

# HOW TO BUILD A TWO-VALVE "UNIDYNE" RECEIVER (EXCLUSIVE TO "P.W.")

# Popular Wireless

## and Wireless Review

PRICE 3d.

EVERY FRIDAY.

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

May 31st, 1924.



Miss Beatrice Harrison playing in her garden at Oxted, when the song of the nightingale was broadcast.

## OUR BIRTHDAY NUMBER. THE SPIRIT OF PROGRESS

BY SIR OLIVER LODGE, F.R.S.

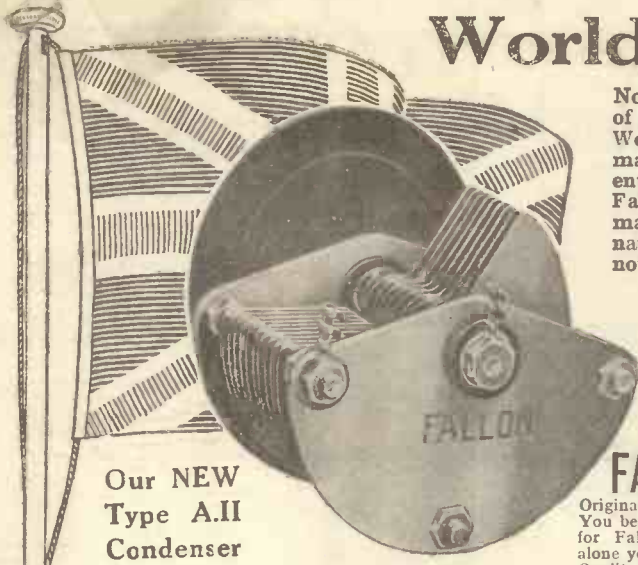
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# POPULAR WIRELESS

AND WIRELESS REVIEW.

May 31st, 1924.] THE RADIO WEEKLY WITH THE LARGEST CIRCULATION. [Every Friday, Price 3d.

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

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

## RADIO NOTES AND NEWS OF THE WEEK.

### "China Expects—"

A FRIEND of mine who has just returned from China tells me that Chinese citizens are forbidden to purchase or use wireless sets. I presume that every patriotic Chinese citizen is otherwise engaged in mastering the intricacies of Mah Jong in preparation for the Olympic Games.

### A Knock-Out.

A COINCIDENCE unparalleled in my short but sweet life took place recently while parading in Hyde Park with my dog. A small "very intelligent" Pekinese snapped at my "bloodhound." The owner, an elderly lady, called to her dog: "Come here, Ariel, you naughty boy!"

Wondering if she had recognised me, I approached her and asked her why she had so christened the little "mongrel."

"My husband is a wireless expert, don't you know, and when my little dog was born he suggested that name because "Ariel," of POPULAR WIRELESS and the "Daily Mail," severely criticises my husband's work, and he thought "Ariel" had as much intelligence as my little dog."

I quietly faded away without enlightening the good lady as to who I was. I am told, however, that Pekinese are very intelligent. One of the few instances in my aforementioned life, however, when I felt really—cr—squashed!

### No Copyright.

THEY are having hectic times in America. Many of the most famous song-writers have recently formed a deputation to a Senate committee to protest against what is known as the "Dill" Bill, which, if carried by Congress, would permit wireless broadcasting stations to use copyright compositions without payment.

### A Wembley "Stunt."

THE "stunt," or experimental department of the B.B.C., is planning to give listeners new surprises from Wembley. I hear that they intend to broadcast sounds from the Amusement Park on some typical evening when the various attractions are in full swing. Screams of scared but ecstatic ladies on the switchbacks will, therefore, be heard in your 'phones shortly, but must not be confused with the depredations of your local howler.

### Naval Interference.

I HAVE received frequent complaints from readers concerning the interference of naval wireless stations, and the other day I inquired at the Admiralty

if the transmissions were to be reduced. I was told that steps will shortly be taken to reduce signalling during broadcasting hours to a minimum. This will favourably affect listeners in Portsmouth and other naval bases.

### A Counter Attraction.

I HAD occasion to visit my dentist recently, and was rather surprised when I entered the surgery to hear "We are now switching over—" I

length or find a remedy for its harmonies, which play great havoc with good broadcast reception.

### Our Birthday.

THIS is our birthday number. P.W. is two years old. The happy event will be celebrated on June 2nd. The Editor has been busy answering the 'phone and receiving congratulatory messages from readers—most of them stressed the point that they had taken the paper regularly since the first issue—and from most of our regular contributors.

### And Another Birthday.

YOU will find in this issue many messages from famous men who have not forgotten P.W.'s birthday, and, in particular, I would draw your attention to the special article by Sir Oliver Lodge on the spirit of progress.

And, by the way, our next issue will also be a special birthday number, in honour of our scientific adviser, who reaches his seventy-third birthday on June 12th, an event which should make us all think of the big debt science—and especially wireless science—owes to this great man.

### German Broadcasting.

I HEAR that, in addition to the wireless transmitting stations at Berlin, Frankfurt, and Munich already in operation, new stations at Königsberg, Breslau, Hamburg, Stuttgart, and Leipzig will be operating local services by the end of this month. Each of these new stations will have a range of about 100 miles.

### A Loud-Speaker Riot.

THE "Daily News" states that there were amusing scenes in South Kentish Town the other evening as the result of a Conservative meeting to protest against the abolition of the McKenna duties held in the Memorial Hall, Hawley Road. At the same time the Labour Party held a demonstration outside.

Loud speakers had been erected to carry the Conservative speeches inside the hall to those outside who had been unable to obtain admission.

The Labour Party outside the hall found the task of competing with the stentorian tone of the loud speakers a heart-rending process, and ultimately resorted to singing, "cat-calling," and booing. The attempt to hold a counter-demonstration was for the most part abandoned, and although the platform from which the Labour speakers endeavoured to address

### The P.W. "UNIDYNE." A READER'S SUCCESS.

52a, Dalston Lane, E.8.  
May 17th.

Dear Sir,—I hooked up the "Unidyne" circuit one valve very roughly indeed, but it worked well.

Besides London, I got at least three other stations, including Radiola on larger coils, using the average telephone transformer and a four-electrode valve. Slate pencil leak.

The strength was roughly ordinary valve reaction. I anticipate better results by using the correct components.

I am now anxiously waiting the two-valve circuit.

Yours faithfully,  
C. R. PRIESTLEY.

quickly looked round to see what it was. My friend the dentist opened a neat cabinet which contained a three-valve set with the latest type of loud speaker. "I believe in a counter attraction for my patients, and," he continued, "I am able to attend to more patients in a day when the set is switched on. Not because they are bored with the broadcast programme, but because they sit quietly while I am boring their teeth." My dentist friend may be quite genuine, but personally I could not be carried away even by one of Captain P. P.'s talks on "Oscillation" if the dentist was oscillating the drilling machine on my nerves.

### Leaflet Again.

LEAFIELD station is causing considerable annoyance to listeners in the Oxford district, and many have been so bold as to write to the P.M.G. about the inconvenience caused. Some have asked the P.M.G. to have this station moved to where it will not cause so much annoyance! Rather a big order, but I hope the G.P.O., at any rate, will alter Leafield's wave-

(Continued on page 486.)

## NOTES AND NEWS.

(Continued from page 485.)

the crowd was removed farther from the hall, it was still ineffective.

## Popular Music Wins.

THE result of the "Daily News" Broadcasting Programme Competition shows that, in the opinion of some 300,000 people who entered for the competition, no great change in the B.B.C. procedure is needed. The analysis of the voting shows that the order of popularity of twenty subjects is as follows:

1. Popular music. 2. Dance music. 3. Classical music. 4. Children's hour. 5. Humorous items. 6. Light opera. 7. Grand opera. 8. News. 9. General talk. 10. Modern plays. 11. Sport. 12. Educational. 13. Classical plays. 14. Sacred music. 15. Fashion talks. 16. Literature. 17. Hobbies. 18. Domestic economy. 19. Religious addresses. 20. Decorative schemes. 21. Clothing.

## G. B. S. and the B.B.C.

CAPTAIN P. P. ECKERSLEY, speaking at a Rotary Club lunch in Liverpool the other day, said the B.B.C. were faced with a big difficulty in keeping broadcasting free from anything contentious.

"We asked Mr. George Bernard Shaw to give a talk," he said, "but we told him he could not speak on politics or religion. G. B. S. wrote back:

"Politics and religion are the only things I ever talk about. They are the only things worth talking about."

## Some Odd Items.

Endeavours are being made to secure a broadcasting station at Great Yarmouth.

Three quarters of a million people now hold broadcasting licences.

There are 569 broadcasting stations in the U.S.A., and there are more under construction.

The broadcast song of the nightingale was heard in Paris by listeners-in.

## The Shy Nightingale.

DID you hear the nightingale on Monday, May 19th?

That much lauded bird was evidently not feeling inspired that night. Perhaps he guessed he had an extra large audience and felt a little shy. Anyway, he contented himself with chirping and one or two half-hearted trills.

From a transmission point of view he did splendidly, and the faint answer of other birds in the Oxted wood gave an added touch of reality to the whole performance.

## Captain West's Success.

CAPTAIN WEST was in charge of the technical arrangements, and his placing of the super-sensitive microphones was largely responsible for the excellent effects obtained.

## A Touch of Romance.

MR. KAY ROBINSON'S short talk on nightingales in general was some-

what marred by distortion and slurred phrasing. I got the impression that he was speaking impromptu and far too close to the microphone, and that his voice is by no means clear enough for good broadcasting.

The effect of Miss Harrison's 'cello playing in the background gave a touch of real romance. It was a pity we could not have heard more of her.

## Our Biggest Station.

THERE is fast growing on a hillside at Hillmorton, near Rugby, what, it is claimed, will be the biggest and most powerful wireless station in the world. It is to be controlled by the Post Office.

Its aerials are to be fixed on 16 masts, each 820 ft. high, which will dwarf the 300 ft. high masts of Leafield, Oxfordshire, the station which is to be the British end of the proposed British Empire chain of wireless communications.

It will cover a site of 950 acres—more than four times as large as the Empire Exhibition at Wembley. Work has already been begun on some of the many buildings that are to be erected in connection with it.



One of the stands (that of Alfred Graham & Co.) in the Wireless section of the Exhibition at Wembley.

## The Liverpool Station.

THE new Liverpool relay broadcasting station is to open on June 11th, in charge of Mr. H. Cecil Pearson, at present assistant director of the Birmingham Station. He will have an assistant and three engineers. The radio relay station is situated at Milner's Safe Works, Smith-down Lane, and the offices and studio will be in Lord Street, Liverpool. For the aerial the company's experts have chosen the 200ft. chimney-stack of Messrs. Milner's works. It will take three weeks to get the station fixed up.

## Birds of the Ether.

I AM told that arrangements will be made to broadcast further items from nature, as the broadcasting of the song of nightingales was, generally speaking, a success. I am told, however, that the suggestion of "Uncle Jeff" to bind these nightingales by contract, to appear when called upon, will not be adopted by the B.B.C.

## Psychic Radio.

MR. DENNIS BRADLEY, author, cynic, satirist, and wit, has become a member of the Spiritualist world,

and believes it possible to broadcast spirit messages. I am told that at a recent séance Senatore Marconi, Lord Dewar, Viscountess Grey, Mr. William Archer, and Sir Arthur Conan Doyle were present, and with the exception of Senatore Marconi the party were quite satisfied with results obtained. I know that Senatore Marconi's attitude to Spiritualism has always been one of "intense scepticism."

## Sir Arthur's Suggestion.

YET, on the other hand, Sir Arthur Conan Doyle is one of the prime movers of Psychic Research. While I was walking with him down the Strand the other evening, accompanied by Lady Doyle, he suggested that if religious subjects can be broadcast on Sundays why cannot a lecture be broadcast on Spiritualism?

Both Sir Arthur and Lady Doyle are keen wireless enthusiasts, and cannot speak too highly of broadcasting. After Sir Arthur's recent talk from 2LO I had a long conversation on the subject of broadcasting with him. "I cannot understand why people should grumble at the Broadcasting Company's efforts," he said. "I think broadcasting one of the most wonderful institutions in the world."

## 5 H.M.

THIS station is at present making extensive tests with choke-control and absorption circuits, also single-valve transmissions applying grid modulation, with power varying from 2-10 watts, and any reports from amateurs receiving these transmissions (stating their location and number of valves used in reception), outside a ten mile radius of this station, would be thankfully received by J. Fitton, 276, Milnrow Road, Rochdale, Lancs.

## The 25 kw. Station.

I MET Captain Eckersley the other evening, off to catch a train to Liverpool. He looked far from well, and is in evident need of a good holiday and a rest from overwork. He told me that owing to troubles in getting the gear ready in time, the 25 kw. station will not be ready much before the end of June.

## Alterations at 5 P.Y.

PLYMOUTH listeners should be now well satisfied with their station, because 2O Emma has spent some considerable time at 5 P.Y. and has made important alterations to the station.

## Captain Eckersley's Station.

2QC, the experimental station of Captain Eckersley, is situated at Hendon, not Hampstead, as was reported in a previous issue.

## The Marconi Beam.

IT is reported in the Press that the Marconi short-wave directional beam system has now been perfected. This will probably cause fresh complications in the Imperial Wireless Scheme.

ARIEL.

# THE SPIRIT OF PROGRESS.

## WHAT WIRELESS CAN DO FOR HUMANITY.

### A SPECIAL ARTICLE FOR "P.W.'s" BIRTHDAY NUMBER.

By SIR OLIVER LODGE, F.R.S., D.Sc., LL.D. (Scientific Adviser to "Popular Wireless").

The following special article on the Spirit of Progress has been written at my request by our Scientific Adviser for publication in our birthday number and it contains a direct message to every listener-in, amateur, and experimenter who is interested in wireless and the furtherance of scientific knowledge.—The Editor.

WHEN I think of the early beginnings of the generation and detection of ether waves (which, except in the form of light and other very high-frequency radiation, had never been generated or detected before 1887 and '88, though their theory was given by Clerk-Maxwell in 1865), I am amazed at the rapid progress that has been made in their application to signalling all over the world, and especially to the transmission of human speech to surprising distances, with clear articulation and with avoidance of many of the difficulties which accompany cable transmission.

#### Creating a New Industry.

By no other means than through the free and untrammelled universal ether could the fine shades of articulate utterance be transmitted instantaneously and with so little power, considering the long range achieved in all directions.

The broadcasting of news and speech always seemed to be the object for which ethereal waves were specially adapted; but I never expected to live to see the process so successfully and marvellously developed by the labour and ingenuity of a number of workers in co-operation, as has now been accomplished, in a way which is a daily surprise and delight to listeners.

The creation of a new industry, which has come into existence as a consequence of the widespread demand, is but one of its benefits. The younger generation will surely be stimulated to take more interest than ever in the science of physics, which has rendered such an achievement possible. And the widespread and growing interest in science which has thus been begun may lead a few of the enthusiasts towards further investigation and to further inventions and discoveries, of which we at present have hardly an idea.

#### Emulation and Competition.

It is devoutly to be hoped that in the long run, when present international troubles have subsided, the power of rapid communication will surely conduce to better understanding among the nations, and will lead in due time to the much-desired but long-delayed era of universal peace. To this end much more than physical and material progress must contribute, for nothing can replace the whole-hearted desire for co-operative advancement of all nations on terms of mutual amity and goodwill.

The interchange of discoveries between the nations has long been in operation. All scientific discoverers throughout the world virtually pool their resources and communicate to each other their results, except indeed those of a destructive and inhuman character. Secrecy is alien to the spirit of science; and all true wealth increases in value when freely shared.

Indeed, that is the test of true wealth, as Mr. Ruskin long ago pointed out—namely, that the more it is shared the more it is possessed and the greater value it has for everybody. Witness the broadcast distribution of music and drama and works of art generally. These are not things for private possession only, but can be shared and enjoyed by all. Things of this sort constitute the true wealth of humanity, and to that category scientific discoveries belong.

The spirit of nationalism is wholesome enough if it be held reasonably and without flaunting claims to superiority. The spirit of emulation is also wholesome, for it is by no means the same as competition. Emulation is the desire to do something better than has been done before, and better than others have as yet learnt to do it; while competition is merely the effort to monopolise some activity, to do things instead of others, and to prevent others from taking their due share in the beneficent work of the world.

#### Natural Evils.

Hence progress surely lies in the direction of co-operation all round, each nation and each individual doing his best, and not seeking to prevent others from doing theirs. Nations which interchange scientific discoveries might also wisely interchange commodities, since not every locality is equally suitable for producing everything. Division of labour of a sane and salutary kind might be recognised as good. And international jealousies, based on mere rivalry and competition, ought to cease, especially rivalry and competition in such

things as armaments and instruments of destruction.

Civilisation ought to have progressed too far by now for the perversion of ingenuity responsible for the construction of diabolical and otherwise useless mechanism, and the artificial increase of those natural evils, among which it is our lot to live, and against which it is our business to contend.

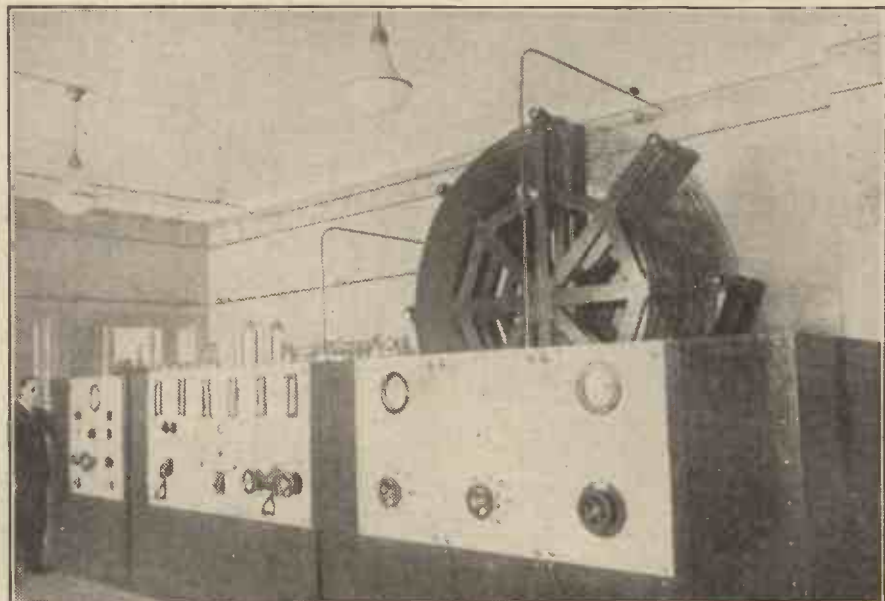
#### Towards a Worthy Goal.

Sorrow and sighing there must be in plenty during this planetary existence, without our trying to increase their sum, without adding to each other's difficulties, and without bringing about those horrors of death and torture and destruction which, when they occur by inadvertence or by accident or by the unconscious and uncontrolled forces of Nature, arouse world-wide feelings of sympathy and desire to help.

"Our wills are ours, we know not how;  
Our wills are ours, to make them thine,"

as Tennyson wisely sang.

And until the will of man is brought into harmony with what we can gather of Divine intention, humanity cannot be called really and effectively civilised, although it may achieve marvellous feats of locomotion, and although it has extended the range of human speech to distances undreamt of by our ancestors. Now that we are able to travel farther and faster, we should travel to some good purpose. And now that we can speak across a continent, let us see to it that we have something worthy to say.



The 10 kw. wireless transmitter at Reval.

# OUR BIRTHDAY.

## "P.W."—AGE TWO.

By THE EDITOR.

On Friday, June 2nd, two years ago the first issue of "Popular Wireless" was on sale to the Public. This week we celebrate our second birthday.

LOOKING back over the files of POPULAR WIRELESS until issue number one is reached is like looking back over a period of one's own life, because the last two years have been so closely associated with the production of this journal that it seems an integral part of my very existence.

If the reader casts his thoughts back a couple of years, he will remember that when P.W. made its debut the whole country was just becoming excited about the possibilities of broadcasting.

In America the boom had started, and picturesque tales about the wonders and attractions of listening-in were daily appearing in our newspapers.

### Early Days.

An agitation for a broadcasting service in this country had been started; the late lamented 2 M T did its splendid bit every week and fanned the flame of public interest; the Hague was received "on crystal" at the average of about 5,000 times a week (according to super-enthusiastic amateurs) and the time seemed ripe for a popular journal devoted to the interests of the wireless amateur and experimenter.

And so P.W. started. I think those early days were some of the best post-war days in my life. For the first issue the staff consisted of myself and a typist; for the second, of Mr. G. V. Dowding, since famous for his participation in the "Unidyne" invention, the typist; a good friend, by name Dossett, who gave much valuable assistance in his spare time, and myself!

But once started we grew like Jack's beanstalk, and to-day P.W. has a special Technical and Sub-Editing staff; a staff to deal with readers' queries; a consulting staff, headed by that great pioneer of wireless, Sir Oliver Lodge, and special correspondents in all parts of the world.

It was obvious from the very first issue of P.W. that there was a very large public interested in wireless as a hobby. One hundred thousand people bought the first issue of this journal—and remember, broadcasting was only a rumour in this country at the time—and this number has steadily increased ever since until P.W. can to-day claim the largest circulation of any weekly or monthly wireless journal in the country.

But this success would never have been achieved had it not been for the loyal support and devoted co-operation of the staff.

Both Mr. Dowding and Mr. Rogers—the latter joined the staff some six months after the issue of number one—have laboured like Trojans to gain the premier place for P.W., and no words of mine can adequately express the appreciation I have for their services. And every reader knows and appreciates the bright work of "Ariel," whose weekly notes and frequent articles in these pages are such a feature of our policy.

The Technical Queries department, in charge of Mr. P. R. Bird and Mr. L. W. Corbett, has grown rapidly. Over five hundred letters are received a week, each letter containing, on an average, three queries—and some of them decidedly of the "stinger" variety!

interest in our progress. His advice has proved invaluable—not only in technical matters, but in other ways in connection with the journalistic side of the production of P.W.

The publication of the details of the "Unidyne" invention so close to our second birthday marks the beginning of a new epoch in the career of this journal and in the history of wireless. I think readers will forgive me for feeling very proud and happy that two members of my staff should have solved the problem of H.T.-less receivers, and for adding that, from what I know of Messrs. Dowding and Rogers, their output is by no means ended!

It seems very trite to say that wireless makes rapid progress, but it is a truth that is so constantly being borne out in actual practice that it becomes more remarkable as it becomes more trite; wireless progress does make astonishing reading and exactly what stages we shall have reached this time next year—who dare say?

Since we made our debut we have seen the birth of the B.B.C. and the phenomenal growth of that phenomenal band of enthusiasts.

### P.W.'s Aim.

Captain Eckersley and Captain West have accomplished wonders in "S.B." and in relaying concerts from America. The Sykes-Round Magnetaphone is another marvel about which I could write many pages of copy; the efficiency and triumph of the broadcasting of the King's Speech at the opening of Wembley; the progress made by Marconi and Franklin in very short wave transmission; the progress in television experiments made by Fournier D'Albe, Swinton, Jenkins, and others; the development of the valve as a big kw. generator; and the amazing growth in the popularity of listening-in. . . . Indeed, the past two years have been cram full of wireless achievements.

And still it goes on: the researches of physicists such as Lodge, Rutherford, Thomson, Bohr, Aston, Soddy, Bragg, and many others, are daily revealing new wonders about the electron and the whole constitution of matter—of the Universe—and all their work helps to accelerate the progress made in radio work.

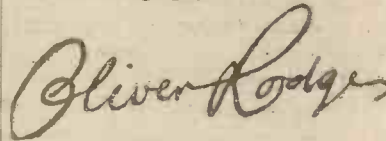
But, however rapid and vast the progress made, it will always be the endeavour of P.W. to keep its readers informed of the latest developments and to justify its claim as the most popular and most reliable of all wireless periodicals.

To all the many kind friends and constant readers who have sent P.W. birthday messages—the best thanks of the staff and myself are due. May our third birthday be as happy and the prospects as bright!

### THREE SPECIAL GREETINGS TO "P.W."

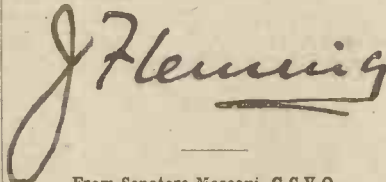
From SIR OLIVER LODGE, F.R.S.

I hear that POPULAR WIRELESS is celebrating its second anniversary this week, and I write to wish it well in its effort to interest amateurs, not only in practical details, but in an understanding also of the general principles which underlie the remarkable development of human ingenuity called Radio or Wireless Telegraphy.



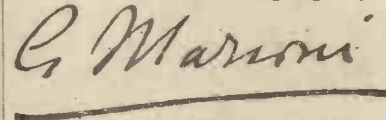
From Dr. J. A. FLEMING, F.R.S.

As this is the second birthday of POPULAR WIRELESS let me send my warmest congratulations and all very best wishes for the prosperity and success of your excellent journal in the future.



From Senatore Marconi, G.C.V.O.

On the occasion of its Second Anniversary, I send to POPULAR WIRELESS my very best wishes for its continued success and future prosperity.



But they will tell you with justifiable pride that such is the efficiency of the department that no reader is kept waiting more than three days for an answer. In fact, at the moment of writing, the queries are answered and posted the same day as they are received!

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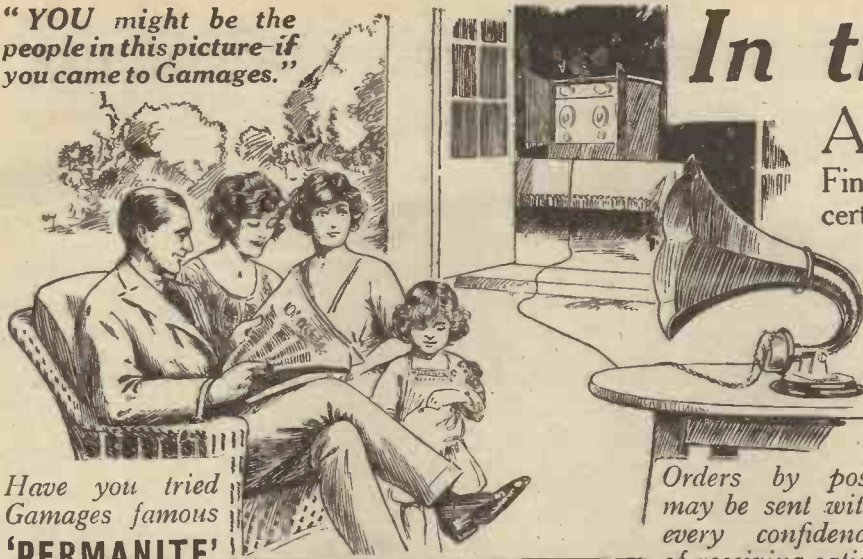
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# GAMAGES

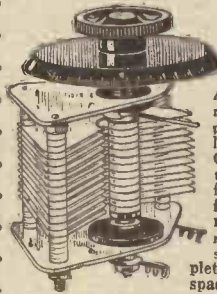
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# A TWO-VALVE "UNIDYNE" RECEIVER.

## HOW TO BUILD AND OPERATE IT.

### PART I.

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

The inventors of the "Unidyne" principle of H.T.-less receivers describe in the following article the construction of a very compact two-valve "Unidyne" receiver. The essential features of this receiver are its simplicity of control and the excellent amplification obtained.

ONE of the most useful combinations of valves is undoubtedly that of one detecting with reaction and one L.F. amplifier. With a receiver employing this it is possible to operate a loud speaker very comfortably quite a distance from a broadcasting station. On quite an average amateur aerial, with a water-pipe earth, the particular set which we are going to describe has brought in Birmingham on a loud speaker at a distance of 70 miles, and this while 2 L O was transmitting 16 or so miles away. Plug-in coils are provided for, so that its wave-length range can be said to be "unlimited."

#### Construction Very Simple.

Again we wish to emphasise the fact that we do not claim that any of the Unidyne circuits are capable of greater ranges of reception, or of providing greater volume of signal strength than ordinary H.T. circuits. There are, of course, many great advantages possessed by the Unidyne, but these are obvious.

The theoretical diagram of the two valve-Unidyne is shown in Fig. 1, and doubtless to the surprise of our many critics, it will be seen that there are no more components required than with an ordinary

two-valve set. It has been said that to eliminate H.T. one must introduce circuit complications. Fig. 1 will quickly disprove that statement. On strict analysis it will show that a Unidyne two-valve receiver is, if anything, *actually simpler*.

#### Dull Emitter Valves.

With regard to Fig. 1, the first point that will strike readers is the absence of anode circuit transformers. These are unnecessary now that valves are being made that have been specially designed for use with Unidyne circuits, for the following reason. The valve electrodes have been brought nearer together than is the case with four electrode valves, as have been manufactured hitherto, and the weak anode current due to the electron emission can be taken direct to the additional grid and overcome the "resistance of the valve" with the assistance of the battery positive bias without the necessity of "stepping up."

With a one-valve Unidyne use a transformer by all means, as besides imparting a certain amount more liveliness to the action of the grids, it introduces reaction lag, which is to a certain extent advisable when one has only one valve.

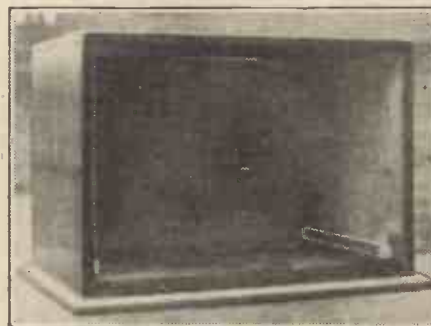
Again referring to Fig. 1, a single-pole double-throw switch will be seen, this is for the purpose of

bringing in either one or two valves as required.

In passing, we would like to mention that during the past week or two we have been

experimenting with four electrode dull emitters, and have discovered one that operates perfectly in all Unidyne circuits and requires but a very small battery indeed. We believe and trust that this valve will shortly be on the market.

The two-valve Unidyne is constructed on American lines, and with the absence of our



The cabinet before the panel was mounted.

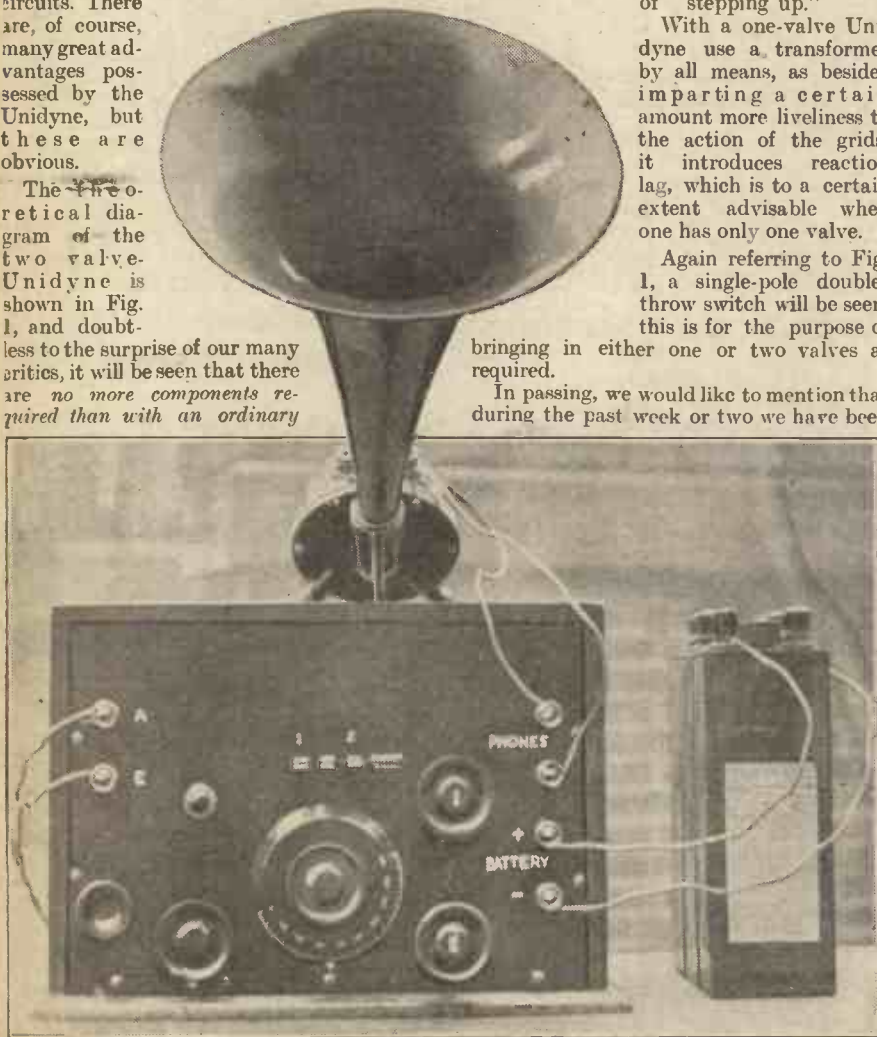
late bulky friend the H.T. it makes a very neat and attractive outfit. Moreover, besides proving quite ornamental, this two-valve Unidyne is a receiver that even the totally uninitiated will be able to handle quite safely and obtain really good results. A small reaction coil, only just sufficiently large to bring the set on to the point of oscillation when the coils are tightly coupled, can be fitted so that "howling" cannot occur, and then there is no damage that carelessness can do unless actual violence be employed.

A certain amount of care is required in construction, as with any type of receiver, but it seems hard to go wrong with a Unidyne. First-class components are advised if first-class results are to be guaranteed.

#### Necessary Components.

The actual components required are as follows: One two-way coil holder; one L.F. transformer; one .0005 mfd. variable condenser; one grid leak, preferably variable; one grid condenser .0002 mfd.; one fixed condenser .001 mfd.; two filament resistances, type optional, but should be of good make; double-throw signal-pole switch, various terminals, wires, screws, etc.

Some enthusiastic constructors will doubtless desire to make or assemble every one of the above components themselves, and there is no reason why they should not do so, but as the vast majority will be purchasing the parts complete so that with a minimum of delay they can place their Unidynes in commission, we will have to refer the minority to previous articles published in "P.W." For instance, in the last issue the construction of an L.F. transformer was detailed in full in the article describing the



The complete receiver with battery and loud speaker. The two knobs on the left are for reaction main and Vernier control.

(Continued on page 492.)

## A TWO-VALVE "UNIDYNE" RECEIVER.

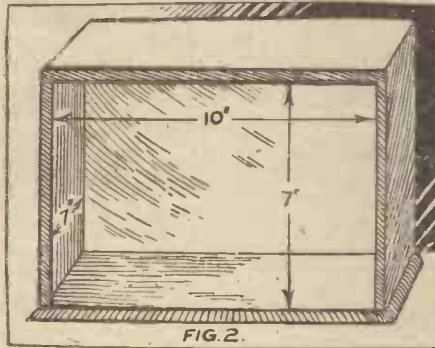
(Continued from page 491.)

construction of a Unidyne L.F. amplifier; this transformer is quite suitable for the two-valve Unidyne at present under consideration.

### Construction of the Cabinet.

The case will be the first consideration, and unless the constructor is a good carpenter it will be as well to place this part of the work in the hands of an expert, as upon the finish of the case will depend to a very great extent the appearance of the completed receiver.

Material used should be  $\frac{3}{8}$  in. through-out. Any wood fancied can be used,



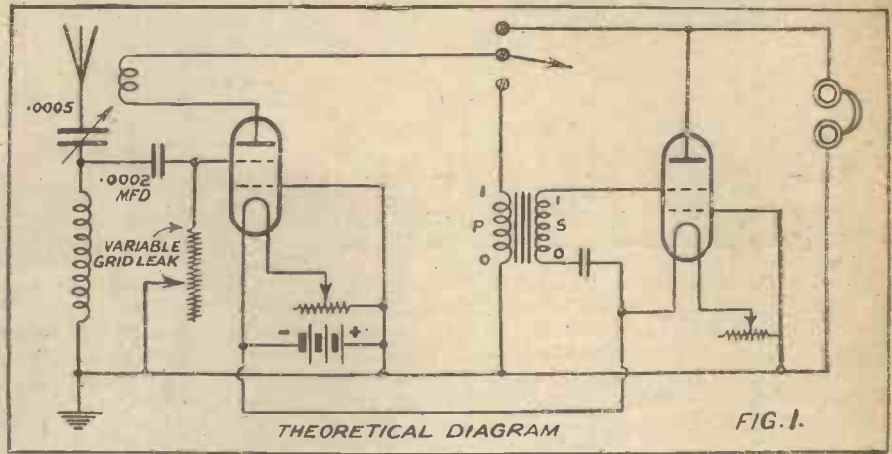
although preference should be given to teak, mahogany, or oak in that order. The case consists of two portions; the case proper, Fig. 2, and the ebonite panel and base, as at Fig. 3A. Upon this latter all the components are mounted permanently, so that complete accessibility is obtainable by merely sliding the panel and base out of the case when required. 10 in. x 7 in. x 7 in. are the internal dimensions of the case, the bottom of which should have an  $\frac{1}{2}$  in. bevelled edge jutting out all round.

The ebonite panel should be 10 in. x 7 in. and  $\frac{1}{8}$  in. in thickness. The wooden base to which the ebonite is fixed should be 10 in. x  $6\frac{1}{8}$  in., although it can, of course, be slightly smaller than this all round to provide an easier sliding fit into the case. The same applies to the ebonite panel, although it is better to work to actual dimensions and ease them off gently later, if necessary, with a file.

### Securing the Panel.

The ebonite panel should be fitted with side pieces, as at B, Fig. 3, in order to hold it the more securely. These side pieces should be let into the baseboard, as shown. The baseboard and side pieces should be of  $\frac{3}{8}$  in. material similarly to the case.

Some amateurs may prefer to leave the fixing of the ebonite panel on the baseboard until they have the components mounted and everything is ready for wiring, but we found that having the panel so mounted was rather an assistance to the rest of the work as it could be slipped into the case and drilling carried out from the front. Naturally, if this procedure be

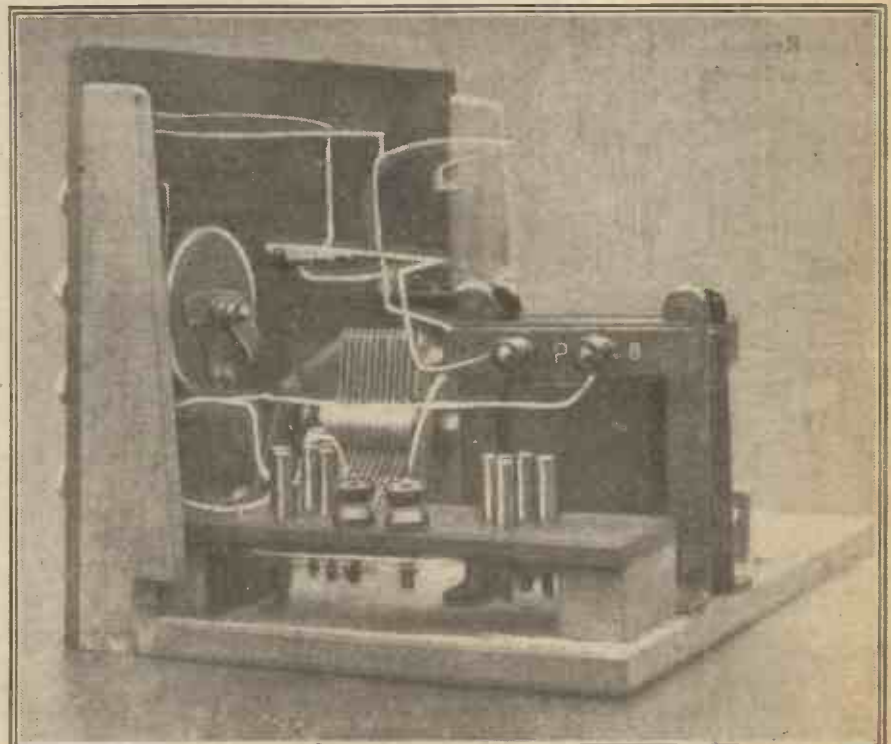
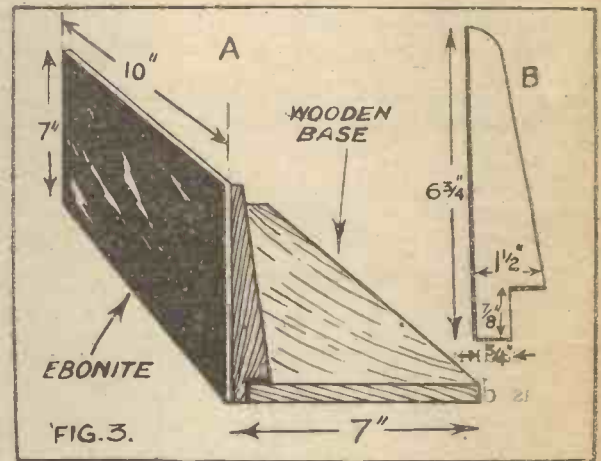


adopted care must be taken not to scratch the front of the ebonite or the case, although in any case the final polishing of this latter should be left to the last if it is being "home-made."

that side of the "tray" which will be nearer to the side of the case in order to permit ample clearance of the small struts. (Continued on page 495.)

### The Valve Tray.

Now we come to the "valve tray," as shown at Fig. 4, and clearly to be seen in the photograph. This should consist of a piece of  $\frac{3}{8}$ -in. ebonite 6 in. x  $1\frac{1}{2}$  in. It should be drilled for five-pin valves, if such are to be used, but can be drilled to standard dimensions and provided with two terminals if four-pin valves are in hand. Two small hardwood blocks  $1\frac{1}{2}$  in. x  $\frac{7}{8}$  in. x  $\frac{1}{2}$  in. should be cut and fastened to the ebonite strip at the two extreme ends by means of small wood screws. A  $\frac{1}{2}$  in. clearance should be left on



This photograph effectively shows the simplicity of the Unidyne wiring.

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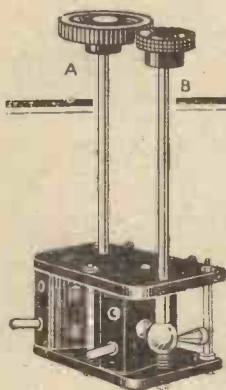
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# THE "UNIDYNE" AND THE SCEPTICS.

By THE EDITOR.

An Answer to Some Premature Criticisms.

WE have already pointed out to readers the striking contradictions concerning the P.W. "Unidyne" invention which have recently appeared in one of our contemporaries. These have now been followed up by details for the construction of a "High-Tensionless" Receiver, employing four electrode valves, so it would seem that in the minds of the gentlemen controlling the technical destinies of that journal; the idea of effectively cutting out

the H.T. from a set is not so comically impossible as their first thoughts led them to believe. In passing, we might mention that the circuit arrangement is a conventional one, with the H.T. left out, and has little in common with the highly developed "Unidyne" circuit. One similar to it we thoroughly tested and examined some months ago. The results were appreciably inferior to those obtained with the "Unidyne" circuit. The arrangement of the variable grid leak in the "Unidyne" circuit, especially in long-range reception, and the special transformer connections, make all the difference.

### The Amateur's "Credulity."

However, we are glad to note which way the wind blows at last, and that our contemporary has now come to the conclusion that the pioneer research work of Messrs. Dowding and Rogers has at least shown up new avenues of investigation in connection with the four-electrode valve.

Another contemporary seems uncertain about the direction of the wind—metaphorically speaking.

In its May 21st issue we find these words: " . . . to those who are interested in exploiting the public, and in some cases, we fear, trading on their credulity and lack of technical knowledge to further mercenary interests."

Of course, the cap may not be intended to fit the "Unidyne"—but in any case, the point about "lack of technical knowledge," and "credulity," is one which is vastly complimentary to the majority of amateurs interested in the technical side of wireless.

There is a good deal more like this in the

same issue, but which we will spare our readers, except one final quotation:

"It follows logically that startling announcements regarding new discoveries which may appear in other sections of the Press, or apparatus for which new and arresting claims are made, when not dealt with in the columns of this journal, may be understood to have been 'found wanting.'"

Readers will thus perceive that if the journal in question does not mention the "Unidyne" it will, in the opinions of the directors of that journal, be "found wanting"—a sentence which will no doubt clash rather conspicuously with the "sentence" passed by Messrs. Bower Electric, Ltd., who are sole licencess of the "Unidyne" patent, and some fifteen other gentlemen connected with the technical departments of such well-known firms as Cossors, B.T.-H., Mullard, Ediswan, Siemens, Ltd., the Ever-Ready Co., Metropolitan-Vickers, Ltd., and many others.

These gentlemen had the courtesy to refrain from criticism until they had investigated our claims. Whatever their individual opinions were, they kept them to themselves until after a demonstration—a demonstration, by the way, which resulted in their unstinted praise and admiration for the "Unidyne" invention.

### The End of the Matter.

And so, if our contemporary chooses to keep its readers in the dark about the "Unidyne" and thus give the impression that the invention is "found wanting," in spite of the proof to the contrary which we have made public, it will doubtless regret such a short-sighted policy in the long run. Our circulation and advertisement average is far away the largest, and we know that the great majority of amateurs are among our readers, and that they realise that it is natural that P.W. should hold the exclusive publication rights of the "Unidyne," especially in view of the fact that both inventors are on the staff of this paper.

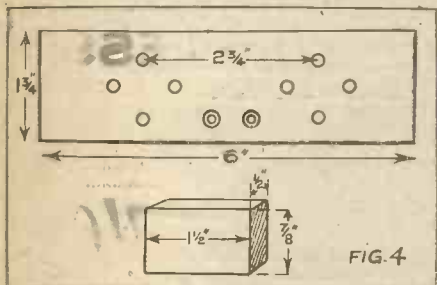
Therefore, we treat with amused tolerance the comments of our contemporaries.

And there the matter must end.

## A TWO-VALVE "UNIDYNE" RECEIVER.

(Continued from page 492.)

These latter, which should be of  $\frac{1}{4}$  in. teak, should be so fitted in the interior of the case as will allow the baseboard and panel to run in smoothly and yet provide a firm "groove" in order that the whole structure may be rigid. If this part of the work is carefully carried out there will be no necessity to provide a "catch" or any-

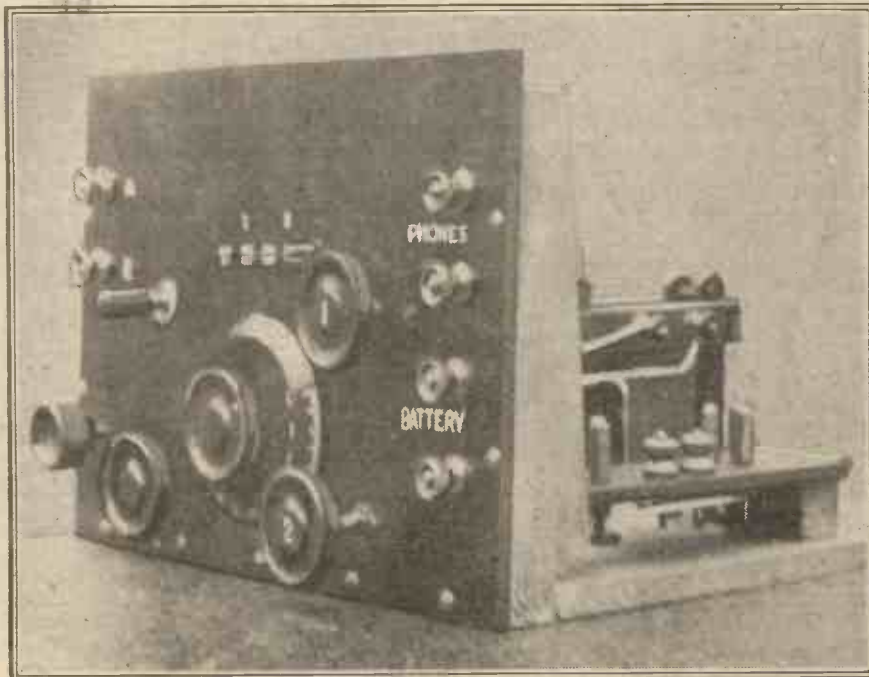


thing of such nature to hold the panel in position, and yet the panel should slide in and out without undue force having to be used when it is desired to inspect or rather exhibit the interior. If well made, Unidyne receivers should never require "internal" attention, and the more that readers become acquainted with them the more they will realise how many previous valve set ills and ailments can be traced directly and indirectly to the one time essential H.T.

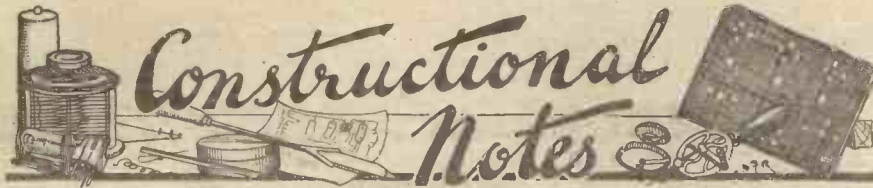
[Another instalment of this article will appear in next week's issue. Order your copy of "P.W." NOW.]

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The "Unidyne" is mounted on a panel and baseboard, so that it can slide into the cabinet.



Conducted by Dr. J. H. T. ROBERTS, F.Inst.P.

**Lead-in Without Drilling.**

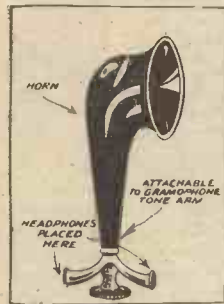
Sometimes it is inconvenient to drill holes in the window-frame for the purpose of bringing in the lead-in wire from the outside aerial. In such a case, it is possible to get the same effect by means of a condenser, of which the glass window-pane forms the dielectric.

Paste a sheet of tinfoil, say a foot square, upon the inside surface of the pane, and another sheet, the same size, opposite to it on the outside surface of the pane; the sheets may be pasted to the glass by means of shellac.

The lead from the aerial is connected to the outer piece of foil, and aerial terminal of the set to the inner sheet of foil. The two pieces of foil act as a series condenser in the aerial circuit.

**Loud Speaker from Headphones.**

The arrangement illustrated herewith forms the subject of Patent 197,435/23 (G. R. Judge), and is for the purpose of making a loud speaker from a pair of headphones.



Headphone loud speaker.

A Y-shaped member is fitted to the lower end of the conventional trumpet, the open ends of this latter member being of the proper size for the headphones to be fitted to them. The sound from the 'phones is thus conveyed into the trumpet and issues from the bell-shaped mouth in the usual way.

**French Polishing.**

By removing the trumpet, and fitting the Y-shaped member to the tone-arm of a gramophone, the sound-box of the gramophone being first removed, the sound-trumpet of the gramophone may be utilised instead of the trumpet illustrated.

It is comparatively easy for the experimenter to obtain quite good results at french polishing, with a few simple instructions and precautions. The wood must first of all be carefully smoothed with fine sandpaper, and stained the desired colour, by means of stain which can be purchased. The absorbent properties of the wood must then be overcome by "filling."

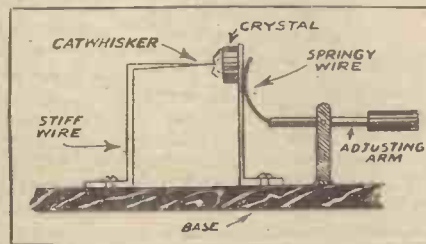
With small work, successive thin layers of the french polish itself may be used, but for larger work, a solution of "size" should be used. Each successive coat may be rubbed down with fine sandpaper before the next is applied. After a suitable surface has thus been obtained, the french polish surface itself is laid on.

This is done by means of a wad of clean cotton wool, soaked in the polish, and then covered in a layer of linen, so as to prevent fibres from adhering to the work. The

polish will soak through the linen, and a drop of linseed oil may be applied to the outer surface of the latter. When the pad is ready for use should be applied to the work with a circular motion.

After a thorough "body" has been given to the surface coating, the work should be laid aside for 24 hours, after which the surface may be given a final polish with a little spirit carefully applied.

**Vernier Adjustment of Crystal Pressure.**

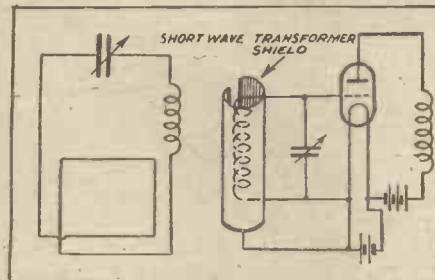


Vernier adjustment of pressure.

When the cat-whisker comes into contact with the crystal, or when two crystals come into contact with one another, an infinitesimal further motion may produce a large increase in the pressure between them. For this reason, devices for varying the pressure must have an element of resiliency, as there is practically none in the contacts themselves.

A simple and novel arrangement for varying the pressure is that shown in the accompanying diagram (Patent 194,800/23). The cat-whisker is a fairly stiff wire, with sharp point, and the crystal is mounted upon a fairly stiff support, the two nearly in contact. The crystal support is pushed forward by moving a control handle to which is attached a cam-shaped or scythe-shaped piece of springy wire or strip.

After contact is established between crystal and cat-whisker, a considerable further motion of the control-arm is necessary for a comparatively small increase in the pressure, the device thus providing a



Transformer shield for short waves.

simple vernier control of pressure. The same mechanism may be employed for gradually varying the distance between two spark electrodes, or for varying small distances generally. The invention is described as being particularly applicable to toy wireless sets.

**Transformer Shield for Short Waves.**

The diagram herewith illustrates the short-wave transformer shield invented by H. J. Round, the well-known wireless engineer, and assigned to the Radio Corporation of America. A metal sheet is bent into cylindrical form, so that its straight edges do not quite touch one another. This partial shield is placed around the secondary of the transformer, as shown.

This arrangement greatly decreases the interference from short waves, often due to certain kinds of electrical machinery in the vicinity or neighbourhood of the set, internal-combustion engine ignition, and so on.

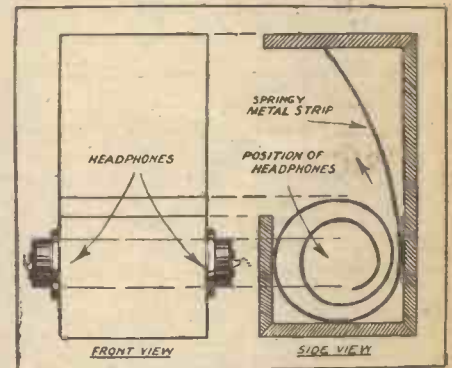
**Restoring Efficiency of Coils.**

In making up coils yourself you should be careful not to use any binding material which is in any way likely to absorb moisture, otherwise the occurrence of damp weather will soon result in a marked decrease in the efficiency of your set. Unfortunately, some of the coils on the market are not free from this defect.

However, if you should suspect your coils of being damp, it is a good plan to remove the binding carefully, and bake the coil in a gently warm (not hot) oven for a few hours. It is better to subject to a gentle heat for a long time than to a severe heat for a short time. Celluloid is a suitable material with which to replace any strip which has proved defective, as the latter material does not absorb moisture.

**A Curious Loud Speaker.**

Many people believe that there is some subtle property about a sea shell in virtue of which it is naturally adapted for the



Curious loud speaker trumpet.

amplification of sound. Whether this is so or not, many attempts have been made to construct loud-speaker horns on a similar principle, but the solid geometry involved has proved rather formidable. An American inventor (Donnell, Pat. 209,555/24) has devised a simple method of making a trumpet which has a somewhat similar formation to that of a shell.

A strip of thin springy metal, about 6 inches (or more) in width, is formed into a spiral as shown herewith, and the metal spiral is secured between two flat wooden boards, so that the resulting sound-channel is spiral with flat sides. Holes are drilled in the two sides of the box, in the region where the spiral commences, and the headphones may be placed in position so that the sound enters the spiral channel. Details as to the angle of the spiral and other dimensions, unfortunately, are not given.

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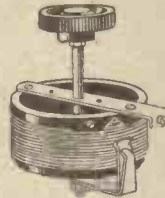
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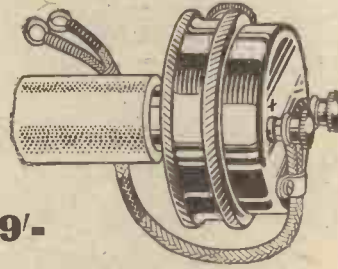
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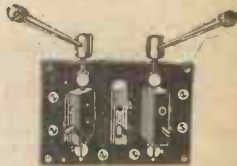
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# EFFICIENCY IN L.F. AMPLIFICATION.

## HOW TO GET GOOD LOUD-SPEAKER RESULTS.

By E. J. WYBORN, A.C.G.I.

Amateurs who specialise in loud-speaker reception should pay quite as much attention to the receiver as to the loud speaker, as the former is usually the main cause of distortion and unsatisfactory results.

UP to the present, we have taken the amplifier in its most common present-day form—i.e. with transformer coupling, and have showed how to minimise the distortion due to transformer resonance, and how to avoid distortion introduced by incorrect valve operation, and by the use of unsuitable valves.

### Three Types of Amplification.

Transformer coupling is not the only method of L.F. amplification, but is one of three possible methods, the other two being resistance-capacity coupling and choke or reactance-capacity coupling. At the present time in probably ninety-nine cases out of a hundred, owing to the fact that it gives a "step-up" of voltage between the valves, thus enabling the same magnification to be obtained with a smaller number of valves.

Unfortunately, however, this advantage is somewhat discounted by the fact that more distortion is introduced by transformer coupling than by the other two systems, and it seems likely that in the future, as excellence of quality becomes of more importance than at the present time, the transformer method will have to give way to some extent to the other less efficient, but less distorting methods.

A consideration of resistance-capacity coupling, the least distorting method of the three, will also give a good idea of the general principles involved in the design of L.F. amplifiers. In Fig. 1, A, is a diagram showing the principle of the system. A high resistance  $R$  (50,000 to 100,000 ohms) is connected in the plate circuit of the valve, and the voltage variation across this resistance, caused by the variation of plate current, is communicated to the grid of the next valve by means of the coupling condenser  $C$ .

### Resistance Coupling.

The change of voltage in the plate circuit of the valve produced by a given change of grid potential has to produce a change of current in both the anode resistance and

Now the voltage variation across the resistance ( $E_r$ , Fig. 1) is, with a small loss in the coupling condenser, applied to the grid of the next valve, whilst the voltage variation across the valve ( $E_v$ ) is not utilised.

It is thus our object to make the voltage drop across the resistance  $E_r$  (Fig. 1) as large as possible, relative to the voltage drop across the valve, and this is attained

(Fig. 2). From this curve we see that when the value of the external anode resistance  $R$  is equal to the resistance of the valve, the amplification obtained is equal to half of the amplification factor of the valve, which is what we should expect, as the voltage pulsations are then equally divided between the external resistance and the valve.

### Increased H.T. Voltage.

When  $R = 4R_v$ ,  $A = 0.8\mu$ , and this value is seldom exceeded in practice, owing to the increased H.T. voltage necessary. This increase of H.T. voltage is one of the principal drawbacks to resistance coupling. It is evident that there will be a voltage drop across the anode resistance, and this voltage must be added to the ordinary voltage of the H.T. battery if the plate voltage of the valve is to be kept at the correct figure.

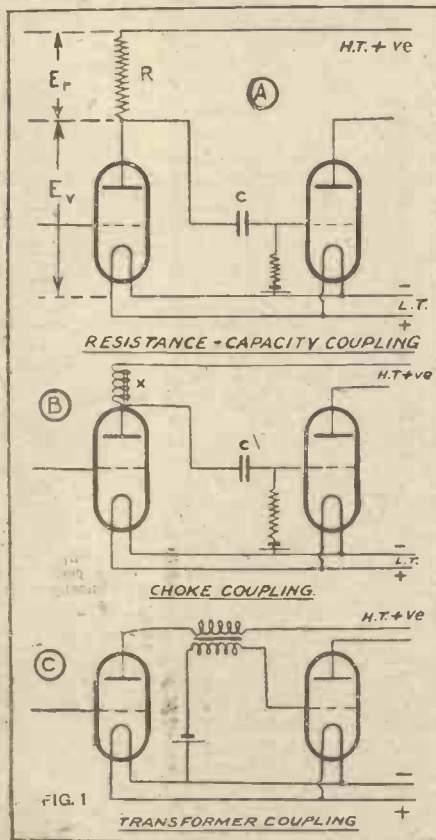
Thus, if  $R = R_v$ , the H.T. voltage must be twice normal, if  $R = 2R_v$ , it must be three times the normal figure, etc., and this consideration really limits the value of  $R$ , and therefore the value of the amplification obtained.

To illustrate the principles set out above, we will consider a three-stage resistance-capacity coupled amplifier employing two  $R$  valves and an L.S.3, the latter, of course, in the last stage. Plate voltages of 80 for the first valve, 100 for the second  $R$  valve, and 120 for the L.S.3 are suitable, the grid potential being: 2 volts for the first valve, 3 volts for the second, and 6 for the L.S.3.

### Three-Valve Amplifier.

The circuit diagram of the amplifier is given in Fig. 3. The value of the first anode resistance (or input resistance) will, of course, depend on the impedance of the rectifier, and should be high in the case of a valve (100,000 ohms is the highest value usually obtainable). In the case of a crystal, the value of the input resistance should be lower, 50,000 ohms being suitable.

(Continued on page 500.)



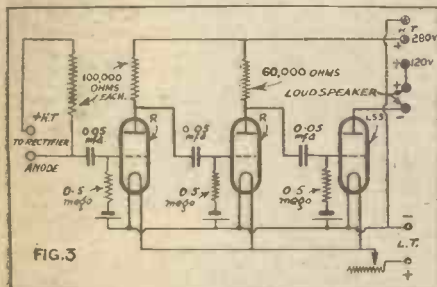
by making the anode resistance as great as possible. The actual value of the amplification obtained is given by the expression :

$$A = \mu \frac{R}{R + R_v}$$

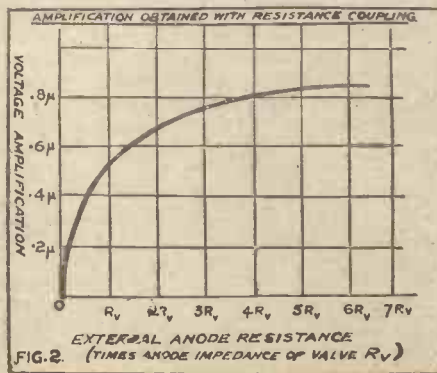
(where  $R_v$  is the internal impedance of the valve,  $R$  is the value of the external resistance and  $\mu$  the amplification factor of the valve).

Thus, when the value of  $R$  becomes infinite,  $R_v$  is relatively negligible and  $A = \mu$ . The maximum amplification which is ideally obtainable with resistance-capacity coupling is thus equal to the amplification factor of the valve.

The values of the amplification  $A$ , given by different values of  $R$  (obtained from the above expression), are shown in the curve



in the valve itself, i.e.—the change of voltage is shared between the anode resistance and the anode-filament circuit of the valve.

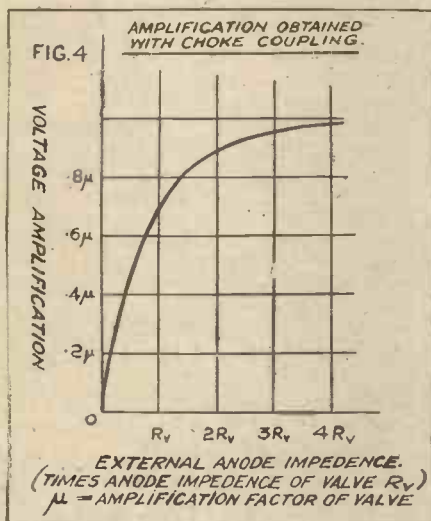


## EFFICIENCY IN L.F. AMPLIFICATION.

(Continued from page 499.)

With a grid potential of 2 volts, the impedance of an R valve is 40,000 ohms, so that an anode resistance of 100,000 ohms will necessitate an H.T. battery of  $3.5 \times 80$  or 280 volts, and will give an amplification of nearly three-quarters of the maximum obtainable.

In the case of the second R valve the impedance is 30,000 ohms, and if the same H.T. battery is to be used, an anode resistance of 60,000 ohms will give 100 volts on the plate of the valve, and nearly 7 times the amplification of the valve.



The impedance of the L.S.3 is 12,000 ohms, and this low value enables maximum amplification to be secured, as it approximates to the impedance of the average high-resistance (2,000 ohms) loud speaker. As there is only the resistance of the loud speaker in the anode circuit, an H.T. voltage of 120 or 130 volts will be ample, a tapping being made in the H.T. battery for this purpose.

The value of the coupling condenser, which is necessary to keep the plate voltage from the grid of the next valve, may be between .01 and .1 mfd., and it is not critical. If the value is too low, the condenser will offer an appreciable impedance to the lower frequencies, which will therefore be amplified less than the higher frequencies. If, on the other hand, the coupling condenser be too large, distortion will be introduced by the fact that the grid potential will not have fallen to its initial value before the arrival of the next pulsation.

### The Inter-valve Condenser.

As a general rule, the larger the coupling condenser the lower should be the value of the grid leak, which is necessary to allow the potential of the grid to return to its initial value. Good values are .05 mfd. for the coupling condenser, and .5 megohms for the grid leak, which may be of the ordinary type as used for rectification.

### Anode Resistances.

Ordinary grid leaks are, in general, unsuitable for this purpose, as the resistance is required to carry the whole plate current of the valve, which may be 2 or 3 milliamperes, without change of value. Any changes in the value of the resistance will produce crackling noises, which are very objectionable. The special anode resistances manufactured by the Dubilier Company are very satisfactory.

### Choke Coupling.

In this method, also known as reactance-capacity coupling, an iron core choke is used instead of a resistance (see Fig. 1, B). Distortion is always introduced by the use of an iron core owing to the hysteresis and eddy currents set up, but by the use of a stalloy core, built up of thin laminations, this is so reduced as to be almost negligible.

The coupling condenser and grid leak are similar to those required for the resistance-capacity method, and the system has the very important advantage that the H.T. battery need not be materially increased, owing to the low direct current resistance of the choke.

Owing to the fact that the large number of turns of wire required for the choke have capacity as well as inductance, there is a tendency for resonance on some particular note or notes, making it very difficult to secure equal amplification of all the different notes. This, of course, produces distortion and renders choke coupling inferior to resistance as regards quality.

The amplification obtained is given by

$$A = \frac{X}{\sqrt{X^2 + R_v^2}}$$

where  $X$  is the reactance of the choke. Fig. 4 shows a curve plotted from this expression, and from this it will be seen that nearly 90 per cent. of the maximum amplification is obtained when  $X = 2 R_v$ , whereas with resistance coupling  $R$  must be equal to  $7 R_v$  in order to obtain the same amplification.

### Transformer Coupling.

The maximum amplification is the same as in the case of resistance coupling—i.e. equal to the amplification factor, but in practice 90 per cent. of this is easily obtainable as against 70 per cent. in the case of resistance coupling.

In Fig 1, C, the most common of the three methods, a primary winding wound on an iron core is connected in the plate circuit of the valve and a separate secondary winding is connected in the grid circuit of the next valve. The method has the advantage that by choosing a suitable turn ratio, a "step-up" of voltage is obtained, so that the amplification obtainable is not limited to the amplification factor of the valve.

The resonance trouble is, however, aggravated by the capacity between the two windings, and it

is extremely difficult to design a transformer which will amplify equally all the frequencies used in music. The turn-ratio of a transformer is no guide to the amplification actually obtained, and the writer has actually met a case in which an instrument with a low turn-ratio gave greater average amplification than another instrument by the same firm in which a higher turn-ratio was employed.

Resistance-capacity coupling introduces less distortion than the other methods, and will give quality of reproduction unobtainable by any other means. It gives, however, less amplification than either of the other methods, and requires a much greater H.T. voltage. Resistance-capacity coupling is used for the amplifier between the microphone and the transmitter in most of the broadcasting stations.

### Loading the Transformer.

Choke coupling gives somewhat greater amplification and does not require a large H.T. voltage. It introduces, however, somewhat more distortion.

Transformer coupling gives the greatest amplification, a voltage amplification of 25 being often attained. Much more distortion is, however, introduced than in the case of the other two methods.

The amateur in quest of perfect quality, regardless of cost, will employ resistance coupling, and he will be well repaid. When cost is an important consideration, transformer coupling should be chosen, but high ratio and cheap instruments should be rigidly eschewed.

Should distortion occur when transformer coupling is employed, care should be taken that the valve is operating under the best conditions possible, and the effect of a grid bias should be tried. A resistance or condenser across the secondary of the transformer will assist in cutting out the distortion, though signal strength may be decreased somewhat. The effect of the condenser or resistance (about 25-50,000 ohms) is to load the secondary of the transformer, and thus flatten its resonance curve and prevent it from amplifying some frequencies more than others.

The resistance can be made of paper or wood and indian ink.

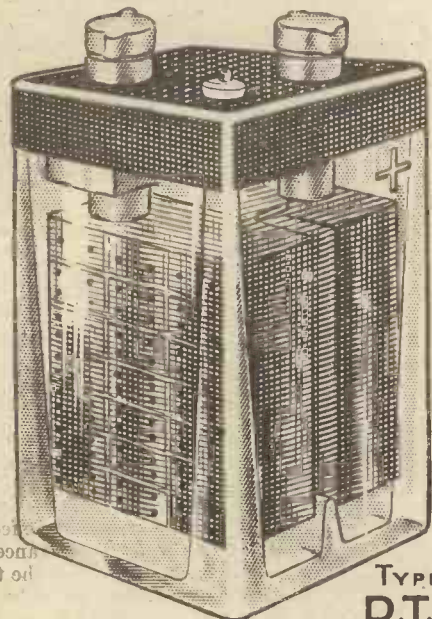


Street organs have given place to portable loud-speaker receivers in Berlin. One of the new "organs" in operation.

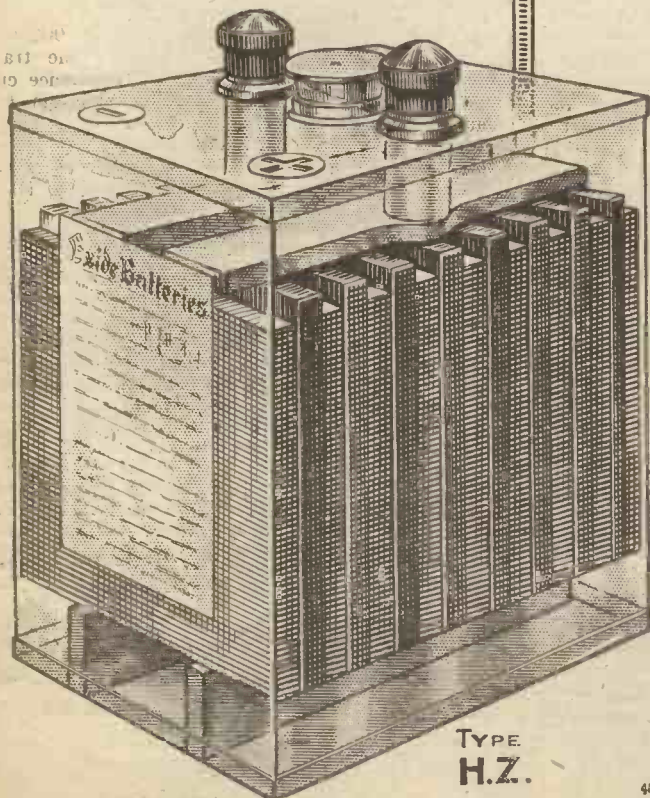
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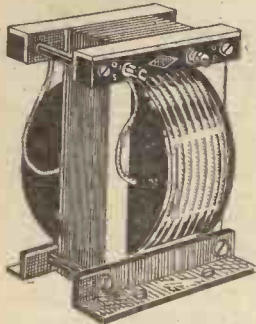
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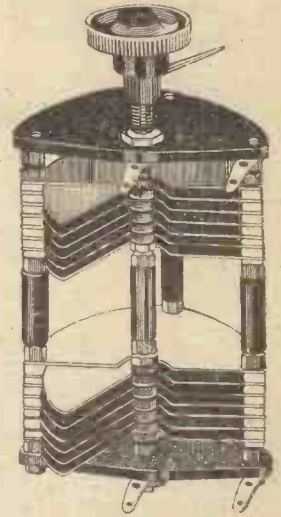
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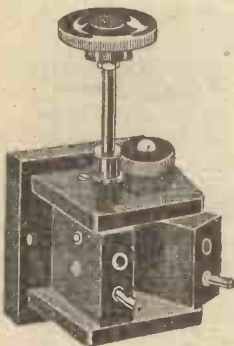
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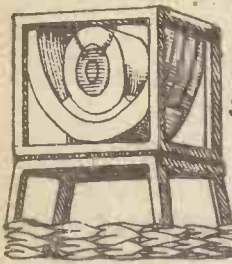
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# Artistes of the Aether

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



**V**ARIETY is the present key-note of 2 L O's programmes, and consequently we have had a very wide range of musical art, and most of the instruments represented by artistes of first calibre.

The organ is not so popular an instrument in England as in America, possibly because it is associated only with the church or school-days, but it is gradually gaining a stronger hold.



Mr. William Wolstenholme.

From the broadcasting standpoint, however, the pipe-organ is by no means an ideal medium, as so many of its effects fail to "carry over." Some of the most popular of the organ concerts have been carried out by Mr. William Wolsten-

holme, the blind organist and composer, from the National Institute for the Blind, at Great Portland Street.

Another well-known artist is Miss Edith Penville, one of England's leading lady flautists.

Miss Penville has not only broadcast on several occasions, but was one of the first musicians broadcast from Marconi House to the first wireless exhibition, and subsequently it was found that this transmission had been heard perfectly at Rotterdam.

## 2 L O's Programmes.

The works of such a composer as Arnold Bax are often unsuitable for broadcasting purposes, though in the concert hall he has obtained a large following. Gaining his technical experience at the Royal Academy of Music under Tobias Matthay, and composition under Frederick Corder, Mr. Bax developed a propensity for writing lengthy elusive works that lend themselves well to lovers of technical display.



Mr. Arnold Bax.

Amongst the best known of his vocal works is a cycle of "Celtic Songs," set to the words by Fiona Macleod, and his violin and piano-forte Sonata in E,

which was the one chosen to broadcast, with Frederick Holding and the composer as executants.

Humour has been safe, however, with John Henry" calling, and more old

memories have been revived by that famous comedian, Charles Coborn.

One of the old guard, Mr. Coborn has had his triumphs at all the principal music-halls in the country, including the Empire in its palmiest days when it was the first music-hall of London. At this theatre is still told the story of how Coborn, as clever at "make-up" as he was composer and actor, was waiting his turn in the "wings," when a newly-made and fussy director, taking him for the coster loafer he undoubtedly looked like, had him thrown out by a delighted stage hand who entered into the joke.

## Newcastle.

From time to time there arises a vogue for the work and ways of the American Red Indian, and, following a full performance of Coleridge Taylor's Indian opera "Hiawatha" at Royal Albert Hall, there has been caused, one might say, an "epidemic" of this work. After the example of 2 L O, Newcastle devoted an evening to the woes of the Indian maiden, with Beatrice Paramor in the title-rôle. New-



Miss Edith Penville.

castle also indulged in a Brahms evening, but re-deemed itself with a perfect programme of English songs, interpreted by one of the greatest baritones in the country, Herbert Heyner.

## Cardiff.

Having announced a programme of Dvorak's music, the Symphony in E minor was inevitable. Best known under its title "From the New World," it was intended to be a musical picture of America. Consequently much of it is tinged with the negro folk songs and dances.

For their Magic Carpet series to Mexico, Miss Dorothy Clark, the South African Contralto, and Herbert Heyner were the vocal "passengers," while for the seventh of this fascinating series, a trip to Portugal, the "pilot" was Professor Joseph Burt, F.R.G.S.

A very wide field of art was covered in the sixth concert of Chamber Music, works ranging from Purcell to Arensky and Bridge, the chief artiste announced being Robert Radford, of the B.N.O.C.

## Bournemouth.

Several stations have displayed an attraction for Handel programmes, and Bournemouth last week scored well with "The Messiah," amongst the principals being Dorothy Street, Kathleen Dance, Arthur England, and George Dale. The 6 B M choir and wireless orchestra was under the direction of Captain Featherstone.

To the aria "The Trumpet Shall Sound"

George Dale played the obbligate. Mr. Dale is attached to the B.B.C. station and is one of the best known of their instrumentalists. The Bournemouth Municipal Orchestra was also relayed from the Winter Gardens under the baton of Sir Dan Godfrey, the soloists being Herbert Smith and Dorothy Clarke.



Mr. Charles Coborn.

For the Comic Opera Night we had the familiar old-time work by Planches, and "Les Cloches de Corneville." In this was Harry Nightingale, a remarkably fine young singer. A night with Schubert also included the services of Herbert Heyner and a performance of the great "Unfinished" Symphony.

## Glasgow and Aberdeen.

Glasgow also essayed a Brahms programme, including the lengthy Symphony No. 2 in D, and a movement from the Double Concerto for violin, 'cello, and orchestra, with Isaac Loswosky and John Dickenson as soloists.

On the lighter side we had "Falka," the comic opera of H. B. Farnie and F. Chassaigne.

Aberdeen gave us a unique idea in "Beautiful Harmonies from Great Discords."

I can't agree with closing down for one minute on the 7th inst., even though it marks such a tragedy as the torpedoing of the "Lusitania." If German artistes are to fill our Royal Opera House as though there had never been a war, then I am afraid it is useless to look back on any atrocity performed during that cataclysm.



Mr. George Dale.

# EXPERIMENTS IN TELEVISION.

## PROGRESSING TOWARDS SUCCESS.

By **SEXTON O'CONNOR.**

This is the first of a series of two articles by a well-known contributor to "Popular Wireless," who outlines the chief systems employed by Television research workers.

**T**HE problem of wireless television is that of presenting far-off scenes or pictures to the eye in much the same way that distant sounds are at present made audible to the ear. When perfected the system will in effect constitute a wireless cinema of unlimited scope and variety. In operation, the picture at the far end is first translated into a corresponding electrical effect and so conveyed through



Mr. C. F. Jenkins, an American television experimenter who has achieved considerable success within the last twelve months.

the ether to the receiving station, where it is restored to its original form.

This may appear fantastic, but we are living in the midst of an amazing flood of scientific discovery and achievement. Thirty years ago the bare suggestion that we might one day listen at our own firesides to the voice of an American speaking in New York would have been considered ridiculously far-fetched. Yet within the next few years there is every reason to expect that we shall be able not only to hear but also to see across the Atlantic.

### Early Methods.

In view of the fact that POPULAR WIRELESS AND WIRELESS REVIEW recently paid a solatium prize of £150 in recognition of his meritorious television researches, it is the purpose of the present article to give a brief outline of the progress that has already been made. This should not only prove of interest to the general reader, but may also serve to stimulate some of the more enterprising wireless enthusiasts to a serious study of the whole subject.

The first approach to the general problem of television inevitably lies along the trodden path of picture-transmission by the earlier methods of line-telegraphy. It is therefore necessary to glance at such methods, to reject those which are not adaptable to television proper, and finally to consider in greater detail certain new

systems which, though not yet fully developed, give promise of ultimate success.

In one of the earliest and crudest methods of photo-telegraphy the picture is first divided by horizontal and vertical lines into small squares, and a code signal is used to indicate the brightness of illumination of each square in turn. The squares are dealt with in a predetermined order, and the receiving operator, being acquainted with this order and with the code employed, is thus able to set up a picture corresponding roughly with the original. In a later development the picture is reproduced automatically by causing the code signals themselves to vary the intensity of a source of light which illuminates the successive squares of a sensitive film.

### Light and Shade Effects.

In the system due to M. Bélin the picture is formed in relief, the lights being represented by elevations, and the shades by depressions. The picture so prepared is then wrapped on a rotating and axially-advancing cylinder, across which a stationary sapphire point traces a spiral line over the hills and dales of the picture.

The sapphire is connected by a lever to a rheostat or microphone in the transmitting circuit, so that its movements are converted into variations of line current. At the receiving end a photographic film is wrapped round a cylinder, which is rotated and advanced in step with the transmitting cylinder. The line-current variations control the brilliancy of a glow-lamp or arc lamp, and in this way are reconverted into light variations which reach the film through a small aperture. On account of the movement of the film, this aperture traces a spiral line similar to that of the sapphire at the transmitter, and so reproduces the light and shade effects.

### The Korn System.

The tracing point and the picture to be transmitted may both be formed of conducting material and connected directly in the line circuit, the varying thickness of the relief picture giving it a variable resistance according to the different density areas of the original. In the Dieckman process of picture transmission, which is somewhat similar, an ingenious synchroniser is provided for keeping the transmitting and receiving cylinders in step with each other.

Another system, developed by M. Korn, utilises a selenium cell for varying the line current. The picture is formed as a transparency and is wrapped on a transparent cylinder which contains a source of light. The selenium cell is arranged in much the same way as the Bélin sapphire tracer, so that its illumination is continually varied in accordance with the density of the picture elements. Obviously a number of separate selenium cells may be used in combination, each being responsible for the transmission of a definite portion or zone of the picture and operating independently of the others. Successful results with this system have been achieved by the late Professor Rhümer of Berlin.

### Drawbacks.

In a more recent method of photo-telegraphy referred to subsequently in detail a stream of electrons is utilised for traversing the elements of the picture at the transmitting end, and a similar stream of electrons, impinging on a fluorescent screen,



Another view of the Jenkins television apparatus. Details concerning it will be given next week.

is caused to reproduce the picture at the receiving end.

It must be remembered, in considering the applicability of these methods to the problem of television, that picture telegraphy is a comparatively leisurely process in which each picture may take several minutes in transmission. In order, however, to produce a continuous vision of moving objects, it is necessary to send at least ten complete pictures per second. Each picture must therefore occupy in transmission only one-tenth of a second, and must then be replaced by another slightly different picture. In view of this requirement, it is clear that any method involving the contact of a metal or sapphire stylus with an undulating picture would be impracticable from the point of view of speed. It also fails because it entails a preliminary preparation of each picture.

(To be continued next week.)

# Mainly About Broadcasting

by The Editor

LETTERS from several readers of POPULAR WIRELESS who have already constructed sets embodying the P.W. "Unidyne" principle reached me a few days after the publication of the articles describing the construction of a one-valve "Unidyne" set. The very first letter received, from Mr. Priestley, is published on page one of this issue, and although "Ariel" accused me of cribbing space from his "Notes and News," I felt that Mr. Priestley's letter deserved a conspicuous position in this journal. So on page one it went, despite "Ariel's" sulks.



Lord Gainford.

That the first letter from a reader who has built a set on the "Unidyne" principle should contain such an excellent report, must prove encouraging to other potential constructors, and somewhat of a set-back to those pessimists and doubters who, despite the publication of the opinions of experts who had heard and tested the set, believed that "P.W." was running something in the nature of a glorified "stunt."

From SIR RONALD ROSS, K.C.B.,  
K.C.M.G., F.R.S.

I am very glad to see that POPULAR WIRELESS is now celebrating its second birthday, and I write to wish it every success in the future. Although I do not possess a set myself, I often dip into the paper and find many interesting articles.

With compliments,  
Yours sincerely,

That this P.W. "Unidyne" principle can be easily embodied in a set is shown by the remarks made by Mr. Priestley in his letter, and that the results are as good as a set using H.T. is further borne out by this correspondent and by the results he has obtained.

**Rodo Patents Ltd.**

Readers will be interested to note that an announcement appeared in our last issue concerning the manufacture and conversion of broadcasting apparatus in accordance with the "Unidyne" circuit.

Rodo Patents Limited are now the sole licencees of "Unidyne" patents, and they are prepared to grant licences for the use of all patents in connection with the manufacture or conversion of broadcasting apparatus to any member of the British Broadcasting Company, Ltd. All apparatus so licensed, and on which royalties have been paid, will bear a special "Unidyne" stamp,

(Continued in column 3.)

## GREETINGS TO "P.W."

From LORD GAINFORD (Chairman of the B.B.C.).

It gives me pleasure to send a message of good wishes on the occasion of the second anniversary of POPULAR WIRELESS.

There is no doubt that your excellent paper has contributed materially to the spread of interest in wireless telephony, as it combines technical information with popular features which are very acceptable to the listening public.

The British Broadcasting Company are glad that the promoters of the wireless journals recognise that the interests of the B.B.C. and the wireless journals are identical. They are not surprised to learn that as the number of listeners increases, the number of wireless periodicals increases also.

I feel sure that POPULAR WIRELESS will celebrate many more anniversaries, and that it will continue to grow in prosperity and in usefulness to the public.

Yours faithfully,

From THE B.B.C. STAFF.

Please accept our hearty congratulations and good wishes on the attainment of your second birthday.

Since broadcasting began in this country thousands of people have found their ideal hobby in wireless work, and in POPULAR WIRELESS a weekly collection of articles and comments which cannot have failed to have stimulated and encouraged a wide interest in a fascinating hobby.

Several of us have, from time to time, had the pleasure of contributing to your columns, and all of us have noticed with pleasure the sympathy and interest shown in the efforts of the B.B.C.

It is, therefore, with the heartiest goodwill that we congratulate "P.W." on the occasion of its birthday, and take this opportunity of sending our cordial good wishes for its continued success and prosperity.

Yours sincerely,

R. F. PALMER, C. A. LEWIS,  
DAN GODFREY, Jun., L. STANTON  
JEFFERIES, K. D. WRIGHT, P. P.  
ECKERSLEY, H. BISHOP, A. D.  
G. WEST.

and any persons or firms manufacturing or offering for sale broadcasting apparatus of the "Unidyne" circuit which does not bear the stamp will render themselves liable to legal proceedings for infringement. Applications for royalty stamps should be made to the Bower Electric Co., Ltd., 15, Grape Street, Shaftesbury Avenue, London, W.C. 2, who are the sole agents for Rodo Patents, Ltd.



Mr. Arthur Burrows.

## Atmospherics.

The recent spell of warm weather has had the inevitable effect of stirring up atmospheric, and readers who have fixed up sets since last autumn are probably making a painful acquaintance with noises in their telephones suggestive of the frying of eggs and bacon, and the crunching of gravel by an L.C.C. steam roller. I mention this in case some novice feels he has a grievance against the B.B.C. transmissions, and writes to Captain Eekersley to tell him so.

The effect on the B.B.C.'s chief engineer might be interesting, but it won't stop "X's."

From Mr. ARTHUR BURROWS.

How time flies!

One of the earliest indications for the British public that the night would soon be filled with music was the appearance in the early summer of 1922 of No. 1 of POPULAR WIRELESS, a magazine which has not only done much to stimulate public interest in broadcasting, but by its criticism and general activity has helped to keep the broadcasters in touch with their unseen audiences.

May POPULAR WIRELESS continue to progress in the years to come in the same manner as it has done in the months that are now past! If it does so, then the future is a great one.

Yours faithfully,

No one has yet found a way of cutting them out, so we have just got to grin and bear it. Anyway, we should be thankful that the B.B.C.'s wave-lengths are all reasonably short, and the atmospheric noises, in consequence, are not too bad, especially when using a loud speaker. But if you switch over to Radiola, as I did the other evening, the row is pretty fierce in the 'phones, especially if there is any thunder about.

It is always just as well to fit an earthing switch to the sets. Merely opening the aerial switch is not a guarantee of safety, as a spark could easily jump it if the aerial were struck by lightning.

## JOTTINGS FROM 5 I T.

By OUR BIRMINGHAM CORRESPONDENT.

Some interesting news and comments concerning the popular Midlands broadcasting station.

**DURING** the past few months 5 I T has been, it seems, increasing its points in the matter of out-of-the-studio broadcasts. From January 1st up to May 3rd there were broadcast two special church services and four outside concerts, as well as a speech delivered by the Lord Mayor of Birmingham at the Birmingham Town Hall, and last, but not least, the inaugural recital of the Bournville Carillon.

One of the four concerts was a special concert by 5 I T's own artists in aid of the Lord Mayor's Distress Fund, and so great a success was it that there was not a single empty seat in the Town Hall, and the amount of £130 was cleared for the fund.

### A Humorous Incident.

The latest of the broadcast concerts was a band concert by the Birmingham City Police Band, facetiously described as an attempt on the part of the police to locate receivers. In addition to broadcast events described above the station has also broadcast the first organ recital at the Town Hall by the new City Organist, Mr. E. D. Cunningham, this event taking place during the midday hour and supplying the occasion for 5 I T's first mid-day broadcast.

With regard to the two church broadcasts, in each case the particular church was well over a mile distant from the station, and in each case one microphone was used, and proved effective. In the first instance, when a service was broadcast from St. Augustine's Church, Edgbaston, there occurred an incident which suggests the problems which sometimes arise in broadcast management.

During the voluntary at the end of the service an interested chorister and his companion halted near the microphone to examine it. The former read the manufacturer's inscription upon it, and read it aloud, with the result that the listeners-in heard him repeat, above the sound of the organ, "Made in England." Without hesitation the man at the switchboard cut out, and thus though listeners were deprived of the last chords of the voluntary, they did not hear any other remarks which the chorister may perhaps have made.

### Further Proposals.

In broadcasting the inaugural recital of the Bournville Carillon 5 I T made wireless history by anticipating 2 L O's proposal to arrange, if possible, a transmission of the famous Malines Carillon.

The Bournville Carillon, which is now one of the finest in England, was set up by Mr. and Mrs. George Cadbury in 1906, and in memory of the late Mr. George Cadbury was increased to 37 bells, and the completed carillon was inaugurated by M. Nauwelaerts, carillonneur of Bruges.

A microphone of the same type as is used for broadcasting Big Ben was placed

in a sealed tin on a parapet running around the belfry, and connected up with the amplifier (designed by Mr. J. A. Cooper, chief engineer at the station), which is so portable that one man was able to carry it up the winding belfry staircase.

It has now been proposed that 5 I T should broadcast the annual memorial service which the cyclists of England hold at Meriden, said to be the centre of England. As yet the idea is being considered by



A section of the 500-mile range wireless telephony installation on the great liner, s.s. "Deutschland."

the engineers, and no decision has been made. There has lately been remarked the sequel to an interesting request made to Mr. Appleby Matthews, who for a short time last summer broadcast from 5 I T. Mr. Matthews, a well-known figure in Midland musical circles, received after he had conducted a broadcast concert, a letter in which the writer (Freddie John, of Birmingham) thanked him for "the wholly unexpected pleasure and privilege of hearing him play. I never dreamt I should hear you," he wrote. "You see, I am bedridden, having, through an accident, injured the

spine years ago, and I have to be in my room far from the madding crowd."

"A Great Pleasure."

"This letter was written by my holding a pencil between my teeth while lying flat on my back I only heard the broadcasting for the first time on Saturday, and it is a great pleasure already. Ask them to aim high in their standards. Could we not have a whole Wagner evening, or a Beethoven or a Bach evening? I know nothing about music, and I can only learn to be a good listener. I have heard on my player piano the "Parsifal" prelude and March to the Holy Grail, the "Mastersingers" prelude, and three rolls of "Lohengrin."

"We have Beethoven's 3rd and 5th Symphonies, the Emperor Concerto.

I also have Chopin's Berceuse, and I want you to play it for me, because I have never heard this thing of beauty hand played. I hope we also get operas broadcast and I—even I could hear one then."

The sequel is that the plea of this suffering boy was willingly met. The Berceuse was played for him, and every piece he delighted in has since been broadcast, and many another thing beside.

### Broadcasting a Service.

Mr. H. Cecil Pearson, who for the last six months has been an announcer at 5 I T, has been presented by the station staff with a set of pipes on his leaving Birmingham to take the appointment of station director of the new relay station at Liverpool, which opens on June 11th. His successor at Birmingham is Uncle Felix, or rather Mr. A. Pelham, who was connected with the Marconiphone, Ltd., staff at Birmingham, and who has considerable experience in wireless work.

Mr. Colin H. Gardner, Midland organiser of the Radio Association, and a contributor to "P.W." was responsible for an interesting experiment at a Staffordshire church. He installed a six-valve set and suspended two Amplions—one over the pulpit, and one over the choir stalls. He tuned in the hymn being transmitted in the religious service at 5 I T, and so good was reception that the congregation stood and joined in the singing which the loud speakers led. The service was a great success, and people travelled many miles to be present.

## Technical Notes

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

### Preserving the Valve.

**WHEN** using a valve which is at all soft, great care should be taken never to allow a blue glow to develop in the interior of the valve. If this glow appears, it is a sign that the H.T. voltage in the anode circuit is too great, and this voltage should accordingly be reduced until the glow disappears.

When the glow is present in the valve, not only are the conditions all wrong for best reception, but the valve is suffering deterioration, for the filament is being

vigorously bombarded by positive ions produced from the residual gas in the bulb. This bombardment rapidly shortens the life of the filament.

### Power from the Sky.

A German scientist, Dr. Plauson, of Hamburg, has proposed a revolutionary scheme for extracting electrical energy from the atmosphere. He suggests the employment of a large number of balloons, consisting of thin metal envelopes, covered with

(Continued on page 522.)



**GENERAL RADIO COMPANY**  
LIMITED

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R. A.**



THE MULLARD R.A. was designed for amplification, but can be used equally well for all general purposes. When used as detector in "straight through" circuits the anode voltage only requires to be 30/50. In reflex circuits its stability gives easy control. As transformer amplifier the anode voltage varies from 50/100 and in the case of resistance amplifier up to 200 volts. The superiority of this type of valve for amplification was recognised during the Great War by the British and French Governments, and as a result it was used extensively for the high standard of results that were necessary. Further information and R.A. valve curves can be had upon application to Dept. (P.W.)

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# HOW TO BUILD A FLEWELLING "SUPER."

## EXPLICIT INSTRUCTIONS FOR THE HOME CONSTRUCTOR.

By J. LAURENCE PRITCHARD

(Technical Editor, Harmsworth's "Wireless Encyclopædia").

Extraordinarily fine results can be obtained with the Flewelling Receiver, and the construction of this set will fully repay the amateur who wishes to combine experimental work with first-class reception of signals.

**EXTREMELY** good results are obtainable with the Flewelling receiver, but these results are usually obtained after some amount of experiment with the set and careful readjustment of values. In the original Flewelling receiver the fixed condensers and a variable grid leak were used to obtain the necessary super-regeneration.

The circuit as described in this article is modified, and uses only one fixed condenser of .006 mfd. capacity for super-regeneration while the use of the variable grid leak across the bank of condensers is entirely obviated. A feature of the set is the two-stud switch seen to the top right-hand side.

### Construction of the Cabinet.

The use of this switch is to enable the circuit to be used as a straightforward regenerative set, and by switching the arm

to which the panel is attached is made in two pieces, which are hinged to form two doors of equal size. The back edge of each of the sides of the case is mitred at 45 deg. and the edges of the doors are similarly mitred on the edge where they fit the mitred sides. This construction allows 270 deg. of movement to the hinged doors forming the back, and enables them, when fully opened, to rest flush against the sides of the case.

The width of each door is greater than the width of the case, so enabling the set to be placed face downwards without damaging the con-

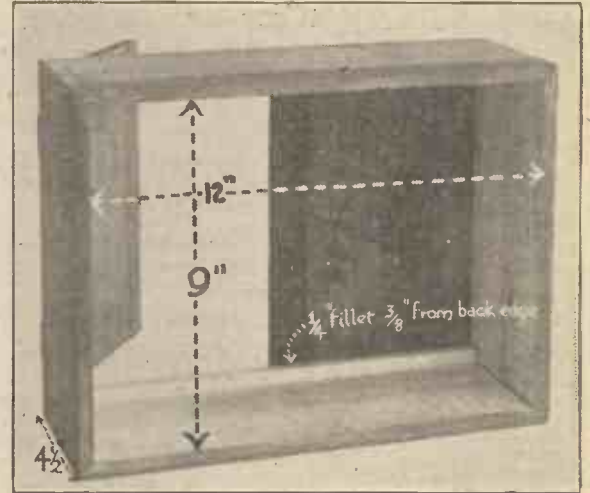


Fig. 3. Dimensional photo of the cabinet.

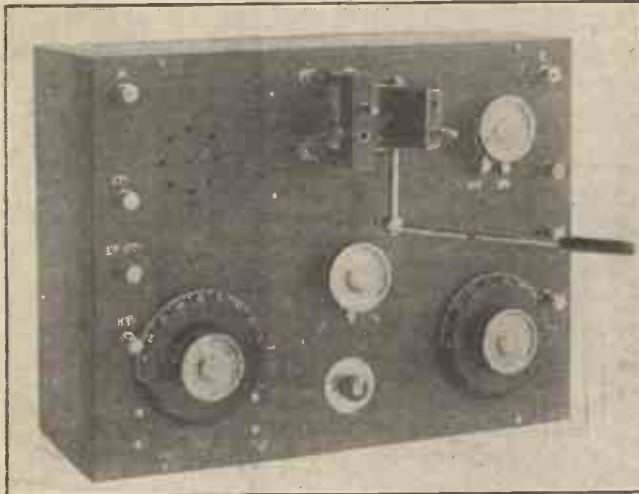


Fig. 1. The completed receiver showing the switch for changing the circuit.

over to the other side the circuit is changed into the Flewelling circuit. The switch is seen in Fig. 1, which gives an illustration of the completed instrument.

To allow of rapid and easy access to the interior of the set the back of the case

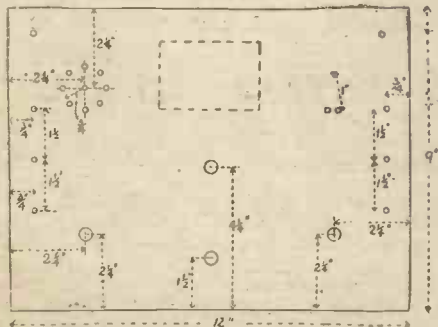


Fig. 2. Drilling template of the panel.

back to front is necessary, as it may, if of an unsuitable type, come higher than the projecting doors. In other respects the case is of usual form, the dimensional photograph in Fig. 3 giving all the details necessary for its construction.

### The Panel.

The panel, cut out and drilled to the dimensions given in Fig. 2, is of best quality  $\frac{1}{8}$  in. ebonite, and has a bevel of 45 deg. at its outer edges. It is secured

to the outside ends of the case, so that the panel comes flush with the outside of the case. Any two-coil holder of suitable pattern is attached to the centre of the panel and towards the top.

Grid Leak Critical.

### Grid Leak Critical.

Also, centrally placed below the two-coil holder, are attached a filament resistance and a variable grid leak. The latter, which is fixed in the holes shown in Fig. 2 below the filament resistance, should be of the best quality and have a variable resistance up to 5 megohms.

A variable condenser of .0005 mfd. maximum capacity is placed to the right-

(Continued on page 510.)

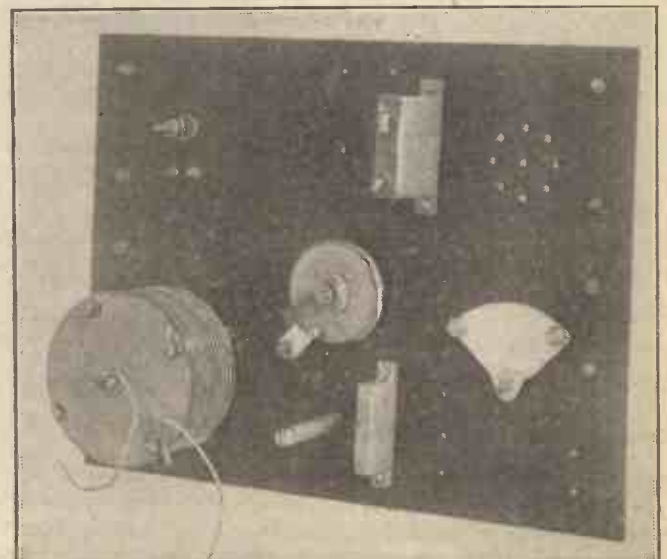
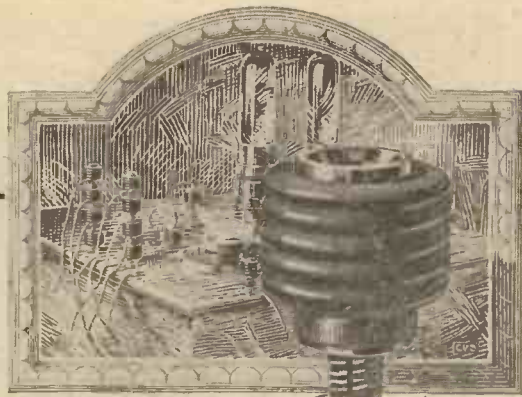


Fig. 4. The back view of the panel with main components mounted.



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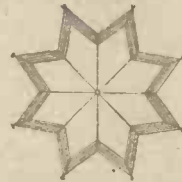


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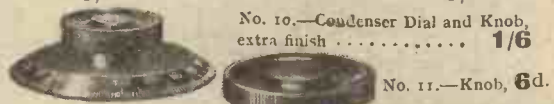
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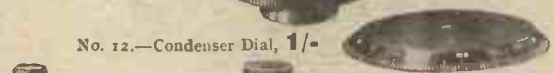
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## HOW TO BUILD A FLEWELLING "SUPER."

(Continued from page 508.)

hand corner of the panel, while a vernier condenser shunted across the larger one is fixed in a similar position to the left of the panel. Battery terminals and telephone

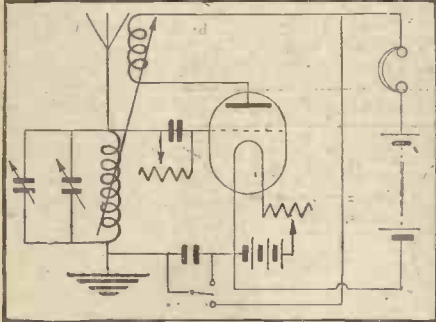


Fig. 5. Theoretical diagram of the circuit.

terminals are centrally placed to the left and right-hand edges of the panel. Three terminals are provided for the telephones. The centre terminal is not connected up to

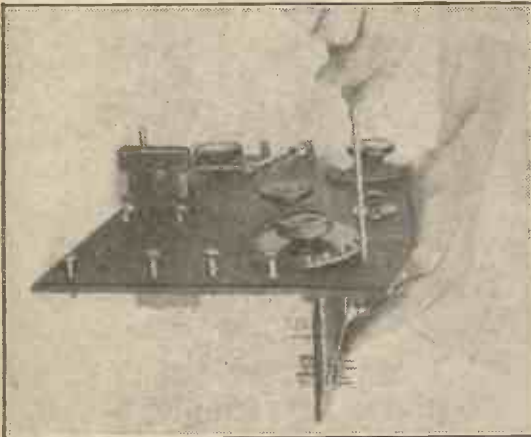


Fig. 6. Fitting the valve platform under the panel.

any part of the set, but is used for securing the two telephone tags where two telephones are used in series. Where one pair of telephones is employed, the centre terminal is not used.

### Fine Adjustment Necessary

The vernier condenser is of simple construction and does not depend on a back plate for its support, the points of attachment to the panel being found sufficient. For the fixed plates, two standard sized condenser plates are cut down as shown in Fig. 4. These are attached to the panel by means of short lengths of 2 B.A. screwed rod, screwed into tapped blind holes on the underside of the panel. Two small spacer washers are first put over each of the screwed rods, then follows the fixed plates, separated from each other by a single spacer washer. The nuts are now screwed on, thus holding the fixed plates firmly in position.

The single moving plate of the vernier

condenser is cut to the size of the fixed plates and is fixed on a short length of 2 B.A. screwed rod by means of a locking nut on either side of it. A spring washer is then threaded on, and the spindle inserted through the spindle-hole. An ebonite knob and lock nut tightened on the spindle from the outside of the panel prevent any backward or forward movement of the moving plate. They also provide means of adjusting the moving plate to clear the fixed plates.

Connection is made to the spindle of the moving plate by a flexible insulated wire soldered to its end. The completed vernier condenser is shown in Fig. 7, and the positions of the main components before the valve platform is mounted are shown in Fig. 4.

The valve is mounted on a platform of  $\frac{3}{16}$  in. ebonite, measuring  $3\frac{1}{2}$  in. by 3 in., and is placed on brass brackets as illustrated in Fig. 8. The valve sockets are centrally fixed to the back edge of the panel, and in this position are least affected by body capacities introduced in tuning.

The platform is attached to the panel to the back of the vernier condenser in such a position as to allow inspection of the valve through the peep-holes provided to the top left-hand side of the set.

### Wiring Up

The wiring operation may now be commenced, convenient positions for the two fixed condensers being shown in Fig. 7, which illustrates the completed wiring of the receiver. The wiring can be followed from Fig. 5. The

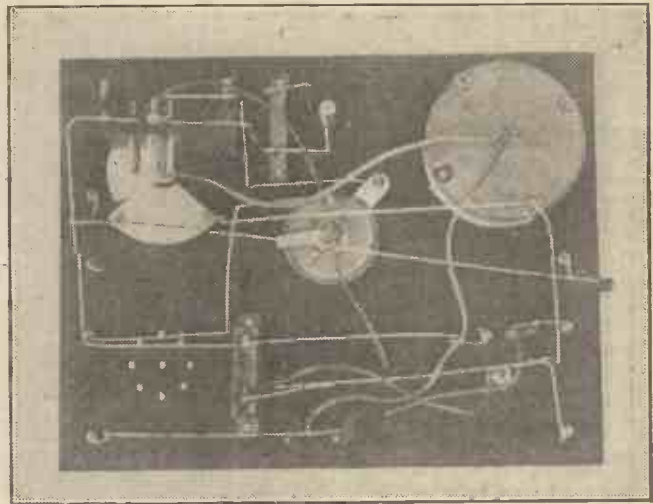


Fig. 7. The wiring is clearly shown in this photo of the underside of the panel.

grid condenser has a value of .00025 mfd capacity. When the wiring has been completed and checked, the valve and coils may be inserted for the preliminary test.

### Testing the Connections

To safeguard the valve from damage if the wiring is incorrect, the low-tension battery should be applied to the high-



Fig. 8. The valve platform ready to be attached.

tension terminals; the high tension battery not being employed at this stage. If the valve lights up under this arrangement, it is a sure indication that a wire has been wrongly connected. Both positions of the switch should now be tried.

(Continued on page 522, Column 2.)

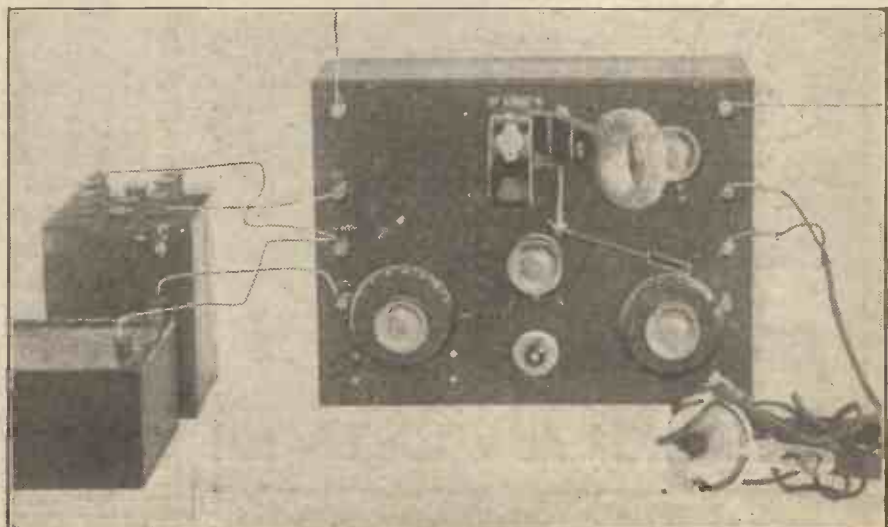


Fig. 9. The receiver connected up ready for use.

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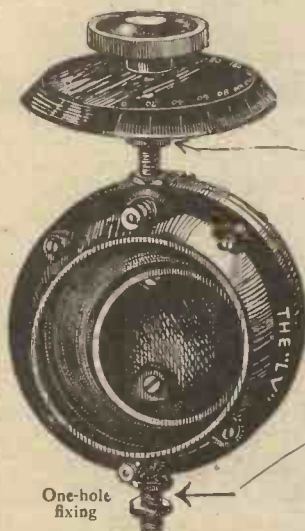


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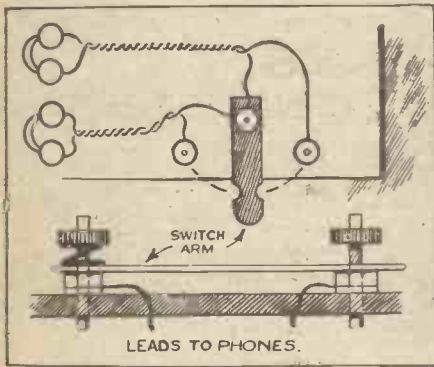
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## ADAPTING TELEPHONE TERMINALS.

WHERE frequent changes are necessary in order to include a second pair of 'phones or to change over to a loud speaker, a very simple and cheap switch can be made with a single additional terminal. Suppose, for instance, that generally only one pair of 'phones is required, but sometimes two pairs are used in series with each other.

Where the spacing permits a third terminal should be mounted between the two 'phone terminals, but where the space on the panel is insufficient for this the terminal can be placed behind the two existing terminals and equidistant from them, as shown in the accompanying sketch.

The two pairs of 'phones (or 'phones and loud-speaker leads) are then connected with one leg to the third terminal, the remaining leg of each connecting with the ordinary



terminals, and being secured by a locknut. This leaves the third terminal free for the switch arm, which consists simply of a short strip of brass, with a hole drilled at one end that is large enough to take the shank of the terminal.

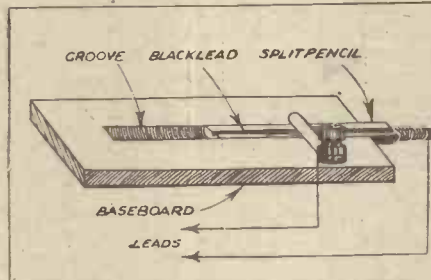
The strip is placed upon this terminal, and can swing round and make contact with either of the other terminals.

In the "off" position both leads are in circuit but either can be shorted by the switch as desired.

## A CHEAP AND EFFICIENT RHEOSTAT FOR '06 VALVES

AN accidentally broken filament resistance recently led me to try an improvised form of rheostat which I

made from a hard blacklead pencil. This has given better results than the rheostat of the wire type formerly in use, and it has the advantage of only costing a few pence, whilst the control of the current supplied to the filament is very efficient.



The construction is quite easy, but needs great care if a perfectly smooth and even contact is to result. One hard pencil of good quality forms the variable resistance, and is placed in hot water to warm until it is possible to split it open into its original halves.

One of these halves holds the blacklead, and care must be used not to bend or break it. A length of flex is now bound to the end of this, and a perfectly good contact can be made with the lead in the following way:—

Bare the flex for one and a half inches and lay it along the lead, with the insulation touching the end of the pencil. Then firmly bind the flex to the lead with a fine, bare wire, passing round and round the pencil for a distance of 3/4 in. This is half-way along the bare flex, so the latter is now bent back upon itself and the winding resumed back to the end of the pencil, and finished off.

Before commencing the winding, the end of the pencil for 3/4 in. is trimmed down, to allow the binding to sink beneath the surface level. If care is used in making the joint all that remains to be done is to provide a sliding contact bearing upon the blacklead, so that more or less of the pencil resistance may be included.

Any firm, smooth contact is sufficient, and in my own case it was afforded by the pencil sliding in a groove on a baseboard, with a short strip of brass pres-

sing down upon the blacklead. The brass was fixed to the baseboard with a terminal, to which connection was made from the dry cell.

The various makes and grades of blacklead vary widely, and as success lies in obtaining a suitable resistance, care must be exercised in the choice.

If a suitable pencil has been chosen the valve will not light up until the pencil resistance is partly cut out. It commences to glow very faintly, and this can be increased to any desired degree as the pencil is moved.

It will be seen that before the battery is connected up the pencil should be withdrawn from the slot, so that all its resistance is in circuit.

## H.T. BATTERY AND TELEPHONE CONDENSERS.

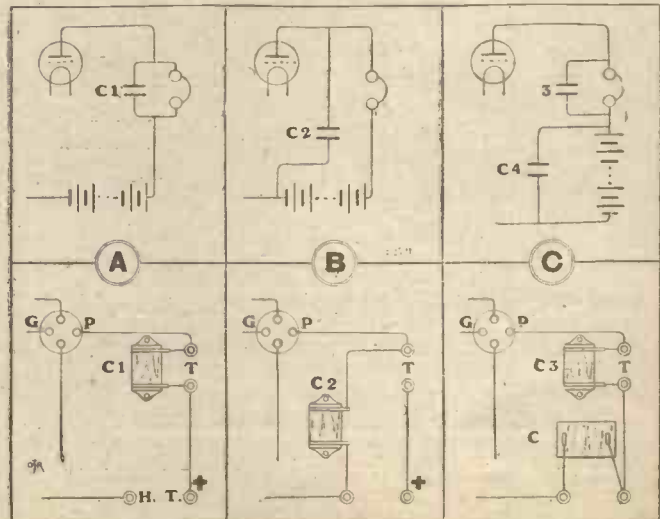
FIXED condensers connected in shunt with high-tension batteries and telephones act as storage or reservoir condensers. Signals may be heard when no telephone condenser is used, because the twin cords supply sufficient capacity to prevent any choking effect; but to obtain the best results it becomes necessary to increase this capacity by adding a small fixed condenser.

The accompanying diagrams show the three most common methods of arranging these condensers.

Suitable Values to Use.

In diagram A no high-tension battery condenser is shown, and although this would be a suitable arrangement for single-valve sets employing valves which are designed to work on a very low plate voltage, the addition of a high-tension battery condenser would be an advantage. The telephone condenser C1 may have a capacity of .001 or .002 mfd., the best value being ascertained by experiment.

In diagram B one condenser, C2, is used for both the 'phones and high-tension battery, the value of the condenser being somewhere in the neighbourhood of .01 mfd. Many amateurs prefer to provide a separate condenser for each, as indicated in diagram C, where a .001 mfd. condenser, C3, is connected across the 'phones, and a separate Mansbridge condenser, C4, having a capacity of 1 or 2 mfd., connected across the high-tension battery.





See Catalogue No. P/105 for full particulars, free on request.

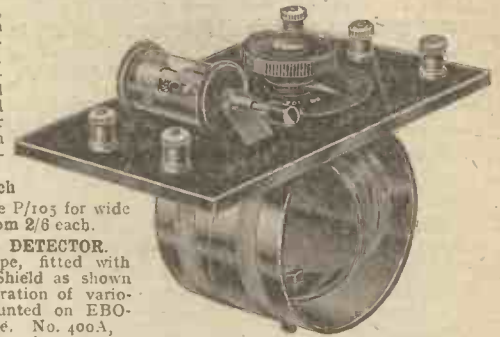
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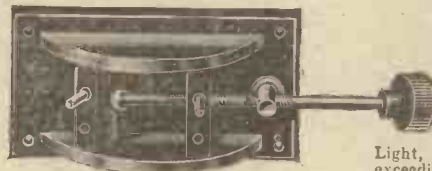
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# SELECTIVE RECEPTION.

Flat tuning is often a great drawback to many receiving sets, making it impossible to cut out a local station in order to pick up a more distant one. The hints given in this article explain how this evil can be remedied, enabling more selective signals to be obtained.

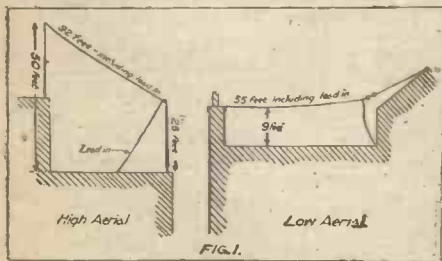
ONE of the most extensive and interesting fields for experiment in wireless reception open to the amateur is that of developing apparatus which is capable of eliminating the local B.B.C. stations in favour of the more distant stations. Ever since the second B.B.C. station commenced operations I have devoted some attention to the subject, with a certain measure of success, and the results of my experience may therefore be of some assistance to those who have so far failed.

## H.F. Amplification Necessary.

Before considering the introduction of "wave traps" or rejector circuits, every effort should be directed towards making the tuning of the set as selective as possible. One method of doing this is to push reaction to the verge of oscillation; but since this is for various reasons undesirable, we can have recourse to the following considerations:

- (1) Reduce damping in all H.F. circuits to a minimum by employing a reasonably stout gauge of wire and making all contacts firm and clean.
- (2) Employ a stage of H.F. amplification, using either a tuned anode or a tuned transformer coupling.
- (3) Use some form of loose coupling.

Now, if we employ an aerial coil loosely coupled to a secondary and a tuned coupling between the H.F. and detector valves, we have a very selective receiver, but unfortunately one which renders the searching for a weak station under the powerful jamming of a local station an exceedingly difficult and often a hopeless task; and the control of reaction is frequently by no means easy when the coupling is made very loose. A circuit of the type indicated in Fig. 2, however, appears to give all the advantages of the more usual transformer coupled circuits without many of the disadvantages.

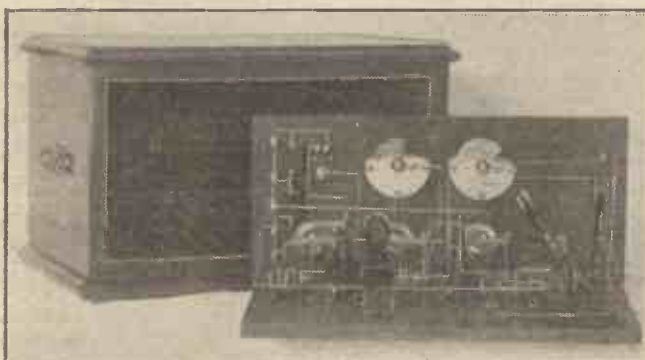


$L_1 C_1$  is the usual aerial tuning arrangement and passes the signal on to the first valve, which, acting as an H.F. amplifier, reproduces the signal in its amplified form in  $L_2$ . This coil, being untuned, will not tend to make the first valve oscillate.

It will, however, pass the signal on to  $L_3 C_2$ , which is tuned to the desired wave-length, and thence on to the second valve, which is a detector.  $L_4$  is a reaction coil coupling into  $L_3$ .

Regarding coils,  $L_1$  is of the size usually employed as A.T.I., while  $L_3$  is of the size usually employed as secondary or as anode coil.  $L_2$  should for preference be one or two sizes bigger than  $L_3$ , and should be variably coupled to it. It is this coupling which controls to a large extent the selectivity of the receiver. The reaction coil should be of such a size as will give easy control over reaction up to oscillation point, and personally I find a coil about equal to  $L_3$  is suitable.

In passing, attention may be directed to a peculiar advantage which may be taken with this circuit. If the aerial be removed from its usual terminal and joined to a ter-



The interior of an efficient 3-valve receiver built on the American principle by Mr. S. Starkey, West End Commercial Studios, Stoke-on-Trent.

minal on  $L_3$  ( $L_3$  being replaced by a suitable coil), the detector valve only can be used, the H.F. side being completely isolated by withdrawing the coil  $L_2$ .

## Action of the Wave Trap.

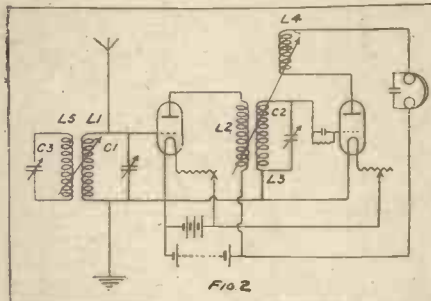
Though  $L_2$  is not intentionally coupled to  $L_1$ , it is probable that a certain amount of accidental coupling will exist, and good use may be made of this by changing over the leads of  $L_1$  or  $L_2$  until best results are obtained. According to the method of connecting, this slight coupling may be used either to produce a reaction or a damping effect, as desired.

With the arrangement described it has been found possible to pick out all the B.B.C. stations while 2 L O is working, but some means are necessary to prevent interference by that station. After trying various forms of "wave-traps," that shown in Fig. 2 has been adopted.  $L_5 C_3$  is a simple oscillatory circuit variably coupled to the A.T.I., but not in any way connected to it.

The condenser may have a maximum capacity of .0005, and the coil should be of about the size usually employed as a secondary for 2 L O's wave-length.

The method of tuning is as follows: The A.T.C. is set as near as possible for the desired wave-length, and the station tuned in by means of adjusting  $C_2$  and the reaction coupling. The coupling between  $L_2 L_3$  may be at first set fairly close, and adjustment made when the station has been found.

A little experiment, however, will soon show the best degree of coupling, after which it will probably be found that further



adjustment is seldom necessary. Having tuned in the desired station  $L_5 C_3$  may now be adjusted to the wave-length of the interfering station. A correct setting will soon be found, where the offending signal is either much reduced or disappears entirely; while the desired signal increases considerably in volume.

If the most careful tuning of  $L_5 C_3$  fails to completely eliminate the unwanted signal, the coupling between  $L_5$  and  $L_1$  should be tightened and the circuits involved retuned. Having finally disposed of the interloper, a few small adjustments on the actual receiver will probably be found necessary; but here again, once the correct setting for  $L_5 C_3$  has been found, no further adjustment in this circuit need, as a rule, be made.

## Results Obtained.

A rather interesting exception to the above method of tuning is that used for receiving Cardiff, whose wave-length is lower than that of 2 L O. It has been mentioned that  $L_1$  is a coil of the size usually employed as A.T.I. Using this circuit, however, I find it better to employ a coil of the same size as  $L_3$ —say of a basket coil of about 70 turns, and the A.T.C. is set at zero. This gives considerably better results than when the normal coil is used, although no such effort is noticeable when listening for the stations above the wave-length of 2 L O.

Contrary to what might be expected from the fact that five coils are employed, the arrangement is actually very easy to operate. Since once the wave-trap and coil  $L_2$  have been suitably set they need seldom be altered over the band of wave-lengths at present covered by the B.B.C., the operation of the remainder becomes practically identical with the operation of the usual loose-coupled single-valve reaction receiver.

With the exception of Aberdeen, who occasionally seems to fade out for extended periods, all the B.B.C. stations can be tuned in at will without interference from 2 L O on practically any evening, using either of the aerials shown in Fig. 1.







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best results, but, curiously enough, Smith seems to get most satisfaction out of his set. The reason was this—Jones thought that expense meant good results and left his set to care for itself, but Smith gave scrupulous care to every minute detail, even to soldering each connection. The moral is obvious. Solder your connections and be satisfied. Soldering is the easiest thing in the world when FLUXITE is at hand to help you.

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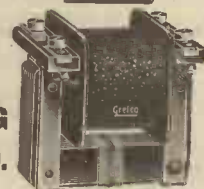
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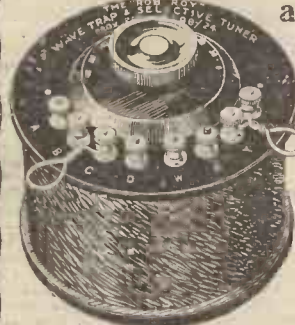
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# Wireless Club Reports

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.

### The Birmingham Wireless Club.

At the last meeting the president, Dr. J. R. Ratcliffe, read a paper on "Some Causes of Distortion."

### Radio Society of Highgate.

Recent and forthcoming events:  
 Friday, May 16th.—Demonstration by the General Electric Co., Ltd.  
 Friday, May 23rd.—Lecture by Mr. P. G. A. H. Voigt, B.Sc.  
 Friday, May 30th.—Entertainment.  
 Friday, June 6th.—Lecture on "Accumulators," by Mr. W. Schofield, of the Hart Accumulator Co., Ltd.  
 Friday, June 13th.—Lantern lecture on "The Manufacture of Valves," by Mr. W. J. Jones, B.Sc., of the Cossor Valve Co.  
 Friday, June 20th.—Lecture on "Harmonics," by Mr. J. D. Steel.

Friday, June 27th.—Lecture on "The Neutrodyne Receiver," by Mr. L. Skinner.

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

On May 5th, Mr. F. Bartlett favoured the association with a lecture entitled "A Wireless Pot-Pourri."  
 Hon. sec., Harrie King, 2, Henslowe Road, East Dulwich, S.E.22.

### Radio Association: Midlothian Branch.

A branch of the Radio Association is being opened up in Midlothian. Enquiries should be addressed to the Chairman, John Pickard, Esq., 50, Forth Street, Newton Grange, Midlothian.

### Hastings Radio Society.

The opening lecture was given on April 26th by Mr. John L. Baird, the inventor of the Baird system of television.  
 Hon. sec., A. E. Marriott, 42, White Rock, Hastings.

### Hackney and District Radio Society.

Recent and forthcoming events:  
 May 8th.—"Reminiscences of a Wireless Operator," by Mr. A. Bell.  
 May 15th.—Demonstration on a five-valve set, by Mr. Van Colle.  
 May 22nd.—Demonstration and talk on "Simple Allbright One-Valve Circuit," on club's experimental panel, by Mr. Bell.  
 May 29th.—Surprise night.  
 June 5th.—Test-room experiences, by Mr. Shefford, General Radio Co.  
 June 12th.—Vest-pocket talks.  
 Asst. sec., Geo. E. Sandy, 70, Chisenhale Road, E.3.

### Brockley and District Radio Association.

A highly interesting and instructive lecture was given recently by the Cossor Valve Co.  
 Hon. sec., Harrie King, 2, Henslowe Road, East Dulwich, S.E.22.

### The Leeds Radio Society.\*

At a recent meeting, Mr. C. Wainwright delivered an excellent lecture on the subject of "Receiving Circuits Design."  
 At the fifty-fourth general meeting, Mr. A. F. Carter, A.M.I.E.E., described the "Phasing of A.C. and Distribution of Power," and the hon. sec. described an "Electro-magnetic Pipe Finder."  
 The meeting of May 2nd was spent informally.  
 Hon. sec., D. E. Pettigrew, 37, Mexborough Avenue, Leeds.

### Southampton and District Radio Society.\*

At a recent meeting, Mr. Paul D. Tyers, the well-known author of wireless publications, lectured on "Amplifiers for Speech Frequencies."  
 Hon. sec., Lt.-Col. M. D. Methven, O.B.E., 22, Shirley Avenue, Southampton.

### Midlothian Branch, Radio Association.

At a meeting on May 7th, 1924, a lecture was delivered by the chairman, Mr. J. Pickard.  
 Hon. sec., R. S. Daniel, 77, Sixth Street, Newton Grange, Midlothian.



A Tottenham reader's "P.W." Set constructed upon American principles.

## Catalogues Book Reviews Etc.



A FULL range of the Radio Communication Co.'s apparatus, both receiving and transmitting, is on view at their stand, "Avenue 15, Bay 10," in the Palace of Engineering at the Empire Exhibition, Wembley.

### A Wireless "Vade Mecum."

*Wireless Telephony and Broadcasting.* By H. M. Dowsett. Published by the Gresham Publishing Co., Ltd., 66, Chandos Street, Covent Garden, London.

The two volumes which constitute this *magnum opus* of Mr. Dowsett's contain about as much information on wireless as any average amateur or experimenter is likely to want in a lifetime.

The labour and painstaking care exercised by the author, together with evidence of a truly enormous amount of knowledge, has resulted in a work which cannot be adequately praised. These two volumes are absolutely indispensable to the amateur "who wants to know."

Mr. Dowsett has not strewn his pages with formulae, nor has he plunged into a complicated sea of technicalities; but he has set out to tell about all there is to know about wireless in a sane and entirely comprehensible manner. And he has succeeded. There is no sense in giving extracts here; it would take several pages to do justice to Mr. Dowsett's work. He has even included a chapter dealing with the operation and idiosyncracies of all the best-known B.B.C. sets.

The publishers are not exaggerating when they call this work *the Wireless "Vade Mecum."*

### Lamplugh Radio Products.

An attractively arranged sheet describing and illustrating some "Lamplugh" radio products has come to hand from the Burwood Electrical Supplies Co., 41, Great Queen Street, Kingsway, W.C.2. The home constructors' receivers are especially neat in appearance, and are very moderately priced. There is a set of parts for a two-valve receiver priced at £7 5s. which includes the Marconi royalty, to which may be added a two-valve amplifier in separate cabinet which sells at £5 10s.

## APPARATUS TESTED

SOME weeks ago we reported on the "Fellows" Junior loud speaker in these columns, commenting on its remarkably pure tone and low price. We have since

had an opportunity of testing the new and larger model, the "Volutone," which is priced at £4 10s. and compares very favourably with other large loud speakers costing more. A control lever is mounted in the base of the Volutone for diaphragm adjustment. This model is capable of delivering a really large volume of sound without sacrificing the quality of reproduction, and has a richness of tone that is so essential when good music is being broadcast.



The new "Volutone" loud speaker.

# RADIOFORIAL

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

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**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.

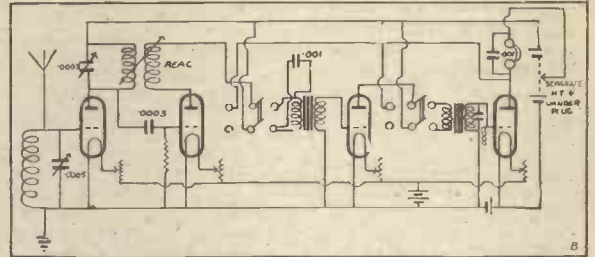
## Questions and Answers

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.

J. W. B. (Bath).—What is the best straight-forward circuit to employ for general loud-speaker work, a maximum number of four valves to be used. I wish to include D.P.D.T. switches to cut out the L.F. stage or stages.

Under favourable conditions it would be possible to receive all B.B.C. stations on the loud speaker with the accompanying circuit. A small battery is included to give the grid of the last valve a negative bias and a separate positive wander plug is shown which will allow of extra H.T. being used for the last valve. D.P.D.T. switches are employed for cutting out the L.F. stages.



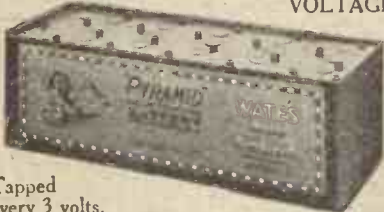
(Continued on page 519.)

# STUDY THESE WATES PRODUCTS.

### "PYRAMID" H.T. BATTERIES.

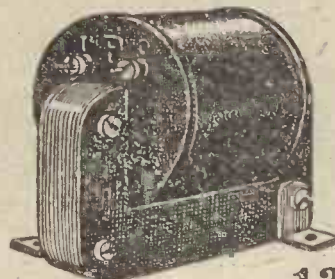
15 volt. ..	2/9
33 volt. ..	6/9
60 volt. ..	11/9
90 volt. ..	17/9

You improve your reception by their use. Distinctive features: LONG LIFE. SILENT WORKING. CONSTANT VOLTAGE.



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RATIO, 5-1. **12/6**

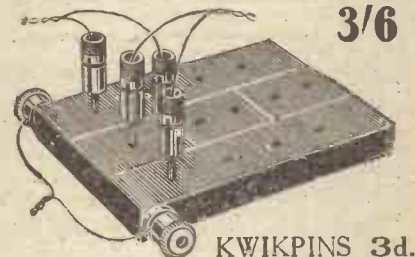
The windings of this transformer are specially wound in insulated layers, each having six sections. This gives the maximum amount of amplification, but eliminates distortion. The iron core has 38 laminations.

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## RADIOTORIAL QUESTIONS & ANSWERS.

(Continued from page 518.)

"MANY READERS."—What are the correct connections of the transformer in the one valve "Unidyne" circuit. The theoretical and wiring diagrams in POPULAR WIRELESS No. 103 seem to disagree.

The side with the lesser number of turns is connected in series with the 'phones. The transformer shown in the theoretical diagram on p. 407 is a step-up L.F. transformer, the larger winding in this case of course being the secondary. Fig. 3, the wiring diagram, shows a Telephone transformer with a step-up ratio. In which case the secondary of course has the lesser number of turns and is therefore connected in series with the 'phones. The idea is to give a step-up to the extra grid.

S. M. (Tamworth).—When using my regenerative set on my own aerial I have no difficulty whatever in getting it to oscillate, but when using it on a friend's aerial and earth I fail to do so. His aerial appears to be perfect, but I am doubtful whether his earth, which runs to a pipe, is satisfactory. Is this liable to prevent the set oscillating?

Yes, quite probably your trouble lies in a faulty earth. It is best to try all available earths, individually, and linked together.

A. D. F. (Poole).—What is the simplest form of wave-trap, and how is it connected up to a receiver. What type and what size should the coil be?

A coil with a variable condenser shunted across it placed between the aerial and the earth terminal of the set will give satisfactory results. Any type of coil, but preferably one of fairly low self capacity, may be used. The capacity of the variable condenser should be about .0003 mfd., and the size of the inductance will of course depend on the wavelength of the station it is desired to cut out.

W. L. D. (London, N.).—I have a small crystal set with an outside aerial. I get a very "live" crystal long after midnight when the telephones are connected between the A.T.I. and earth. I cannot hear actual messages upon it, but when the crystal is adjusted the circuit is "live." If 'phones and crystal are connected across the coil instead of in series with it they become absolutely dead. Is there a continual electronic discharge going on from aerial to earth irrespective of human transmission, and is it that which I interrupt with the 'phones and crystal in series with aerial coil?

Continuous wave working is probably responsible, but in order to hear the actual signalling it would be necessary either to interrupt the current at audio-frequency or to heterodyne it with a local oscillation so as to produce low-frequency beats.

R. M. (Woolwich).—I have made up the Ideal Loud Speaker Set described in P.W., beginning November 17th and ending December 8th, 1923, but I have set it up on a piece of ebonite measuring 10 in. by 6 in. instead of 12 in. by 12 in., as recommended, because I had that size in stock. On operating the set a slight turn of variometer or of the rheostats will cause it to react and oscillate. The wiring is correct. Is the trouble arising because the components are cramped?

Inadequate spacing is the cause of the howling. Although slight modifications of lay-out may be made in most constructional articles, the substitution of a 10 in. by 6 in. panel for one more than double its size is certain to cause trouble. In fact, as you have proved, from every point of view it is a "howler."

Try a  
**MARZITE CRYSTAL**  
and then tell your friends.  
**CLARITY UNEQUALLED.**  
**DURABILITY GUARANTEED.**  
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Master  
Musicians  
No. 3.

Wolfgang Amadeus Mozart.

A contemporary of Haydn, Mozart undoubtedly owed much of his success to one fact—that his father was court musician and a recognised composer of church music. Small wonder then that the boy Wolfgang (born in 1756), we are told, was picking out thirds on the harpsichord at the age of three!

At 30 Mozart began that period of his life which was responsible for all those wonderfully tuneful melodies, which, 150 years later, are still unsurpassed in beauty and delicacy.



OF all Mozart's works none appeals to the music-loving public so much as "The Magic Flute"—his last opera. The extraordinary beauty of its music—much of it being reminiscent of the days of the minuet and totally unlike that from any other opera—never fails to appeal to those who are fond of tuneful melodies.

To hear Mozart music by Radio really necessitates the use of a Loud Speaker sufficiently sensitive to bring out the beauty of delicate airs, while not blunting the importance of bolder passages.

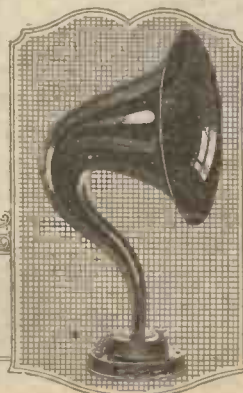
Due to its aluminium diaphragm—as thin as paper—and a sensitive vibrating reed mechanism, the **Brown Loud Speaker** is the only one able to give a truthful rendering without having to effect a compromise.

Musicians know this—that is why whenever the **Brown** is actually tried out on a comparative test, it is invariably selected on account of the exceptional purity of its tone.

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**Loud  
Speakers**



**THE WEEK'S BROADCASTING PROGRAMMES.**

**SIMULTANEOUS EVENTS.**

Sunday, June 1st.—Miss Maude Royden—address.  
 Monday, June 2nd.—R.S.G.B. talk. Savoy Bands.  
 Tuesday, June 3rd.—French Talk.  
 Wednesday, June 4th.—B.B.C. Dramatic Critic. Dr. H. B. Baker. F.R.S. Savoy Bands.  
 Thursday, June 5th.—R.S.G.B. Talk.  
 Friday, June 6th.—B.B.C. Film Critic. Topical Talk.  
 Saturday, June 7th.—Savoy Bands.

**LONDON (2 L O, 365 m.).**

Sunday, June 1st.—Light All English Programme. Choral Night.  
 Monday, June 2nd.—Hours with Living British Composers. Cyril Scott.  
 Tuesday, June 3rd.—Popular Programme.  
 Wednesday, June 4th.—R.A.F. Request Night.  
 Thursday, June 5th.—Programme of Light Orchestral Suites.  
 Friday, June 6th.—Light Opera Night.  
 Saturday, June 7th.—Popular Programme.

**BIRMINGHAM (5 I T, 475 m.).**

Sunday, June 1st.—The Station Symphony Orchestra.  
 Monday, June 2nd.—Miscellaneous Programme.  
 Tuesday, June 3rd.—Light Classics.  
 Wednesday, June 4th.—Miscellaneous Programme.  
 Thursday, June 5th.—Play Evening.  
 Friday, June 6th.—Mainly from London.  
 Saturday, June 7th.—Popular Programme.

**CARDIFF (5 W A, 353 m.).**

Sunday, June 1st.—Ballad Concert. Gustav Holst Evening.  
 Monday, June 2nd.—Feature Programme.  
 Tuesday, June 3rd.—A Pleasant Evening.  
 Wednesday, June 4th.—Magic Carpet.  
 Thursday, June 5th.—Play Night.  
 Friday, June 6th.—Mainly from London.  
 Saturday, June 7th.—Popular Night.

**MANCHESTER (2 Z Y, 375 m.).**

Sunday, June 1st.—The Radio Military Band.  
 Monday, June 2nd.—Light Musical Programme.  
 Tuesday, June 3rd.—Popular Concert.  
 Wednesday, June 4th.—Classical Night.  
 Thursday, June 5th.—Series of Choral Concerts.  
 Friday, June 6th.—Musical Comedy Night.  
 Saturday, June 7th.—Dance Night.

**NEWCASTLE (5 N O, 400 m.).**

Sunday, June 1st.—Symphony Concert. Service from Newcastle Cathedral.  
 Monday, June 2nd.—An American Night.  
 Tuesday, June 3rd.—Vocal and Dramatic Evening.  
 Wednesday, June 4th.—Opera Night.  
 Thursday, June 5th.—An Evening of Grieg.  
 Friday, June 6th.—Mainly from London.  
 Saturday, June 7th.—The Musical Tournament.

**BOURNEMOUTH (6 B M, 385 m.).**

Sunday, June 1st.—The Wireless Military Band. Shakespeare Night.  
 Monday, June 2nd.—The Bournemouth Municipal Orchestra.  
 Tuesday, June 3rd.—Comic Opera Night.  
 Wednesday, June 4th.—Plantation Night.  
 Thursday, June 5th.—Lucky Dip Night.  
 Friday, June 6th.—Recital of Art Songs and Music.  
 Saturday, June 7th.—Oriental Night.

**GLASGOW (5 S C, 420 m.).**

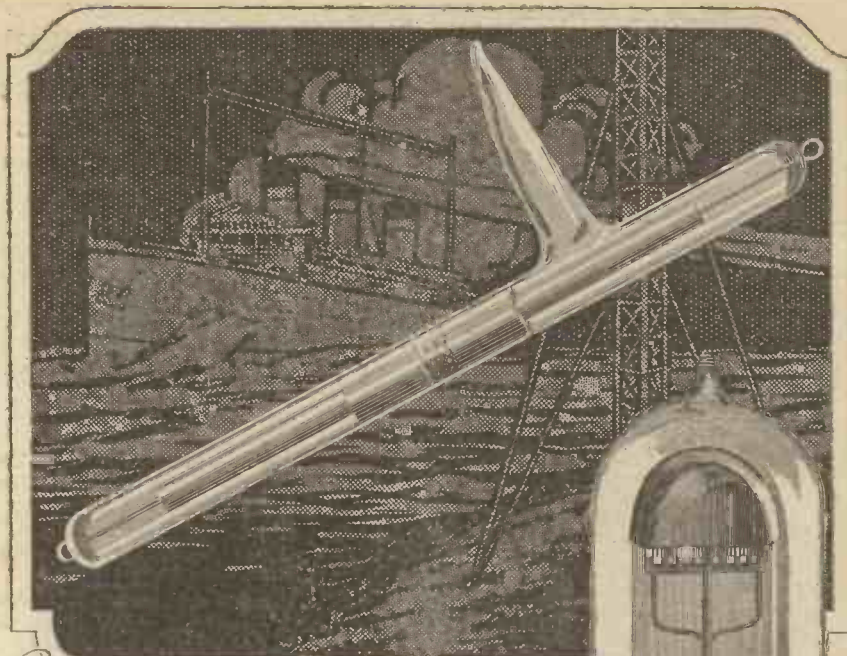
Sunday, June 1st.—Orchestral Concert.  
 Monday, June 2nd.—An Evening of Flowers.  
 Tuesday, June 3rd.—Recital Night.  
 Wednesday, June 4th.—Schumann Night.  
 Thursday, June 5th.—Request Night.  
 Friday, June 6th.—Chamber Music and Light Orchestra.  
 Saturday, June 7th.—Music, Humour and Dance.

**ABERDEEN (2 B D, 495 m.).**

Sunday, June 1st.—Concert from the Music Hall. Band of 2nd Batt. the Gordon Highlanders.  
 Monday, June 2nd.—Everybody's Programme.  
 Tuesday, June 3rd.—Special Vocal Night.  
 Wednesday, June 4th.—Dance Night.  
 Thursday, June 5th.—Popular Scandinavian Night.  
 Friday, June 6th.—Mainly from London.  
 Saturday, June 7th.—Scottish Night.

**PLYMOUTH RELAY STATION.**

Sunday, June 1st.—From London.  
 Monday, June 2nd.—Orchestra from Savoy Picture House and from London.  
 Tuesday, June 3rd.—Orchestra from Savoy Picture House and from London. French Night.  
 Wednesday, June 4th.—Orchestra from Savoy Picture House and from London.  
 Thursday, June 5th.—Orchestra from Savoy Picture House and from London.  
 Friday, June 6th.—Orchestra from Savoy Picture House and from London.  
 Saturday, June 7th.—Orchestra from Savoy Picture House and from London.



*Yesterday the Coherer  
 — to-day a Cossor.*

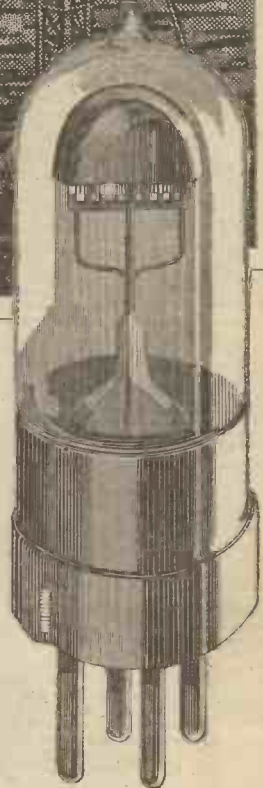
It is a far cry to that memorable December's day nearly 25 years ago when the first wireless signals ever sent across the Atlantic were received on a Coherer at Signal Hill, near St. John's, in Newfoundland.

Experimenters in those days had no thermionic valves to help them. Instead, we know that their apparatus was so delicate and easily put out of adjustment that reception was often more a matter of good luck than judgment. And instead of an aerial anchored to a huge kite swaying in the breezes five hundred feet above the ground, the modern wireless enthusiast can often receive strong signals from powerful land stations several thousand miles distant on a mere 20 feet of wire running round the picture moulding.

For long-distance work to-day there is one Valve universally recognised as being developed to a high pitch of perfection for this specific purpose—the Cossor P2.

To distinguish it from other Cossor Valves it has a red top. If your Set uses high-frequency amplification (practically all Receivers with more than one Valve do), then be sure that the one on the extreme left is a Cossor P.2—no other Valve can give you such results.

Cossor efficiency (whether P.1 or P.2) is due to its unique construction (patented throughout the world), for its hood-shaped Anode traps practically the whole of the electron stream. Incidentally this improved design has many other advantages. For instance, its curved filament—arched for strength like an old bridge—is self-supporting and cannot sag. Therefore the normal life of any Cossor is considerably greater than any Valve with a long and slender straight filament.



Manufactured in two Types:  
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 From all Dealers.

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**Cossor Valves**

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£1 for a low-frequency transformer? You can make your own for about 3/-. All B.B.C. and some of the foreign stations received with 1 valve. Instructions sent for 1/6 only.  
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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.

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## HOW TO CONSTRUCT A FLEWELLING SUPER.

(Continued from page 510.)

If the valve does not light up, the low-tension battery may be transferred to its correct terminals and the low-tension negative connected. The valve should be alight with the resistance nearly all in when the high-tension positive is connected. This should be put in a low tap and increased up to its correct voltage when it is seen that the wiring is correct.

### Tuning-in.

For broadcast wave-lengths a No. 50 Igranic, Burndept, or other well-known make of duo-lateral coil, will be found suitable on a standard P.M.G. aerial, while a No. 35 may be used in the reaction circuit. Careful adjustment of the variable grid leak and the filament resistance will do more to bring out the best in the set than adjustment of reaction coupling or tuning of the aerial circuit.

Before commencing on the Flewelling circuit, the set should be tested out as a straightforward regenerative set. The signal strength and especially the range of stations should be noted before switching over to the Flewelling circuit. For this circuit the coupling between reaction and aerial inductance should be tight, and the resulting whistle reduced to a low beat or note, a comparison to which may be heard when a high-powered motor-car, well-silenced, is revving up preparatory to changing gear. Care should be taken to look out for this symptom, as it is easily possible to miss altogether the Flewelling effect.

### Considerable Range.

Until the grid leak and the filament resistance are correctly adjusted, trouble will probably be experienced from capacity effects, and to avoid this long anti-capacity handles should be used. An easy method of controlling the knobs is effected by means of a long stick roughened or serrated at one end to grip the control knobs.

As a guide to the correct adjustment of the grid leak in the set described, nine complete turns in an unscrewed direction brought in the most distant signals, and the range was found to be very considerable.

## TECHNICAL NOTES.

(Continued from page 506.)

hundreds of short metal spikes, and anchored by conducting cables at a height of not less than 1,500 feet above the ground.

The inventor has concluded from his experiments that a considerable amount of electricity can be obtained practically continuous by this method, and he has proposed to turn this energy to useful account by passing it into coils, somewhat after the style of Tesla coils, and using it to drive special resonance motors which he has designed for the purpose. He would erect his collecting stations in deserted regions, such as moors, mountains, and so on, where there would be little or no interference with or from machinery or buildings. He has calculated that for a district of the area of the State of Texas, for example, there would be available about five hundred million horse-power.

### Modulation Problems.

One of the difficulties in securing proper modulation in broadcast transmission is due to the large range of frequency of the modulator waves and the large range of power in the same. Music may range in frequency from, say, 50 to 5,000, or even 10,000 cycles per second, depending upon the instrument which is being transmitted. Provided the carrier-wave frequency is large compared with the largest modulation frequency, however, this difficulty is not unduly serious.

Correct rendering of the comparative loudness of different sounds is, however, a more difficult problem. In speech sounds, for instance, the variations in power may be of the order of 1,000 to 1, whilst in music, especially that of a symphony orchestra, the ratio of the power in the loudest and softest passages may be as much as 100,000 to 1. In the present state of transmission technique, it cannot be said to be practicable to reproduce such great variations in volume. This limitation arises not so much from the capability, or incapability, of the transmitting apparatus, as from the existence of extraneous noises. The softest musical passages when broadcast must be made sufficiently loud to override static and other interfering and incidental noises. When the softest passages are based upon this standard, however, it would be impracticable to provide the equipment to make the loudest passages 100,000 times as loud.

(Continued on page 524.)

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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.

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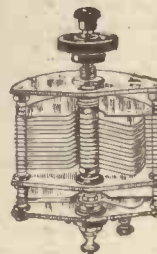
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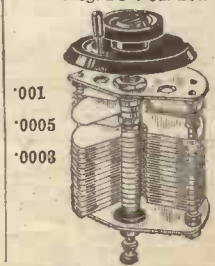
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 Watmel Var. Gd. Leak . . . . . 2/6  
 Watmel Anode Res. . . . . 3/6  
 100,000 ohm. Fixed Res. . . . . 2/3  
 Variometers, Inside Wind- ing. . . . . 11/3  
 Talite Crystal . . . . . 9d.  
 Tungstalite . . . . . 9d.  
 Midite . . . . . 9d.  
 Globite . . . . . 9d.  
 Geocisite . . . . . 1/3

### HEADPHONES

- 4,000 ohms.  
 Sterling B.B.C. . . . . 21/-, 25/-  
 B.T.H., B.B.C. . . . . 25/-  
 Brown's Featherweight Sidpe . . . . . 12/6  
 Brunet, Type D . . . . . 14/6  
 Brunet, 8,000 ohms for crystal sets. . . . . 19/11  
 Brunet, 4,000 New Model "A" type de Luxe . . . . . 18/11  
 Brunet, Single earpiece. 4,000 ohm . . . . . 8/11  
 B.B.C. Fine Phones . . . . . 15/6  
 Ericsson E.K. (the old original) . . . . . 12/-  
 French Thomson Hous- ton. Finest possible tone. 4,000 ohms . . . . . 12/9

### TOOLS.

- Set of Drills . . . . . 1/3, 1/6  
 Screwdrivers . . . . . 6d., 8d.  
 Wire Pliers . . . . . 1/-  
 Insulated Pliers . . . . . 1/3, 1/6  
 Soldering Irons . . . . . 6d., 8d.  
 Hollow Tweezers . . . . . 4d.  
 Post 3d. extra.

### EBONITE 3/16 in.

- Post Extra.  
 Stock Sizes.  
 6 x 6 . . . . . 1/6  
 8 x 6 . . . . . 2/- ALSO CUT  
 9 x 6 . . . . . 2/3 TO ANY  
 12 x 9 . . . . . 4/3 SIZE WHILE  
 12 x 12 . . . . . 6/- YOU WAIT.

### RAYMOND.

- Fixed Condensers. Ebonite Base. True Capacity. Pure Mica and Tinfoil.  
 .001, .0001 to .0005 . . . . . 10d.  
 .002, .003, .004, .005 . . . . . 1/-  
 .006, .000025 . . . . . 1/6  
 .01, .02 . . . . . 2/-  
 Post 3d. each.

### VALVES.

- Coscor P.1., P.2. . . . . 12/6  
 Ediswan "R" . . . . . 12/6  
 Marconi "R" 5 . . . . . 12/6  
 B.T.H. "R" . . . . . 12/6  
 Mullard Ora . . . . . 12/6  
 Marconi D.E.R. . . . . 21/-  
 Ediswan D.E.R. . . . . 21/-  
 Marconi D.E.R. . . . . 30/-  
 Mullard, Ediswan, 06 . . . . . 30/-  
 Reg. Post 6d. each.

### CRYSTAL DETECTORS.

- Enclosed Glass. Brass, Nickel  
 Ebonite Fittings.  
 Small . . . . . 1/-, 1/3, 1/6  
 Large . . . . . 1/4, 1/6, 1/9  
 Enclosed Perikon. Small, 1/8. Large, 2/2 with Zincite and Bornite. Post 6d. each.

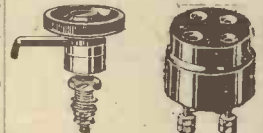
### SHAW'S GENUINE HERTZITE 9d. and 1/- Post 2d.

### WE ALLOW FARES ON CERTAIN GOODS.

- Over 20/- order . . . . . 2/6  
 Over 40/- order . . . . . 5/-  
 Over £5 order . . . . . 15/-  
 Above NOT allowed on callers' cut prices.

### UNIDYNE CIRCUIT.

- 4 electrode valves . . . . . 12/6  
 (Error in price 10/6)  
 Telephone Transformer Ratio 10-1 . . . . . 15/-  
 Specially wound coils 2 for Our '0005 Var. Condenser (Ideal for this circuit. Height 2 inches). . . . . 5/-  
 2-way coil holder . . . . . 2/9  
 2 adapters for same. Pair . . . . . 2/6  
 All parts supplied. Post extra.



This first-class Ebonite Valve Switch Arm, Holder, cut with 12 Studs, from solid rod 12 Nuts, 12 hand-turned, 8 Washers nuts and 10d. Callers, Washers. By Post, 1/6 Each, 1/3. Post 3d.

### LISSEN PARTS.

- WEST END STOCKIST OF LISSEN PARTS, COILS, ALL NUMBERS, etc., etc., at LIST PRICES.  
 Lissen T.1. Transformer . . . . . 30/-  
 Lissen T.2. Ditto . . . . . 25/-  
 Lissen T.3. Ditto . . . . . 16/6  
 Variable Grid Leak . . . . . 2/6  
 Variable Anode Resistance . . . . . 2/6  
 Lissenstat Minor . . . . . 3/6  
 Lissenstat . . . . . 7/6  
 Lissenstat Universal . . . . . 10/8  
 Lissen 2-way Switch . . . . . 2/9  
 Lissen Series Parallel ditto . . . . . 3/9

### "FILOSTAT" FILAMENT RESISTANCE.

- Controls D.E. as well as R. VALVES. ONE-HOLE FIXING. IMPOSSIBLE TO SHORT CIR- CUIT. Screw Connections. No solder- ing. . . . . 2/-

### ACCUMULATORS.

- Summertime Prices.  
 4 v. 40 a. 16/6 & 19/6  
 4 v. 60 a. 18/11 & 21/-  
 4 v. 80 a. 23/6 & 25/-  
 6 v. 60 a. 27/6 & 30/-  
 6 v. 80 a. 33/- & 35/-  
 6 v. 100 a. 45/-  
 Post, Charge under 20/-, 1/6  
 " " over 20/-, 2/-

### VALVES.

- Phillips .04 valves . . . . . 18/6  
 " Metal " .06 . . . . . 18/6  
 Dutch Dull Emitters (D.E.R.) . . . . . 12/6  
 Post Free.

### H.T. BATTERIES, B.B.C.

- 60-volt . . . . . 10/8  
 30-volt . . . . . 5/8  
 Post free.  
 Siemens and Ever-Ready stocked.

### LOUD SPEAKERS.

- Amplions 42/-, 63/-, 105/-  
 Sterling (Baby) 55/-, 57/6, 60/-  
 Brown (Baby) . . . . . 48/-  
 Your fare paid up to 2/6 in £.

## THIS COLUMN IS FOR CALLERS ONLY.

(Net Prices)

No Post Orders from it, Please

Open—

Weekdays 9 to 7.45  
 Sundays 10 a.m. to 1 p.m.

- 2 B.A. Rod per foot . . . . . 2 1/2d.  
 4 B.A. Rod per foot . . . . . 2d.  
 Spade Tags . . . . . 4 a 1d.  
 Scales 0-180 . . . . . 2d.  
 Empire Tape 2 yds. . . . . 1d.  
 Ditto, 1 in. . . . . 4 yds. 3d.  
 Panel Switches, S.P.D.T. . . . . 10d.  
 Panel Switches, D.P.D.T. . . . . 1/3  
 Easy Fix Cup, latest . . . . . 1d.  
 Resistance Dials 0-10 . . . . . 6d.  
 Valve Holders and Nuts. . . . . 9d.  
 Valve Sockets, Nut and Washer . . . . . 4 for 3d.  
 1/16 Sq. Tin Copper 4 ft. 2 1/2d.  
 20 and 22 D.C.C. Wire 1 lb. 10d.  
 24 and 26 ditto 1 lb. 1/-  
 28 and 30 ditto 1 lb. 1/3, 1/4  
 Best Sleeving . . . . . 3 yds. 11d.  
 Pillar Terminals, with Nut . . . . . 1d.  
 Phone, Large, 2 for 2 1/2d.  
 W.O., Large . . . . . 1d.  
 small . . . . . 1d.  
 2 oz. Adhesive Tape . . . . . 3d.  
 Copper Foil (6 in. wide) . . . . . foot 2 1/2d.  
 Dutch Valves, Tubular . . . . . 4/9  
 Dutch Valves "R" Type . . . . . 5/3  
 Phillips Dutch "R" . . . . . 7/8  
 2 and 4 B.A. Washers 3 doz. 2d.  
 Ebomite Bushes, 1d. doz. 6d.  
 Ebomite Coil Plugs 6d., 8d., 9d.  
 Aerial Wire 7/22 100 ft. 1/11  
 Ditto, 7/22 . . . . . 50 ft. 1/2  
 Nickel Gauze Valve Windows . . . . . 5d.  
 Green Phone Cords, 54 in. 7 1/2d.  
 2 B.A. Nuts . . . . . doz. 2d.  
 Telephone Wood Screws . . . . . 1d.  
 Switch Arms . . . . . 5 1/2d.  
 Electron Aerial . . . . . 100 ft. 1/8  
 Bell Wire, D.C.C., I.R.C. . . . .  
 Tin Copper . . . . . 10 yds. 5d.  
 Twin Flex, good quality . . . . . 4 yds. 6d.  
 Stop Pins, with Nut 2 a 1d.  
 Spade Screw Terminals . . . . . 1d.  
 Pin Screw Terminals 2 for 14d.  
 English 4-5 Batteries . . . . . 4d.  
 Brass Plug and Socket . . . . . 1d.  
 Battery Clips . . . . . 6 for 4d.  
 Filostat for D.E. and R. Valves . . . . . 2/-  
 Tinned Copper, 18s. 3 yds. 3d.  
 14, 16, 20 Tinned Copper Stocked.  
 Spear Point Whisker . . . . . 2d.  
 Best Gold and Silver each 2d.  
 Set of 4 (one gold) . . . . . 3d.  
 Midite and Talite . . . . . 8d.  
 Tungstalite, with Whisker Geocisite (G.E.C., Ltd.) . . . . . 1/3  
 Rubber Lead-in 10 yds. 1/-  
 Ditto, heavy . . . . . 10 yds. 1/3  
 Ditto, Extra heavy yard 3d.  
 Variometers 250/600 . . . . . 2/6  
 Shaped Coil Plugs . . . . . 10d.  
 Edison Bell Do. . . . . 1/-  
 Wander Plugs . . . . . pair 3 1/2d.  
 6 Basket Coils 200 3600 m. 1/9  
 5 Waxless Do. 200/2000 1/11  
 Dutch Dull Emitters . . . . . 11/9  
 30 v. H.T. Battery . . . . . 4/9  
 60 v. H.T. Battery . . . . . 7/6

RIGHT OPPOSITE DALY'S GALLERY DOOR

**K. RAYMOND**  
 27, LISLE STREET, W.C.2

PHONE: GERRARD 4637.

HOURS OF BUSINESS:  
 Daily - 9 to 7.45  
 Sundays 10.30 to 1

# WIRELESS ACCUMULATOR TROUBLES BANISHED

We Hire and Deliver a Fully Charged  
Accumulator Weekly  
From 1/6 Inclusive.

or  
Collect, Maintain, and Deliver your own  
Accumulators Weekly  
From 1/3 Inclusive.

By Quarterly Subscription Only.

## SPECIAL NOTICE.

Our business is now entirely devoted to Wireless Accumulator Hire and Maintenance. We have considerably increased our charging plant and transport, and are in a position to take new subscribers. Early application is advised as the number we can accept is limited in order to give a guaranteed efficient service and regular weekly delivery.

Our Folder explains this guaranteed weekly service and contains a useful chart showing the various sizes and hours they last for sets using 1 to 5 valves, and it's post free.

Accumulator Maintenance Company,  
267, High Street, Camden Town, N.W.1

\*Phone: Hampstead 2698.

The MEGAVOX LOUD SPEAKER and long-distance set, without Transformer or Crystal, can be used on Frame Aerial. Simple, efficient, and economical. Price within the reach of all. Particulars free.—J. SCOTT, Engineer, 7, Manor Park, Richmond.

A LIMITED NUMBER ONLY.  
**N & K Headphones** (Genuine 4000 ohms) **12/6**  
(non-rustable diaphragms)  
MELITZA Super Crystal with special cat-whisker 1/-  
This crystal recently took First Prize in all classes at a recent Radio Societies Exhibition. We guarantee this to be the best crystal on the market. All post free. Trade supplied.  
MELITZA RADIO CO.,  
405, HOLLOWAY ROAD, LONDON, N.7

**WIRELESS PORCELAIN INSULATORS**  
Large Shell Type, Green, per gross net.....32/6  
Large Barrel Type, Brown, per gross net.....22/6  
Packing included. Ex-London/Stock. Special discount for large quantities.—ANGLO-OVERSEAS,  
34/35, Norfolk Street, London, W.C.2.

**50%  
GREATER  
RANGE**  
Write now for Brochure telling you how you can make your set selective and increase its range 50% by fitting Bowyer-Lowe Square Law Condensers which have a capacity ratio of 150 to 1 and evenly distributed wavelength scale. Send a postcard at once.  
**TESTED SQUARE LAW CONDENSERS**  
BOWYER-LOWE CO. LTD. LETCHWORTH

**LIGHTNING ARRESTER**  
New patent, "ANDRECO," safe and sure. PROTECT yourself and your INSTRUMENT. No. set should be without one. Send 2/6 to-day. Trade enquiries invited. Makers:  
**ANDREWS & CO., 31, Tollington Park, N.4.**

**"B" TELEPHONE TRANSFORMERS**  
RATIO 10-1  
Price 9/6 each  
Each Transformer tested before dispatch and Guaranteed. Overall Dimensions 2 1/2 x 1 1/4 x 1 1/4. Ratio 10-1. (Other Ratios would order). Satisfaction or your money refunded. Special Terms to Trade.  
**THE BEANCO ELECTRICAL MFG. CO.**  
21, BOWLING GREEN LANE, CLERKENWELL, E.C.1

## TECHNICAL NOTES.

(Continued from page 522.)

### Amplification by Valves.

Since the amount of energy coming in from the aerial in a receiving set is so extremely small, it is evident that there must be a very large amplification in the successive amplifying valves before the large volume commonly reproduced from the loud speaker can be attained. Just how great is this amplification is a question which is often discussed, but which it is difficult to settle.

Theoretically, there is no limit to the amount of amplification which can be attained by "piling on extra valves," but, of course, everybody knows that distortion soon puts a stop to the game. To come to actual figures, many of the modern circuits will successfully stand an amplification of from 30,000 to 100,000 times the strength of the incoming signal. Amplification of several millions have, in fact, been obtained under experimental conditions, and some sets, handled by an expert or by an experienced experimenter, will do this in practice.

### New Use for Microphone.

Everyone knows that the carbon transmitter or microphone depends for its action upon the fact that when the carbon elements or granules are pressed closer together, the resistance of the microphone to the passage of electric current is reduced. An ingenious application of this principle to quite a new purpose has recently been made. It is in connection with the investigation of stresses in metal or wooden structures, such as the beams of an airship or aeroplane.

A small tube filled with carbon discs is inserted into the beam at the spot where the stresses (or, rather, the variations of stress) are to be determined, and the changes are easily observed by means of a galvanometer, which registers the current passing through the "microphone." This method has proved very successful, although, as yet, only in its initial stages, and it is probable that it will prove of wide application for the investigation of stress changes in machines and structures generally.

### Fibre Panels.

Many experimenters have a liking for red fibre owing to its attractive colour, and it certainly looks very nice if neatly made up into a panel. A word of warning is necessary, however, for ordinary fibre, unless specially treated, is liable to absorb a surprising quantity of water-vapour, which, of course, considerably reduces its electrical resistance. If you are specially anxious to use fibre for your panels, you should dry it thoroughly in a warm oven for a few hours or in a dry room for a few days, and then coat it carefully with shellac varnish or other insulating resinous compound.

This will protect it to a large extent from the absorption of moisture, but it is doubtful whether it will ever compare with really good ebonite for insulation resistance. Of course, there are specially treated grades of fibre on the market which are no doubt excellent, but I am referring here to ordinary fibre which is used for rough electrical purposes where the very high insulation necessary for a wireless panel is not required.

## SKINDERVIKEN MICROPHONE

(The Smallest in the World).

### TO THE GENERAL PUBLIC

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:

### "THE MARVELS OF THE MICROPHONE,"

which gives full details how to make your own amplifier for crystal sets.

PRICE 6d. Post free 6 1/2d.

Send P.O. (not stamps) to-day.

**MIKRO Ltd., 32c, Craven St., STRAND, W.C.**

## INVENTIONS PATENTED.

J. E. S. LOCKWOOD,  
3, NEW STREET, BIRMINGHAM.  
\*Phone: 5116 Cent. GUIDE FREE

**AERIAL—AERIAL—AERIAL**  
**THE MOST EFFICIENT INDOOR AERIAL.**  
You can arrange one for a few shillings. Have one and dispense with disfiguring poles outside. There will then be no fear of lightning destroying your set, or worse.  
**PERFECT RECEPTION ON CRYSTAL SET.**  
In many cases there is no need for outside aerial. Drawing and full particulars, 2/6 only, post free.  
**RADIO ACCESSORIES CO., 14, Endwood Court Road, Birmingham.**

## THE "MIKE-A-JUST"

Patent Applied for.

BEST  
BRITISH  
MAKE.



PRICE  
**8/6**  
Post  
Free.

One coarse, one fine Micro-meter Adjustment. The nut at side provides adjustable tension, so that heavy coils can be used without fear of falling. Money returned if not satisfied. Write for list.

C. BRISTOW, Standard Works  
Waldram Road, F're 1 Hill, London S.E.23.  
Trade Supplied.

## THE KINGSLAND WIRELESS Co.

Manufacturers of Crystal  
Detectors of all kinds.

Prices on application.

380, Kingsland Road, London, E.8.

## EBONITE PANELS

Any size cut. 1/4" thick, 1d. for 2 sq. ins.; 3/16" thick, 1d. for 2 sq. ins.; 1/2" thick, 1d. for 1 sq. in. Panels drilled any circuit, 9d. Post and packing, 6d. **WORMALD & SON,** Manknall Street, Bradford Road, Manchester. \*Phone: Central 2868.

## WHOLESALE AND EXPORT ONLY 6/6 OSRAM VALVES 6/6 R.A.F. Type "C." 5 v. 6 amp.

The most efficient H.F. and Detector Valve under double the price. British made by G.E. Co. and Ediswan Co. Can be obtained retail from your local Dealer.

**Wholesale and Export Only**  
Liberal Trade Discounts. \*Phone: Central 4253  
**J. M. BLAIR, M.I.E.E.,** Amberley House,  
Norfolk Street, Strand, London, W.C.2



Fresh interests are the great antidote to boredom.

There are endless possibilities with a really efficient portable set that can be carried about like a week-end suitcase. Such a set can be used indoors, on the river, when motoring, or equally well to while away the time on a long train journey.

The new FELLOPHONE PORTABLE THREE is shown below. It requires no aerial or earth wires whatever; all being included in the case. Dry cells are also fitted inside so that there are no accumulators to require constant re-charging. It will give excellent results on several pairs of headphones and a Loud Speaker may be used when close to a Transmitting Station.

The compactness and high-class finish will be seen at once on inspection.

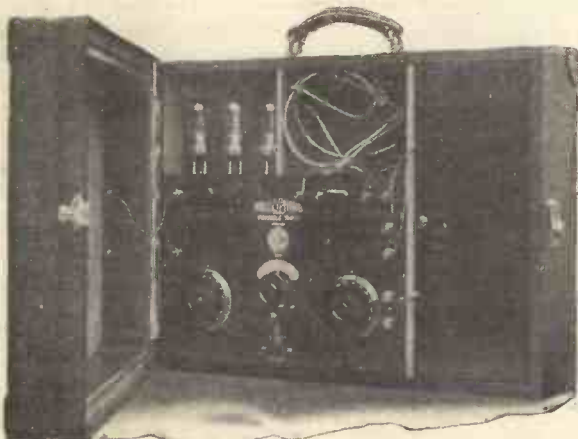
Complete with headphones:

**£14-0-0**

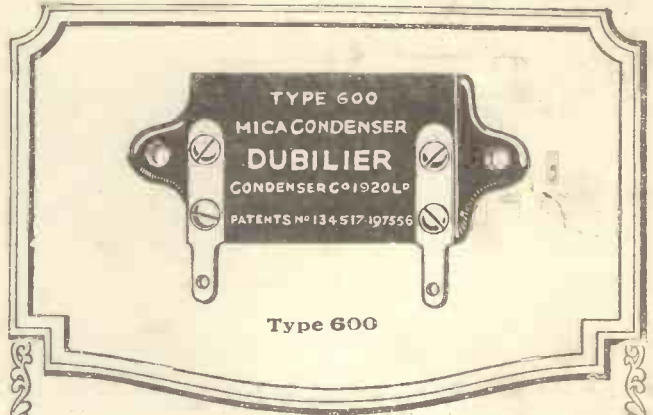
(In real cowhide 15' guineas).

Extras: B.B.C. tax £1-0-0, Marconi tax £1-17-6, and 3 Marconi D.E.3 Valves.

**FELLOWS MAGNETO CO., LTD.,**  
PARK ROYAL, N.W.10, 'Phone: Willesden 1560.



E.P.S. 65.



### Confidence.

When you buy a fixed condenser of any unknown make for your set, you buy on trust.

You hope that it really will be of the capacity stated; you hope that it will remain constant and not produce mysterious faults by leaking or altering its capacity.

Not having an electrical laboratory at your disposal, you cannot prove the matter either way. So you hope for the best.

\* \* \* \*

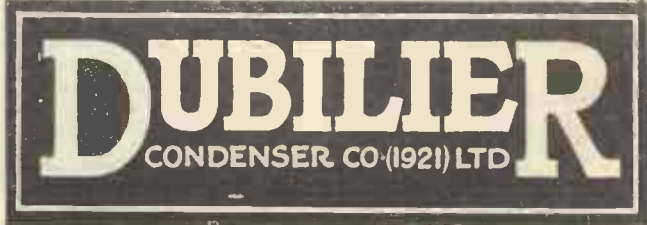
How much wiser to buy a condenser in which you CAN have confidence.

There may be an extra outlay of a few pence, but the soundest possible insurance against condenser faults in your receiver is to

**Specify Dubilier.**

**THE DUBILIER CONDENSER CO.**  
(1921) Ltd.

Goldhawk Road, Shepherd's Bush,  
LONDON, W.12.



E.P.S. 59

# LISSENIUM

## Lighting the Valve Filament

The days are gone when mere lighting of the valve filament was called filament control. The successful tuning of the detector and H.F. Valves is a critical thing which largely depends upon the proper regulation of electron emission. Filament temperature must be exactly right for each



station tuned in—especially is this important on long distance work. The introduction of LISSESTAT control has shown what unique filament control can do to improve fine detection of long-distance telephony. The difference it makes to tuning is a revelation. There are three types to choose from. Each is suitable for dull emitter and all valves:—

**LISSESTAT** (prov. pat.)—This is the super filament control—brings in stations which have previously eluded every other control of the receiver ... **7/6**

**LISSESTAT MINOR** (prov. pat.)—There must be hundreds of thousands of inefficient rheostats in use. The LISSESTAT MINOR has been introduced to provide something of the beautiful LISSESTAT control at a popular price. It is well worth while **3/6** discarding any existing rheostat and replacing it with this perfect little control

**LISSESTAT UNIVERSAL** (prov. pat.)—Gives full LISSESTAT control, and by means of an ingenious arrangement a minimum resistance can be left in circuit to protect expensive valves, while zero resistance can also be obtained when full battery pressure is required ... **10/6**

## Cutting out Station after Station

Start with any station you please, and you can go right round them all if you use the LISSENCEPTOR and a separate tuning condenser. In turn, you can cut out any of the stations you do not want—Morse interference also. Users on the coast say they can now enjoy broadcasting in a way impossible before. Some type of Morse interference calls for somewhat more skill, but 95 per cent. of Morse is cut out easily. Even the more difficult Morse, however, can be sufficiently subdued so that it ceases to be troublesome.



**LISSENCEPTOR Mark 1 type**, for broadcasting **7/6**

**LISSENCEPTOR Mark 1 type**, for 600 metres **7/3**

**LISSENCEPTOR Mark 2 type**, for broadcasting and 600 metres combined (with switch for more selective tuning) **15/6**

THE LISSENCEPTOR ACTS AS A SENTINEL BESIDE YOUR RECEIVER.

## Switching that is Helpful to Regeneration

When working on the lower wavelengths perhaps the set will just oscillate with the condenser in parallel. If the LISSEN Series-Parallel switch were fitted, you could immediately try the effect of putting the condenser in series, and so seeing whether the increased regeneration obtained would more than compensate for the slight damping of signals consequent upon the changing over of the condenser. The LISSEN Series-Parallel switch is easy to fit—takes up little room—LISSEN ONE HOLE FIXING, OF COURSE **3/9**



## Make Your Batteries Last Longer

In the case of dull emitters, the current taken per valve is small, but there is a drain on the batteries all the same. If the dry cells used are given the opportunity to recuperate the voltage which has dropped when the cells are in use will rise again. Two cells, for instance, which are worked alternately throughout will last a great deal longer than twice as long as one cell which is worked continuously. Apart from the economy of introducing a switch to change over to alternate batteries, the voltage will be steadier and the efficiency of the set improved. The best switch to use is the LISSEN two-way switch—easy to fit—hardly any room is taken up—LISSEN ONE HOLE FIXING, OF COURSE **2/9**



## What would Happen to the Negative Charge?

If you had an unreliable grid-leak in your receiver, the negative charge left on the grid of the valve by each radio frequency oscillation of a radio wave would leak away too quickly, with the result that it would be impossible to regulate the charge that should accumulate on the grid. With the LISSEN Variable Grid Leak (prov. pat.) is used it is possible to select the exact value of leak resistance, and to obtain correct grid potential under all conditions of valve and circuit. An interesting alternative use is across the secondary of a transformer or across the loud speaker itself, when it will suppress any tendency for the high notes of the musical scale to be amplified disproportionately to the lower notes.

**LISSEN Variable Grid Leak** has positive stops both ways—continuously variable  $\frac{1}{2}$  to 6 megohms—LISSEN ONE HOLE FIXING, OF COURSE **2/6**

**LISSEN Variable Anode Resistance**, 20,000 to 250,000 ohms continuously variable, same outward appearance as the LISSEN Variable Grid Leak **2/6**

WHY USE MIXED PARTS?—You can be sure that your receiver built with all LISSEN Parts will give results which would never be possible with a receiver built with mixed parts.

# LISSEN LIMITED,

8-16, WOODGER ROAD, GOLDHAWK ROAD, SHEPHERD'S BUSH, LONDON, W.12.

Telephones: Hammersmith 3380, 3381, 3382, and 1072. Telegrams: (Inland) "Lissenium, Shepherds, London," (Foreign) "Lissenium, London."

BUILD WITH LISSEN MASTER PARTS.

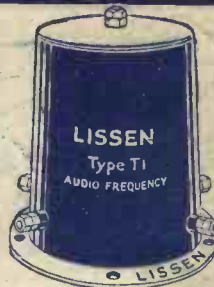
## The Loud Speaker's Voice

You have no doubt heard that blurred, woolly reproduction which is more jarring than beautiful. More often than not, such reproduction comes from a badly-designed transformer. Not all high-priced Transformers are well designed. If you would have beautiful tone quality, crystal-clear music, perfect in every detail of light and shade, song and speech that come through with absolute fidelity of tone, you will fit LISSEN Audio Frequency Transformers at the price you choose.

**MAKES A WHISPER LOUD.**—The LISSEN T1 has a coil with over 8-ozs. of copper in the coil—the coil would amplify by itself without any iron core at all—for immediately after the detector valve always, throughout when superradiative amplification is desired, and **30/-** especially for POWER WORK also

**AUDIO FREQUENCY IN REFLEX CIRCUITS.**—An all purpose transformer is the LISSEN T2, and it has been found an excellent transformer in dual and reflex circuits, where it will yield pure and powerful amplification. May be used for all stages and recommended to follow the LISSEN T1 where multiple stages of audio frequency are used **25/-**

**SKILFULLY BALANCED DESIGN.**—Many expensive transformers are not so good as the LISSEN T3—it is one of the best light transformers made **16/6**



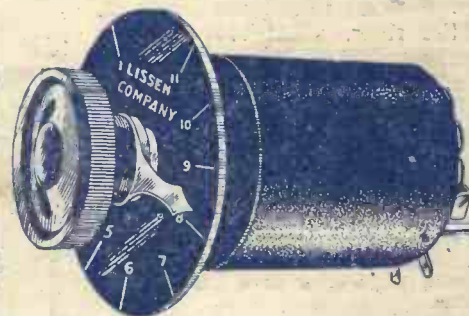
## Stronger Light—and Fading Signals. The Need for Radio Frequency Amplification.

Have you yet noticed how signals which used to come in strongly are now more difficult to tune in while daylight lasts? No sooner has darkness set in, however, than signals seem to come in strongly again. Summer shows up any weakness in your set if it is without proved radio frequency amplification. Build up wave energy with the aid of LISSEN radio frequency amplification. Then see how strongly your signals are received and with what certainty they come in. There are three well-known types of LISSEN radio frequency parts: When to use the LISSEN Selective H.F. Transformer. In some dual and reflex circuits transformer coupling of H.F. valves is essential, and even where it is not indispensable many still like to use transformer coupling. The advantage the LISSEN H.F. Transformer has over all others is that it makes a receiver exceedingly sensitive—it is also very stable and as many stages of H.F. as desired can be **19/6** introduced into a receiver. 150—4,000 metres

Blue print with each shows easy connections.

## When to use Lissen Reactance (prov. pat.)

If you desire great parity of reception, a high degree of amplification, and extreme sensitivity, the LISSEN REACTANCE should be introduced into the anode circuit of the H.F. valve. Diagram with each shows how. It gives greater amplification than any other H.F. coupling, and it will amplify even the loudest of signals almost as much as a good audio frequency transformer. Recommended for one or two stages H.F., for which it is widely used, and has done much to popularise radio frequency work. Gives its best results with aerial reaction.



It is easy to control. Beyond two stages some little skill is required. It is widely used, and has done much to popularise radio frequency work. Gives its best results with aerial reaction.

150—10,000 metres **19/6**

150—600 metres **17/6**

The LISSEN REACTANCE AND LISSEN H.F. TRANSFORMER have the same outward appearance—latter has four connections instead of two, however. Successfully Used in the Reception of American Telephony.

No aerial reaction need be used for the LISSEN GENERATIVE-REACTANCE (prov. pat.) will take its place. It is non-radiating—replaces plug-in coils—it is lower in cost than a set of 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 of radio frequency. Blue print with each shows easy connections—unbroken regeneration possible over **£2/12/6** the whole range—150—4,000 metres

Tune always with a vernier—preferably the LISSEN Vernier, which is specially designed for fine tuning in H.F. circuits, **12/6**

Note.—LISSEN H.F. Transformer and LISSEN REACTANCE are self-tuned and no separate condenser is essential, but the aid of a vernier will oftentimes be an advantage, and the LISSEN VERNIER is recommended. All these parts have LISSEN ONE HOLE FIXING, OF COURSE. And the radio frequency parts are complete with internally connected switch, so that drilling and soldering are avoided.

