a swinging coil attachment to R.B.9. Price of Attachment 6/-.

**FOR DISTORTIONLESS AMPLIFICATION.** If you are not satisfied with the quality of your Loud Speaker Equipment, fit a resistance amplifier with one or more R.B.10 Resistance Coupling Units, using blocking condenser of .005 mfd.

"RADIOBRIX" are obtainable from all Wireless Retailers. Ask your dealer for a copy of the "Cosmos" Radio Catalogue and Handbook—pp. 7117/1 or write to

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# AN ELEMENTARY TALK TO LISTENERS.

By CAPTAIN C. C. J. FROST, M.I.R.E. (of the B.B.C.)

In this article the author discusses the problems that beset the listener who is subject to interference due to various electrical causes.

IN my last talk to you I promised that I would answer the questions which one lady has put to me, and to which she has requested an answer through the medium of "P.W." The questions are:

(a) May two aerials be erected in the same garden behind an ordinary suburban house with a limited garden space, each aerial to have a receiving set for use in different parts of the house?

(b) If this is not possible, could two lead-in wires be connected to the one existing aerial, each to have a receiving set connected to it?

(c) If neither of the suggestions (a or b) are advisable, could one aerial, one lead-in, and one receiving set be used to supply two parts of the house with listening facilities via leads to various parts of the house?

## Indoor Aerials.

Let me answer these queries as they arise. Those of you who have heard my talks from the London station will remember that I have answered similar questions to these previously. The average suburban garden is rather narrow, and could hardly be adapted for two outside aerials. But suppose that you are within, say, ten miles of 2 L O, and are using crystal sets, then why not use an inside aerial in the top of the house for one set and the outside garden aerial for the other?

The lady who has written to me has a crystal set at the top of the house, whilst the folk occupying the lower part of the house have a valve set with an outside aerial. If she could erect an inside aerial in the roof or top rooms for her crystal set, then good results should be obtained. To erect two aerials in the same garden within two or three yards of each other would be inviting trouble.

## Re-radiation Effects.

Re-radiation would occur from the aerial belonging to the valve set, and the crystal set would possibly be receiving Aberdeen! Then would follow a letter to "P.W." stating the abnormal reception obtained with the wily crystal without any amplification. On the other hand, the crystal set aerial might obtain little or no reception whilst the valve set is working; screening might take place. To those whose circumstances are such that two aerials must be erected in the same garden, let me advise you to keep the two at as large an angle to each other as can possibly be arranged.

If you can manage to have them at right

angles, then do so. Have them of equal heights from the ground. Avoid the parallel position of the two aerials. I am not saying that reception will be impossible by having aerials which are parallel, etc., but troubles are likely to come if this is done.

## "Broadcasting Disease."

Two lead-in wires could not be connected from the same aerial if both leads-in are to be used at the same time. The receiving set which offers the least resistance to the passage of the aerial current to earth will obtain reception of signals, whilst the other will not have anything. If the lead-in wires are used alternatively, then reception will be obtained providing that the lead-in



Mr. Arthur Burrows (Uncle Arthur) reading the news bulletin at 2 L O.

wire which is not in use at the time has its end insulated from any contact with wall or tree, etc.

If the strength of signals is good, then it is quite possible for leads to be taken from the phone terminals of the set to supply the two parts of the house. Well-insulated leads of low resistance wire should be used.

I happened to catch an infectious complaint, the presence of which I did not discover until the day following a Friday on which I had been giving my talk during the Children's Hour from 2 L O. The good lady, on hearing that I had the measles, remarked to my wife: "But that is awful. And he was only talking on the wireless yesterday to all those children! Why, infection can easily be spread in that way!"

## Long-Distance Reception.

It needed quite a lengthy explanation to convince our friend of the fact that infection is not carried on the ether wave. It is quite

a common mistake, and comes in the same class as the notion that a wireless wave needs an open window or door through which to gain entrance to a house with an indoor aerial. But I have discussed that in a previous talk.

Have any of my readers ever tasted of the magic of visiting a high-power station in one of the corners of our Empire? I remember the enchantment of the time when, sitting in the operating-room of a station in Northern India, I was able to hear Morse stations in Russia, thousands of miles to the north.

## Coming of the Valve.

We read in wireless text books that "it was found that when a thin wire is heated (by the passing of an electric current through it) to a state of incandescence and placed in a vacuum, small particles of the metal are given off from the wire, which are charged with electricity and are called electrons."

How matter-of-fact that sounds, doesn't it? And yet how extraordinary that it should first have been discovered! I like to think that someone more inquiring and thoughtful than some of us was one day sitting in his room in an easychair with a pipe.

On the wall may have been an electric-light bracket with a bulb in it which had become blackened. Most of us would have thought to ourselves, "Oh, well, that globe won't last much longer! I shall have to change it." But this man of my imagination did not only think that. He asked himself as to why the inside of the glass of the globe should

become blackened and its filament, at the same time, wear thin until it finally snapped. *Something* must happen which caused this.

And then I like to think of him making a number of experiments until he found that he could pick up those tiny fragments of the filament, all charged with electricity, and use them in another circuit. This was done by placing in the vacuum of the globe a piece of metal so that it was not in contact with the filament.

## Two-Electrode Valve.

A negative current travelled across the vacuum from the filament to that other piece of metal called the plate or anode, which had a positive current on it. Thus two poles existed in the valve, which was called the two-electrode valve, which was the forerunner of the three-electrode valve now in general use.

It is time now that I close down. I will tell you some more in my next talk.

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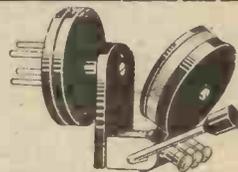
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Reactance Coil, H.F. Plugged into Anode Coil.

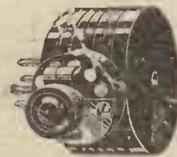
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330-550 " .....	5/6
500-900 " .....	6/-
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1,600-2,600 " .....	7/-
2,600-4,000 " .....	7/6

Any of the above are supplied "matched" if required at an extra cost of 6d.

You can get K.D.K.A. (100 metres) by using the right Intervalve Coupling for your H.F.

We have developed a specially efficient Tuned Anode Coil (4-pin plug-in type) and a Transformer, also a suitable Variable Reactance Coil for use with same. This combination has received K.D.K.A. nightly on 2 or 3 valves, the latter louder, of course, but still clearly on 2.

ANODE COIL or H.F. TRANSFORMER only 6/- With REACTANCE, the pair 17/6.



Instructions with each, 25/-; with Variable Reactance Coil, 35/- Highest finish and accuracy.

**TAPPED ANODE INDUCTANCE.** 180-3000 metres. This new Radiax Registered Intervalve Coupling for the Tuned Anode System, with its neat, self-contained Switch, gives all wave-lengths from 180 to 3,000 metres. It gives powerful regenerative Reactance, and will not oscillate the aerial. Full instructions with each, 25/-; with Variable Reactance Coil, 35/- Highest finish and accuracy.

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Attaches by a pin plug to any of our H.F. Transformers or T.A. Inductances. This system provides most effective reactance on the anode. It is suitable for all wave-lengths. Instructions with each, 10/-

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Three minutes from Tottenham Court Road or Goudge Street Tube Stations.



# Artistes of the Aether

by "Ariel"

SOME OF THE ARTISTES WHO HAVE GIVEN YOU PLEASURE WHILE LISTENING IN

THROUGHOUT the ages Art of every kind has had literally to fight for its existence. It has taken ten years to obtain for the cinema "a place in the sun," but, luckily, little more than ten months to prove that music "over the aether" is as important as that in the concert halls. During that ten months, owing to the short-sighted policy of many of the concert agents, we have had to bear with a vast number of performers to whom the B.B.C. had given unheard and undreamt of opportunities of playing before the largest and most long-suffering public in the world.

## The Various Stations.

Now, however, a new régime may be expected, and 2 L O certainly availed itself of the opportunity in the prompt engagement of three of the most famous artistes in the musical world, namely, Albert Sammons (violinist), William Murdoch (the Australian pianist), and Cedric Sharpe (violincellist). Their reputation is world

wide, and the result was to raise the appreciation of their respective instruments a hundred-fold by the sheer virtuosity of their performance.

Violinist and pianist were in perfect accord in the Greig violin and piano sonata, while separately each artiste was at his best even though admittedly they



Mr. Albert Sammons.

played at a disadvantage, due to the novel experience of playing before a "hole" instead of an "audience." The violin-cello has been previously proved to be the best instrument for broadcasting purposes, and though we have not so much to complain of as to the artistes who have appeared previously, it is safe to say that in the hands of Cedric Sharpe, the instrument rose to its greatest height, in tone power and technical display.

## London Programmes

The programmes of the week showed marked improvement, including an excellent symphony concert conducted by Dan Godfrey, junr., and an evening of plays.

Can a man be in three places at once? Practically Milton Rosmer accomplished the "hat-trick," since he was simultaneously producing "The Conquering Hero" at the Queen's Theatre; broadcasting the three plays, "Five Birds in a Cage" (Gertrude Jennings), "The Rising of the Moon" (Lady Gregory), and "Postal Orders" (Roland Pertwee), at 2 L O; and appearing on the stage of the New Theatre in Shaw's "Saint Joan," thus achieving distinction in the three vehicles of art—stage, screen, and wireless.

Support was given by a talented cast, including Athene Seyler, Reginald Bach, Mona Harrison, and Ann Trevor.

The latter may also be said to have achieved the same "trick," for she is as widely known on stage and screen as she will be henceforth over the aether. By a



Miss Ann Trevor.

happy coincidence, too, her first screen appearance was made with Milton Rosmer when producing "Wuthering Heights"; while on the stage as lead in "Sweet Lavender," "The Young Idea," "Prunella," and at the command performance at the Coliseum in "The Eternal

Spring" with Sessue Hayakawa.

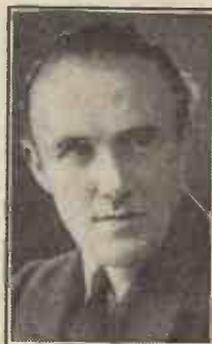
## Birmingham.

Despite his German birth, Handel's music has lived in the hearts of the public as the highest type of English religious music, and of few other foreign-born composers can it be said that they have composed the funeral march of another nation. Handel's Funeral March is the epitome of officialdom, the very essence of a public burial. In devoting a programme to his music, therefore, Birmingham chose some of his best in "The Suite," "The Water Music," the "Hallelujah Chorus" from "The Messiah," and "Angels ever Bright and Fair," sung by Gladys Whitehill.

## Manchester.

Under the baton of Dan Godfrey, junr., the 2 Z Y orchestra acquitted itself in a programme familiar without being hackneyed. Schubert's great "Unfinished Symphony" has long become the standard work of the picture palaces of England; we have had our

papers and our milk delivered in the morning to its accompaniment, and no suburban home is complete without Mendelssohn's "Bees Wedding" open on the piano-forte. These, together with equally fortuitous selections of Edward German, Mascagni, and Tchaikowsky made up an entirely popular programme for the concert of the



Mr. Milton Rosmer.

## Newcastle.

To those who like their music "loud and strong," that of the St. Hilda Colliery

Band makes a wide appeal. Heard recently at a London concert in Central Hall, their tone was at times inclined to be harsh, and this quality is not always lost in wireless transmission.

For a recent classical concert, Beatrice Eveline and Maurice Cole were the soloists. Chopin is not the best medium for broadcasting. Music of the more virile nature is demanded for perfect results, and Mr. Cole has been heard to better advantage in excerpts of Greig and Liszt. A good choice of play was made during the week in Stanley Houghton's "Dear Departed."

## Cardiff.

Amongst all the "talks" that "bore us stiff," to quote the "other side," the Magic Carpet of Cardiff is the best. The travelogue, from the days of the panorama upwards, is ever associated with school and boredom, and it takes a clever entertainer to make them bearable. The "Flight to Holland" was quite good, and the vocalist was Miss Dorothy Robson.

## Bournemouth.

Handel was also given a special programme at Bournemouth, while the Russian and Italian programmes are also to be commended—the former for the inclusion of Romano Ciaroff as vocalist, the latter for the choice of excerpts from Leoncavallo and Puccini.

Russian music is not fitted for broadcasting purposes, and a fuller orchestra would be necessary before 6 B M gets the effects for which it aims.

## Glasgow.

Up in the north, the "best is good enough," and their programme for their symphony concert reached the highest level. Albert Sammons was the soloist, with Max Bruch's Concerto in G minor as the *pièce de résistance*. On the purely orchestral side we have Wagner's "Siegfried Idyll" and the "Ride of the Valkyries," Delibes' famous suite de ballet "Sylvia," and modern British music represented by Edward German's "Welsh Rhapsody," produced at the Cardiff Festival, 1904, and the Comedy Overture of Balfour Gardiner.

## Aberdeen.

To Aberdeen, brave city, remains the proud feat of holding a "Brahms" Night; whether the experiment will be repeated remains to be heard. For its Good Friday choice, the morality play "Everyman" was an excellent one. Its fourth McWhachle evening probably aroused a fit of home sickness in every Scottish breast in England.



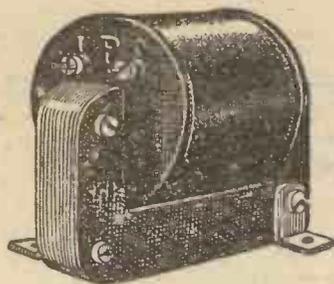
Mr. Cedric Sharpe.

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12/6

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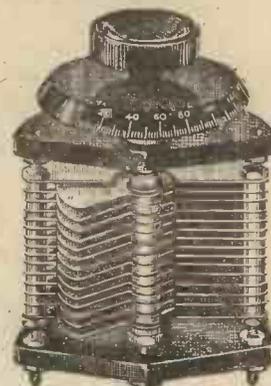
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The Ideal form of filament control for all types of valves. Perfect micrometer adjustment from zero to 200 ohms. No soldering necessary with New Model.

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The "Lightweight" Headphones weigh under 6 ozs., and are extremely comfortable. With the special spring adjustment the ear-pieces may be moved into any desired position or separated without the use of adjusting nuts. This fitting is specially designed not to tear the hair.

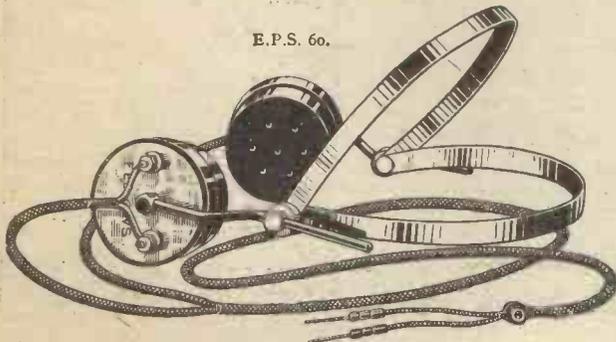
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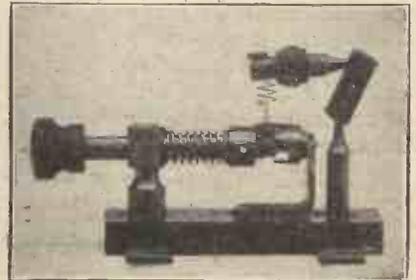
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You need no longer go to the expense and inconvenience of carrying your accumulators to the local charging station.

With the RUNBAKEN RADIO CHARGER you can recharge your accumulator during the night and it will be fully charged ready for use the next day—it need never run down.

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We manufacture a special Charger for Alternating Current.  
Price - £7:10:0  
Write for particulars.



# Wireless Club Reports

The Editor will be pleased to publish concise reports of meetings of Wireless clubs and associations, reserving the right to curtail the report if necessary. Hon. secretaries are reminded that reports should be sent in as soon after a meeting as possible. Reports sent in cannot appear in this paper in less than ten days after receipt of same. An asterisk denotes affiliation to the Radio Society of Great Britain.

#### Honor Oak Park Radio Society.

A very instructive lecture on "Inductance" was given by Mr. Holland recently.  
Hon. sec., J. McVey, 10, Hengrave Road, S.E.23.

#### Dulwich and District Wireless and Experimental Association.

On March 31st, Mr. Bartlett read a very interesting paper on the design and construction of the Cossor valve, which was kindly lent by Messrs. The Cossor Valve Co., Ltd.  
On Monday, April 7th, Mr. Skinner, member of the association, gave an able lecture on "Television."  
Hon. sec., Mr. Harrie King, 2, Henslowe Road, East Dulwich, S.E.22.

#### Barnet and District Radio Society.\*

Mr. Philip R. Coursey, the hon. secretary of the Radio Society of Great Britain, at the last bi-monthly meeting, gave a highly interesting lantern lecture on "Condensers."  
Hon. sec., J. Nokes, Sunnyside, Stapylton Road, Barnet.

#### The Radio Society of Great Britain.

An informal meeting was held on April 25th, at which Mr. Simmonds opened a discussion upon "Short Wave Transmitters."  
On Wednesday, April 30th, Captain P. P. Eckersley delivered a lecture upon "Faithful Reproduction by Broadcast."  
On May 2nd, at the Institution of Electrical Engineers, Savoy Place, a discussion was opened by Captain P. P. Eckersley.  
Hon. sec., Philip R. Coursey, B.Sc., A.M.I.E.E. F.Inst.P., 53, Victoria Street, Westminster, London, S.W.1.

#### The Sydenham and Forest Hill Radio Society.\*

Mr. J. G. Barrett lectured on the subject of "Cabinet Work for Wireless Sets," at a recent meeting.  
Hon. sec., M. E. Hampshire, 139, Sydenham Road, Sydenham, S.E.26.

#### Tottenham Wireless Society.

A new circuit named the ultra-flex, designed by Mr. R. F. G. Holness, was demonstrated by him recently.  
Hon. sec., 10, Bruce Grove, Tottenham, N.17.

#### The Southampton and District Radio Society.

At a recent meeting the lecturer was Mr. G. W. Walton, of the General Radio Co., Ltd., whose subject was low-frequency amplification.  
Hon. sec., Lt.-Col. M. D. Methven, O.B.E., 22, Shirley Avenue, Southampton.

#### The Leicestershire Radio and Scientific Society\*.

An interesting evening was spent recently testing loud speakers, and some very useful results were obtained.  
Hon. sec., J. W. Pallett, 111, Riby Street, Leicester.

#### The Radio Association.

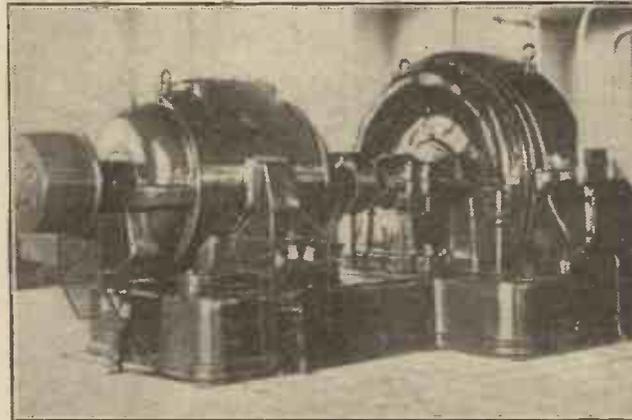
We herewith wish to make a preliminary announcement of the forthcoming Examination for the Fellowship of the Radio Association.  
All those interested should communicate with the hon. sec., S. Landman, Esq. M.A., Sentinel House, Southampton Row, W.C.1.

#### Nottingham and District Radio and Experimental Association.\*

On Thursday, April 10th, Mr. R. Pritchett, B.Sc., gave his experience of experiments in connection with the building of a four-valve neutrodyne receiver.  
Hon. sec., A. S. Gosling, 63, North Road, West Bridgford, Notts.

#### Wimbledon Radio Society.\*

The first annual general meeting of this society was held on Friday, the 25th of last month.  
Hon. sec., P. G. West, "Bonchurch," 4, Ryfold Road, Wimbledon Park, S.W.19.



One of the two huge high-frequency generators used by the new Telefunken station at Kootwijk, near Apeldoorn.

## Catalogues Book Reviews Etc.



#### Amplifying the King's Speech.

THE remarkable success of the broadcasting of the King's speech to huge crowds at variously situated open-air stations throughout Great Britain has aroused great interest amongst wireless enthusiasts as to the apparatus employed to produce the great volume of sound necessary, without distortion or loss of clarity.

Amongst the most successful of the many types and combinations of instruments used on this occasion must be numbered those of the General Radio Company.

The signals were received on a standard G.R.C. 16 two-valve receiver, comprising 1 H.F. and 1 detector valve. Amplification was effected by means of a six-valve L.F.

amplifier. The first two stages of this were transformer coupled—the standard G.R.C. Audioformer being used. These were followed by four stages of resistance capacity coupled valves. Each stage was provided with separate tappings for the H.W. battery, and the voltages employed were: 1st stage, 120 v.; 2nd stage, 400 v.; 3rd stage, 600 v.; 4th, 5th, and 6th stages, 660, 800, 1,000 v., respectively. Provision was made for grid bias by individual batteries to each valve.

#### B.T.-H. Exhibits at Wembley.

Besides a loud speaker horn, to which head telephones may be attached, several designs of loud speakers are shown on the B.T.-H. stands in the Palace of Engineering at Wembley. The usual resistance to which they are wound is 2,000 ohms. High-grade moulded insulating compound is used throughout, and the magnets are made of Cobalt steel, so that permanency of the magnetic field may be relied on. Included in the exhibit are examples of the loud speakers designated forms C1, C2, in which an air gap adjusting screw is conveniently provided; and an electro-dynamic type, known as form D, in which a battery of cobalt steel magnets is provided, whereby the necessity for a field exciting accumulator is avoided. The output terminals are connected to the primary winding of a telephone transformer, housed within a circular base of moulded insulating compound.

#### Loud Speakers.

As the secondary winding of the transformer is connected to a moving coil, which floats freely in the permanent magnetic field, any variation of current in the coil causes a corresponding movement of the diaphragm. For the Form D loud speaker, a B.T.-H. two-valve (power) amplifier is required, but for the smaller loud speakers the B.T.-H. amplifier meets all requirements in a most efficient manner. The terminals in these compact devices are reversible, and when reversed terminate in leaf-spring plugs, which can be plugged into corresponding sockets in another amplifier, so that a greater degree of amplification can be obtained when desired. Much other B.T.-H. apparatus is also exhibited.



B. T.-H. loud speaker, type C1.

# RADIOTORIAL

All Editorial Communications to be addressed The Editor, POPULAR WIRELESS, The Fleetway House, Farringdon Street, London, E.C.4.

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**Technical Editor:**  
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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 contributions to be addressed to The Editor, POPULAR WIRELESS AND WIRELESS REVIEW, The Fleetway House, Farringdon Street, London, E.C.4. 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 Editor desires to direct the attention of his readers to the fact that, as much of the information given in the columns of this paper is of a technical nature and 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 trader would be well advised to obtain permission of the patentees to use the patents before doing so.

**PATENT ADVICE FOR READERS.**  
The Editor will be very pleased to recommend readers of POPULAR WIRELESS who have any inventions to patent, or who desire advice on patent questions, to our patent agent. Letters dealing with patent questions, if sent to the Editor, will be forwarded to our own patent advisers, where every facility and help will be afforded to readers.

## Questions and Answers

F. L. C. R. (Sutton Coldfield).—Where can I obtain a reliable and up-to-date list of all the call-signals of amateur transmitting stations?

No list of this kind is published by the Post Office who are the holders of the necessary information, but lists have been compiled from time to time upon the information received from the amateur transmitters themselves. POPULAR WIRELESS has issued several lists embodying this information as it became available, and they will be found in P.W. Nos. 34, 30, 37, 38, 41, 59, 63, 79, and 97, under the heading "Amateur Transmitting Stations."

### BROADCASTING IN THE HOME.



T. C. D. (Swansea).—Sometimes when tuning-in on my valve-crystal set to certain stations I get a howling in the 'phones when I lift the cat's-whisker from the crystal. What is the cause of this?

The howl is due to reaction between the plate and grid circuits. When the resistance of the crystal contact is in circuit its damping effect is sufficient to prevent self-oscillation.

"P. W. READER" (Leasingthorne, Bishop Auckland).—In "P.W." dated April 26th (No. 100), the A.T.I. is shown with only two connections, but the description says it is a tapped coil. Which is correct?

The diagram is a theoretical one. This type of sketch shows the position of the inductance in the circuit, and it is not intended as a wiring diagram. The different symbols which stand for the various parts of wireless circuits are clearly illustrated in "P.W." 85. Wiring diagrams are published when necessary, and the switch arrangements for the "P.W." Super Crystal Set (upon which the article in question is based) were recently reproduced in "Radiotorial" of "P.W." 98.

Is it correct that H T- and L T- can be connected together?

Yes.  
I am using a dull emitter valve which can take up to 80 volts, on the plate. At present

**A GREAT INVENTION.**  
**How to Eliminate H.T.**

Readers of "Popular Wireless" will notice in this issue the second of a series of exclusive articles by Mr. Dowding and Mr. Rogers which will tell the amateur how to construct apparatus on the new "Unidyne" principle. No H.T. is required, and results are amazing.

"Popular Wireless" has made arrangements with the inventors whereby their secret is presented to readers, and we anticipate a host of enquiries from interested readers.

But owing to the great pressure of work involved in making early publication of the inventors' secret, no queries concerning the invention can be answered until after the publication of the THIRD ARTICLE of the series.

We feel sure readers will appreciate the necessity for this restriction, and after the third article the inventors will be pleased to deal with readers' queries concerning the "Unidyne" principle.

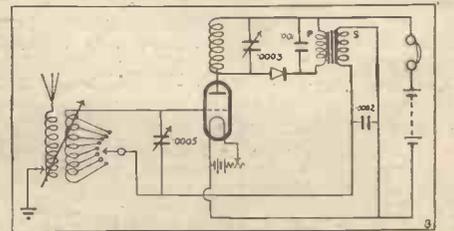
I am using 45 volts. Would it increase the signal strength any if I used, for example, 70 volts?

The best voltage to use varies with different valves (even of the same type), but generally speaking the figures recommended by the valve-makers will give maximum results. If 80 volts H.T. is recommended, you will probably find an exact point near this figure (say between 70 and 80) which gives the best possible results, and until this point is reached an increase in the H.T. voltage will result in additional signal strength.

It is not advisable to use more than the voltage recommended by the makers, but in buying the H.T. Battery it is as well to have a margin in hand to allow for depreciation, etc.

A. E. V. (Bristol).—I wish to improve the selectivity of my dual amplification circuit by using a loose coupler for my aerial tuning inductance. At present I am employing basket coil tuning throughout. What are the connections for the loose coupler and constructional details for same. I should like to be able to tune up to about 1,000 metres.

The diagram herewith clearly shows how the loose coupler may be connected. The primary tuning is accomplished by means of a slider while the secondary coil is tapped. Connect aerial to one end of the primary coil and slider to earth. No further con-



(Continued on page 399.)

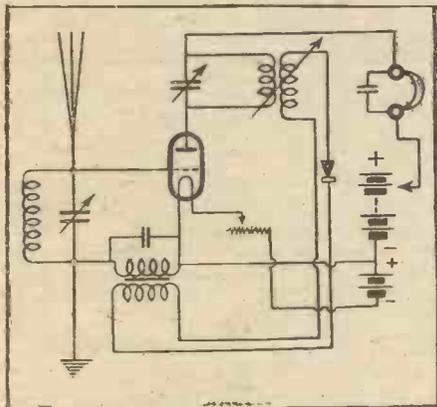
# RADIOTORIAL QUESTIONS & ANSWERS

(Continued from page 398.)

nections are made to the primary coil. The top of the secondary coil is connected to the grid of the valve and the switch arm to O.S. of the L.F. transformer. A .0005 variable condenser is connected across the secondary coil to provide fine tuning. The primary should be wound on a 3-inch diameter former with about 200 turns of 22 S.W.G., while the secondary coil should contain 230 turns of 26 S.W.G. wound on a 2½ inch diameter former.

**F. F. M. (Kintbury).**—Can a variably coupled H.F. transformer be employed in a reflex circuit? I wish to use a crystal detector and the one valve in a dual capacity. I do not wish to have more than two variable condensers in the circuit, a .0005 mfd. and a .0003 mfd.

The variably coupled H.F. transformer will be quite O.K. for a reflex circuit. See the accompanying diagram. You will find it advantageous to place



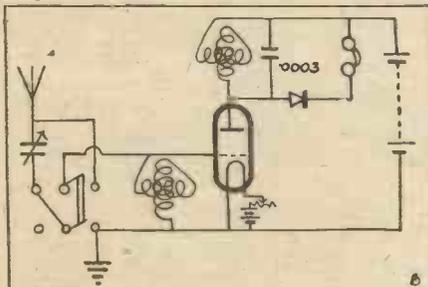
a variable condenser across the secondary as well as the primary of this transformer, otherwise you are liable to lose signal strength.

**B.M.C. (Heston).**—How can I ascertain which is the negative and which the positive pole of a battery as shown in a theoretical diagram? Which is the negative strip of an ordinary flash lamp battery, and which the negative pole of a 1½ volt bell type cell?

A battery in a theoretical diagram is shown by a series of long and short strokes, the short stroke representing the negative and the long stroke the positive pole of the battery shown. In practice, with a flash lamp battery, this must be reversed, as the long strip represents the negative pole. The outside connexion of a bell battery is the negative pole.

**A. M. (Invernrie).**—I have the following apparatus on hand and wish to build an H.F. and crystal set. One .0003 variable condenser, two variometers (Edison Bell), series parallel D.P.D.T. switch, Cossor P2 valve, crystal detector, various fixed condensers and batteries, phones, rheostat, etc. What circuit shall I use?

The circuit is quite simple, as you can see by the diagram herewith. A .0003 mfd. fixed condenser is placed across the anode variometer to compensate for the extra natural wavelength of the aerial which is added to the aerial tuning variometer.



## Members of the Quality!

**T**HERE are members of the quality among Valves, too. Take the Cossor, for example. With its handsome nickled cap solidly clamped to a moulded bakelite base, its bulb made from the finest grade of glass and blown to almost micrometer exactness—it looks what it is, a quality production throughout.

Manufactured in two types:  
**P. 1.** (For Detector and L.F. use) - - - - - 12/6  
**P. 2.** (With Red Top) For H.F. use - - - - - 12/6

And its performance is thoroughly on a par with its appearance. Insert a COSSOR Valve into any Receiver and observe the difference. Used as a Detector, for instance, you will soon appreciate that it possesses infinitely superior rectifying properties owing to its electron stream being almost entirely contained and usefully employed. As an Amplifier, the COSSOR P.1 is responsible for a remarkable degree of pure, sweet-toned

reproduction vastly superior to that produced by an ordinary Valve. And when used as a High-Frequency Amplifier, the P.2 is a veritable magician, reaching out for long distance Stations and obtaining clear and sparkling music of a quality previously considered impossible.

Truly the COSSOR is a member of the quality—an aristocrat among valves you would do well to know.



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" 3 Coil Holder for Igranite	6/6
Fixed Condensers, .001 to .003, and .0001 to .0003	10d.
Fixed Condensers, Dubilier, .001, .006	3/-
Paraflex Slewing	4d.
Phone Cords, 51 in., double	1/-
Ericsson E.V. Continental, 4,000	13/6
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Filament Resistance, with Dial	1/11
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Condenser Vanes, Aluminium, fixed or moving	per doz. 4d.
Gold, Cat's Whiskers	2d.
Coil Plugs	each 7d. & 9d.
Lead-in Tubes, 6 in.	5 1/2 d.
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Double	1/-
Single, 36 in.	9d.
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T.C.B. 300 Potentiometer	1/-
T.C.B. Filament Resistance	4/-
Brass Contact Studs, with nut and washer	per doz. 4d.
Nickel Contact Studs, with nut and washer	per doz. 7d.
Wood Screw Telephone Terminals, each	2d.
Nickel Plated Terminals	each 1 1/2 d.
Condenser Bushes, top or bottom, each	3/4 d.

**\* All Makes of VALVES, LOUD SPEAKERS, TELEPHONES, etc., despatched by return of post, an delivered FREE to your address at Maker's list prices. \***

H.F. Transformer, 250-700 metres	3/3
Igranite Shrouded Transformer, L.F. 5-1	21/-
" Royal " Transformer, L.F., 5-1	20/-
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Variometer Crystal Unit	14/6
Edison Bell Twin Crystal Variometer Set, beautifully made and very sensitive, the pick of the market	50/-
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Edison Bell Twin Crystal Detector, Variometer	5/6
" " Variometer	15/-
" Nu-Graving " Process, Series 1 (63 letters and words)	7 1/2 d.
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## AMERICA ON ONE VALVE.

The Editor, POPULAR WIRELESS.  
Dear Sir,—I thought you would be interested to know of the success I have had with my one-valve K.D.K.A. set constructed according to your article on page 214 of POPULAR WIRELESS No. 97.

Between 1 a.m. and 3 a.m. (summer time) recently reception was remarkably clear, and free from distortion or fading. The Westinghouse band came through as clearly as 2 LO on a crystal set, and although X's were not absent, they did not prevent uninterrupted reception of the concert.

I am working on a single line outdoor aerial, 60 ft. long, with an earth line almost as long.

Many thanks for your valuable article.  
Yours faithfully,  
J. W. FERRY.  
27, Ferme Park Road, Stroud Green, London, N.4.

## BROADCAST PROGRAMMES.

The Editor, POPULAR WIRELESS.  
Dear Sir,—From the first day of owning a wireless receiving set, now 18 months ago, I have been an admiring reader of your paper, and on several occasions been indebted for helpful information on technical points.

Being too old to undertake construction, I have been content with "sealed" B.B.C. sets, and I am therefore more interested in general wireless news than technical instruction; but I am surprised at the small amount of space devoted in any wireless publication to comments and criticism of the broadcast programmes.

Surely this subject is of great interest to the majority of listeners who are able to appreciate the entertainment provided day by day more than they can the details of mechanical construction and the means of reception, however marvellous the whole science of wireless is.

Your page—"Mainly About Broadcasting" does to some extent deal with the B.B.C. programmes, and I am sure your further attention to this feature would be welcomed by your readers, and increase the popular value of POPULAR WIRELESS.

In your issue of April 18th, you mention the necessity of novelty, and refer to "the lofty air of public service is all very well," and I am sure your views are those of the great mass of listeners.

I also agree that "on the whole, the quality of the musical side of the programmes is what the public wants."

But although this may be so as regards the efficiency of the artistes engaged, and that the manner is satisfactory, I submit the matter is far from what ninety per cent desire and would select, if they had any effective choice.

Travelling about the country a good deal, I invariably find my own view—that the music selected is too classical, scholarly, and heavy ("complex," if Mr. Scholes prefers)—is that of all those with whom the matter is discussed.

Two or three evenings a week given up to symphonies, concertos, historical, modern (and formless), and tuneless music—frequently broadcast simultaneously for the whole evening—a church service three-quarters of an hour on Sunday, followed by a string quartette or chamber music—programmes which have always failed to attract an ordinary paying audience to concert-halls in this country outside a very small and cultured circle.

This class of music is being increased and poured into the thousands of humble homes whose aerial masts are becoming a fringe of every railway line in the suburbs of London and all large provincial towns.

Mr. Scholes considers it hopeful that thousands who have never heard a symphony before have now the opportunity. But do they want it? And would they not enjoy much more something "simplex," tuneful and lifting, if they could get it, and the B.B.C. would supply it?

The type of composition, vocal and instrumental, that the average amateur pianist plays in his or her own home, and which is understood and appreciated, is almost entirely ignored, and at best only doled out by the efficient but far too cultivated and musically highly educated directorate of the B.B.C. programmes.

That the existing state of affairs, with the B.B.C. enjoying a monopoly, is seriously damping down the enthusiasm of existing listeners—discouraging the advent of new "wireless fans" and destroying the recreative value of what is, perhaps, the most valuable aid to the enjoyment of the social and home life of the community at large—is the conclusion regrettably come to by

Yours faithfully,  
GEORGE E. HOLLOWAY.  
Wilbury, 71, Sydenham Road North, Croydon.

[We do not agree entirely with the forcible remarks of our correspondent, but nevertheless admit that the bone of contention he is worrying is open to adverse criticism.—ED.]

## UWANTUS

**WILLESFORD'S WIRELESS SPECIALTIES AND PATENTS ARE ESSENTIAL TO THE UP-TO-DATE LISTENER-IN.**

**PATENT TELEPHONE EXTENSION FLEX.** 12 ft. long. A speciality for the summer. Fitted with plugs and sockets, to join up to the ordinary telephone net; enables listeners to sit at any distance from their receiving sets, even out in their gardens if they like. All retailers, 2/6, or P.O. 2/8.

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All above specialties and patents are "Willesford's" and only Willesford's have the right to make them—so Beware of infringements. Ask for WILLESFORD'S and see that you get 'em!

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A MOST EFFICIENT INDOOR AERIAL. You can arrange one for a few shillings. Try it. Drawing and particulars, 2/6 only, post free. King's speech perfect, connected to crystal set.  
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**GOLD SEAL PLASTIC METAL,** the best contact possible, and get LOUDER and CLEARER SIGNALS. Contains no mercury. Of all Wireless Stores. Enough for 3 D. per packet. for 3 8ups. With 61 sales enquiries (or sample packet 6d.) to: S. LEVY, 53, Ben Jonson Rd., London, E.1

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**"FLEMING'S U.S.A. HERTZITE."**  
The world has nothing finer. 36 cents. A startling surprise. 1/6. Try one. Any radio stores.

Be sure to mention POPULAR WIRELESS when replying to Advertisements.

Wanted by Important Post Order House, dealing exclusively in Wireless Supplies, manufacturers able to supply wireless equipment of all sorts, including loud speakers. New ideas welcomed and exploited. Write at once, with full particulars, to Box F.W., c/o Meerloo Publicity Service, Ltd., 96, New Bond Street, London, W.1.

# Max-amp

The quality Transformer noted for high amplification factor with complete absence of distortion. "Amateur Wireless" (Issue Oct. 27th) says: "A really good Transformer." Price 18/6. Sold only by P.T.O.-SCOTT CO., LTD., 64, High Holborn, W.C.1 and branches.

**L.F. Transformer**

## THE HELIUM VALVE

From a Correspondent.

News of an important valve discovery is just to hand from America. Valves filled with Helium gas have been invented by Mr. F. S. McCullough, and experts in America consider this discovery ranks in importance with De Forest's grid.

UNTIL lately it has been almost impossible to separate the helium atom, but in these new valves the helium is the purest in existence. "There is practically no other gas mixed with it, otherwise the valve would become inoperative," says the inventor in the "Radio Digest."

Since wireless has drawn popular attention to the thermionic valve, a great many experiments have been made in connection with electron emission. Glass bulbs similar to the familiar wireless type were used, and a means for exhausting them of air was provided.

A plate was enclosed in the valve, the filament was heated by means of a battery, and the charge on the plate was measured. Before exhausting the air from the bulb the filament current was turned on, and it was found that the plate received a positive electrical charge, which increased until the filament was at a yellow heat.

### Gas Effects.

Further increase in the filament current reduced the positive charge on the plate, which became quite small when the filament was white hot. Then the bulb was slowly exhausted of air. At first the small positive charge decreased, and as the air pressure grew lower it finally became negative.

It was thus found that the electrification of the plate largely depended upon the nature of the gas inside the bulb, and that the charge was reduced by the presence of oxygen.

According to the electron theory, if we could change the grouping of electrons in an atom we should alter its character, and lead, for instance, might become iron or gold. Radio-active substances are examples of electron emission from atoms, but here the change takes place very slowly because the electron emission is very slow.

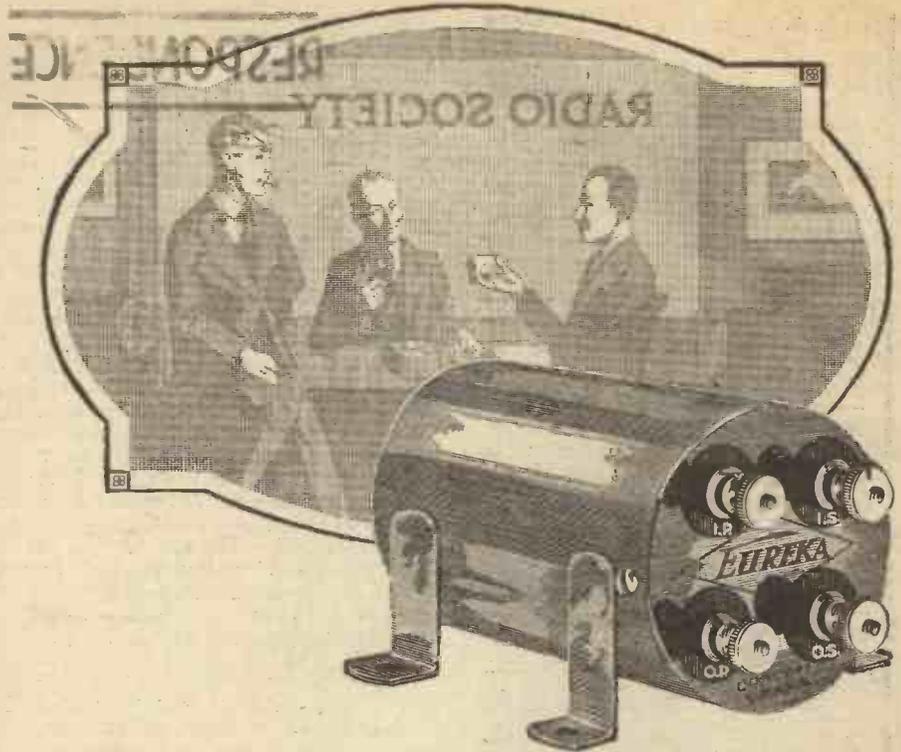
When a tungsten filament is made red-hot the electron emission is comparatively slow, but it increases rapidly as the filament is heated. Just before the filament melts it reaches a maximum, but at this temperature any small quantity of gas present is disturbed, which spoils the effective operation of the valve.

### Cooling the Container.

Other gases were introduced into the valve to stabilise it, with varying degrees of success. Hydrogen was found to have an excellent cooling effect, but unfortunately it decreased the electron emission. All the known gases were used and compared in this way, when the inventor found the great advantage of using pure gases in a free state.

To obviate heating, a metal tube was evolved which was successfully air-cooled, and enabled the gas in it to remain active.

Helium proved to be the best gas, and valves of this kind have been found perfectly satisfactory after tests extending over several months. Their efficiency is said to be three times as great as any other type of valve.



Where wireless enthusiasts gather  
—the Transformer you'll hear  
discussed is the new Eureka.

THE remarkable success which has followed the introduction of the Eureka is a gratifying tribute to the two scientists responsible for its design and to the painstaking—and often tedious—experimental work necessary in the evolution of such an outstanding instrument.

For the Eureka is so radically different, both in design and performance, that in a comparatively short time it will become a standard fitting where the finest possible L.F. Transformer is required, irrespective of price.

And yet the Eureka Concert Grand—although the highest priced—is one of the most economical Transformers it is possible to buy. For instance, because of its

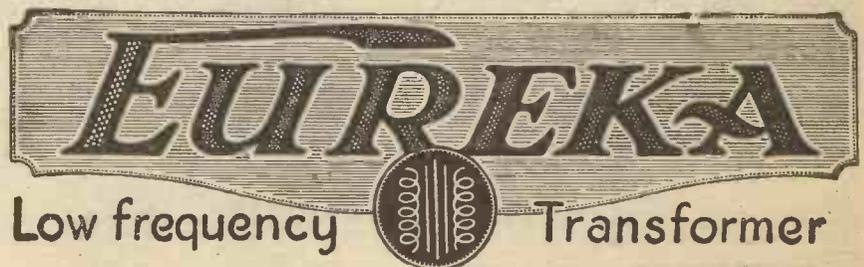
correct scientific proportions and immense windings (considerably greater than any other Transformer on the market) it will give louder and purer amplification than two stages of L.F. using two ordinary Transformers.

The Concert Grand, therefore, in its handsome coppered steel case, is a remarkably fine investment. We know that you can purchase a Low Frequency Transformer of doubtful pedigree at half the price of a thoroughbred Eureka; but is it wise, after spending hours in building up your Set to risk poor results for the uncertain economy of a few shillings.

Eventually you'll select a Eureka. Why not do so now?

Sold by all dealers and manufactured by:  
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Any size cut. 1/8" thick, 1d. for 2 sq. ins.; 3/16" thick, 2d. for 1 sq. in.; 1/4" thick, 3d. for 1 sq. in.; 3/8" thick, 4d. for 1 sq. in. Panels drilled, 9d. Post and packing, 6d. WORMALD & SON, Mangnall St., Bradford Rd., Manchester Phone: Central 2868

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"THE SYMPHONY" LOUD SPEAKER Type 1, £1-15-0. Type 2, £2-15-0. Type 4, £5-0-0. PLACE YOUR ORDER TO-DAY.

THE 3 B Headphones 2/- Cannot burn out or demagnetize	THE 3 B Variometer 6/6, postage 4d. 350-750 metres Send for Price List	THE 3 B Magnetic Crystal Detector, 3/-, postage 3d. 50-100 per cent. increase in signals
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**ENSURE PERFECT RECEPTION.**  
Get my latest vernier detector, post free 2/6; with good crystal, 3/6. One of the greatest detectors we have yet seen. "P.W." report, 5/4/24.

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Ensure the success of the set you make by using Components which are tested and guaranteed accurate before despatch. As used by foremost workers in famous sets.

Complete list free for Postcard containing your name and address. Write at once.

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**EBONITE PANELS, Matt Finish, Ground Edges.**  
ANY SIZE CUT. 3/8 in. 1d. per inch. 1/2 in. 2d. per inch. CARRIAGE PAID

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## A BETTER WAY

of charging Accumulators from alternating current is by using the **TUNGAR BATTERY CHARGER**. Simple, Safe, and Economical. No moving parts. Requires no attention. No Garage, Owner-Driver or Wireless Enthusiast should be without one. Will charge from 1 to 10, 6-12 volt batteries at a time. Descriptive Booklet free on application. Deliveries from stock.

**THE BRITISH THOMSON-HOUSTON CO., LTD.,**  
Mazda House 77, Upper Thames St., E.C.4.

## TECHNICAL NOTES

(Continued from page 376.)

### Wireless Underground.

It has often been suggested that wireless communication should be developed for use in mines, particularly when a disaster occurs, and other means of communication are cut off. Experiments in this direction have shown that wireless waves can easily be detected after passing through 100 feet of earth, and with improved methods, and more suitable wave-lengths, it is likely that this achievement may be considerably improved upon. It has also been shown that waves can be sent for quite useful distances through sea-water, in attempts to communicate with disabled submarines, which is more surprising than the transmission through earth, since the electrical conductivity of the sea-water increases the absorption or dissipation of the energy in the waves. This absorption by electrically-conducting substances, although generally a disadvantage, has been turned to useful account in a method of searching for ores and suchlike materials in the earth by means of a beam of wireless waves.

### A Capacity Tester.

In order to facilitate the testing of capacities, an American manufacturer of wireless condensers has introduced the following very simple method. Two strips of metal are bridged across five fixed condensers of different capacities, in such a way that different condensers can be thrown into circuit. This in itself is really a crude form of condenser-box. The two metal strips are connected in the grid circuit, and different capacities are tried until the best results are obtained. The device is then disconnected, and a fixed condenser of the required capacity is inserted in its place.

### Resistance and Capacity Unit.

In an interesting unit which has recently appeared, variable resistance and capacity are provided for grid control, the resistance being capable of control between one-fifth of a megohm and 12 megohms, while the capacity may be varied between 000002 and 005 microfarads. This grid control is claimed to have increased signal strength by 25 to 50 per cent., and to be especially advantageous in the case of critical circuits, such as the Reinartz.

### Aerial Efficiency.

It has been for a long time customary to indicate the power of a transmitter station in kilowatts, this power being presumed to be that supplied to, and usefully radiated from the aerial. As a matter of fact, however, it was more usually the power actually delivered by the generator; and was very different from that usefully radiated. A valuable paper dealing with this subject, by Prof. Howe, the well-known authority on aerial design, appears in a recent issue of the "Electrician." It is now realised that the only proper measure of the effectiveness of a station is the radiated power, and since, for a given frequency, this depends upon the produce of the effective height and current, this product is now specified instead of a meaningless number of kilowatts. To obtain the maximum radiation for a given power delivered to the

(Continued on page 404.)

## Accumulator Hire

—a guaranteed Service

We will lend you an accumulator suitable to your set, or, if you have your own accumulator we will regularly collect, clean, adjust acid gravity, correctly re-charge and deliver weekly at *inclusive and moderate terms.*

It will be worth your while to write for a fully descriptive folder to

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267, High St., Camden Town, N.W.1  
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12/3 per doz.

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**STEEL "LAKER" MASTS**  
STRONG, LIGHT, DURABLE.  
**BUILT FOR SERVICE.**

More "LAKER" Masts are sold than all other makes combined. Each mast is a standing testimonial. Made from best Steel Tubing 2" dia. in 10 ft. sections. Quickly assembled and erected. 25 ft. 35/-, 30 ft. 45/-, 35 ft. 52/6, 40 ft. 63/-, 45 ft. 75/-, complete with all accessories. Ask your dealer or order from us direct.

Send postcard for catalogue.

**J. & J. Laker Co. 457 Romford Rd., London, E.7.**

### WHY NOT

have your ex-Army phones re-wound? All 4,000 ohms per pair. Will do all makes. Ex-Army, 5/-, Brown, 4/-, G/, Sullivan wax-filled 7/- per pair. Transformers re-wound from 6/-, Postage 6d extra. **THE H.R.P., 48, St. Mary's Road, Leyton, E.10.**

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### BEST BOOK OBTAINABLE.

If you wish to make your own receiver, or to improve the set you already have, you cannot do better than obtain this book, **HOW TO ERRECT, CONNECT, AND MAKE Aerials**, Complete Crystal and Valve Receivers, Coils, Tuners, etc.; also the latest two and three valve, tuned Anode Receivers and one and two valve Amplifiers.

144 pages (including 28 diagrams), 1/3 post free

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Dial, one hole fixing.  
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0005 .. 5/6 .. 0002 .. 4/3 .. 0005 .. 3/6 .. 0002 .. 2/-  
Vernier, 3/9, post free. Vernier, 1/6, all post free.

**PARTS FOR TWIN CONDENSERS!!!**  
Wonderful value, easily assembled. Each half 0002, 6/-; 0003, 7/-; post, 6d. each.

End Plates, 4 ebonite, full size, 8d. each; Semi, 7d. each. Drilled and tapped, 1d. each extra.  
Knobs and Dials, taper, fitted, 1/6; Standard Knob and Dial, 1/3; Knob and Pointer, 4 1/2d.; Scale, 3 1/2d.; post 2d.

Crystal Detector Parts, 1/-, Gold Cat's Whisker, 3d.; post, 1 1/2d.

Thorpe K.L. Valves, 10/-, post free.

Stamp for list.

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Do., 2-way on Stand	5/9
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Various Designs do.	5/11, 6/11 & 7/-
Shaw's Genuine Hertzite	1/3
Pin Screw Terminals, doz.	1/3
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Our Air Dielectric Condensers are the simplest and MOST efficient on the market. Lowest in price, Highest in quality, made for panel mounting and are the most suitable condensers for Broadcasting or Amateur work. They have passed THE TEST for guaranteed capacities, are scientifically accurate, and built for durability.

### NEW MODEL.

'073 in. Spacers.  
Post 6d. per set extra.

Cap.	Plates.	Price.
'001	49	7/11
'00075	37	6/11
'0005	25	5/11
'0003	15	5/3
'0002	11	4/11
'0001	5	4/3
<b>VERNIER</b>		<b>3/11</b>

Trade discount on Condensers 20% plus postage. Good terms for quantities.

**NATIONAL LABORATORY CERTIFICATE.**  
Above new model specially adapted for taking up minimum amount of space. All parts nickelled. Passed National Laboratory Test. One hole fixing.

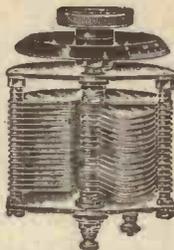
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Prices include KNOB and Dial. Without Dial 6d. set less

### "A" TYPE.

'088 in. Spacers.  
Post 6d. per set extra.

Cap. Approx.	Plates.	Price.
'001	57	6/6
'00075	43	5/9
'0005	29	5/-
'0003	19	4/6
'0002	13	4/-
'0001	7	3/6

Vernier, 2/6. (No Dial)

Above "A" type is a wonderfully cheap and reliable condenser. One hole fixing. Thousands of testimonials from satisfied users.

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30 v.	4/3 & 4/6
36 v.	4/9 & 5/6
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4,000 ohms	13/9
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Post 1/- per pair.

### VALVES.

Marconi R. Ediswan Mullard O. Cossor P.1. Cossor P.2.	} 12/6
Post 1/- each.	

### VALVES.

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French R.	6/11

No post orders.

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All makes in stock.

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<b>EBONITE VARIOMETER</b>	
250/260, Ball Rotor wound D.C.C. with knob	8/11
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Best. Stamped Genuine.

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------------	------

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## SUPER CONDENSER WITH THREE PLATE VERNIER. "IT" FOR VERY FINE TUNING.

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'0005	10/6
'0003	8/6

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4 v. 40 a.	17/6 & 19/6
4 v. 60 a.	19/6 & 23/-
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Set of 6 .. 1/11  
Set of 7 .. 2/3  
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Set of 6	2/3

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4 B.A. Rod	.. ..	foot 3d.
4 B.A. Rod	.. ..	foot 2d.
Valve Pins	.. ..	doz. 6d.
Brass Bushes	.. ..	1d.
Spade Tags, best	.. ..	doz. 3d.
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Pin Screw	do.	4 for 3d.
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H.T. Batteries, 60 v. 8/6 & 10/6	.. ..	2/-
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Insulators, Egg	.. ..	100 ft. 1/10
Aerial Wire	.. ..	100 ft. 1/10
Extra Hard Drawn, 7/22	.. ..	100 ft. 2/6
Valve Windows	.. ..	7d.
Res. Dials, 0-100	.. ..	4d.
Ebonite Dial and Knob	.. ..	1/1 & 1/3
Filament do. and Knob	.. ..	9d.
Filament Dial, 0-10	.. ..	6d.
Fixed Condensers to '001	.. ..	10d.
Do., '002 to '005 & '006	.. ..	1/3
Ins. Screw Eyes	.. ..	1d.
4 Cats Whiskers (1 gold)	.. ..	3d.
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Shaw's Hertzite	.. ..	1/-
Zincite, 6d.; Bornite	.. ..	6/3
Coil Holders	.. ..	1/1 & 1/3
Coil Plugs, Ebonite	.. ..	7d. & 9d.
Do., on Base	.. ..	1/- & 1/3
Best Valve Holders	.. ..	1/3
3 makes, above 10d., 1/- & 1/3	.. ..	1/3
Tinned Copper, 16, 18, 20g.	.. ..	3 yds. 3/6
Sleeving, takes 18g., best	.. ..	1/-
Copper Foil	.. ..	it. 3d.
Filament Res., good	.. ..	1/6
Rubber Lead-in 10 yds.	.. ..	1/- & 1/3
Bell Wire, D.C.C. I.R.C., 10 yds.	.. ..	5d.
Twin Flex	.. ..	12 yds. 1/6
Heavy Rubber Lead-in	.. ..	yd. 2d. & 3d.
Basket Coils (6) up to 3500	.. ..	1/9
Waxless (5)	.. ..	1/11
D.P.D.T. Switches for Panel	.. ..	1/3
S.P.D.T. do.	.. ..	1/6
Telephone Cords	.. ..	1/6 & 8d.
Grid-Leak (2 mer.)	.. ..	1/9
Do., and Condenser '0063	.. ..	1/9
Empire Tape	.. ..	doz. yds. 9d.
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A.A. Earth Clips	.. ..	7d.
Washers, 2 and 4 B.A.	.. ..	3 doz. 2d.
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**10/-**

Deposit.



and your promise to pay 5/- monthly for seven months, making 45/- in all if satisfied.

This is not a converted telephone ear-piece but a real loud speaker with laminated magnets wound to 2000 ohms resistance, with adjustable 3 1/2" diaphragm. 12" trumpet. 9" across bell.

Satisfaction guaranteed or money back

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Established 1918 Phone: Gerrard 8782

**TECHNICAL NOTES.**

(Continued from page 402.)

aerial circuit, all losses must be reduced to a minimum. These consist of losses in the aerial wires, tuning inductances, etc., and in the towers, stays, and so on, as well as losses due to brush discharges, and absorption in the earth below the aerial.

**Fading.**

One of the most elaborate experiments on the causes of "fading" is that which has recently been carried out by the U.S. Bureau of Standards in conjunction with the American Radio Relay League. Ten stations transmitted signals in succession on certain nights, according to a pre-arranged schedule. The signals were received simultaneously by about 100 receiving stations. The general result of the tests supports the theory that fading is closely connected with conditions at the "Heaviside Layer." It is thought that day-time transmission is principally carried by waves close to the surface of the earth, whilst night transmission, especially over great distances, and using short wave, depends largely upon the action of the Heaviside Layer. By night, waves are thus free from the absorption experienced during the day, but are subject to considerable variations caused by the irregularities of the ionized air in the region of the Heaviside Layer, and it is these variations which largely account for fading under certain conditions.

**The Book of the Valve.**

There must be a considerable number of books in existence, large and small, on the all-important subject of the thermionic valve; but it is probable that none will be more comprehensive or authentic than that which has just been published under the auspices of the American National Research Council, entitled "Thermionic Vacuum Tubes and Their Applications." This report gives a summary of all the important properties and uses of the valve, and discusses its employment as amplifier, modulator, and detector. In addition, the construction and properties of valve oscillator circuits is dealt with, as well as the use of the wireless valve in certain special non-wireless applications.

This summary is by R. W. King, and is a most valuable short treatise on the valve. Its substance may be found, also, in the "Bell System Technical Journal," Vol. 2, pp. 31-100 (Oct., 1923).

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(The smallest in the World.)

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If you cannot obtain this device from your local dealer write to the head office: **MIKRO Ltd., 32c, Craven St., STRAND, W.C.** The new type Skinderviken Microphone with Carbon. Electrodes only are obtainable at 5/- each.

Write for Illustrated Booklet:

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PRICE 6d. Post free 6 1/2d. Send P.O. (not stamps) to-day.

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**FOR THE EXPERIMENTER**

These EXCELLENT UNITS have been DESIGNED to give the MAXIMUM EFFICIENCY combined with SIMPLICITY in MOUNTING which is UNIQUE and to be sold at the very MODEST SUM asked for them.



**FOR PANEL MOUNTING AS ILLUSTRATED**

**FOR ALL BROADCAST WAVELENGTHS**

The Coils are specially-wound and contain no wax. Use them in your next set and their merits will appeal to you.

Ideal Varlo Broadcast Tuner	.. .. .	3	6
Anode Reactance	.. .. .	4	3
Varlo Tuner with Reactance	.. .. .	5	9
A.T.L. with Reactance	.. .. .	4	3
A.T.L. Reactance and Anode	.. .. .	6	3
Loose Coupler and Reactance	.. .. .	6	3
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2 M.F. Mansbridge Condensers for H.T., etc., 2 6 post free.

Telephone Plugs and Jacks, 3/- per pair, post free.

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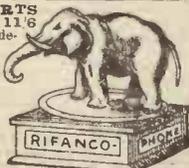
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**ACCUMULATORS.** O.A.V., Fuller's, etc. Guaranteed brand-new and perfect, but slightly soiled. We refund cash with carriage both ways if returned within 7 days.  
4v. 40a. .... 17/-      6v. 40a. .... 25/  
4v. 60a. .... 21/9      6v. 60a. .... 32/6  
4v. 80a. .... 27/6      6v. 80a. .... 40/-  
4v. 100a. .... 32/6      6v. 100a. .... 46/-  
Polished teak cases for 6/60 and 4/100 only. fitted with fuses and switch. 6/6 each.

**SPECIAL LINE.** First-class English make. 6 v. 60-amp. hours. 25/- ea. MAUDE RUBBER CO., 58, PRAED ST., LONDON, W.2.

**LONDON AGENCY** entertained from well-established provincial firm. Manufacturers of Wireless Apparatus. Good Central Office and Show Room. Telephone, etc. Write: **BONS WIRELESS SUPPLY CO.,** 7, Featherstone Buildings, London, W.C.1.

**RIFANCO PHONES & PARTS** 4,000-ohm Tested Headphones, 11/6 pair. Cabinets, Pedestals, Sideboards, Accessories for Wireless and Gramophones, Motors, cheaper than anywhere else. Catalogue (32 pages, 160 illus.) telling How to Assemble Gramophones, 2d. **THE REGENT FITTINGS CO.,** (Dept. P.W.), 120, Old Street, London, E.C.1. Est. 20 years. Tel. Clerkenwell 2923.



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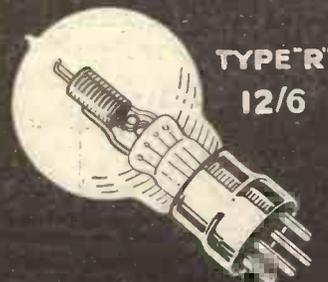
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CRITICAL NOTES  
(continued from page 408)

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All losses must be reduced to  
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# EDISWAN VALVES



TYPE "R"  
12/6



TYPE  
"ARDE"  
21/-



TYPE  
"A.R."  
12/6



The Safety Cap (Prov. Pat.) which is now fitted to all Ediswan Valves. The filament pins are shorter in length than the plate and grid pins, thus avoiding any chance of making surface contact with the wrong socket.

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## Robust, Sensitive and Economical!

These three advantages will strike you immediately you use an Ediswan Valve for the first time. The essential strength is evident in the substantial glass, the firm grid, and the nickel anode—shaped to a minute degree of accuracy. As to sensitivity, you have only to insert an "Ediswan" to appreciate the difference it makes to your Receiving Set. Stations which hitherto have been received indistinctly "come through" clearly, and with absolute freedom from extraneous noises. Moreover, though the amplification is high, actual performance has proved the current consumption to be low.

Made in its entirety at our works, no other Valve undergoes the same thorough supervision and testing—a fact which ensures "Ediswan" superiority.

Type "A.R." and "R." 12/6    Type "A.R." '06 .. 30/-  
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Send now for free booklet "The Thermionic Valve." Also Manufacturers of "Toovee" and other Receiving Sets, "Televox" Loud Speaker, Headphones, Batteries and Accessories. Particulars on Application.

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# Be careful of that minute energy—

Guard it against loss at every point of the path along which it travels—only too easily will it leak away and take other paths than those for which it is intended. Wrong and ill-made, or well-made but incorrectly designed parts in your receiver will uselessly dissipate that vital energy. It is precisely because the total energy dealt in by your receiver is small that all minute losses must be avoided. Every LISSEN Part is made to direct to its proper purpose every impulse that comes to it. That is why a receiver BUILT WITH ALL LISSEN MASTER PARTS yields that extra efficiency which is particularly noticeable on long distance reception.

## Picking up WGY, WOR, and WJAZ.

"I believe that I could not have picked up these stations had I not used the LISSEN Variable Grid Leak, as the adjustment was very critical. A unique resistant element is used in the LISSEN Variable Grid Leak. It is covered by definite patent claims and cannot be duplicated. Valves vary in characteristics, and it is an excellent thing to be able to alter the leak resistance to make full use of the critical features of the valve. With some valves and in some circuits the LISSEN VARIABLE LEAK will be found invaluable. Exact value of leak resistance can be selected to suit every working phase of the valve, and thereby obtaining correct grid potential all the time."

LISSEN ONE-HOLE FIXING—POSITIVE STOPS BOTH WAYS... 2/6



## HOW LISSENSTAT CONTROL IS SPREADING—

A user writes:—First I tried one, and then I fitted five LISSENSTATS. That is how the use of LISSENSTAT control spreads. It is such a beautiful control that it is impossible to do other than appreciate it. It gets you through to a distant station after you have tried all your other controls in vain. It saves your valves and keeps them quiet, so that you tune in THROUGH A BACKGROUND OF SILENCE. It is made to last, too. Easily fitted. LISSEN ONE-HOLE FIXING. OF COURSE! LISSENSTATS (prov. pat.) are sold at 7/6

To those who make the mistake of thinking that LISSENSTAT control is the same thing as an ordinary rheostat, LET THEM TRY THE DIFFERENCE.



## AUDIO FREQUENCY in REFLEX CIRCUITS

It has been found that the LISSEN T2 Transformer is an ideal transformer in these circuits, where it yields very powerful amplification with great purity of tone... 25/-

BUILD UP BEAUTIFUL TONE QUALITY For immediately after the detector valve, a wonderful power amplifier too, this incomparable transformer can also be used throughout. It has a coil which would amplify without any iron core at all 30/-



## AN EXCELLENT LIGHT TRANSFORMER.

The LISSEN T3 is one of the best light transformers made, and actually compares with many much more expensive transformers because of its skillfully balanced design. 16/6

Ask users what they think of LISSEN Parts—ask those whose profit is derived from the satisfaction the parts give in use. If you ever hear of a genuine user of any LISSEN Part who has anything but appreciation to express, please tell him we should like to hear from him, just as we EXPECT to hear from YOU if YOU are not satisfied, for we guarantee every LISSEN Part to satisfy you perfectly. If your dealer cannot supply, you can send direct, post free; but try your dealer first. To the Trade: LISSEN Parts show the trade a fair margin of profit and ensure a quick turnover. It is worth a good deal to those traders who are known to specialise in LISSEN Parts.

## STRONG MAGNETIC LINKAGE BETWEEN LISSENAGON (prov. pat.) COILS

The magnetic linkage between LISSENAGON (prov. pat.) coils is such that a transfer of energy will be effected even though the coils are comparatively a great distance apart. LISSENAGON coils will oscillate easily, even though far apart, and by keeping them as far apart as possible all electrostatic effect is eliminated and the tuning characteristics of each coil are mutually unaffected. Tuning is extremely sharp and selective because the farther apart the coils are kept the sharper and more selective tuning becomes.



It is partly due to the strong magnetic field between LISSENAGON coils and partly due to the negligible losses in the coils themselves that LISSENAGON coils will oscillate easily, though at a considerable distance apart, as there are practically no damping losses to be overcome even on the extremely low wave-lengths.

## LISSENAGON TUNING CHART. Note the Intermediate Coils: Nos. 30, 40, and 60.

No. of Coil.	Minimum Wavelength	Maximum Wavelength
25	185	350
30	235	440
35	285	530
40	360	675
50	480	850
60	500	950
75	600	1,300
100	820	1,700
150	965	2,300
200	1,885	3,200
250	2,300	3,800
300	2,500	4,000

Minimum Wavelength	Maximum Wave length	PRICE.
100	325	4/10
130	425	4/10
100	490	4/10
200	635	4/10
250	800	5/-
295	900	5/4
360	1,100	5/4
500	1,550	6/9
700	2,150	7/7
925	3,000	8/5
1,100	3,600	8/0
1,400	4,300	9/2



## LISSEN PARTS IN JUTLAND—No fading

"I have now fitted the LISSEN-REGENERATIVE REACTANCE and two of your H.F. Reactances. I am more than satisfied. Principal advantage is that there is now practically no fading away of signals once they are tuned in, beside a considerable increase in strength."

## Every Receiver should have one stage of Lisssen Radio Frequency

It builds up wave energy before passing it on to the detector. Where aerial reaction is used LISSEN REACTANCE ALSO SHOULD BE ADDED to bring in signals with greater certainty and with much greater strength. Its simplicity of control has made H.F. amplification extremely easy and increasingly popular. Blue print with each shows the easy connections. 150-10,000 metres 19/6 150-600 metres 17/6

LISSEN REACTANCE IS NOW WITHIN THE REACH OF ALL

## YOU JUST GENTLY PULL OR PUSH—

and you hear these little switches "make" with a reassuring click. The contacts do not short when changing over—they are self-cleaning—there are no neater or handier switches. LISSEN ONE-HOLE FIXING. OF COURSE.

- LISSEN Two-way Switch (prov. pat.) 2/9
- LISSEN Series Parallel Switch (prov. pat.) 3/9

Successfully used in the Reception of American Telephony—No aerial reaction need be used, for the LISSEN REGENERATIVE REACTANCE (prov. pat.) will take its place. It is non-radiating—replaces plug-in coils—it is lower in cost than a set of plug-in coils to cover the same wide range; it is easier to handle, one knob controls tuning and reaction—reception is often possible with both aerial and earth connections dispensed with; cuts out the local station and tunes in the others with full built-up strength. Continental stations come in easily. Introduced into the anode circuit, it forms an unequalled first stage radio frequency. Blue print with each shows the easy connections; unbroken regeneration possible over the whole range; complete with internally connected switch; no soldering. LISSEN ONE-HOLE FIXING. OF COURSE. £2-12-6

## CHOOSING A TUNER

If you do not wish to use plug-in coils there is the LISSEN Tuner, with its simplicity of control, its switch complete, its sharp tuning on all ranges with full efficiency at every point, negligible H.F. resistance, large inductance for a given length of wire—LISSEN multi-wound—150 to 4,000 metres range with a 0005 condenser (preferably use the LISSEN Mica Variable Con. 22/6 denser. 17/6)



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