

# Wireless Weekly

and the Wireless Constructor.

Vol. 4.  
No. 22

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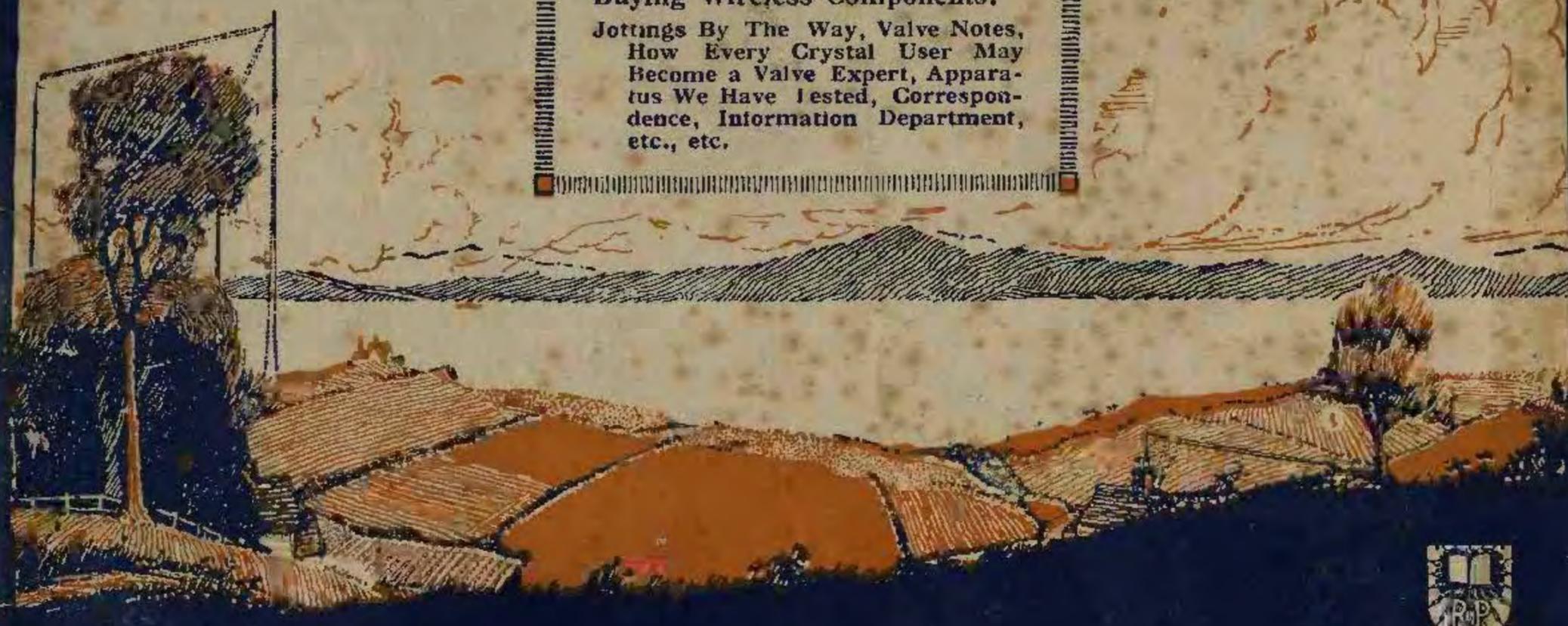
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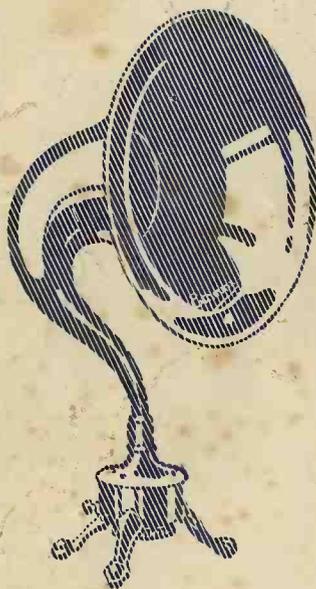
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DATE..... Wireless Weekly, Oct. 1st, 1924

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# Wireless Weekly

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OCTOBER 1, 1924.

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## £500 To Fight The Post Office

Our readers will, no doubt, have seen in the daily Press that the Editor, on behalf of *Wireless Weekly*, has offered the sum of £500 to the Radio Society of Great Britain towards the expenses of fighting a test case with the G.P.O. Since the announcement of this offer the *Wireless World* have also offered a similar sum, and by the time this appears other wireless interests may have followed our lead.

The remarks of Dr. Eccles, President of the Radio Society of Great Britain, appear elsewhere in this issue, and it will be seen that at last the Radio Society is appreciating the fact that the Post Office policy is to tighten up the reins as much as possible and to introduce as many difficulties as they can in the way of experimental transmitters.

With unflinching monotony the Post Office blandly declares their good intentions, while at the same time they introduce more and more restrictions and become more and more reluctant to grant licences at all.

If the Post Office is definitely challenged on the subject in Parliament or elsewhere, they fall back upon the old formula in which they declare that restrictions are necessary, because of possible abuses, but that all genuine experimenters will be given every facility and that extra power, extra wavelength, and all other so-called concessions are readily made in all suitable cases. Perhaps the Post

Office can fob off the general public with statements of this kind, but the excuse offers little consolation to those intimately in touch with affairs.

To introduce all sorts of heavy restrictions and to leave a loop-

tively few number of cases, and a large number of highly competent applicants are refused licences altogether.

Dr. Eccles, in his address, disclosed the fact that the Post Office refused transmitting licences to a special list approved by the Council of the Radio Society. This list included applicants of the very highest qualifications, and if the Radio Society requires any evidence of what the Post Office thinks about their qualifications as judges in these matters, here is a startling example.

The Post Office simply relies upon the Wireless Telegraphy Act of 1903 for imposing all sorts of regulations and restrictions, quite unnecessary, and merely vexatious. Some of their acts, such as the imposition of royalties and the withholding of licences, are absolutely illegal and the sooner this is shown to be the case in the courts, the better.

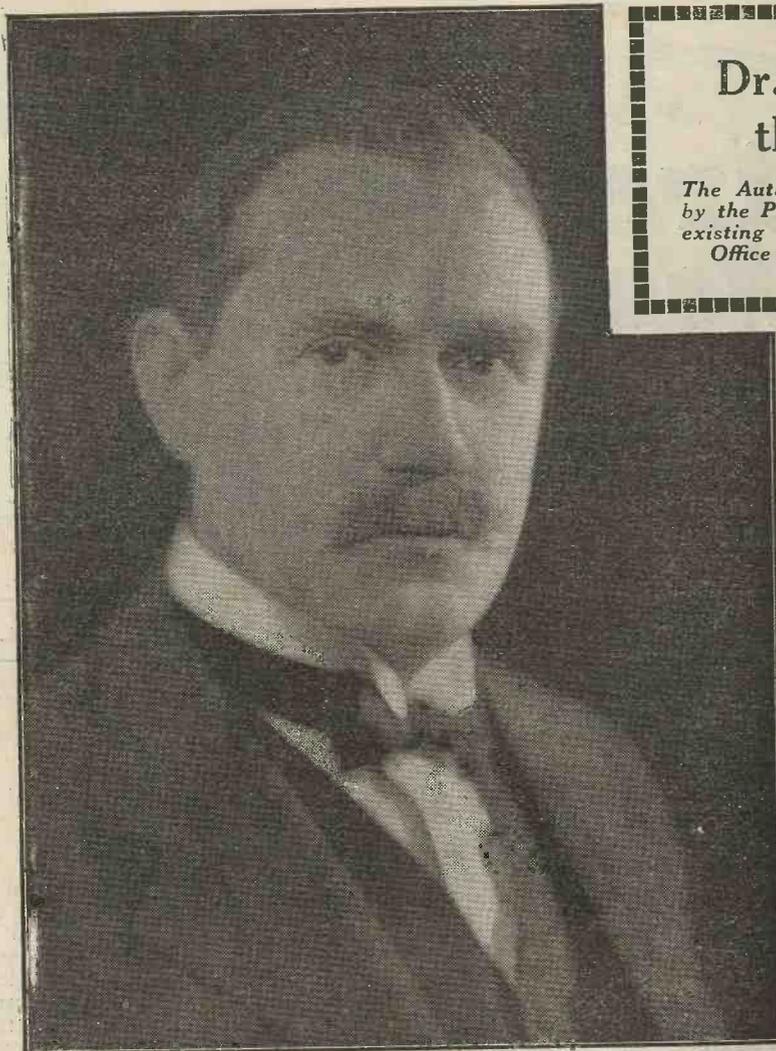
We have often criticised the Radio Society in the past, and we will probably do so in the future, but our offer of £500 with a promise of more is ample proof of our earnestness in these matters. The Post Office have played the fool long enough with the Radio Society, and if the latter's eyes are not open now, they never will be. Let them stage a suitable case and openly challenge the Post Office to take action. It is the only way to bring matters to a head. If the Radio Society fails to show a strong spirit now, their influence will disappear.

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hole by saying that these are removed in all suitable cases, is an attitude which we consider should not be tolerated for a moment.

In actual practice these restrictions are only lifted in a compara-



*Dr. W. H. Eccles, F.R.S., President of the Radio Society of Great Britain, whose trenchant remarks concerning licenses are given below.*

**T**HE Radio Society and its Affiliated Societies comprise every kind of amateur—the home constructor who has fallen a victim to the fascination of making or improving tuners and amplifiers, the ripe enthusiast who welcomes morse as much as music and constructs reflex circuits and other modern marvels, and the matured transmitter who fishes in the ocean of space and learns the ways of the waves in our ever-changing atmosphere. By uniting all these the Societies will surely gain in strength as time goes on. At present the Radio Society consists of about 800 ordinary members and over 200 Affiliated Societies and is governed by a Council and by a General Committee.

The advent of broadcasting has greatly augmented the ranks of the amateurs, especially those interested in building and experi-

menting with receiving apparatus. As broadcasting flourishes so will the number of amateurs increase. It is inevitable that a large proportion of these amateurs will in due time desire to supplement their knowledge of receiving apparatus by actual work with transmitting apparatus. We hope to see them join the Societies early and climb through the various stages into the Transmitter and Relay Section and thereby enter the ranks of the élite in the amateur movement.

We of the Society think that one of the most lasting benefits of the spread of broadcasting—a benefit much less ephemeral than the music and the speeches—lies in the stimulus it is giving to the study of electrical things; and from this point of view broadcasting is an immense force attracting the quicker minds of

## Dr. Eccles Attacks the Post Office

*The Autumn Address before the R.S.G.B. by the President, reveals the strong feeling existing between the Society and the Post Office anent the transmitters' position.*

every country towards physical science. We think this is highly commendable because we know that the spread of a knowledge of electricity and the cultivation of electrical skill (for which there is no better medium than wireless) is in the widest sense of the utmost national value in this glowing morning of the electrical age of mankind.

Since the time when Admiral Sir Henry Jackson, my predecessor in office, gave the first autumn Presidential Address, the custom has grown up of employing the occasion to tell members and the public of the recent joys and sorrows of the Council. I shall take advantage of this custom to-night.

### The International Congress

First of all, I have to inform you that the Society had the pleasure last Easter of taking part in the International Congress in Paris, held under the Chairmanship of Mr. Hiram Maxim, which led up to the formation of the International Amateur Radio Union. Mr. Marcuse, the Hon. Secretary of the Transmitter and Relay Section, represented the Society in Paris and was elected to the International Committee which is to meet next Easter to draw up schemes for international amateur work. Since the formation of the International Union, Mr. Marcuse has been travelling in America and Canada. He came back with a message from the Canadian Radio Relay League, worded as follows:—

"Please convey our greetings to the Radio Society of Great Britain with congratulations on their achievements. We also congratulate the Transmitter and Relay Section on their wonderful success in the transatlantic tests and take this opportunity of expressing our desire for a stronger

affiliation between Great Britain and the Colonies for the general benefit of amateur radio."

#### Transmitting Permits

Very shortly after these events the Post Office began to issue their permits to transmitters with new and unexpected restrictions printed upon them. The one striking directly at the international co-operation of amateurs just described is numbered 7 on the printed permits. It reads:—

"Messages shall be transmitted only to stations in Great Britain or Northern Ireland which are actually co-operating in the licensee's experiments and shall relate solely to such experiments."

I will read to you what *The Electrician*, one of the most important electrical journals of the world, said about it:—

#### "A Curious Restriction.

—The permits to transmit, which are now being issued by the Postmaster-General to wireless experimenters and amateurs, contain a condition and limitation which is likely to give a good deal of trouble and whose precise object is not altogether clear . . . . How is it to be ascertained that the energy transmitted is passing within the frontiers of Great Britain and Northern Ireland and no further? . . . . Again, what exactly is the aim of the restriction? If only experimental messages are sent there can be no objection to whoever will receive them, and in the possibility of reception in unexpected places lies a good deal of the use and interest of this class of work. But quite apart from these points, the imposition of such a restriction, except in so far as it relates to what is sent, seems to us unjustified, not the least because it may have a harmful effect on the development of radio communication."

I call attention to the words in this criticism:—"in the possibility of reception in unexpected places lies a great deal of the use and interest in this class of work." This is so obviously true that the Society got into touch with the Post Office in order to elucidate the matter. We are given to understand that

the printing of the restriction on the permit was merely embodying a practice already recognised; and that each experimenter desiring facilities for foreign communications should furnish particulars of the experiments and evidence of an arrangement for co-operation by a foreign or colonial station or stations. Our comment upon this is that it is impossible to make arrangements for receiving from unexpected places and acknowledging the receipt.

#### An Example

I think the restriction may have been conceived without information of the methods necessary for carrying out this very valuable wireless range finding. For example, during the past few weeks very strong signals have been received in London from a powerful amateur station in the Argentine. The right thing for any English amateur to do would be to reply instantly and endeavour to get into touch on the same wavelength after making sure that he would cause no local interference. If he succeeded and made records of the variations of signal strength, he would have contributed something to wireless progress. But, according to the new restriction, he would thereby be endangering his permit. As *The Electrician* says:—"What is the aim of the restriction? If only experimental messages are sent there can be no objection to whoever will receive them." I agree. It makes no difference whatsoever whether a message is addressed by a Sheffield amateur to a man in the Shetlands or a man in Dublin, yet the latter would be a breach of the permit. It makes no difference because the same waves go forth in the same all-round way whatever morse call sign is put at the front of the message.

#### Protests

I cannot imagine that international amenities can be assisted by any restriction that asks a British amateur to turn a deaf ear to his brother amateur in other countries who is not under such a restriction and will not understand it. The Council have received so many protests from members all over the country that they have had to enquire

under what Act of Parliament and for what national or other reasons this limitation of a licence-holder's liberty is imposed. They have found no answer and they have concluded that such a restriction would destroy one branch of research, would prevent the development of friendly relations between amateur workers in this and other countries, and would tend to isolate the British amateur from international co-operation with the rest of the active world.

#### Continental Amateurs

It may not be generally known that the volume of continental amateur transmission that can now be heard in this country from dusk to midnight is vastly greater than the whole volume of our own amateur transmission at all hours. At this point one cannot reiterate too forcibly that it was the amateurs who discovered the valuable properties of short waves across long distances. Up to three years ago the commercial companies and the experts thought that short waves were no use for long ranges. Then the amateur stepped in and bit by bit extended the range across which one could communicate with another. Two years ago, as a result of the Radio Society's transatlantic experiments, the incredulous ones looked into the matter. Then the engineers of the Marconi Company, by using larger powers and reflecting screens, developed the Beam system, which, it is hoped, will afford many parts of the Empire a service of high speed telegraphy. In view of these very recent triumphs of the amateur, this seems quite the wrong moment to introduce restrictions which will push the British amateur off this field of discovery and leave it to the amateurs of other nations.

#### The Wireless Telegraphy Act.

The restriction and the discussion have called great attention to the Wireless Telegraphy Act. The Act seems very clear and I propose to give you my reading of it. First notice that the expression "wireless telegraphy" is defined to mean any system of communication by telegraph without the aid of any wire connecting the points from and

at which the messages for other communications are sent and received. The main object of the Statute is to protect the State monopoly of the electrical transmission of messages or communications between individuals. A second object is to establish control over the sending and receiving of messages inasmuch as transmission by wireless telegraphy was thought to be a possible source of danger to the State in certain events, especially war. Another object is to obtain such control as will minimise the interference of one user of wireless with another. All these aims are just and necessary. They are to be obtained by prohibiting persons from establishing any wireless telegraphy station or installing or working any apparatus for wireless telegraphy except under licence from the Postmaster-General.

#### Two Important Provisos

Two very important provisos are made in the Act. The first, which governs the whole Act, is that "nothing in this Act shall prevent any person from making or using electrical apparatus for actuating machinery or for any purpose other than the transmission of messages." In other words, if the purpose of a piece of electrical apparatus is *not* the transmission of messages it need not be licensed. This provision is obviously a necessary one, for otherwise every piece of copper wire wound into a coil and every pair of metal plates fixed up as a condenser, would need to be licensed, which would reduce the Act to an absurdity.

#### The Second Condition

The second proviso is that when a British subject wants a licence for the sole object of conducting experiments in wireless telegraphy, that is, in communication to a distance, a licence shall be granted to him as his right. But he must prove to the satisfaction of the Postmaster-General that his sole object is to conduct experiments; that is to say, he must not have the intention to transmit messages for money, must not intend to interfere with other users of wireless maliciously, and must not intend to do anything dangerous to the State. This is the amateurs' Magna Charta.

#### Restrictions

The licence which the Postmaster-General must grant to the amateur may be "subject to such special terms, conditions and restrictions as the Postmaster-General may think proper, but shall not be subject to any rent or royalty." I think much of the trouble that has arisen comes from the last sentences. For example, they seem to have been interpreted to mean that the Post Office may restrict the licence to the use of a station for a few minutes a day between specified times and on a very low power, thus depriving the licence of nearly all utility. The phrase "terms, conditions and restrictions" has been applied to compel applicants to disclose completely the object and the method of their proposed experiments.

#### Experiments

Now there are some experiments for which the method can be foreseen and some for which it cannot. For most of them the method and the apparatus must be evolved as we go along. Hence the applicant for a permit to try experiments of this latter class is refused his licence—which is quite contrary to the spirit and the letter of the Statute. The ultimate consequence is that some surprising anomalies have arisen. For instance, at the beginning of the year the Council sent forward a select list of names of applicants of whose bona fides and competence the Council was confident.

#### Applications Refused

The list included among other experienced wireless amateurs one who has graduated in electrical engineering at a great College of the University of London. All the applications were rejected. At the same time the Council heard of licences being granted to inexperienced beginners with inferior qualifications. I am informed that the solution of this mystery is that some of the successful applicants for permits copy a few pages out of a technical treatise or published paper and present it as a description of their proposed research.

#### The Pre-war Transmitter

Another instance in which the Society has tried to assist is that

of a pre-war transmitter in the North of England who has retired from business and is anxious to return to the study of the variations of signal strength produced by the atmosphere. His application has been refused although, he tells us, beginners in his neighbourhood, some of them his pupils in the art, have been granted permits since.

#### The Post Office Desire

Even in those cases where a problem can be delimited and a method tentatively suggested, the desire of the Post Office to weigh the scientific value of the experiment and method before granting the permit is unpractical. It is an axiom of science and invention that such adjudication is worthless. It is a responsibility that no man of science, no scientific body would presume to undertake. The unexpected happens and is valuable. In short, it is much easier to spot the winner in a handicap than to forecast the result of an experiment.

#### The Society's Station

While I am speaking of the Act I might refer to the enactment that the licence granted for experimental purposes shall not be subject to any rent or royalty. The experience of this Society in connection with its own experimental station is as follows. The original licence was required to cover three and a half months' operation and was granted on December 7 last. The licensing fee of £2 and a royalty of £2 10s. for a complete half year had to be paid. The permit restricted the use of the station to 15 minutes on any one night between the hours of 1 a.m. and 7 a.m., and the power was limited to 1 kilowatt. It is to be regretted that so severe a curb should be imposed upon altruistic scientific work. It is reminiscent of the dark ages. At the present moment the position is that the Society is prohibited from using its station, even for helping amateurs to tune their apparatus correctly, unless the Society consents to pay another £2 10s. in royalty for the remainder of the year.

#### A Similar Position

Perhaps the anomalies I cite above have grown up as the

result of a system adopted long ago and have not been brought plainly before the authorities. I think it will be universally agreed that the system ought to be revised so as to remove them. An analogous case and its remedy is to hand. It will be remembered that at the beginning of the broadcasting movement in this country the Post Office applied the Wireless Telegraphy Act to compel all broadcast listeners to buy their apparatus from a specified group of firms. The upshot was that the home constructor arose in his thousands and defied the regulation. The Post Office thereupon tackled the problem afresh and rectified the mistake.

#### The Present Difficulty

This is exactly analogous to the present difficulty with the amateurs, but in this case the regulations are hindering scientific discovery, are robbing the best men of opportunities for learning advanced technique, are diminishing our wireless prestige relative to other nations, and will ultimately react adversely on the output of invention and technical improvement. The remedy is easy; it is to recast the regulations in the light of the experience of other progressive countries. British transmitters would then attain the same measure of freedom and be put under the same obligations as their fellow amateurs in America, France and elsewhere.

#### A Year of Reorganisation

I have dwelt at some length upon the licensing anomalies because of the great importance of this matter from the national and scientific points of view; but the Council have had many other problems before them. This has been a year of re-organisation; and therefore a very arduous one for the Council, which has in fact held thirty-four meetings in the twelve months. Their work has resulted in many improvements. The first great improvement consisted in concentrating all the work of the Society in a central office and in appointing a Secretary. Next, a number of Standing Committees were formed to deal with much of the detail work of the Society. The amount of devolution can be seen from the list of names of these Committees:—The General Com-

mittee of Affiliated Societies, the Membership Committee, the Papers Committee, the Licensing Committee, the Publicity Committee and the Standards Committee. Full particulars of these Committees will be published in the Annual Report. Besides these there are permanent Committees of the two new Sections of the Society, namely, the Schools Radio Society and the T. and R. Section. Since January the Committees have altogether held more than forty meetings.

#### Activities

The activities of the above-named Committees are more or less invisible, but the scientific meetings of the general membership of the Society constitute an equally good record. During the twelve months there have been ten ordinary meetings with an average attendance of ninety, nine informal meetings with an average attendance of forty, and eleven meetings of the Transmitter and Relay Section with an average attendance of fifty-five.

Among the greater of the public efforts of the Society during the past twelve months I must mention the organisation of the transatlantic tests last autumn. Mr. Coursey's report was published in May last, and is familiar to all members. Another important piece of work was the transmission and reception tests conducted in an express train on the London and North-Eastern Railway, organised by Messrs. Child, Coursey and McMichael. Full reports of these tests have now been published, and the thanks of the Society duly tendered to all who had assisted.

#### The Society Badge

Another matter which has engaged the attention of the Council has been the choice of a badge for the Society and its affiliated Societies. In order to obtain suggestions, the Council offered a prize of £5, reserving the right to use any or none of the suggestions in any manner.

#### Prize Winners

A large number of designs and ideas were sent in, many of them beautifully executed. They will be exhibited at the Society's stand at the exhibition opening

on Saturday. A Sub-Committee, consisting of Admiral Sir Henry Jackson, Mr. Campbell Swinton and myself, went through all the suggestions, and agreed that no one of them was exactly suited to our purpose. Finally, it was decided to combine some of the elements occurring in two of the best designs and to divide the prize. The winners are Mr. Frank W. Taylor, of 60, Cleveland Gardens, Barnes, and Mr. H. H. Townley, 26, de Crespigny Park, S.E. Many other of the competitors deserve prizes, but I can do no more than give them honourable mention, together with the thanks of the Society for their efforts. They are:—Messrs. Adeane of Shepherds Bush, Bampton of Salisbury, Bassett of Crofton Park, S.E., Bowes of Darlington, Brayshaw of Huddersfield, Church of Hendon, Clamp of Sydenham, Cooper of Acomb, Cumming of Yeovil, Farrar of Cardiff, Flinton of Scarborough, Francis of Barnet, Goundry of Barrasford, Harvey of Bristol, Helps of Bradford-on-Avon, Ibbitson of Sunderland, Larkin of Eltham, Loughlin of Salford, Marshall of Harrow, Mitchell of S. Croydon, Rowell of Gateshead, Sugarman of Abercynon, Wright of Portsmouth, and Wysehall of Rotherham.

#### The Marconi Direction Finder on American Vessels

The United American liner *Reliance*, which arrived at Southampton on September 24, is being equipped with a Marconi wireless direction finder. The range of the instrument is 100 miles without correction, and it covers all wavelengths from 400 metres to 1,000 metres. This ensures that accurate bearings can be taken with maximum efficiency over all the wavelengths used in maritime signalling. Most of the signalling between ships and between shore and ships is on 600 metres wavelength, and the transmission of special signals by beacon stations is usually on 1,000 metres, so that the Marconi direction finder is as suitable for assistance to navigation in open waters as it is when making landfall.



## Mud

**I** PLEADED some time ago for something like standardisation of the small parts that we must all use for making up wireless sets or the small gadgets, upon the construction of which most of us spend so much of our time and money. Now I have another grouse, which concerns that indispensable material ebonite. Much of what we buy is very good indeed, but for all your care, you may occasionally be landed with a slab which is of no use for wireless purposes, though if you have not drilled it too full of holes it may be used to replace a missing slate upon your workshop roof. There is, I am told, a variety of the substance, which is known to the trade as "mud." On occasions, when a chunk of it has been planted upon me, I have found a very much worse name for it than that. The trouble is that it looks just the same as the genuine article, and that if you go through life with a trusting faith in your fellow human beings, you may very easily find a quantity of it has been palmed off upon you. You will not find it out at once, for, suspecting nothing, you will spend hours, even days, in marking out, drilling, making up and wiring your latest wireless set upon it. You will try the thing out, and it will not work. You will apply every known test to discover the seat of the trouble, and fail to find it. You will consult your friends, getting no help from them. Your plight will indeed be a pitiable one, until perchance the light dawns. You are a victim of mud!

## Other Things as Well

And there are lots of other little things that make me want to arise at times and go out and slay somebody.

Enough I am by nature a gentle, easy-going soul, there are times when my strong passions are aroused and I feel like murder of the most unpleasant kind. Take the case of valve legs. I have a predilection myself for tapping these in, so that nuts need not be used on the underside of the panel. Thus is capacity saved. To revise an ancient proverb, take care of the micro-microfarads and the milliamps will take care of themselves. Very well, I go forth to a wireless shop and purchase, let us say, a couple of dozen valve legs, all of which come from the same box and look exactly alike. I run the gauge over one of them and find that it is screwed 5.B.A. This alone is sufficient to disturb one's equanimity, for I have never been able to discover any reason for the use of the odd B.A. sizes in wireless work. However, being a proud possessor of a drill of the correct size (if I could only find it) and of a 5.B.A. tap (which *ought* to be in that box over there), I eventually get down to it, and after some strenuous work twenty neatly-tapped holes appear on a large panel for the reception of the legs that will support five valves. Then comes the task of screwing in the legs. The first one goes in beautifully, and so does the second, but the third is unaccountably loose; it does not seem to be gripped by the threads, and when it is screwed home you cannot tighten it up at all. It is withdrawn. It is measured. It is 6.B.A., and so, on further examination, are about half those that I have purchased.

## How it Happens

And there you are, you see. If only the first valve leg measured had been 6.B.A. things would not have been so bad, for it is possible to put a 5.B.A. tap through a 6.B.A. hole. But you

cannot turn a 5.B.A. hole into a 6.B.A. by any process known to me. It is a perfect example of the perverseness of the lady known as Fate. The radio dealer starts it by mixing up anyhow his stock of valve legs and dishes out an odd lot to you. Then Fate, observing what is happening, chuckles up her sleeve and carefully places in your hand a 5.B.A. leg when she sees that you are about to measure the thread. She watches you drill and tap your holes with unholy glee. With fiendish ingenuity she makes you pick out 5.B.A. legs for the first two that you screw in, so that you may think that all is going well. It is always the third or a later one which is 6.B.A. Really, you know, Fate ought to be spanked. She ought to be old enough by this time to know better instead of going on like some silly flapper. Unfortunately it is always she who administers the spankings and you who receive them. You may grin and bear them if you are a stoic, but gnash your teeth and tear your hair should you be made of the same clay as most ordinary men.

## For It

It is really amazing to notice how absolutely wrong things can go at times. You go to your workshop whistling gaily and feeling at peace with all the world. You start some small piece of work, using a setsquare and scribe and ruling a line. Then you lay these two down for a moment whilst you reach for the centrepunch, the hammer and the footrule. After making one or two measurements you become a little doubtful as to whether one of your lines is ruled quite correctly. The setsquare will remove all doubts in a moment; but where is the setsquare? About half a minute

ago you placed it upon the table straight in front of you, but it is not there. It is not upon the nail upon which it normally hangs. It has not fallen upon the floor. It is not under anything else. It is nowhere. If you are wise you will realise at this point that Fate is out to have a game with you, and you pay her out in her own kind by spoiling the whole show. "Well, I don't really need the setsquare," you say; "it will turn up some time. Meanwhile I will just light a pipe." You put your hand in your pocket to pull out your pipe, and there is the setsquare. The lady will now leave you alone for the rest of the afternoon. If, on the other hand, you begin worrying about the wretched thing, she will allow you to turn your workshop upside down before you find it. She will send you indoors in search of matches, and feeling that the day is rather warm you will leave your coat hanging up in the hall and go to the workshop in your shirt sleeves. You will behave like a perfect maniac, and Fate will laugh till she is fit to bust. Then you will decide to chuck it for the afternoon, and will reach to the peg on which it usually hangs in the workshop for your coat. Not there, of course. You try your wireless den; no coat. You go up to your bedroom, fail to find it, and do another. Late that night you come across it hanging up in the hall, and as you reach it down the setsquare falls out of the pocket and smites you on your pet corn.

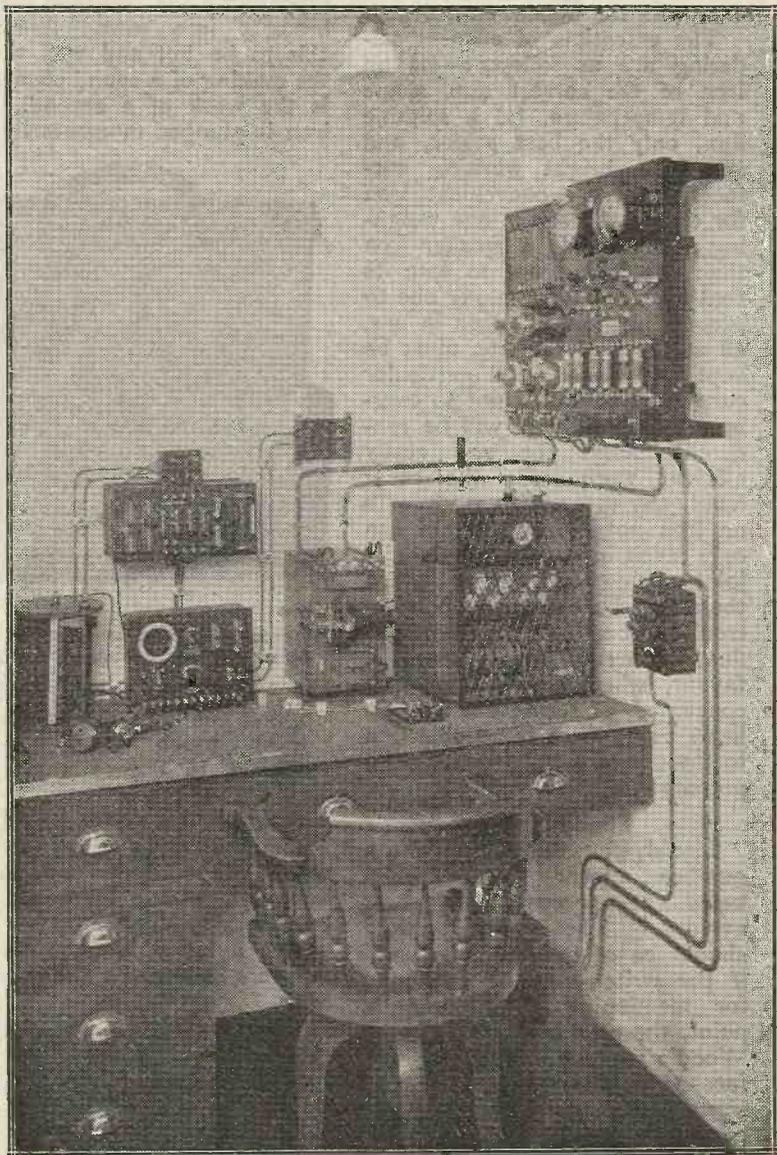
#### Temporary Insanity

I have never been able to understand why it is one suffers on occasions from temporary insanity. Have you not many a time searched high and low for your pencil when it was in your hand all the time? Have you not looked everywhere for a much-needed drill only to discover at last that it was all the time safely grasped in the embrace of the drill chuck and waiting for you to use it? Have you never mistaken IS for OP in wiring up—a thing you could not possibly do in sane moments—and then spent days in wondering why the set would not work? You have done all these things, and so have I, and we shall all of us do them

again in the future. I suppose that one must try to cultivate a philosophic calm, but it is a little hard to do so at times. At the moment, for example, I am searching for a stamp wherewith to post my manuscript. I bought no less than twelve this afternoon in a moment of extravagance, and placed them in the small drawer where stamps always live. They are no longer there, but I am not going to fuss about it, at least. I think I am not; but why on earth people cannot leave one's stamp drawer alone but must be eternally taking the wretched things out when they know how impor-

tant it is to you to have a supply always at hand I cannot think. It is a rotten, miserable shame, and here am I working like a nigger to catch the post and handicapped just because somebody who has come along to my drawer and borrowed a stamp has not the common decency to put the rest back after taking one. It is absolutely sickening. Quite enough to drive a man insane. If I can find out who it was I'll . . . I beg your pardon; let us say "as you were." I have just found them under my writing pad.

WIRELESS WAYFARER.



Our photograph shows a standard Marconi transmitter and receiver for shipboard use. Apparatus of this type may be seen at the Palace of Engineering, Wembley.

It is hoped that the few notes to follow will be of assistance to amateurs who have built up valve sets from instructions given in these or other pages, and experience any difficulty in getting their completed products to function satisfactorily.

#### Soldering

One of the most frequent sources of trouble in amateur-built sets is in badly made soldered-connections. For some reason or other, soldering, in reality an extremely simple and even delightful operation, is to the average experimenter a painful, laborious process, to be got over with the utmost expediency.

The essentials of efficient soldering are as follows:—(1) an iron of the correct size, shape and temperature, (2) a suitable flux, only the best solder, and (3) clean, bright working surfaces. A very convenient iron for electrical work is one weighing about 6 oz.; a smaller iron than this being apt to lose its heat too quickly, a larger one to become unwieldy. When in use, all surfaces of the iron must be kept well tinned, and particular care must be taken not to overheat the iron, or it will be rendered useless for any really efficient work. On the other hand, any attempt to work with an iron not sufficiently hot can only result in ragged, ineffectual joints being formed, at which there will be every likelihood of trouble occurring. In regard to flux, the writer is very much in favour, where electrical work is concerned, of resin; but if sparingly used, there is no objection to the use of a good commercial preparation.

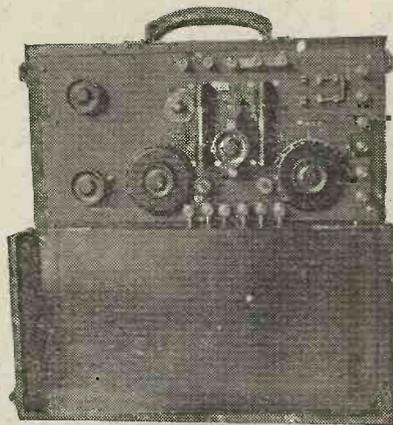
#### Liquid Fluxes

Liquid fluxes, of which a number appear to be marketed at present, are best avoided. The solder used should be of good quality, and if the writer may be pardoned for mentioning so obvious a point, the next best thing is not Wood's metal. Finally, all surfaces to be soldered must be kept scrupulously clean—in this respect a card of small files will be found very useful—and all brass terminals, etc., will require care-

ful tinning before it is possible to make an efficient connection.

#### Modus Operandi

The actual *modus operandi* of soldering is somewhat as follows: In the first place, a short length of wire is cut, the usual thing being a tinned copper wire of No. 16 or 18 gauge, stretched taut prior to use. The two points which this wire is required to bridge are now cleaned, tinned, and finally given a thin application of whatever flux is being used. The wire may now be held in the centre by means of a pair of pliers, its end dipped into the flux, and the iron brought into play. Assuming this to be hot and well tinned, the making of a sound connection is the work of a second. The iron is plunged momentarily into



A portable two-valve receiver made by a "Wireless Weekly" reader.

the flux, a little solder is picked up and run into the joint; the merest touch being usually sufficient to ensure a scientific weld taking place.

A point the writer would like to emphasise is, that once the knack of efficient soldering is acquired, wiring up a set is a considerably simpler matter than where a lot of nuts, bolts and washers have to be fiddled about with.

#### Some Frequent Causes of Trouble

Where a set refuses to function in spite of the soldering having been carried out in an efficient manner, one might proceed somewhat as under:—

## Practical Hints on Valve Set Troubles . . . .

By R. ROBERTS.

In the first place, the wiring should be carefully checked over with the aid of the technical diagram, and thorough investigation made for any imperfect connections or wires crossing and short-circuiting. In any such overhaul it is a good idea to start with the aerial circuit and proceed systematically to the high-frequency and detector units, and thence, stage by stage, through the low-frequency amplifiers. Everything being found correct, it now becomes necessary to test out some of the components.

#### Condensers

Condensers, for instance, should be disconnected at one terminal and tested out for possible short-circuits, particularly the small fixed condensers used in various parts of the set for coupling the detector valve, shunting the primary of the first L.F. transformer, and so forth. A leak in one of these might be responsible for a good deal of trouble. Reactance units, transformer windings and inductance coils may also be tested out for breaks or short circuits; all of these tests being readily carried out by means of a small battery and a pair of telephones.

Failure to reveal trouble in any of the components will mean that the fault is extraneous to the set and must be sought in the external accessories, such as the H.T. or L.T. battery. Either of these connected up in the wrong manner might be responsible for the set not functioning, and both should be tested with a voltmeter.

#### Ebonite

A very frequent cause of trouble in amateur-built sets is

\*   \*   \*

*An article which  
many readers will  
find both interesting  
and instructive.*

\*   \*   \*

in improperly prepared ebonite panels. It should be pointed out that ordinary commercial ebonite is of no use whatever for wireless work until the outer polished surface has been removed. This may be done by rubbing the panel down, on both sides, with a coarse-grade emery paper, afterwards applying a touch of paraffin or turpentine. If this "matting" process has been omitted, it is strongly urged that the entire panel be dismantled and a fresh start made, as with unprepared ebonite there is little likelihood of ever getting the set to function efficiently.

#### Bad Contacts

Another common seat of trouble is in bad contacts made by valve legs and the pins of honeycomb coil and plug-in high-frequency transformers. Pins should be opened out slightly with a penknife, and when reinserting in their various sockets it should be noted whether an effective contact is being made.

#### Other Points.

Other little points that should be looked for are: (1) See that for short wavelengths the aerial tuning condenser is in series with the inductance and in parallel for the longer wavelengths. A list was given last week in which were shown the wavelengths of some of the Continental stations. (2) Make certain there is no trouble in the 'phones or loud-speaker, burnt-out windings, or an incorrectly adjusted diaphragm. (3) Where H.F. transformers or reactance units are being used, see that these cover the correct range of wavelengths required.

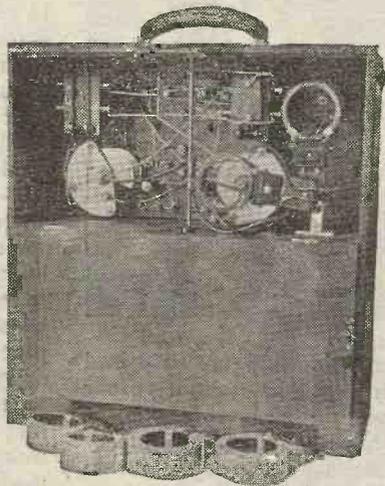
#### Distortion

Of all the various troubles met with in amateur-built sets the most frequent one is, however, distortion.

Very often this is traceable to the use of cheap components; an arch offender being the inferior low-frequency transformer. With an inadequate or badly-designed transformer distortion can be counted upon as a certainty.

For pure reception, the writer would recommend in the first stage a substantially - built instrument, with a ratio of not higher than  $3\frac{1}{2}$  or 4 to 1.

For the second L.F. stage, a one-to-one ratio "power"



*The interior of the receiver is as attractive as the outside.*

transformer should be used, a really efficient component being obtainable for about £2, which may seem a lot, but is practically essential where distortionless loud-speaker reception is desired. Even when first-class transformers have been incorporated in a set, distortion is, however, sometimes experienced. This may be due to the IP—OP—IS—OS connections being wrongly made. The correct method of connecting most transformers is IP to plate or anode of the valve, OP to high-tension positive, OS to grid, and IS to low-tension negative. Small points, such as these, will be found to make an enormous difference so far as tone and clarity are concerned.

Where the amount of distortion is only slight, matters can

sometimes be considerably improved by connecting a large fixed condenser of, say, 1-2 microfarads capacity across the loud-speaker and H.T. battery terminals; or almost the same purpose may be served by shunting the secondary of the last transformer by a 2-3 megohm leak.

#### Other Causes

Other causes of distortion are (1) too tight reaction coupling, the remedy for this being obvious, and (2) the use of the wrong type of valve.

In the opinion of the present writer, another absolute essential for perfect loud-speaker results is a suitable type of power valve for the last stage of low-frequency amplification. A number of these valves are now obtainable, and among them the B.T.H. B<sub>4</sub> and the Mullard DFA<sub>1</sub>, both designed to operate on 6v L.T. supply at a filament consumption of only .25 of an ampere, are to be thoroughly recommended. These valves require an H.T. supply of 80-120 volts.

#### Elimination of Distortion

Finally, the elimination of distortion is very often merely a matter of adjustment. Particular care must be taken to get the correct values of H.T. on the various valves, and separate H.T. batteries are recommended for the H.F. and detector units and the low-frequency valves. The correct value of grid bias on the L.T. valves will also be found to make an enormous difference to the quality of the speed and music being received. Correct adjustment of the filament rheostats is a further important factor, and one too often overlooked.

As a concluding hint, it may perhaps be mentioned that where it is desired to obtain first-class reproduction and absolute purity of tone in preference to mere volume of sound, it is advisable to adhere strictly to a straight-forward circuit arrangement. "Supers" and "reflex" circuits—good as some of the latter may be—are best avoided by the beginner.

## Winter Preparations

**N**OW that the best season of the year for wireless reception has begun the set should be given a thorough overhaul so as to make it thoroughly efficient for the work which it will have to do during the long evenings. Here are a few of the points which demand attention. All terminals should be examined to see that their contact surfaces have not become dull or verdigrised. If the nuts are polished up with fine emery paper far better contact will result, with probably an increase in signal strength in many cases. Next see to the valves. You will probably find that their pins are dull. Polish them with emery-cloth or scrape with a penknife, and before replacing in the holders splay all the pins out a little with the blade of the knife. During the summer your variable condensers will most likely have collected a considerable amount of dust on the surfaces of the vanes. Clean out both fixed and moving vanes by working a pipe cleaner or feather between them.

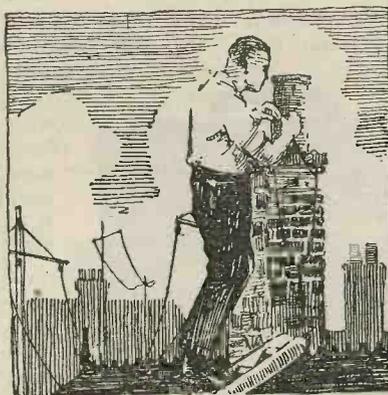
### Condensers

The presence of dust, hairs and so on between vanes is one of the commonest causes of noisiness in the set, though apparently few amateurs seem to realise this. The upper surfaces of panels will probably have been dusted in the ordinary course of events; but what of their undersides? Dust collects here as well, even when the panel is protected with a well-fitting cover, especially if during soldering operations a certain amount of greasy flux has been left on the ebonite. Clean over the under sides of panels, dusting also the wire. Examine carefully all connections screwed or soldered below the panel. Nuts have a way of working loose in the interior of sets, and when this happens connections may become bad and results will be very poor. Soldered connections, too, sometimes give way, and though they may appear all right there may be really only the poorest contact. Give each soldered connection a good pull. If anything is wrong the fault

will be felt, even though it cannot be seen. Next look to the low-tension battery. See that the electrolyte in the accumulator is up to its proper level and that the terminals have not corroded.

### Batteries

It is just as well to take the battery to the charging station yourself and to see the specific gravity of the acid solution tested by means of a hydrometer.



You may possibly be surprised on finding that it is about 10 per cent. too high. If the sp.g. is too high or too low the battery will suffer, since the acid solution in this condition has a very severe action on the lead plates. Lastly, run over the high-tension battery cell by cell with a reliable voltmeter to see whether there are any that are dead. In spite of a popular belief, high-tension batteries do not last for ever. Cells are very apt to give out after a period of hard work, and one "dud" cell in the middle of the battery may reduce the total voltage to something very small indeed. All cells which show less than two-thirds of their proper voltage should be short-circuited.

### The Aerial

When you are doing the autumn overhaul do not forget your aerial. Many of those erected since last spring are very flimsy affairs likely to fare badly in the storms of the colder portion of the year. One sees these gimcrack affairs everywhere, and it can be only a question of time

until such things are "earthed," possibly in rather an expensive way if they should happen to crash through a neighbour's greenhouse. Quite a flimsy pole will suffice for supporting the aerial wires if only it is properly stayed. If therefore your mast is of the willow kind purchase a length of ex-Army telephone cable and rig up a few stays to keep it from swaying too much. Even a backstay alone is better than nothing, and will often preserve the mast from destruction in bad weather. Old masts which have been standing for some time should be examined at the point where they enter the ground.

### Masts

The best way of doing this is to remove the soil at the foot for a few inches and to try the wood with a bradawl. You may get an unpleasant surprise by finding that a stout-looking mast is really thoroughly rotten and likely to snap like a carrot when the next gale comes. Should such an unpleasant discovery be made there is no need to tear your hair or to burst into scalding tears. All that you have to do is to obtain a 6-ft. length of good pine with a pointed end and to drive it well into the ground close to the foot of the mast with a maul. You can then splice the mast to it with rope or wire, and may sleep soundly even when the wind howls, knowing that your mast is perfectly safe.

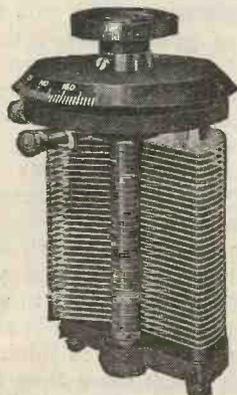
R. W. H.

## A NEW REFLEX CIRCUIT

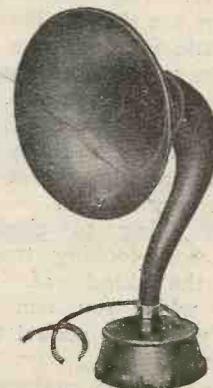
"Modern Wireless" for October (out on October 3rd) will contain an important article by Mr. John Scott-Taggart, F.Inst.P., A.M.I.E.E., on the Resistoflex, a new reflex circuit without a crystal. Order to-day.

## Buying Wireless Components

By R. W. HALLOWS, M.A., Staff Editor.



A Dubilier variable condenser.



The Sterling "Dinkie" Loud-speaker.

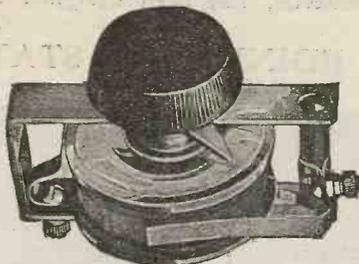
PERHAPS one of the most difficult tasks which faces the constructor to-day is that of selecting really good components for the sets or pieces of apparatus that he intends to make up. With most of us the tendency to economise is a natural and strong one. But in wireless it simply does not pay except possibly for such simple things as terminals, valve legs and similar small articles. Even here one has to be careful, for if you order a dozen terminals of a cheap variety you will quite possibly receive, as I did the other day, eight of one sort, three of a second and one of a third! And I have actually had two valve legs in one dozen which were *solid*—that is, they had no holes in them for the pins to fit into. The golden rule is to get the best that you can possibly afford. If you are prepared to spend only a certain amount of money on the construction of a receiving set, then make a good single or two-valve receiver rather than a three or four-valve using cheap and doubtful components.

### Condensers

There is, unfortunately, at the present time a very large amount of stuff of the poorest quality on sale. How bad some of these things can be you do not realise until you have the opportunity of testing them with accurate instruments. Then their performances come as an eye-opener. Some of the very worst components are the cheap fixed condensers that one frequently sees, all of which are "guaranteed" to be of a stated capacity. Not one in a hundred of them is actu-

ally anywhere near it. You may purchase two .0003  $\mu$ F fixed condensers of this kind, one of which will have a capacity of less than .0001  $\mu$ F, whilst the other may be anything from .0002 to .0004.

The points to look for in a fixed condenser are these: In the first place, a good finish is in this case *generally* a criterion of quality. Most of the cheap and nasty affairs have a kind of ragged half-finished appearance. See that the contact points are good and there is no wobble between them and the case of the condenser. The grid condenser *must* have a dielectric of the very best ruby mica of uniform thickness. As you cannot see inside the case of an ebonite-covered condenser, it is



An Igranic Potentiometer.

always best to buy one of known and reliable make, even if it does cost a few pence more than other kinds.

Variable condensers again can be very good and very bad, though it is quite possible to buy cheap ones which will give perfectly satisfactory results. Here are the points to look for. Rotate the knob and see that the spindle which carries the moving plates is straight in its bearings. If it is slightly askew the capacity of the condenser will be "all over the place" and the condenser will not be of much use, even if its plates do not touch. Push and pull the knob to see that there is no play in the spindle. The moving plates should go round quite smoothly, but the bearings should be fairly tight. If you can spin the moving plates

round you may be pretty sure that their contact is of a pretty chancy kind. The plates themselves should be of stout gauge, and the condenser should be so constructed that both those which are fixed and those which move are very tightly clamped on their rods. The point at which a fault is most likely to occur is in the contact between the spindle and the bush into which it fits. See that there is a good fit. An excellent type of contact is that made by means of a spiral of springy copper, but if this is fitted there must be stop-pins, otherwise a break is likely to occur.

### Rheostats

If cheap fixed condensers are bad, cheap rheostats run them a very close second for sheer nastiness. Usually you will find that they have a thin flimsy winding not properly supported, and therefore bound to get out of shape in a very short time, formers made of very poor material—I have seen painted wood used instead of ebonite—and contact arms so designed that they are bound to work loose at frequent intervals. Go for a good solid-looking winding brushed by a contact arm which is firmly fixed to the spindle. If possible, see the rheostat which you are buying, or a similar one, tried before you purchase, and note whether it does dim the filament of the valve properly. Avoid anything which gives a harsh grating contact.

### L.F. Transformers

Low-frequency inter-valve transformers, if they are bad, will utterly ruin the reception of

any set. The commonest faults in them are these. There may be too little wire in the primary windings; the core may not be sufficiently substantial, and the connections between the ends of the windings and the terminals may be so flimsy that they will break very readily.

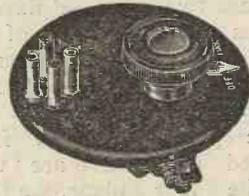
The thing to choose is a good solid-looking transformer, not the kind of miniature affair which you can put into your waistcoat pocket and never notice it.

Not everyone, perhaps, realises the importance of having thoroughly good gridleaks. Of all the components in the set, the gridleak is perhaps the most difficult to make, for it is a very hard task to manufacture a high-resistance which will remain constant

under all ordinary conditions. It pays distinctly when buying gridleaks to go for a well-known make. You may be rather surprised if in an access of recklessness you open an expensive gridleak to see what is inside it. You may feel for the moment that there is not very much for half-a-

unaffected by heat, cold or damp. And you will find that if you try gridleaks of good make with a "megger" everyone of them is very close to the stated resistance. This is a great deal more than can be said of job line gridleaks whose resistance may be anything from a few thousand ohms to infinity.

The conclusion to which we come is that you get what you pay for. The saving of money in buying cheapjack parts is very small when you come to think of it, and it is much more than offset by the trouble that you have with your apparatus and the pooriness of your results. The strength of a chain is that of its weakest link, and the quality of a wireless receiving set is that of its worst component.



*Bowyer-Lowe valve disc.*

crown! But you must remember that the makers have discovered the secret of so encasing the "innards" that they are quite

□ □ □

An interesting innovation which may be seen at the "All British" Wireless Exhibition is the Safety Disc which is being given away at the Mullard Stand.

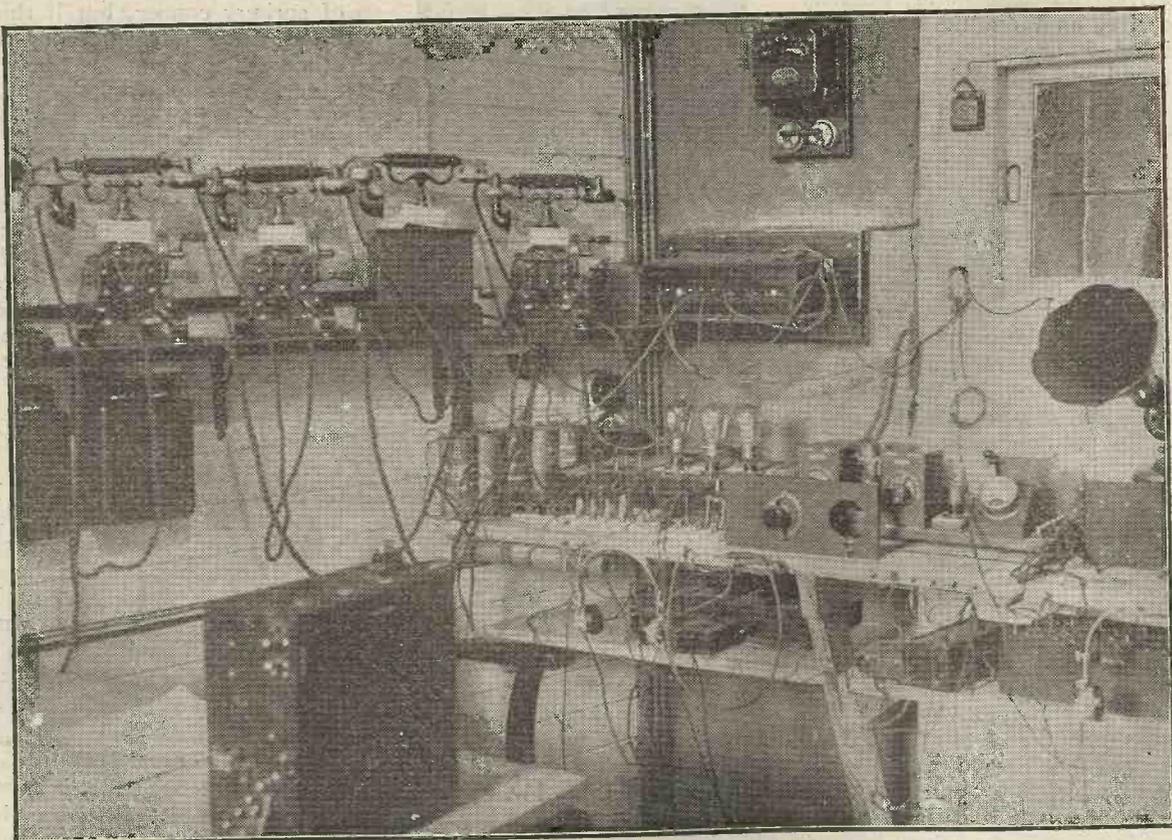
**A Safety Disc for Valves**

This device, which consists of a disc of coloured insulating material, has been designed to

□ □ □

prevent the filament pins touching any metal in the valve-holder until actually in contact with the filament supply sockets when they are safely home.

**THE EDINBURGH STATION.**



*Our photograph shows the control room of the Edinburgh station.*



# Valve Notes

By

**JOHN SCOTT-TAGGART,**

F.Inst.P., A.M.I.E.E.

### A New Variable Condenser

I HAVE been trying the new Fulstop variable condenser, and for general use in wireless circuits it can certainly be very strongly recommended. A great feature is made of the absence of hand-capacity effects, but the point which appeals to me most is the fact that a 360 degrees scale is provided. In other words, very fine tuning may be accomplished, because of the special gearing introduced into the condenser. This gearing works admirably, and to those who are prepared to pay a little more there will be the great advantages of fine tuning without the necessity for a vernier condenser.

### A Vernier Policy

Continually I am coming across people who imagine that by using a small variable condenser of, say,  $.00025 \mu\text{F}$ , they are going to get very fine tuning and that tuning on weak signals will be easier.

This is far from being necessarily the case. I will readily admit that it is better to use a  $.00025 \mu\text{F}$  variable condenser than the lower range of a  $.001 \mu\text{F}$  condenser. Obviously, in the former case, one has a half-circle variation (180 degrees), while in the other case all the tuning must be accomplished on a sector of, say, 40 degrees. There is obviously no comparison.

### Inductances

Let us, however, examine another aspect of the subject, and to do this we must consider the amount of inductance we have in the circuit. A given wavelength may be obtained by a small value of inductance and a comparatively larger value of parallel capacity, or it may be obtained by a large inductance

and a very small capacity. In a wireless receiving circuit the capacity in parallel with the inductance is not merely the variable condenser, but also incidental capacities, such as the grid to filament capacity of the valve and the leads going to the electrodes of the valves and the self-capacity of the coils and similar factors, which all contribute to the capacity in shunt with the inductance.

### Effective Tuning

It is generally accepted that the larger the inductance and the smaller the parallel capacity, the

small, and such a circuit will not be selective. For example, when listening to broadcasting on, say, 400 metres, spark interference on 600 metres is often obtainable. If, however, we have reaction introduced into the circuit, either by inherent reaction or by some deliberate coupling, then tuning is sharpened up remarkably, and the fact that the parallel capacities are small makes little difference.

### Tuning

To return, however, to the question of using small variable

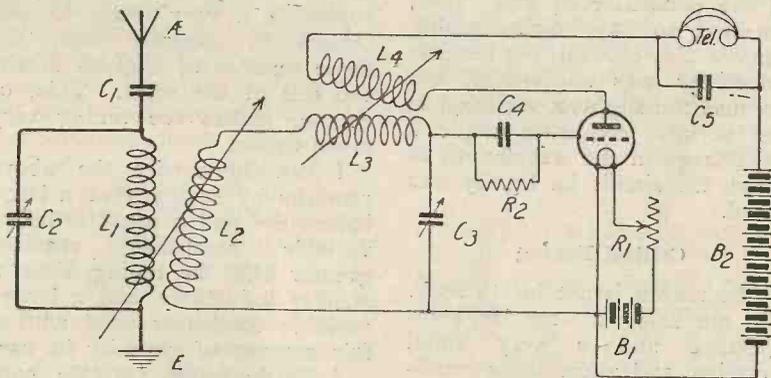


Fig. 1.—A loose-coupled circuit employing a "split secondary" for easier operation and adjustment.

larger the potentials built up across the inductance. It is, of course, always desirable to have sufficient capacity to provide effective tuning, as otherwise the circuit would become virtually aperiodic. This aperiodic effect, however, is not so important when reaction is introduced, but it is important when reliance is placed simply on the ordinary selectivity of the circuit.

### Variometer Coupling

If, for example, we use a large variometer for coupling one valve to another, the capacities across the variometer inductance are

condensers, the object of using such small variable condensers is to enable a large inductance to be employed, and so enable an increase of signal strength to be obtained. At the same time, of course, it is expected that greater ease of tuning will be accomplished.

I want to point out, however, in these notes that working with large inductances and small capacities makes tuning considerably more difficult and not by any means easier, although, of course, I have admitted above that it is better to use a small variable condenser than a small

portion of a large variable condenser.

Let us assume, for example, that we are receiving  $\lambda$ LO on a circuit of the kind shown in Fig. 1. It will be seen that loose-coupling is employed and that the aerial coil  $L_1$  is coupled to the grid coil  $L_2$ , a reaction coil  $L_4$  being coupled to a separate grid coil  $L_3$  in the grid circuit. The aerial tuning is accomplished by means of the condenser  $C_2$ , while  $C_3$  tunes the grid coil.

#### Incidental Capacities

In a circuit of this kind the incidental capacities may be kept small, and it is possible to use a large amount of inductance in the grid circuit and a corresponding small value variable condenser  $C_3$ . In actual experiment it is found that  $\lambda$ LO on 369 metres could be received when  $L_2$  was a 60 coil and  $L_3$  a coil of similar size. The variable condenser used was of .0003  $\mu$ F value, and it was possible to cover from 300 metres to 600 metres with only about one-third of the condenser in use. This, needless to say, made tuning considerably difficult, not because selectivity was so perfect, but because the slightest variation in the variable condenser made a big change in the wavelength to which the circuit  $L_2$   $L_3$   $C_3$  was tuned.

#### Critical Tuning

The reason is not far to seek. We are using a very large inductance and a very small capacity, and under these conditions the slightest variation of the capacity will make a big change in the wavelength. The wavelength of a circuit is proportional to the square root of the capacity across the inductance; consequently, if we multiply the capacity by four we will double the wavelength to which the circuit is tuned. If we assume, for the sake of simple explanation, that the variable condenser provides all the capacity across the inductance, and that the amount of capacity tuned by the condenser depends upon the number of degrees, then, if we are working on 5 degrees of the condenser and receive a station of, say, 300 metres wavelength, if we now turn the condenser

round to 20 degrees, we should reach a wavelength of 600 metres.

If, on the other hand, we were to use a single inductance coil, say, a No. 50 plug-in coil and shunted by a .0005  $\mu$ F variable condenser, we could cover this range of wavelength over the whole scale of the condenser, and consequently tuning would be very much easier.

We therefore have to bear in mind that by the use of a large inductance and a small variable condenser, especially when the latter is used at its lower values, tuning becomes a really critical operation.

#### Use of Square Law Condensers

This brings us, of course, to the subject of square law condensers, which have their plates so shaped that on the lower degrees the capacities are much smaller than in the case of an ordinary condenser. In other words, the capacity is not even approximately proportional to the number of degrees of the condenser used. A few degrees on the lower end of the scale represent a very much smaller change in capacity than the same number of degrees at the top end of the scale. This, of course, makes the tuning very much easier.

I can summarise the above remarks by saying that a large inductance and a small ordinary variable condenser requires greater skill in tuning than a smaller inductance and a larger variable condenser used with a fair amount of capacity in use.

A fairly large variable condenser will not give the same signal strength as a small variable condenser with a larger inductance. The advantages of both arrangements may be obtained by using a large inductance and a small square law variable condenser.

#### Inductances in Series

In connection with the Fig. 1 circuit or, in fact, in any circuit where two inductances are connected in series to give a longer wavelength, it must be remembered that larger inductances are required than if one single coil of a larger number of turns were employed. For example, two coils of 60 turns each will not

give the same wavelength as a single coil of 120 turns. This point is frequently overlooked by experimenters who use coils in series, and the reason is because when a single coil is employed the turns act mutually on each other to increase the inductance. When we have two separate coils of 60 turns each, and these coils are separated, the total inductance is exactly twice that of a 60-turn coil, but if the two coils are put close together, or wound as one big single coil of 120 turns, we not only have twice the inductance, but also the added effect, or mutual inductance as it is called, due to one coil acting on the other and helping it in its inductive effect. We have an effect very similar to that in a variometer where the two coils are brought together so as to help each other. The inductance, then, is very much larger than the two inductances added together. The two coils in Fig. 1,  $L_2$  and  $L_3$ , do not act on each other, and this arrangement is therefore similar to a variometer in which the two windings are wide apart or are at right angles to each other, in the case of a rotating type.

If, however, a single coil of 120 turns were employed, then we would have an effect similar to that in a variometer when the two coils were close together and assisting each other so as to produce a big increase in the inductance.

#### A Single-Valve Reaction Circuit

Fig. 1 itself is interesting as an example of a single-valve reaction circuit, which will combine selectivity with good signal strength. It will be seen that two separate couplings,  $L_1$   $L_2$  and  $L_3$   $L_4$  are employed, instead of the more usual three-coil arrangement. In the ordinary three-coil arrangement any variation of any of the couplings will seriously affect the others, whereas in the Fig. 1 arrangement, by separating the couplings, the effect is almost eliminated and the whole circuit becomes much easier to handle. This, however, does not mean that even with this circuit slight variations of either coupling will not necessitate a slight readjustment of the variable condensers.

# Random Technicalities.

By PERCY W. HARRIS.

*Some Notes of interest to the Home Constructor and Experimenter.*

SOME time ago there was published in *Wireless Weekly* an article describing the tests which took place in the vicinity of New York to ascertain the difference in signal strength and the effect obtained by screening of high buildings. The results were very illuminating and showed quite conclusively that there were extraordinary variations in signal strength between a number of different points at equal distances between the broadcasting stations. I was reminded of this a few days ago when I ran home to Wimbledon in a friend's car, a portable set with loud-speaker being kept in operation the whole time. Outside Bush House immediately in front of 2LO's transmitting aerial (or, rather, immediately below it) the strength of signals was not surprisingly great, certainly no stronger than we were able to receive two or three miles away. Down the Strand signal strength was fairly constant, although in Whitehall we were obviously screened from 2LO. It must be remembered that we had but a small low aerial (not a frame, but a few wires strung underneath the hood of the car), and one would have thought that this would have been screened very considerably when passing high buildings.

Considerable variations of strength revealed themselves when running along the Embankment, and prior to this a run alongside some iron railings had completely cut off signals, not a sound coming in. As soon as we had passed these, signals came up again, and the only other "cut off" we experienced was when we found ourselves underneath an iron bridge. From Westminster onwards there were quite large variations in signal strength. At Putney and on Wimbledon Common signals

were excellent. My companion informed me that in one small area on Wimbledon Common it is impossible to receive 2LO, although a few yards away signals come in at excellent strength. It is evident that we have still much to learn about the differences of signal strength in the vicinity of a broadcasting station, and the causes of these variations.

During the early hours of September 21 (in fact, just after 1 a.m.) I picked up fairly strong signals on a wavelength of about 120 metres, which I took to be KDKA owing to the peculiarities of transmission and that distortion which one learned to recognise so easily last year. After two or three items, which may have been gramophone records, I heard the announcer's voice, but could not identify the station. It was obviously not English, and sounded more like Spanish or Italian. The peculiar distortion was identical with that heard last winter from KDKA on 100 metres. Later, I learnt that the station is one operated by the Italian Army. I tried a few experiments while the transmission was on to see if any alteration of distortion could be effected in the receiver.

The particular receiver I use for this short wave work has the grid leak clips mounted on the outside of the panel, so that a quick change can be made. Two or three months ago Messrs. Dubilier kindly supplied me with a set of calibrated grid leaks from  $\frac{1}{2}$  to 5 megohms. I use these in preference to the variable grid leaks which cannot be properly calibrated. I found there was less distortion when using a high value of grid leak (for example, three or four megohms), and values below two megohms reduced signal strength quite 50 per cent. Five meg-

ohms, however, was too high for the particular detector valve used. I should say that the signals were strong enough to be heard without forcing the set up to the critical point of reaction. In all cases, however, the peculiar distortion was still there.

I am glad to see that two components for which I have pleaded for months are now generally available.

The first is guaranteed ebonite, free from surface leakage, and the second square law condensers, which at last are being made by a number of manufacturers. In future it will be increasingly difficult to realise that there was ever a time when strenuous advocacy of these components was needed, yet twelve months ago there was but one make of square law condenser, and not a single firm advertising its guarantee that the ebonite supplied was free from surface leakage.

Now that Esperanto has been officially recognised by the American Radio Relay League, interesting developments are likely. It is a good sound idea, and is easily learnt. I gained my own diploma in it as long ago as 1909, and was teaching it in London in that year. In the autumn of the same year I delivered in Esperanto, at the London Esperanto Club, a lecture on wireless, with experimental demonstrations. I believe at the moment I am the only English Esperantist with a transmitting licence, but this will soon be remedied!

Many people believe that gramophone records are made of ebonite. Actually this is not so, though they are nevertheless good insulators, and may be used to good account in small constructional work.



\* \* \*

*Another circuit which  
may be experimented  
with upon this popular  
receiver.*

\* \* \*

oscillation and the usual advantages of reaction will be found. The brightness of the filament of the detector (second) valve may be found to affect signal strength and stability.

A little experimenting in the correct value for the filament current for this valve, and also in the types of valves themselves,

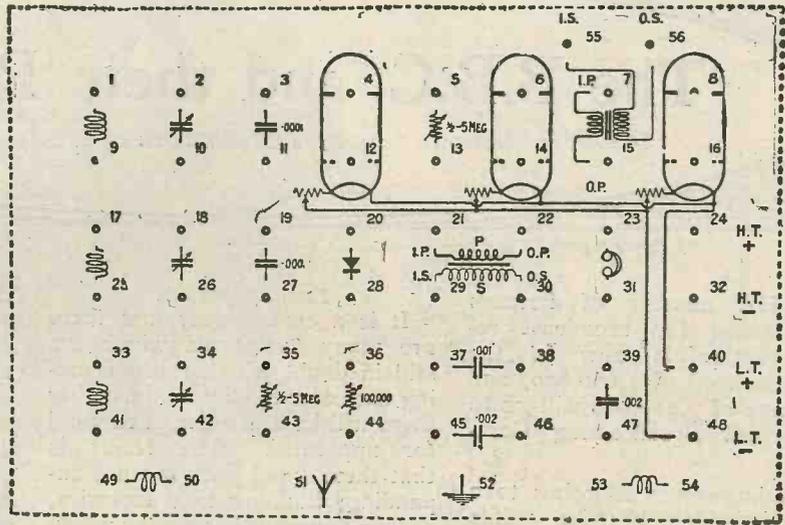


Fig. 2.—The terminal board.

will sometimes cause the difference between good and bad reception.

easily. All that is required is a piece of hard wood about  $\frac{3}{4}$  in. in thickness. A hole is then made with each drill in turn and the drills are inserted point uppermost, the size of each being marked in pencil against its hole on the wood. I use a stand of this kind for my taps, each size having three holes for first, second and third cut. For loose dies I use a stand made on the same lines, but instead of drilling holes headless nails are driven into the wood at regular intervals. These are passed through the middle hole of each die and keep it in its proper place.

R. W. H.

## A Handy Drill Container

ONE of the most convenient gadgets for the workshop bench that I have come across for a long time is a special cylindrical container for drills of Morse sizes from No. 1 to No. 60. This consists of a wooden body in which are made sixty holes to act as containers for the drills. It is fitted with two metal lids, both pivoted on a spindle running down the centre of the container. In the outer lid are three holes corresponding to the concentric compartments made for the drills. The inner lid has also three holes made in it, one of which can be made to coincide with a corresponding hole in the upper lid by moving a small knob. These three holes are marked 1 to 20, 21 to 40, and 41 to 60. To obtain any particular drill, say No. 16, one sets the figure on the rim of the outer lid against the pointer and puts the knob of the inner lid to the position labelled 1 to 20. The holes in the two lids then coincide with the hollow in which the required drill rests, and on the container being inverted it falls

out into your hand. The description may sound a little complicated, but the container is delightful to use, for any drill can be obtained in a moment, and as all are kept covered up they are always clean and bright. Those who already possess sets of drills can obtain these containers separately at reasonable prices.

There is only one disadvantage to this type of drill container, which is that a drill should always be replaced after it is used, for otherwise one may have a medley of drills lying on the table. If these are of very small size some difficulty may be experienced in getting them back into their right places, since on fine drills there is no room for the numbers to be marked. If one always replaces the drill after use there is no trouble, but should one fail to do so the size can be found by putting it through the drill plate.

Constructors who do not possess complete sets of drills will find it most convenient to make a stand for such as they have, which can be done very

## Broadcasting Alterations

We learn that on and after Monday, September 29, all the stations of the B.B.C. will revert to their winter schedule of times, commencing their programmes half an hour earlier, and that on Tuesdays and Fridays one provincial station will continue its transmission for half an hour after the closing of the other stations.

Chelmsford will radiate the programme of a provincial station upon one night in each week, and the 2LO programme upon the remaining evenings.

The fifteen minutes preceding the first news bulletin is to be filled in the case of the London station with a topical talk.

# The B.B.C. and their Revenue

By THE EDITOR.

THE number of licences issued for broadcast reception is now in the neighbourhood of 1,000,000, and a revenue of £400,000 will go to the British Broadcasting Company.

This huge sum is going to a company which has its profits limited to 7½ per cent. The company is a public utility concern, and since it is the public which is contributing the whole of the revenue by a form of taxation they are intimately interested in the use made of these funds.

We do not know the full programme of the B.B.C. during the coming year, but we may, perhaps, be permitted to make one or two suggestions. It is, of course, very demoralising generally for a company to have its profits limited to a certain amount. The directors of the B.B.C. have already voted themselves sums of money as a reward for their hard work, and salaries of the B.B.C. staff have been raised. We do not question these matters because we believe that this expenditure was, and is, a justifiable one.

## The Wireless Industry

We believe that the B.B.C. can do a great deal more to stimulate the wireless industry, which is by no means as great a one as it should be. The B.B.C. can assist by demonstration programmes which at present are only given on certain days. Moreover, we have constantly recommended that the B.B.C. should advertise their programmes just as any other entertainment organisation, and such advertisements will increase the ranks of listeners and will undoubtedly have a great influence on the development of the industry and the relief of unemployment in this country.

## Encouragement

It is a curious fact that there are many businesses which are still in doubt whether broadcasting has come to stay, and whether there will be a permanent demand for apparatus. The result is that these timid ones are not expanding, building new factories, or launching out in the way which would be of national benefit. It should be the policy of the B.B.C. to try and instil the fullest confidence in broadcasting, and by its own bold action encourage others.

Much improvement could also be made in the purely local relay stations, the power of which is too small. Then again, we notice that it is the intention of the B.B.C. to transmit the same programme from 5XX, the high-power station, as from London. It may be desirable to send the programme from London to 5XX, but we do not think that it is at all desirable that the same programme should be radiated from 2LO and 5XX. There is no reason, with such an ample revenue behind the B.B.C., why an entirely separate and distinct programme should not be radiated from the high-power station.

## Gramophone Recitals

Another point we notice is that gramophone recitals are being given, and we have some doubt whether this is being done as a matter of economy or whether it is done for the purpose of amusing those who have gramophone records. As we are only afflicted with these recitals at the less important times of the day, we are inclined to think that the first consideration is the chief one. It is interesting to note that American broadcasting stations are prohibited from radiating music produced from gramophone records.

## The Official Organ

We may be accused of self-interest if we criticise the policy of

the B.B.C. in issuing their programmes in a form which competes with private enterprise. The *Radio Times* does not in any way compete with technical journals as regards circulation; it is purely and simply a programme paper. On the other hand, the wireless industry is spending some £50,000 a year with the B.B.C. whose paper, being purely a programme, does not contribute to the development of the industry, as is the case of the technical press. In other words, as regards advertisement revenue, which is the backbone of any publishing organisation, the B.B.C. are seriously competing with private enterprise, and this very largely by virtue of their exclusive programme and the exclusive publicity which they enjoy by announcements regarding the paper by radio.

## N.A.R.M.

This serious competition with private enterprise is not consistent with the policy of a public utility company, and cannot be defended at a time when the revenue of the company is of the order of half a million pounds annually. The matter is a small side-line to the B.B.C., but it is of vital importance to wireless publishers.

The National Association of Radio Manufacturers, we understand, is in favour of wireless advertisements being excluded from the *Radio Times*, and private enterprise and the wireless public generally would benefit by the B.B.C. making a voluntary sacrifice of wireless advertisements in their journal.

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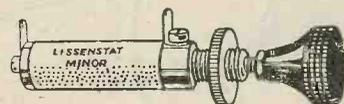
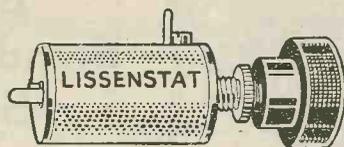
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SIGNALS THAT PASS IN THE NIGHT!—You get them stronger and from farther away if you are using LISSENSTAT control. After you have tuned in as far as you can go with every other control on your receiver you can still do a great deal more—IF YOU ARE USING LISSENSTAT control. When at last you realise that you are on to an unknown station there is a thrill in the thought that it has been brought in to you by nursing the valve with the turn of a knob that stands out so simply above your panel.



The secret is in the structure of the LISSENSTAT and its composition—so critically is it possible to control electron emission of the valve that you can get right on to the very spot necessary for the finest detection of long distance telephony.

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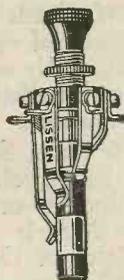
You can feel for fine detection—if you use LISSENSTAT Control.

## USE A RADIO SWITCH

Many switches sold are undesirable for radio work—they have been designed from the purely electrical point of view, which is not good enough for radio.

LISSEN SWITCHES, on the contrary, have been designed primarily for radio, but they are useful also for other switching purposes. You just gently pull or push them, and you hear them make with a reassuring "click"—and you know they are free from capacity effect.

## WHAT LISSEN 5-POINT SWITCH DOES



- Switches off one stage of L.F. without touching the filament control—a separate switch for each stage.
- Connects the telephones to the plate of whichever valve it is desired to use, and at the same time switches off the L.T. current from the unused valve.
- Cuts out a stage of H.F. in the same way as it does L.F. (we do not recommend any switching in H.F. circuits where it can be avoided, but where it is decided to use a switch, this is the switch to use).
- Will also disconnect both the H.T. and L.T. batteries, and short the aerial to earth so that the receiver can be left adjusted ready for switching instantly into commission next time.

With diagram. Price **4/-**

## LISSEN REVERSING SWITCH

Particularly useful when the LISSEN 5-point switch is used for cutting out one stage of H.F. When a H.F. stage is cut out, and reaction is being taken off the aerial circuit, it is necessary to reverse the reaction coil connections for each H.F. stage cut out, and this new LISSEN switch conveniently does it. Can also be used anywhere when it is necessary to reverse the connections of a battery, a coil, or a condenser, for instance. VERY USEFUL FOR COMPARATIVE TESTS. With diagram **4/-**

## TWO OTHER LITTLE SWITCHES.

LISSEN 2-way switch - - - **2/9** LISSEN Series-parallel switch - **3/9**

# How every Crystal User may become a Valve Expert

By E. REDPATH.

*Some further constructional details of a Single-Valve Flewelling Receiver, together with some notes concerning its operation.*

### Components Required

- One ebonite panel, 9 in. x 5½ in. x ¼ in. thick.
- One containing box to suit, 4½ in. deep inside.
- Eight terminals.
- One two-coil holder with extension handle.
- Four valve sockets.
- One filament rheostat.
- One variable condenser (capacity 0.001 or 0.0005 µF), with single-plate vernier for fine adjustment.
- One grid condenser 0.0003 or preferably 0.0002 µF.
- One variable grid leak, about 1 to 5 megohms. (This must be smoothly and continuously variable. That shown in the photograph is a "Microgrid.")
- One fixed condenser 0.005 µF (McMichael).

### Details of Operation

At the first few attempts to

operate practically any super-regenerative receiver, there are certain to be loud howlings and whistlings in the telephone receivers. Accordingly, until some experience is gained the set should be used only upon a frame aerial, which may consist

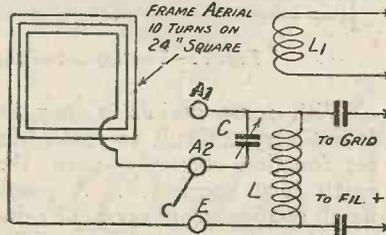


Fig. 5a—Showing method of connecting a frame aerial to the receiver.

of a temporary arrangement of 10 or 12 turns of wire upon a rough frame. Alternatively, a "loop" aerial, consisting of a single turn of cotton-covered wire

suspended round a picture rail, may be used. To use the set upon the outdoor aerial before experience has been gained in its operation will be almost certain to cause considerable interference to neighbouring receiving stations. The method of connecting the "frame" or "loop" aerial to the receiving set is shown in Fig. 5a. The aerial coil L may be either a 35-turn or 50-turn plug-in coil of the honeycomb type, whilst the reaction coil L1 should be a 75-turn or a 100-turn coil.

When all external connections are completed, set the variable condenser to zero approximately, bring the reaction coil fairly close up to the grid coil, and vary the grid leak until a howl or whistle is heard, upon which make further adjustment of the grid leak until a steady and extremely

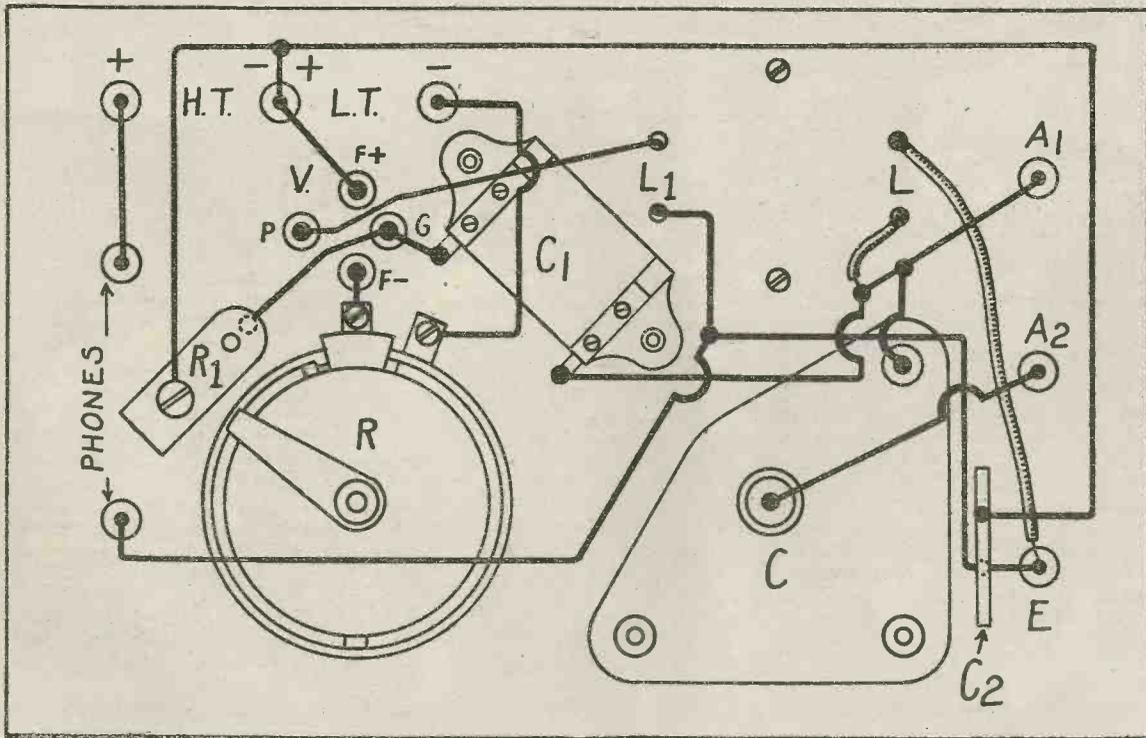
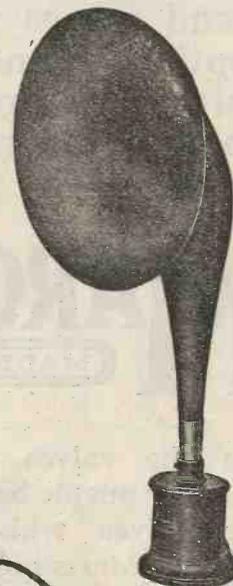
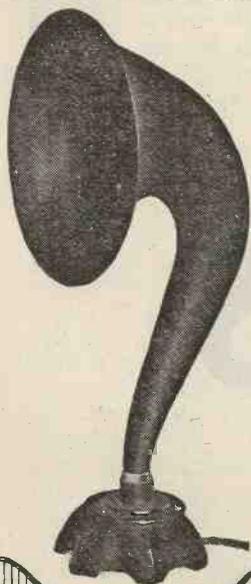
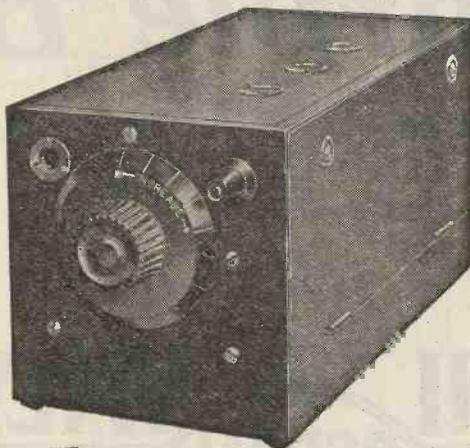


Fig. 6.—Practical back-of-panel wiring diagram.



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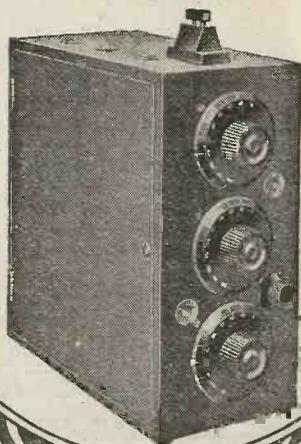
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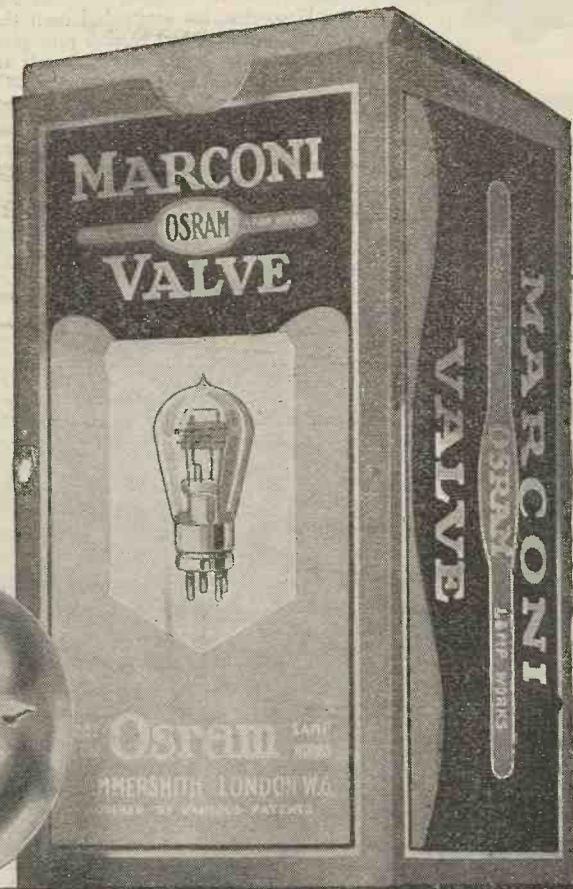
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**Handy B.A. Screw Gauges**

**A** VERY useful B.A. screw gauge can be made at home with very little trouble. It consists simply of a plate made from sheet brass  $\frac{3}{16}$ -in. thick and measuring 3 in. by  $1\frac{1}{2}$  in. The dimensions can be reduced considerably if desired, but it is not advisable to do so, since if gauge plates are made very small they are so easily mislaid or lost. The plate is marked out as shown in Fig. 1, tapping holes for the even-numbered sizes being made along the top row and for odd-numbered sizes along the bottom row. If you do not possess a full set of B.A. taps the best plan is to drill the holes tapping size and to have them threaded for you by the handyman at an electrical shop. This job will be quite an inexpensive one, and the cost will be amply repaid by the usefulness of the gauge which enables you to discover in a moment the size of any particular screw.

A nut gauge is an equally useful accessory for the wireless bench. Fig. 2 shows how it can be made from a 3-in. length of round brass rod  $\frac{1}{4}$  in. in diameter. If a lathe and a set of B.A. dies are available the constructor will have no difficulty in making the gauge for himself. Those who are without these appliances must have recourse again to the handyman referred to above. It is not possible to make a single-nut gauge for both odd and even sizes, since a

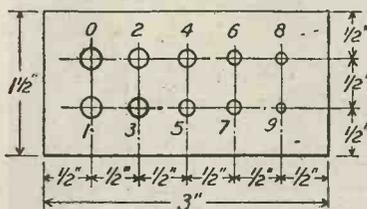


Fig. 1.—The B.A. screw gauge plate.

3 B.A. nut, for example, will not pass over a 4 B.A. thread. Separate gauges should therefore be made for the odd and even sizes. Reference to the drilling table shows us that the tapping size for 2 B.A. is the clearance size for 4 B.A., and so

on right down the table, hence a 4 B.A. nut will pass over a 6 B.A. thread, 2 B.A. over 4 B.A., and so on. The same happy arrangement applies to the odd sizes.

D. O. R.

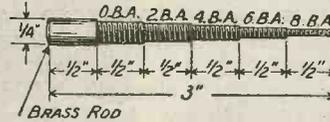


Fig. 2.—The B.A. nut gauge.

**Marking Out Panels**

**T**HERE are many different opinions as to the best method of marking out ebonite panels. Some hold that they should be marked lightly with a scribe on the upper surface, others that the under surface should be dealt with. Most writers condemn the use of the lead pencil for marking out purposes on the very sound ground that if graphite is left upon the surface of the ebonite it may provide paths between undesirable points for high-frequency currents, and so lead either to an absolute refusal to work on the part of the set when finished, or to its bringing in very weak signals. Again, should the polished surface of panels be removed and a semi-matt finish be given to them before or after marking out? Those who advocate that polishing should be taken in hand first recommend that marking out should be done on the underside with the scribe, and this is quite a satisfactory way of going to work. There is much to be said for and against each method.

Having made up a very large number of sets of different sizes, and being engaged almost daily in constructing small components, the writer has come to the conclusion that the best method is to use a lead pencil for marking out (this sounds like a terrible heresy!), to do this part of the work first, and to drill the panel before removing the polished surface; he prefers also to mark the upper side of the panel. The way in which a

piece of ebonite is dealt with is as follows: It is first of all squared up. For this purpose the ordinary small bench set-square is often not big enough, and a draughtman's T-square is used instead when necessary. The edges are roughly trimmed, and the panel is then marked out with a sharp-pointed pencil. The centres of all holes are next centre-punched, a very fine punch being used to ensure accuracy. When especially fine and accurate work is in hand the centre-punch is discarded, and in its place a most useful and easily-made little tool is employed. It is made from a jeweller's screwdriver, such as can be purchased for about a shilling from any good tool shop. This, as it stands, is a most handy little tool for fine work. At the top of the handle, which is about 3 inches in length, is a revolving head. The



The scribe.

fine screwdriver blade is fixed into the screw grip at the other end. To use the tool one places the first finger on the revolving head, inserting the blade into the nick of a screw. The handle is then revolved with the thumb and second finger. To convert one of these screwdrivers into a tool for accurate marking out, cut off the flat part of the screwdriver blade and file it to a triangular point. In marking out, the point is placed at the intersection of two fine lines which indicates the position of the centre of the hole to be drilled. It is held as before, the forefinger exercising a light downward pressure. As the handle is turned with the thumb and second finger the triangular

point cuts into the ebonite, making a small perfectly circular hollow without any "lip." This method is, I believe, used by instrument makers, and it certainly enables absolutely accurate marking out to be done.

When the centres have been marked drilling is done. It should be noted that it is very difficult to get a large drill exactly into the small pit made by the centre punch or the tool just described. It is recommended therefore that whenever holes  $\frac{1}{4}$  inch or  $\frac{3}{8}$  inch in diameter have to be made for the spindles of rheostats and so on, a smaller drill should be run in first for some distance, so that it makes a depression into which the big one can be centred without difficulty. Drilling having been done, the glossy surface is removed from both sides of the panel, medium emery cloth being used for the underside, whilst the upper side is treated first with *used* fine emery and is finished off with a piece of the finest obtainable glass paper which has also seen previous use. In this way all pencil marks are removed, and there is no fear of their causing short circuits.

**Better Days for Wireless**

IT is curious to notice the sudden entrance of what we may call autumn wireless conditions. In the spring-time there is quite a gradual change as the days lengthen out, as the ground becomes more parched, and as the trees become more and more thickly covered with masses of foliage. We find our range slowly decreasing, and when we try to tune in many stations which during the winter we could pick up readily, they become harder and harder to find, whilst the strength of those which we do get suffers in many cases a considerable diminution. By the time that high summer is with us most of us are reduced, so far at any rate as really good broadcast reception is concerned, to only one or two of the nearest main stations.

But the change back again from summer conditions to the better times of autumn and

winter seems to occur much more rapidly. There is nothing gradual about the process. We find quite suddenly when searching round one evening that an old friend lost for several months has come back again. Further searching discloses the fact that we can now pick up any other stations without having to increase reaction coupling, and we find that they are little short of their proper strength. This year the change back began about August 15, and, once started, it went on with amazing speed. There was one slight setback about August 20, but from that time onwards conditions grew swiftly better and better. Before the end of the month I found that there was hardly a degree on the dial of my A.T.C. which would not bring in something between 300 and 500 metres. Strangely enough, selectivity improves, too, as range extends. This is due probably to the lowered resistance of the earth connection as the ground more and more nearly approaches its winter degree of dampness. Anyhow, I find that I can now separate with ease stations so close together as Breslau and Glasgow.

Real autumn conditions are with us now. Reception is first-rate, and atmospherics are seldom bad enough to cause

much trouble, even on the higher wavelengths. Now is the time for any who have not so far taken up wireless to do so without delay, for we have before us the seven or eight best months of the year from the wireless man's point of view.

L. W. N.

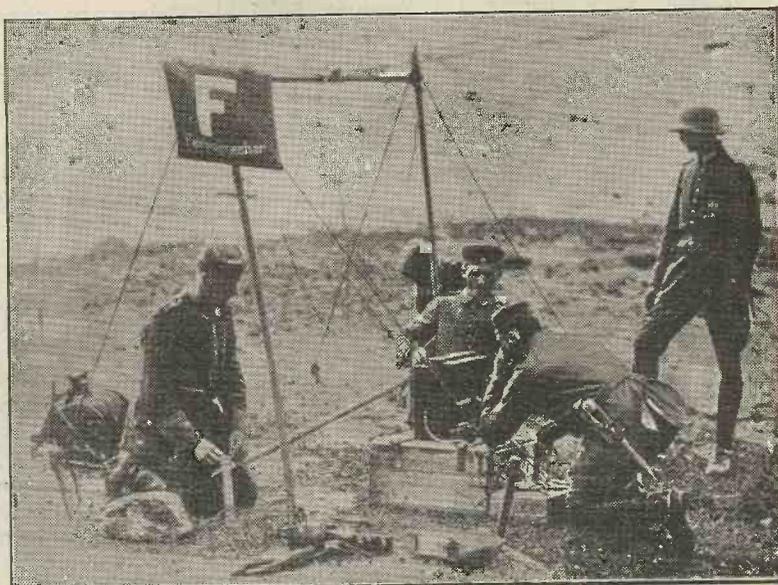
**Condenser Values**

We are given to understand that, through an oversight in the advertisement of the Lighting Supplies Co. (Finston Fixed Condensers), the capacity was shown as 0.001  $\mu$ F to 0.005  $\mu$ F in our issue of September 24. This should have read 0.001  $\mu$ F to 0.0005  $\mu$ F.

**Give Your Set a Professional Finish.**

Use Radio Press Wireless Panel Transfers, and your set will acquire "that professional look" at once. They can be obtained from all dealers and booksellers, price 6d., and they are as easy to apply as a child's transfer.

**GERMAN ARMY WIRELESS**



Our photograph shows signallers of the German Army Corps of Signals and their apparatus at the annual manoeuvres.



## Interpretation "to the life"

THE process of broadcasting is an eventful one . . . between the singer and your headphones several pretty drastic transformations take place. The most entrancing music is nothing but a wave length when it leaves the transmitting station. And that's all your aerial cares about it. An aerial is only interested in oscillations: It rests with the detector to find what the waves are saying and to interpret. But even then it's

not the actual singing you are listening to. Only a copy. With an Ediswan Valve you would probably not notice the difference. That is one of the advantages of a really good valve.

Ediswan Valves are highly sensitive and operate with a complete absence of noise. They are the outcome of 30 years' experience.

*Ediswan Valves will bring the best out of your wireless set--get some on the way home and enjoy a better programme from to-night onwards. All dealers sell them.*

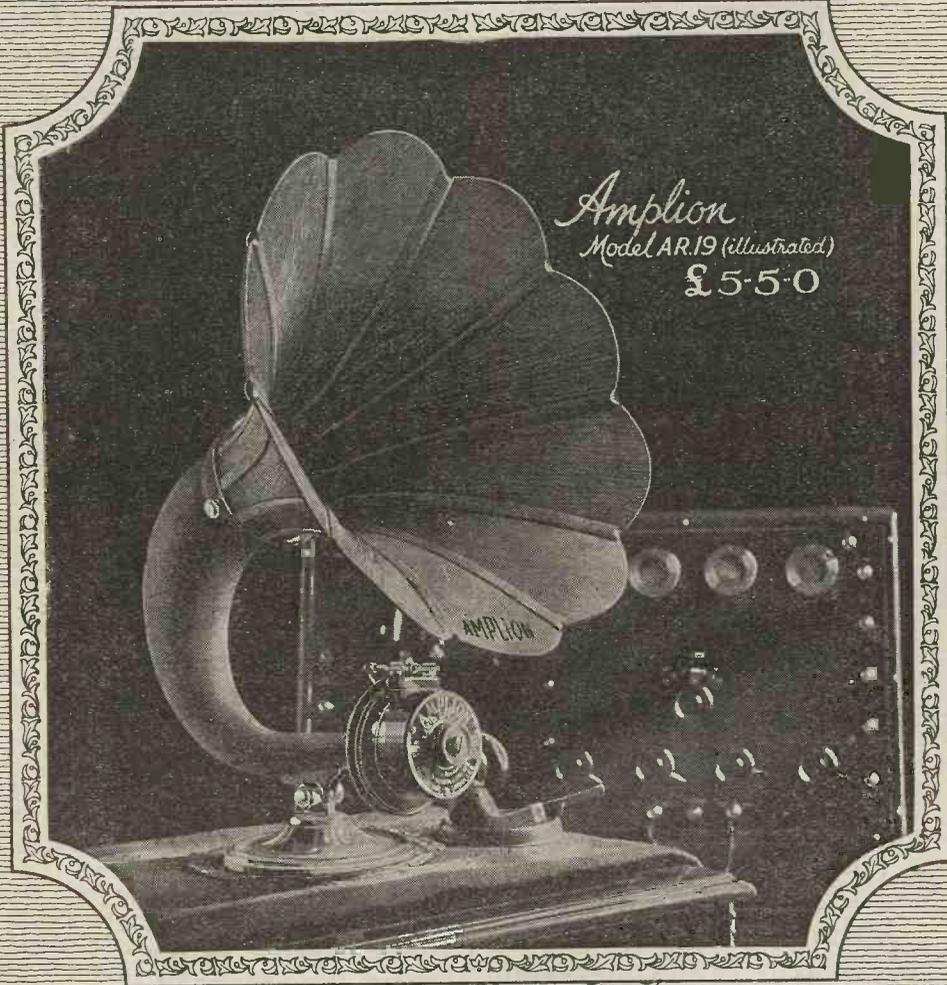
THE EDISON SWAN ELECTRIC CO LTD.  
QUEEN VICTORIA ST., LONDON E.C.4.

The first valve ever made, was produced in the Ediswan laboratory

162-6

# EDISWAN VALVES

# AMPLION



*Amplion*  
 Model AR.19 (illustrated)  
 £5.5.0

## *The World's Standard Wireless Loud Speaker*

Amplion Loud Speakers are world-famous for sensitivity, full volume, clarity and wonderfully natural tone—qualities due to the incorporation of many exclusive features including a non-resonating sound conduit with wood horn and an improved unit embodying the "floating" diaphragm.

ALL BRITISH RADIO EXHIBITION **STANDS 45 & 46** ROYAL ALBERT HALL  
 Sept. 27th — Oct. 8th

**ALFRED GRAHAM & COMPANY (E. A. GRAHAM)**  
 St. Andrew Works, Crofton Park    ::    ::    ::    LONDON, S.E.4

*It will pay you always to watch WIRELESS WEEKLY Advertisements.*

### Wavemeter Troubles

THE buzzer type of wavemeter is exceedingly popular among amateurs, and justly so. It can be bought at very reasonable prices, whilst those who like to construct their own apparatus can make wavemeters of this kind very easily. In spite of its simplicity, a well-made buzzer wavemeter gives extraordinarily fine and accurate readings for all wavelengths in a band which it is desired to cover.

Most users of the buzzer wavemeter will have had experience at one time or another of a rather peculiar form of trouble. The buzzer is switched on, and gives out its characteristic singing note, but the instrument refuses absolutely to radiate. Even if it is held within an inch of the A.T.I. no sound at all will come through in the receivers. The first time that this happens one is inclined to wonder whether there is not something wrong with the set itself. But doubts on this score can be set at rest by tuning in a signal. The fault lies not in the receiving set but in the wavemeter. It can be remedied as a rule by making a very slight adjustment to the tuning screw of the buzzer. What actually happens when the buzzer refuses to radiate is rather difficult to say, but it seems likely that arcing is taking place at the contacts of the buzzer. The best method is to place the meter with the buzzer running two or three feet from the A.T.I., and to make adjustments with a fine screwdriver with the instrument in this position. It sometimes requires a little patience to obtain both the high-pitched note that is so much to be desired and good radiation in combination with it.

If the buzzer is absolutely out of adjustment those who are not used to it may find it rather a difficult problem to tackle. I remember once with my first buzzer wavemeter spending a couple of heated hours without being able to get more than the most fleeting and ragged buzz from it. Here is the best way of going to work. Switch on the buzzer; then turn down the small screw whose point makes contact with the reed which serves as

armature until the two are just touching. Slacken off the tuning screw which will be found at one end of the buzzer. Now turn the contact screw very carefully down, tapping the wooden case whilst you do so, until some kind of note is obtainable. Then tighten up the tuning screw and work one screw against the other until you have got a note of the highest possible pitch. It will very likely be found that when a high note is achieved the buzzer will not start by itself when it is switched on. In this case slacken the contact screw by a fraction of a turn, which will usually set matters right. If

hear the buzz quite a long way on either side of the real wavelength, and you then have to trust to your ear to tell you the point at which it is loudest. By far the better method is to put the wavemeter at such a distance from the A.T.I. that its note is just comfortably audible when the set is sharply tuned to the wavelength indicated. When this is done very fine readings indeed can be obtained, for there is no difficulty in detecting the point at which the buzz is most distinctly heard.

N. O. P.

### Ancient and Modern

#### ABOUT OURSELVES

In the advertisement pages of this issue will be found a drawing of remarkable power. It is the first of a series of allegorical drawings prepared by Barclays Advertising, Limited, to typify and illustrate the work carried on by the Radio Press, the publishing firm, or rather, the band of keen radio engineers who produce "Wireless Weekly," "Modern Wireless," and a large number of non-periodical publications.

The drawings are prepared by one of the leading artists in this country and the beauty and force of his work will be something to look for each week.

The artist has a personal and intimate knowledge of the work of the House of Radio Press and he represents, in various ways, the confidence which the wireless public has in Radio Press publications. "By wireless people for wireless people" is one of the slogans of Bush House, where the new home of the Radio Press is situated.

The Radio Press realise that their success has depended upon the support of the wireless public which can rely upon what it reads. Radio Press set designs have a reputation which is a real reputation; Radio Press readers know that facilities are afforded for any set described in a Radio Press publication to be inspected, and that suitable representatives can see a demonstration. This House goes farther and undertakes, for a purely nominal fee, to report on and put right any set made in accordance with its designs.

Every reader knows that advertisers' apparatus is tested and that the Radio Press will stand by him if by any chance he should not be thoroughly satisfied. In short, he knows that neither in the text nor the advertisement columns will he be let down.

it does not the buzzer can always be started, provided that the adjustment is approximately correct by tapping the case of the wavemeter after switching on.

To obtain accurate readings with the buzzer wavemeter, always place it at some distance from the receiving set. If the two are close together you will

ONE has begun to wonder a little of late, says a *Wireless Weekly* correspondent, whether wireless valves are as good now as they were, say, two years ago. In many respects they are undoubtedly better, for owing to improved manufacturing processes it is now possible to turn them out so well matched that if a valve of a particular make is burnt out we may be quite sure that a new one fitted in its place will perform in just the same way. The vacuum, too, of modern valves is probably a good deal better than it was in those that we used to use. New methods of pumping and the use of the magnesium "getter" have made it possible to produce a vacuum which is very hard and at the same time very lasting. Three years ago I purchased half-a-dozen valves of a certain make, not one of which burnt out until it had given well over a thousand hours of good service. That is an excellent record; here is the sequel. In May last I bought four of these valves for use on a five-valve set, the last valve being a small-power valve. They were most carefully used, the filament potential being kept as low as possible and the anode voltage never exceeding 60. One of them burnt out within three weeks of its installation and another was dead by the end of July. Valves are certainly cheaper to buy now than they were then, but they are dearer in the long run if this is a fair example of their life.

# A Low-Power Radio Transmitter

Part I.

By K. ULLYETT

**I**N the two portions of this article it is intended to describe the construction and operation of a low-power radio transmitter suitable for the amateur who is taking up the more interesting and extensive side of his hobby.

The circuit diagram is shown in Fig. 1, and it will be noticed that the set is designed for use with an outdoor aerial. Should, however, the operator be the owner of a "dummy aerial" licence, an auxiliary circuit consisting of resistance and capacity may be shunted across the tuning inductance as shown in Fig. 2.

### The Aerial System

The aerial system—consisting of aerial, tuning inductance and earth—though by far the most important item in a transmitting station is, strangely enough, the most neglected portion of the set, in most cases. For short-wave work a vertical cage aerial is the ideal radiator, but as many difficulties are encountered in the construction of such a type, most amateurs have to content themselves with the usual inverted L or T type aerial. This, needless to say, should be as high and unscreened as possible, but for short waves the length should not greatly exceed 50 feet.

Insulation must be carefully attended to, especially at the free end, for there the highest potential exists.

The lead in should be short and should come as directly as possible to the aerial series condenser.

This latter is generally found necessary in order to reduce the natural wavelength of the system to the licensed limits, and if used, should have a capacity of about  $0.001 \mu\text{F}$ . Unless the very best make is used losses will be introduced which seriously reduce efficiency, so that if it is found possible to work on 200 metres without it, it is decidedly better to omit the series capacity.

### Aerial Tuning Inductance

The A.T.I. consists in the present instance of 36 turns of No. 16 bare copper wire wound on an ebonite former 4 in. in diameter, tapings being taken every three turns to a strip containing 13 valve sockets.

All leads are soldered and well spaced, in order to reduce losses due to capacity effects.

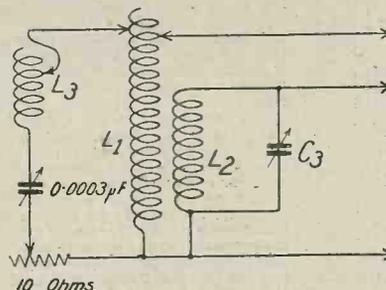


Fig. 2.—A "dummy aerial" system.

If it is not desired to use an input higher than about 5 watts, it is unnecessary to use copper strip for the inductance. The turns of wire are spaced  $\frac{1}{4}$  in.

The aerial ammeter should be carefully chosen. Until some few years ago "hot wire expansion" types of ammeters were exclusively used, mainly for their cheapness. They are, however, very unsatisfactory in operation; expansion type instruments also possess the very serious objection that their high resistance makes it difficult to obtain a true reading.

As an alternative a thermocouple instrument, of which a commercial type is now available, may be used. The resistance of the aerial ammeter must be low.

It is safe to say that in 99 per cent. of amateur stations, the

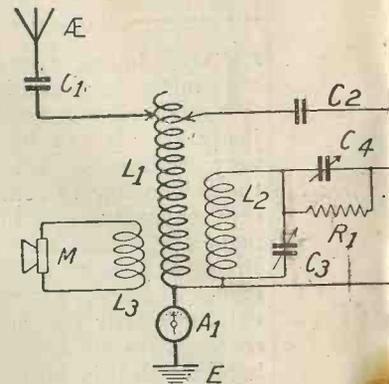


Fig. 1.—The circuit diagram

counterpoise is the most efficient earthing system possible.

In the second part of this article the aerial system will be discussed more fully and the merits of the counterpoise pointed out.

Six wires suspended about 4 ft. from the ground in fan formation directly under the antenna form a very efficient earthing system. The earth lead must, of course, be very carefully insulated.

The ohmic resistance of the whole antenna system must be kept as low as possible if maximum radiation is to be obtained.

### The Plate Circuit

The plate circuit may be divided into two parts:—

(1) The oscillatory side, consisting of blocking condenser and A.T.I.

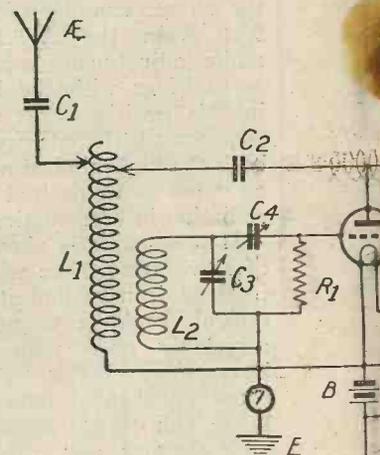
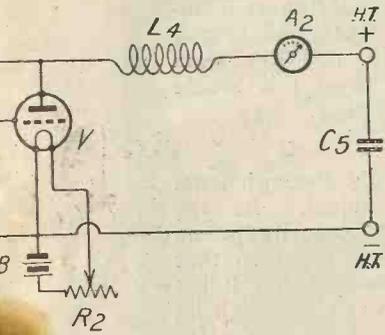


Fig. 3.—Method of adding



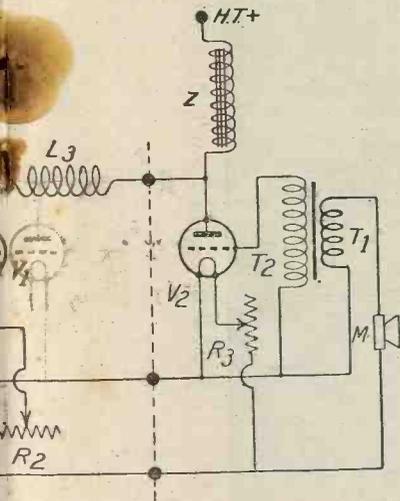
the low-power transmitter.

(2) The high-tension side, consisting of radio-frequency choke, condenser, and plate voltage supply.

The blocking condenser in the oscillatory side should have a value of about  $0.002 \mu\text{F}$ , but deviations from this value may be made, as the condenser is only intended to prevent a short-circuit for the H.T. For this reason it should be very well insulated and tested to at least twice the voltage it is desired to use for high-tension.

Although the D.C. plate supply may have a fixed voltage, fluctuations may be expected in the oscillatory circuit of considerably more than this value.

The A.T.I., the second component in the oscillatory circuit, has been described before, but it



oscillator with choke control.

may be mentioned that, although the anode tap on the A.T.I. is not essential to efficient working, yet it is a decided advantage where measurements of efficiency, aerial current, etc., are to be made.

The high-tension side of the plate circuit is usually the *bête noir* of the amateur transmitter.

The choke  $L_4$  is designed to prevent radio-frequency oscillations from leaking back into the anode supply. It may conveniently consist of 300 turns of No. 24 d.s.c. copper wire wound on an ebonite former  $1\frac{1}{2}$  in. in diameter. Tuned rejector chokes are sometimes used, but are tricky in operation. The choke coil must be carefully insulated

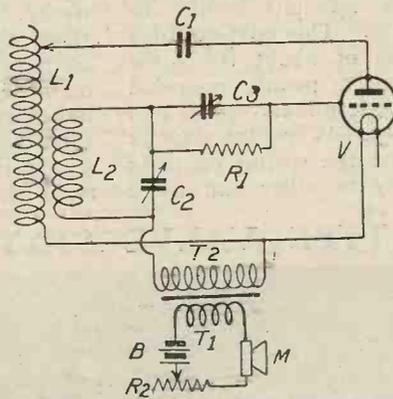


Fig. 4.—Grid control method of modulation, using a microphone transformer.

from earth, and also within itself, as a considerable difference of potential may occur between the ends of the winding.

If the amateur has access to the public supply mains, these may be used as a source of anode voltage. If not, a high voltage battery consisting of large dry cells or small Leclanché cells is the only cheap substitute.

Experiments in Morse transmission may be conducted in the use of a T.V.T. unit worked from the filament accumulator. Considerable hum would most likely be introduced, even if the supply were rectified and well-designed filter systems were used.

The condenser  $C_5$  (value about  $2 \mu\text{F}$ ) somewhat smooths out the supply, and is an aid to efficient operation.

\* \* \*

*An article which will make especial appeal to the beginner in radio transmission.*

\* \* \*

As it is placed directly across the anode supply, its insulation must be carefully attended to. Lamps may be placed in series with this capacity to prevent damage by a "short."

**The Grid Circuit**

The part of the transmitter,  $C_4, R_1, C_3, L_2$ , although the easiest in construction, will cause the greatest difficulty in operation.

The grid coil  $L_2$  may consist of 50 turns of No. 20 d.s.c. wire on a 3-in. diameter former, and the coupling between it and  $L_1$  may be varied by sliding (after the principle of the loose-coupler) or by rotation, as in a variometer. This latter method is conducive to the best results.

The variable capacity  $C_3$  (maximum value  $0.0005 \mu\text{F}$ ) is not essential, but it greatly facilitates control of oscillation.

The grid condenser and leak ( $C_4, R_1$ ) need careful alteration before best results are obtained. For this purpose  $C_4$  should be variable (maximum  $0.001 \mu\text{F}$ ), and  $R_1$  may consist of a variable water resistance; the usual variable grid leaks used in receiving circuits could not stand up to the current, and variable wire-wound, non-inductive grid-leaks are rather costly.

A little careful experimenting with values for  $C_4$  and  $R_1$  will greatly improve efficiency, and generally the highest values give best results.

**Filament Circuit and Valve**

The values for low-tension and filament supplies depend on the type of valve in use. For very

low powers, a hard R valve with 6 volts on the filament and 200 on the anode will yield surprising results, but the life of the valve is seriously shortened.

There are many suitable types of lower-power transmitting valves on the market with four-prong fittings, and there is little to choose between the different makes.

**The Telephony Absorption Circuit**

The original transmitter from which these data are derived was designed solely for the purpose of experimenting in values for components and measurements of efficiency, aerial and anode current, etc., and so a telephony modulating device was scarcely necessary.

The simplest type of control, i.e., aerial absorption control, was fitted, but is used only on rare occasions, most work being done on a non-radiating aerial.

The microphone M is the standard G.P.O. solid back type, and the absorbing inductance consists of 15 turns of No. 22

d.c.c. copper wire on a 3-in. diameter former, coupled loosely to the end of the tuning inductance L<sub>1</sub>.

If the amateur is more ambitiously inclined he may add the modulating unit shown in Fig. 3 or use the grid control system as shown in Fig. 4.

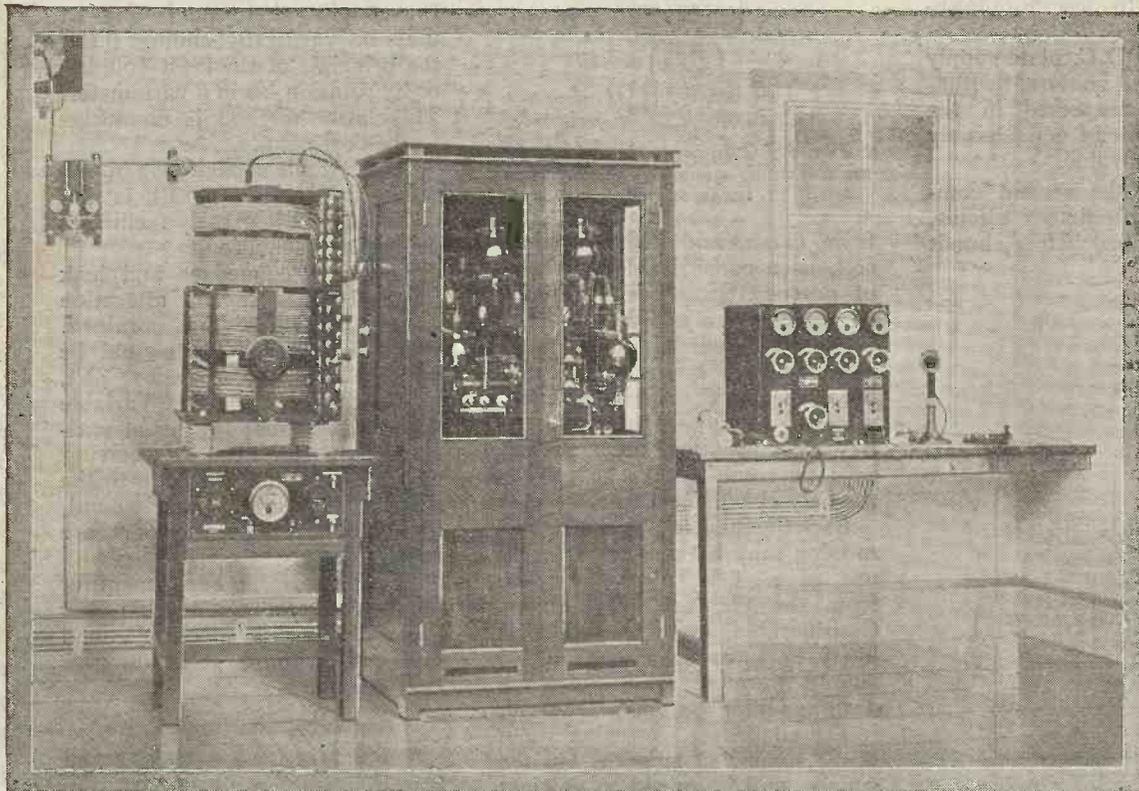
**Plugs and Jacks**

ONLY a few constructors nowadays make much use of plugs and jacks, though these provide the most convenient way of varying circuits, cutting out valves at will, and so on. Excellent jacks can be obtained from those who deal in disposal goods, and one firm has recently put on the market a simple little contrivance specially made for wireless use. This consists of a round base of about the same diameter as a penny, provided with two terminals and two socket holes. When the plug is not inserted the spring contacts come firmly together and there

Many amateurs will wish to carry out experiments and tests in efficiency rather than to burn out the ammeter with badly distorted telephony, and these members of the "ether-shaking" community will find the data given in Part II of this article especially interesting.

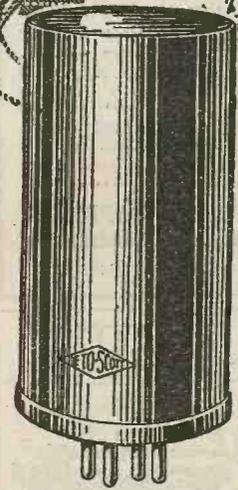
is a path straight through from terminal to terminal. As the plug is pushed home its points force the contacts apart so that current now passes through the leads attached to it. Though its uses are many I do not quite agree with the makers who recommend it as an automatic earthing device for the aerial. The idea is that when the plug is pulled out the aerial earths itself and there is then no need to worry. This is all very well, but when the plug is inserted the contacts are only a very short distance apart, and there is an undesirable capacity between them which is likely to result in a loss in signal strength and to make the tuning rather flat.

**A COMMERCIAL TYPE VALVE STATION.**



The compactness of a modern valve transmitting station is well illustrated in the above photograph showing a combined wireless telegraph and telephone station. Only the tuning and transmitting controls are exposed. (Photo. Marconi's Wireless Telegraph Co., Ltd.)

# Guaranteed AMPLIFIERS



## For all wave lengths over 1000 MULTI-WAVE AMPLIFIER

### Used in the "P.W." 24-Valve Set

The wonderful 24-Valve Set just used in an attempt to receive Mars by the Editorial Staff of POPULAR WIRELESS used Multi-wave amplifiers. This Receiver is now on view at Selfridge's in Oxford Street, W. In "P.W." issue of Sept. 6th, the Editor said, in reference to the 24-Valve Set: "Preliminary experiments proved disappointing; but when we substituted resistance Coupled Transformers for aperiodic Transformers and embodied one or two new ideas of Mr. Dowling's, the Set functioned excellently, and it was calculated that we obtained full efficiency from 16 H.F. Valves, which on the whole is a very excellent average."

FOR high-frequency amplification over 1,000 metres there is nothing to beat the resistance coupling method. It brings in distant stations easily and clearly and requires absolutely no tuning at all. The Peto-Scott Multi-wave Amplifier, introduced just over a year ago, has been the most successful amplifier of its kind, and with the opening of 5 XX at Chelmsford there is even a greater demand for it. If your set has a stage of H.F. amplification just plug in the Multi-wave Amplifier in place of the ordinary H.F. Transformer. Immediately your Set (using the correct Aerial Inductance, of course) is available for all Stations above 1,000 metres. Without further expense all such stations as Chelmsford, Radiola, Eiffel Tower, Berlin, and all other Continental Broadcasting Stations on the high-wave band come within your reach.

The Multi-wave is made in two types. No. 1 for use where one stage of H.F. amplification, and No. 2 for use where two stages (or more are used). In such cases, No. 1 is always used after the last H.F. Valve as a coupling between that valve and the Detector Valve.

Remember, every Multi-wave is fully guaranteed to give you perfect satisfaction. It is a Peto-Scott exclusive design, produced entirely in our own works and manufactured from the highest grade of ebonite. In future, do not fuss with a number of transformers to cover a wide band of wave lengths, but invest in a Multi-wave which is guaranteed to function equally well over all wave-lengths between 1,000 metres and 26,000 metres.

No. 1 .. .. 8/6 No. 2 .. .. 12/6

Send for a copy of Peto-Scott's large Catalogue of Wireless Components and note how much you will save by dealing with one of the oldest firms in the Radio Industry. Price 3d., complete with unit Folder, Unette pamphlet and other literature.

## MAX-AMP L.F. Transformer

"a great little Transformer"

The sound test for a good L.F. Transformer is what the experts say. After all, a technical man equipped with measuring instruments and a big experience in the Radio field is better able to pass a judgment on a Transformer than anyone else.

For instance, he would not be unduly biased by the small size of the Max-Amp. Read, therefore, what the scientific expert on the staff of "Amateur Wireless" said in his candid report (issue dated October 27th, 1923):—

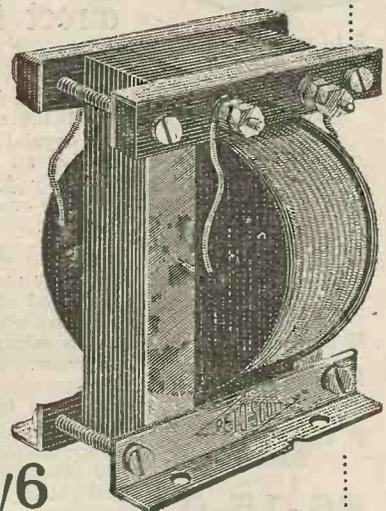
"As the severest test of all, the Peto-Scott and a large and very expensive Transformer, which is used as a standard for gauging the performances of others, were connected to a four-pole two-way switch. This enabled either to be thrown into action in a moment, so that their performances could be properly

compared. To my intense surprise, the Peto-Scott actually gave a greater degree of amplification than the standard Transformer, and that without any kind of distortion or harshness."

After such an unsolicited expert opinion it is small wonder that an immense number of Max-Amps. are in daily use, giving complete satisfaction to their owners.

Remember every Max-Amp. is fully guaranteed for one year. If at any time during that period it fails to give the fullest satisfaction, you may return it to us for replacement with a new one or your money will be refunded in full.

Its standard ratio is 5½ to 1, but a Unidyne type is sold with a ratio of 10 to 1. Both are sold at the same price in coloured sealed cartons.



18/6

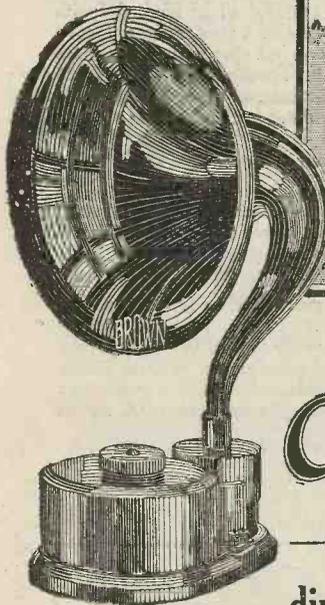
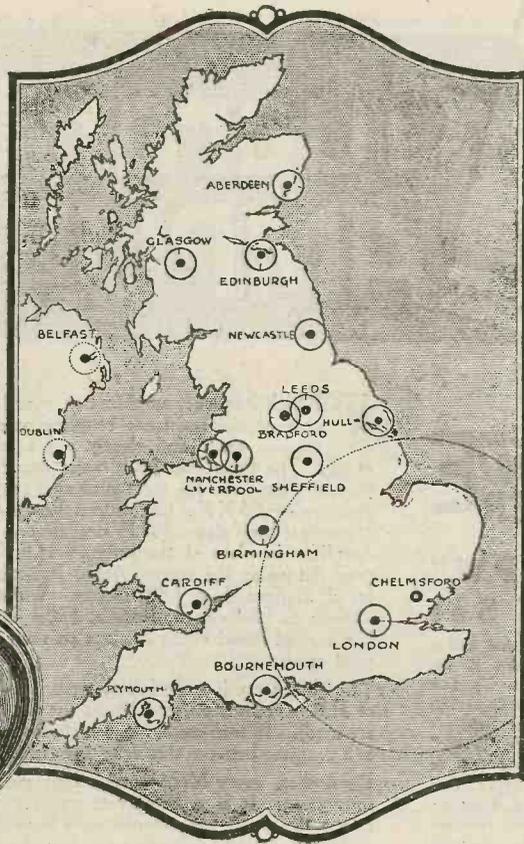
# PETO-SCOTT Co., Ltd.

Head Offices, 77, CITY ROAD, LONDON, E.C.1. Mail Order Dept. and Showrooms:

Branches: LONDON—62 High Holborn, W.C.1. WALTHAMSTOW—230, Wood Street. CARDIFF—94 Queen Street. PLYMOUTH—4 Bank of England Place. LIVERPOOL—4, Manchester Street. Gilbert Ad. 1489

It will pay you always to watch WIRELESS WEEKLY Advertisements.

**Q** This Map shows the effective working areas of the Crystavox—the only Loud Speaker in the world capable of operating direct from a Crystal Receiver. If you live within any of the circles—and if your Crystal Set will respond to the simple test described below—you can use a Crystavox Loud Speaker.



# CRYSTAVOX

—the only Loud Speaker working direct from a Crystal Receiver

Exhibited at our Stand at the Albert Hall Exhibition.

From all Dealers or can be demonstrated at the following Showrooms:

19, Mortimer St., W.1

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THOSE fortunately living within easy range of a B.B.C. station require nothing more than a good Crystal Set and a Crystavox. In return they will receive all the pleasures of Broadcasting at an absurdly low price—a few shillings every six months or so for the replacement of a small dry battery.

Nothing more to buy—compare it with a Valve Set with the constant replacement of valves, accumulators to be recharged, and the uncertainty as to whether it will break down at the critical moment. But every Crystal Set won't work a Crystavox—they differ considerably in sensitiveness and local conditions vary, too. Apply this test: hold the phones 12 inches from the ears—if signals can still be heard then the Crystavox can be relied upon to fill the whole room with its delightfully mellow tone.

If you would know more about its capabilities ask your dealer for a free copy of a new Crystavox Folder, or if his supply is exhausted, we will send you one direct.

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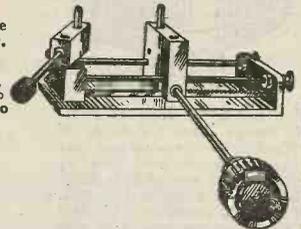
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Adds 50% value to any set.

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WIRELESS WEEKLY.

Vol. 4. No. 22. Oct. 1, 1924.

(This coupon must be accompanied by a postal order of 2/6 for each question, and a stamped addressed envelope.)

# The Marconi Osram D.E. 5 B. Valve

By A. D. COWPER, M.Sc., Staff Editor.

In view of the great interest being shown in these new valves, we publish below our test report, together with some interesting characteristic curves.

A SPECIMEN of the new Marconi Osram D.E. 5 B. valve, a dull-emitter valve of the type which is best operated in conjunction with a six-volt accumulator, has been submitted to an extensive test by members of the "Radio Press" staff.

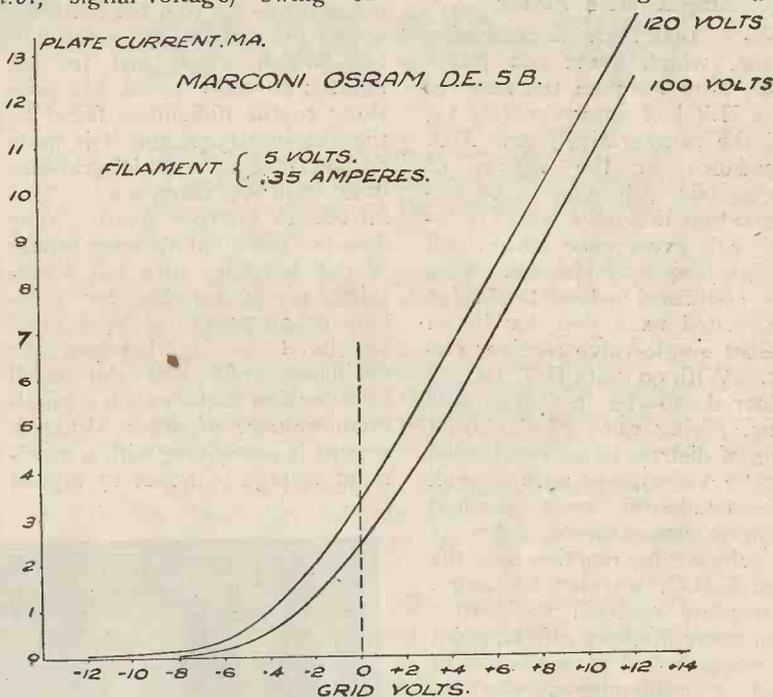
This valve is more particularly designed for use in low-frequency amplifiers of the resistance-capacity coupled type. For this purpose, as there is no build-up of signal-voltage through the use of a step-up transformer, a high (theoretical) voltage amplification ratio is desirable in the valve, in order to compensate in some measure for the inherent inefficiency of this mode of coupling. In the D.E. 5 B. this high amplification ratio is attained by the design and arrangement of the electrodes, a fine-meshed grid being used, and this being mounted close to the filament, so giving a close control of the electron stream. It is a fairly large valve, and has a large flattened box-like anode, and a looped filament supported at the centre of the loop, the fine-mesh grid being also rigidly held, the whole forming a stiff and mechanical-looking structure. The bulb is only partly obscured by the metallic mirror-film which has become customary in valves. It is not noticeably microphonic in use.

### Characteristics

On determining the characteristics, it was noted that at the rated filament voltage the filament required .35 amperes, the nominal rating being .22 amperes 5 volts. A fair emission was recorded at 4.5 volts and .32 amperes; but the curves were taken at the former rate. Saturation was not reached with 120 volts H.T. with 14 volts or more of positive grid-potential. The anode voltage specified by

the makers, 100 to 120 volts, was used in the test. It was noticed that at both 100 and 120 volts plate-potential the characteristic gave a long straight portion to the right of the zero-grid volts line, but comparatively short and tending to curve slightly on the left of that line. Hence, at this value of H.T. there is not a great deal of room for grid-voltage (i.e., signal-voltage) swing of

With the value of H.T. and anode resistance specified (100 to 120 volts and 100,000 ohms respectively), the valve was tried, in comparison with a standard R valve of fairly high amplification-ratio, and following another R valve as rectifier; in comparison, qualitatively from the point of view of tone and fidelity and quantitatively by actual measurement of the audio-signal voltages



Characteristic curves of the D.E. 5 B. valve.

any magnitude, and any grid-bias applied must be limited accordingly. In practical trial this was confirmed, only some 1.4 to 3 volts grid-bias being needed, and signs of rectification becoming noticeable if really strong signals were applied through the medium of an efficient step-up transformer coupling. Evidently a substantially higher value of H.T. supply should be available if the valve is to be used to amplify signals which are already of some strength.

obtained across the phones—with several L.F. transformers and a choke-capacity coupling. A marked increase of signal strength was noted over the standard R valve in all cases, most noticeably in the case of resistance-capacity coupling. With a coupling condenser of approximately .01  $\mu$ F capacity and a grid-leak of .5  $\Omega$  to the L.T. minus, better signals resulted with a 70,000 ohm anode resistance in the place of the 100,000 ohm anode resistance, and reaction was easier to obtain.

### Tone

The tone was pure and free from distortion, though, of course, the amplification could not compare with that obtained, together with excellent quality, when a good L.F. transformer was used. The deflection of the microammeter recording the signal strength obtained, with a certain steady medium audio-frequency signal applied directly to the grid of an R valve and amplified in one L.F. stage with this valve, was actually three times as great with the transformer coupling as with the resistance capacity under the conditions named, though the latter was considerably higher than with valves not explicitly designed for this work.

### Amplification Factor

With the high amplification factor, which came out (at a mean value between 100 and 120 volts H.T.) of approximately 13, and the comparatively low A.C. impedance in the region of 21,000 ohms, it was to be expected that the valve would oscillate with great ease when used in high-frequency circuits. This was confirmed when the valve was tested as a detector in an efficient single-valve receiver circuit. With 90 volts H.T. (which appeared to be a favourable value, giving none of the usual signs of distress of an overloaded detector valve), and with a small series condenser, most excellent reception was obtained, a No. 35 coil sufficing for reaction over the usual B.B.C. wavelength range, or a plate reaction variometer when some distance off the point of resonance. A plate current of about 2 milliamperes was recorded; under these circumstances 2LO came in at moderate loud-speaker strength on a by no means ideal or high aerial at 35 miles on the single valve.

### Oscillation

On account of the great ease of oscillation and the appreciable internal capacity (which is the price of a high amplification-ratio combined with a low impedance, the valve is not suitable for H.F. amplification on the shorter waves, though, of course, for long waves, which approximate more closely to L.F. conditions, it can be used.

For resistance-capacity ampli-

cation of signals which are not of great intensity already, for loud signals in a single-valve receiver, and particularly for an

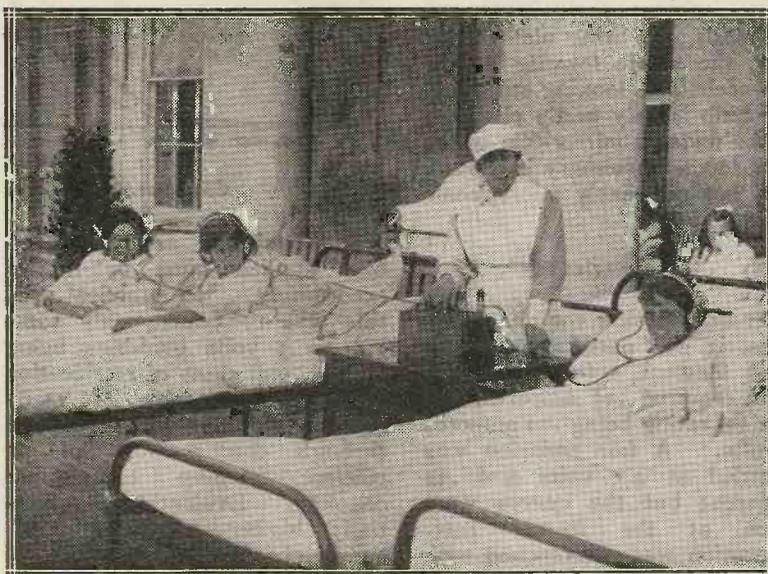
efficient first-stage L.F. amplifier with transformer coupling, this D.E. 5 B valve evidently has great possibilities.

## A Long-Felt Want

I HAVE always thought it rather curious that so very few ready-made sets are fitted either with a fixed grid-biasing battery for the note-magnifying valves or with terminals to which such a battery may be attached. The aim of makers who turn out sets of this kind is very largely to make them as simple as possible, but it does not seem to me that the inclusion within the cabinet of a small battery which would last for six months or more could add anything to the difficulties faced by the absolute tyro, and it is quite certain that a suitable grid-bias does improve reception. This introduces another point. Why does not some enterprising maker of dry batteries turn out something really suitable for grid-biasing purposes? At present we have nothing between the flashlamp refill and the small high-tension battery with a maximum voltage of 36. What is needed is something with a maximum voltage of about 15 tapped

at every  $1\frac{1}{2}$  volts. The battery could be quite a small thing, for since the current taken from it is almost infinitesimal, very small cells will stand up well to the work. One can, of course, place two or three flashlamp refills in a specially made case and take tapings at every  $1\frac{1}{2}$  volts; but it is rather a nuisance to have to do this, and now that the usefulness of the grid-biasing battery is so generally realised, one feels that there would be a very ready sale for the suggested 15-volt unit. It might even be better to make, say, 9-volt units, for there are few valves which require a much higher grid potential than this with anode voltages up to 100. If this were done, two of the tapped batteries could always be wired in series when higher voltages were required. I am quite sure that many more people would make use of grid batteries if only there was some simple trouble-saving device of this kind readily available.

M. U. P.



The utility and appreciation of wireless in hospitals is demonstrated by the above photograph which shows patients listening-in.



## 57·58·59 - up!

**T**HE Seconds tick by in the silent chart room and down in the Southern Pacific the navigator shapes his course by the unfailing accuracy of his chronometer.

How would he fare if his shipowners had tried to economise by installing cheap alarm clocks in place of chronometers?

And yet frequently enough we find instances of people getting inferior results from their wireless sets because they have attempted to economise on condensers.

There is no economy in this really, because sooner or later they have to take out the "just as good" and substitute an article of sound manufacture.

We do not say that all cheap condensers are necessarily bad; you may be lucky and get a good one, but if you buy a Dubilier you bet on a certainty—you get a good one *every time*.

Naturally if we are to maintain such a high standard our products must be slightly more expensive than those which carry no guarantee, but we are convinced that in the interests of true economy you should specify Dubilier.

**DUBILIER**  
CONDENSER CO. (1921) LTD

Adot. of the Dubilier Condenser Co. (1921), Ltd., Ducon Works,  
Goldhawk Road, London, W.12.

E.P.S. 71.

*It will pay you always to watch WIRELESS WEEKLY Advertisements.*



Bill Smith was awfully puzzled. He had accumulated some experience of valves, — and had contracted valvular disease of the pocket —



Then he thought of installing valves that take less "juice", but the price of most of them would play the devil with his funds.



So he turned in his seven-valve mental equipment on every valve that produced and listened in to every valve-maker's programme of praise for his product.



One happy slogan jammed all other messages. It runs thus —

# 'fit RADION'

**LOW CONSUMPTION VALVES**  
*and amplify enjoyment!*

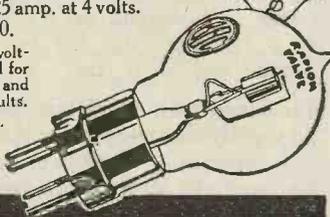
Appropriately filling the gap between "dull" and "bright" emitters, Radion Valves fill a long-felt need.

Take only .25 amp. at 4 volts.  
Anode 30-90.

Very high anode voltages can be applied for loud-speaker work and with excellent results.

Economical to buy.  
Economical to run.  
Perfectly pure tone.

**10/- EACH**



## VALVE REPAIRS.

(Most Makes)

Valves repaired by us are guaranteed:—(1) Not to consume more current. (2) To have the same amplification. (3) To give the same radiation.

Ordinary types. Price (post extra) . . . . . **6/6**  
No extra charge for new Glass or new Cap, or for both if needed. Ask for particulars of other types.

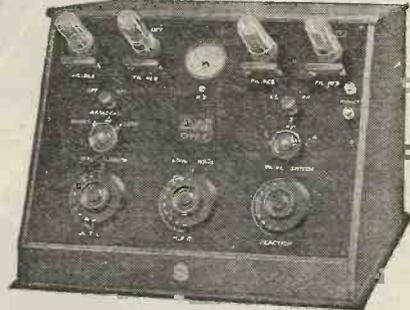
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**RADIONS LTD., BOLLINGTON, MACCLESFIELD.**

B & D

# A.J.S.

## TWO, THREE & FOUR-VALVE RECEIVING SETS



Are Simply Perfect and Perfectly Simple, and are unsurpassed for Selectivity, Clearness of Reception and Power.

### REVISED PRICES:

COMPLETE SETS.	PANELS ONLY.
Two-Valve Set .. £17 : 10 : 0	Two-Valve Panel .. £12 : 0 : 0
Three-Valve Set .. £22 : 5 : 0	Three-Valve Panel .. £15 : 17 : 6
Four-Valve Set .. £27 : 5 : 0	Four-Valve Panel .. £20 : 5 : 0

Complete Sets consist of Panel, as illustrated, Valves, Head Phones, High and Low Tension Batteries, Aerial Wire, Insulators, Lead-in-Tube, etc.

The LIST Price of the A.J.S. Sets is the LAST Price, as with them it is not necessary to purchase numerous extras, the Specification embodying everything ready for installation, and the prices include all Royalties.

Write for Illustrated Catalogue.

**A. J. STEVENS & Co. (1914) Ltd.,**  
**WIRELESS BRANCH, WOLVERHAMPTON.**

Telephone: 1550 (3 lines).

Wireless Call Sign: 5 R.I.

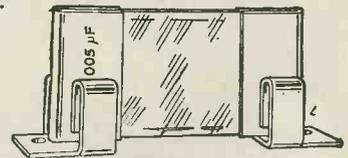
Telegrams: "Reception, Wolverhampton."



## CONDENSERS

for all purposes.

We introduced, and have adopted as our standard, the flat type of fixed condenser which slips into two clips. They are made of high-grade virgin amber mica and tinfoil. Connection is made by their solid metal ends to two spring clips. This type is a distinct advance in the design of the fixed value condenser; its utility and adaptability are at once obvious and appeal to all users.



Each supplied with two clips.  
PRICES: 0.001  $\mu$  F to 0.0001  $\mu$  F 1/4 each  
0.01  $\mu$  F to 0.002  $\mu$  F 2/- each

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Wireless Engineers,

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Barclay's 113.

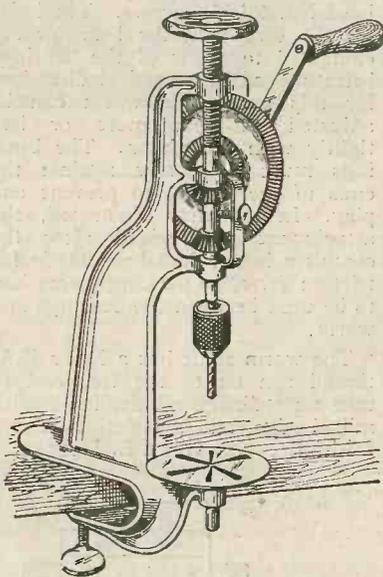
## Bench Tools

IF I were asked what was the most useful mechanical contrivance that the wireless constructor can install in his workshop I should have no hesitation in naming the bench drill. The hand drill is a most useful little appliance, and even if you possess a bench drill, it should not be discarded, for there are many pieces of work in difficult corners which can be done by it alone. But the hand drill has certain drawbacks. To begin with, it is most difficult to make sure that all the holes drilled are perfectly vertical. Again, if you have to make large holes such as those  $\frac{3}{8}$  in. in diameter for the bushes of condensers, selector switches and so on, it is not at all an easy matter to avoid making them oval instead of round, since there is naturally a slight swaying movement of the hand that holds the top of the drill; and drilling a hole of this size, even through  $\frac{1}{4}$  in. ebonite, is pretty hard work. With a bench drill the work becomes very much easier.

The bench drill is by no means an expensive appliance. Mine cost exactly £3 12s. 6d., which included an excellent vice and three most useful centres. The choice of the drill is not at all an easy matter, for nearly every type has some drawback from the wireless constructor's point of view. What he wants is a machine which will take drills up to  $\frac{3}{8}$  in. and which will allow holes to be drilled at least 4 in. from the edge of the material. Now, there are a great many bench drills which will not take a  $\frac{3}{8}$  in. drill even though they may be stated by the makers to do so. The jaws of the chuck will expand sufficiently wide to grasp the drill, but in many cases the distance between the table and the drill when at its highest is too small to allow the drill to be inserted. Drills of this diameter are all of one standard length, and short ones can be obtained for some curious reason only in complete sets. Make quite sure, therefore, that the machine which you select is capable of

taking a  $\frac{3}{8}$ -in. drill by seeing one actually inserted. Be sure, too, that the distance between the upright member and the centre of the table is sufficient to allow holes to be drilled at least 4 in. from the edge of the material.

The next point to consider is the question of the feed. There are three kinds of feed—lever, automatic and hand. In the first of these there is a metal bar fixed to the top of the frame



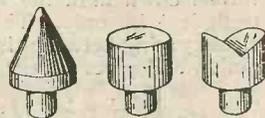
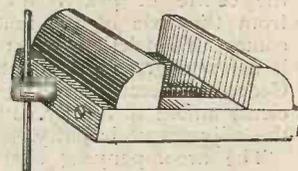
Illustrating a typical bench drill, a useful vice and centres.

and to the rod engaging with the spindle of the drill. The right hand works the crank handle and the left presses the drill down by means of the lever. For fine work this is probably the best of all feeds, since one can regulate the pressure applied to a nicety. Unfortunately, there are few machines with this type of feed which will both take a  $\frac{3}{8}$ -in. drill and allow holes to be made at a sufficient distance from the edge of the work. In machines of the automatic feed each revolution of the crank handle gives a partial turn to the feed screw. Two speeds are generally provided, but as drills are designed as a rule for metal work, neither is very suitable for drilling ebonite. Further, if various drills between 4 B.A. tapping and  $\frac{3}{8}$  in. are used, one

would really require at least half-a-dozen different speeds for the automatic feed. There remains the hand feed. In machines fitted with this movement the spindle is pressed downwards by means of a screw at whose head is a wheel that the left hand actuates. Though not nearly so handy as the lever feed is, it is probably the best type for the amateur, since drills so fitted can be regulated to a nicety.

### The Drill Table

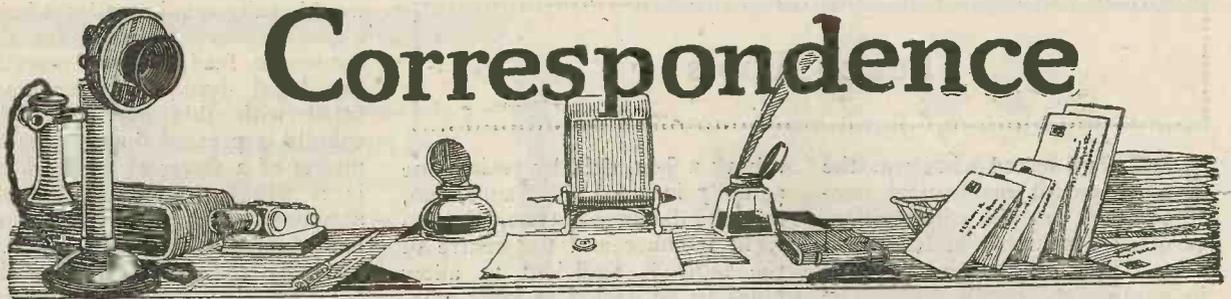
The drill table should be of good size, and it is desirable that it should have a hole right through its middle. It should also be provided with suitable attachments for a drill vice.



With a bench drill and a good vice one can do quite a number of jobs that are really not the function of the drill at all. For instance, if an end-milling tool  $\frac{1}{8}$  in. in diameter is purchased, grooves can be cut in ebonite to take bare wires. Again, the bench drill can be used quite effectively for small turning jobs if a pointed centre is provided. Work is gripped in the drill chuck, its lower end being punch-marked and rested upon the point of the centre. Then by placing the tool in the vice one can accomplish respectable turning. Small round parts which are slightly oversize can be run down quite easily by placing them in the drill chuck and using either a file or a piece of emery paper.

W. H. R.

# Correspondence



## AN ANTI-FRICTION COIL-HOLDER

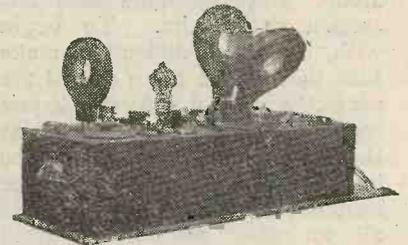
SIR,—Those who use home-made inductance coils will have found that for the larger sizes—400 and upwards—the ordinary coil-holders are no use when it is required to have coils movable in a vertical plane. The majority of coil-holders depend on friction (spring washer) to hold the moving coil in position. The weight of the larger home-made coils combined with the distance of the centre of gravity of the coil from the axis of the holder overcomes this friction when the coil is a few degrees out of the vertical. Geared movement even is not sufficient, unless so tightly coupled that the adjustment is jerky.

The accompanying sketches and photograph illustrate a home-made holder in which the movement is obtained by a Meccano worm and 24 tooth pinion, the pinion being turned down until the width of the teeth is  $\frac{1}{8}$  in. only. This allows of close gearing between the worm and pinion and gives a very smooth and

The worm is carried on a piece of the same brass rod as used for the pinion shaft. The worm shaft works in two bearings. In the case illustrated these consist of one plain flat piece of 3-16 in. brass and one angle piece of the same thickness. These are each attached to the side of the frame by two cheese-head No. 6 B.A. screws. The holes for the screws in the bearings are elongated to allow of the bearings being moved in a vertical direction. By this means the worm can be adjusted to gear more or less tightly with the pinion. The bearings must fit closely against the ends of the worm, to prevent end play. In the case illustrated, the attachment was added after the complete holder had been made for friction drive, so packing pieces had to be used between the bearings and worm.

The worm shaft has a No. 2 B.A. thread run on to the free end to take an ordinary ebonite knob with milled edge, and a locknut.—Yours faithfully,  
G. DE L. DUDLEY.

Radio-Paris, 5XX would appear to be quite double the strength of the foreigner. As your correspondent states, the modulation is perhaps not so good as that of the other main stations, but taking into consideration the large power being handled



The coil-holder suggested by Mr. Dudley, mounted upon a set.

great credit is due to the B.B.C. and, incidentally, Capt. P. P. Eckersley.

D. V. BRIGGS, A.M.I.Rad.E.  
Pontypridd.

## WBZ

SIR,—With reference to Messrs. D. & R. G. Smith's enquiry about the American station WBD (?), Boston, I beg to enclose a letter received from the Westinghouse Electric Co. in reply to a complaint made regarding the announcement of their call sign. I could only distinguish "WBZee" after being pronounced about six times (loud-speaker strength).

WBZ is not very difficult to tune-in when conditions are suitable, and is equal in strength to WGY, New York, on some occasions.

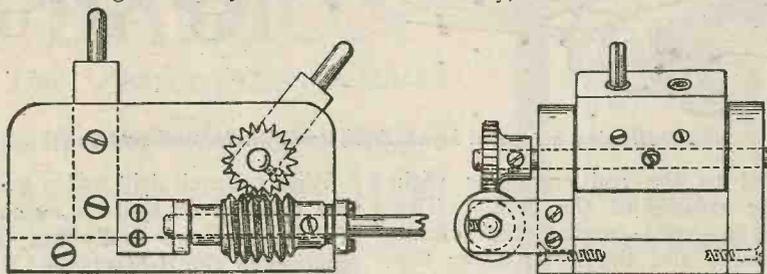
The station below WBZ's wave may be KDKA on 326 metres, not so strong as the above and generally a little distorted, or KGO on 312 metres. I have heard dance music from KGO, but never from KDKA, although they may have transmitted such.—Yours faithfully,

NORMAN HARVEY.

Thornton Heath.

DEAR MR. HARVEY,—It is with pleasure that we enrol you as one of the distant listeners to our radio broadcast programmes, and we wish to thank you for your letter of April 14, commenting on the programme we broadcast on Saturday, April 12.

WBZ is owned and operated by the Westinghouse Electric and Manufacturing Co. at Springfield,



Diagrammatical sketch of the coil-holder.

critical (equivalent to micrometer) movement of the coil, with no backlash. The illustrations are self-explanatory, but for those who may wish for details the following is a brief description.

The shaft carrying the pinion passes through the moving coil-holder and side pieces of the frame and is of brass rod turned down at one end to fit the hole in the pinion (or this sized rod may be used throughout). To fix the shaft in the holder a No. 8 B.A. screw is passed right through from front to back of the holder and the axis of the shaft. Two grub screws were first used for this purpose, but they had to be screwed up so tight to hold up against the weight of the coils that the ebonite broke away.

## RECEIVING 5XX

SIR,—With reference to your reader's letters regarding the new station, 5XX. This station can be received here (although situated between two ranges of Welsh mountains) consistently at "good" loud-speaker strength, interpreting "good" that music and speech can be heard with perfect clearness in the hall, even when the receiving room door is closed. The actual signal strength is approximately 75 per cent. of that of our local station, 5WA (12 miles distant).

The B.B.C. have, without a doubt achieved their object, and to myself the new station is an excellent standby when the local station's programme is not to my liking. Comparing signal strength with

# Mullard Service

## Gift to all valve users

The Mullard Radio Valve Co. Ltd. have always endeavoured to give the highest standard of production accompanied by a service that will enable all wireless enthusiasts to obtain perfect reception.

The enclosed safety disc will save all valve users time and money. These discs can only be obtained from The Mullard Radio Valve Co. Ltd.

**Mullard**  
**THE MASTER VALVE**

**MULLARD SAFETY DISC**  
for Mullard Master Valves

*To prevent filament burn out by H. T. Battery short circuit.*

Strip linen from back. Press adhesive surface firmly to the face of the Valve holder, taking care that holes in disc correspond with holes in holder.

PATENT APPLIED FOR.

## There is a Gift for you at Stand 52

THE MULLARD SERVICE for wireless valve users has always endeavoured to ensure perfect broadcasting reception, not only by Master design and workmanship in their productions, but also in reliable and useful information. This policy has been met with sincere appreciation by thousands of satisfied wireless amateurs all over the world. Here is another token of the Mullard Service.

An envelope will be given to all visitors to Stand 52 at the Wireless Exhibition in which will be found a Mullard SAFETY DISC. You will find out all about this disc when you receive the gift envelope.

Come early. Only a limited number of these patented safety discs are available for distribution, and they can only be obtained from The Mullard Radio Valve Co., Ltd.

Those who are unable to attend the Exhibition should apply to their Wireless Dealers, to whom a supply of Mullard SAFETY DISCS will be given for distribution.

The Master achievement of 1924 is undoubtedly the production of Mullard H.F. and L.F. Master Valves. In the field of general purpose bright filament valves they stand alone for giant strength, giant results and giant life. You will be astounded by the tests they will undergo at the Wireless Exhibition, and you will be delighted with the splendid results they will give you during a long life.

## REMEMBER Stand 52

MULLARD WECO, 1 volt ORA & D.F. ORA Valves are now reduced to 25/-

# Mullard

## THE MASTER VALVE

The Mullard Radio Valve Co., Ltd. (W.W.), Nightingale Works, Nightingale Lane, Balham, S.W.12.

British Empire Exhibition, Palace of Engineering, Avenue 14 — Bay 13

It will pay you always to watch WIRELESS WEEKLY Advertisements.

And now —

# Brandes

*The Name to Know in Radio*

## Introduce the Table-Talker

*Trade Mark*

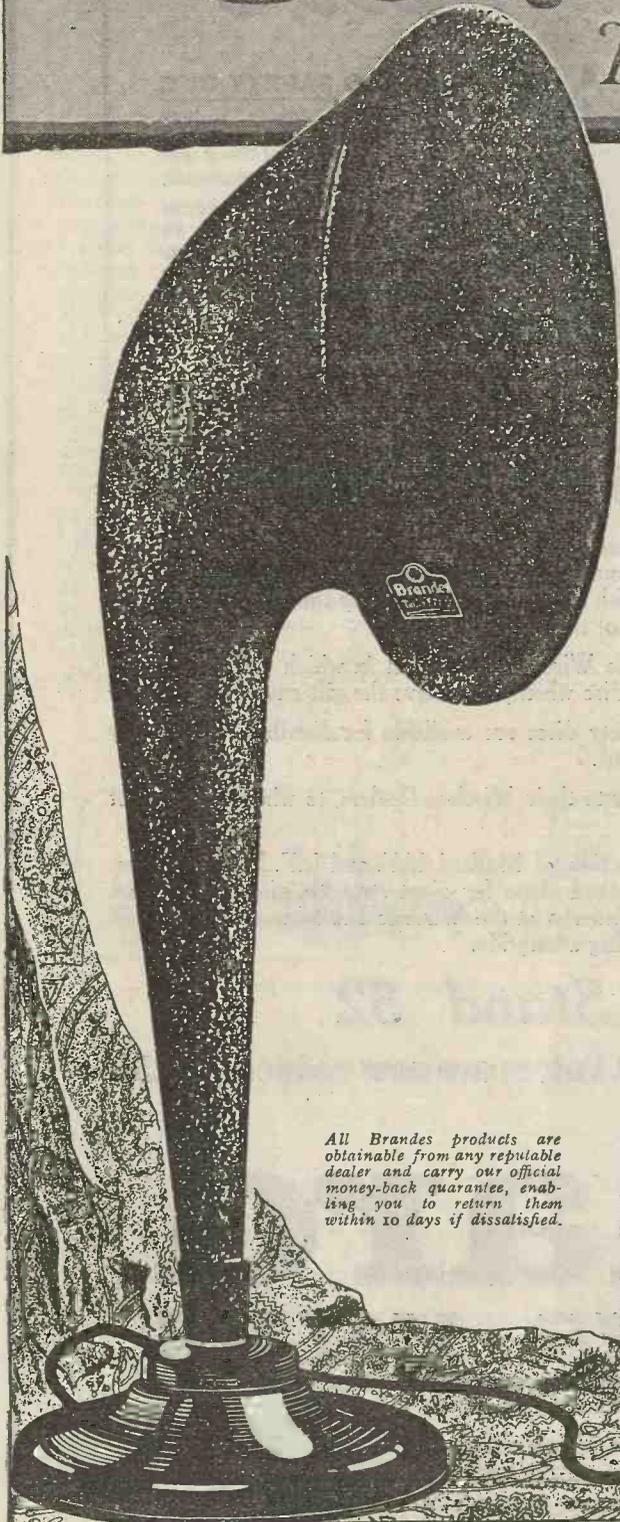
Original in the real beauty of its performance, original in its ingenious construction, original in its remarkable price. The horn is so contrived that every note registered is encompassed and emitted with absolute purity—there is no discordant echo from its walls. The full-toned accuracy of reproduction is consistent with the mellow note which is the chief characteristic of the famous Brandes Superior "Matched Tone" Radio Headphones.

The horn is matched to the unit so that the air resistance produced will exactly balance the mechanical power of the diaphragm. It has a self-adjusting diaphragm, is twenty-one inches high, with a 10-inch bell and felt-covered base. Simple lines and a neutral brown finish make it a tasteful and effective addition to your set.

# 42/-

All Brandes products are obtainable from any reputable dealer and carry our official money-back guarantee, enabling you to return them within 10 days if dissatisfied.

Tune with Brandes  
"Matched Tone" Radio Headphones  
Then listen with  
Brandes "Table Talker"



Mass., and we broadcast each evening between the hours of 5 and 10.30 p.m. Eastern standard time, which is five hours slower than Greenwich mean time, on a wave length of 337 metres, or 890 kilocycles frequency.

We shall be pleased to receive your comments on any of our future programmes which you may pick up.—Yours very truly,

A. S. EISENMANN.

Radio Station WBZ.

**A.C. MAINS FOR FILAMENT HEATING**

SIR,—I have just read with great interest Mr. Fox's article in your August 13 issue on using the A.C. mains for filament heating.

To my mind, far too little use is made of the mains, and in the many places where the supply is direct and of a useful voltage, viz., 230, or thereabouts, the requisite filter can be made up much cheaper than purchasing an H.T.120 volt battery suitable for running one or two power valves. With unlimited plate current at a high voltage and resistance capacity coupling a really fine job can be made of the loud-speaking end of the business. The current cost is negligible.

Users of dull emitter valves are usually cautioned (and rightly so)

not to exceed the voltages specified by the makers; but all the same, I have run a "B<sub>4</sub>" power valve for 14 months on 230-volt mains, and to-day it is as good as ever, and is in use every evening.

Many strange statements concerning wireless appear in the daily Press, and one such in a recent column struck me. It was to the effect that the famous "Neutrodyne" circuit can be used only with bright valves. Some information on this point might be welcome to a great many readers of *Wireless Weekly* who, like myself, have tried this circuit and not made very much of it. At present I am comforting myself with the thought that the three .06 valves I tried were the cause of failure.—Yours faithfully, Edinburgh. S. H. MILNE.

[Practically all the Neutrodyne receivers in the U.S. use dull-emitter valves.—ED.]

**A READER'S EXPERIENCE**

SIR,—No doubt you will be interested to know about a crystal set I have recently assembled. It has quite a usual circuit, made up with a basket coil, tuned by a .0005 variable condenser.

With this set 2LO came in, though very faint, and in changing over to my regular set I detached the earth,

but instead of this cutting out the transmission entirely, it made but very little difference. I then found that by attaching the earth wire to the aerial terminal and dispensing with the aerial altogether, the strength was somewhat increased. By connecting the aerial terminal to a gas-pipe in the same room as set; and using this as substitution for above earth, results were slightly louder; compared with normal results from the regular set, this last strength was little over half as loud. The foregoing tests were carried out in a semi-basement room. I then took the set to the top floor, where I connected a gas earth to aerial terminal as before, with the result that the strength was increased to at least that obtained from the other set.

This is by no means a freak, for it works any time, and as I have never read of a similar occurrence, I thought perhaps you might like to know.—Yours faithfully,

R. CYRIL J. CHIAPMAN.

S.W.9.

**A NOVEL LOADING COIL**

SIR,—I enclose herewith circuit diagram and sketch of a loading coil and fixed condenser in the form of a plug-in coil suitable to tune a crystal set with variometer which

**The famous B.T.H.**

**B.5 Valve**

*Price reduction*

As a result of increased demand and correspondingly greater production, we are able to reduce the price of the B5 Valve from 30/- to 25/-. Needless to say, the characteristics which have made the B5 valve so widely popular will be retained and, if possible, improved.

By reason of the exceedingly low current consumption of the B.T.H. B.5 valve, a 4-valve set can be worked on less than half the current taken by one "R" valve. It functions equally well as a detector, H.F. or L.F. amplifier, and better than many valves designed for use in any one of these positions.

Filament Current ... ..	0.06 amps.
Filament Vol's ... ..	3 volts
Anode Vol's ... ..	21-80 volts

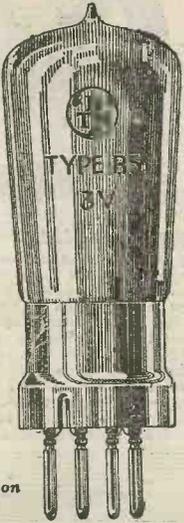
**New Price 25/-**

Obtainable from all Electricians and Radio Dealers.

**The British Thomson-Houston Co. Ltd**

Works: Coventry      Offices: Crown House, Aldwych, London, W.C.2

Branches at: Belfast, Birmingham, Bristol, Cardiff, Dublin, Glasgow, Leeds, Liverpool, Middlesbrough, Manchester, Newcastle, Swansea, Sheffield.



TYPE B.5  
2V

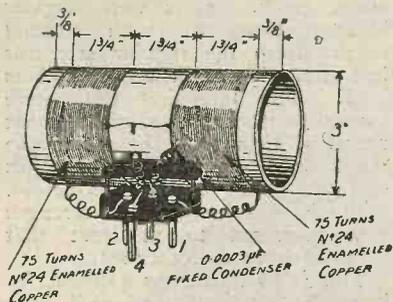
All British  
Wireless Exhibition  
Albert Hall,  
Stand 41.



2223A

already covers wavelengths up to 600 metres to the Chelmsford Station, 1,600 metres, which may be of interest to your readers.

It consists of a combination of a loading coil and fixed condenser (which reduces the somewhat large number of turns necessary in the coil) which can be plugged in in a moment, avoiding switches, etc.

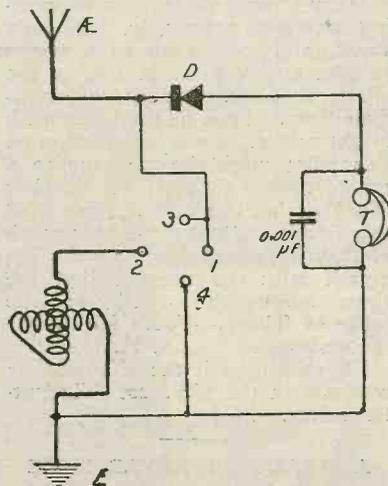


The loading coil suggested by Mr. Forwood.

The plug-in "combination" is made up of a cardboard former 6 in. long and 3 in. diameter wound with 150 turns No. 24 enamelled wire in two sections of 75 turns each.

For convenience the .0003 fixed condenser may be placed inside, as I have not found any ill-effects from this arrangement. A small piece of

ebonite about 1 1/2 in. square is fitted with the valve legs spaced as for a valve, so that the "combination" can only be inserted one way into the sockets corresponding on the set. Two legs, 1 and 2, pass

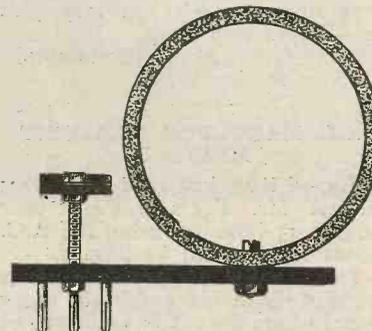


The circuit arrangement.

through the former and are nipped on the inside, thus securing the base; 3 and 4 need only be secured to the base itself.

Nos. 1 and 2 are the two ends of the coil and 3 and 4 the condenser.

In fitting care should be taken to fix in the correct order, as it will be seen that 1 and 2 valve legs must be nipped up before the condenser is fixed, as it comes on top of the nuts. The countersunk screws securing condenser are sunk on the outside of the former, and the winding can pass over these, covering



A side view of the loading coil.

them up, thus economising in the space occupied by the windings.

On referring to the theoretical circuit diagram, it will be seen that the action of inserting the "combination" adds a loading coil across sockets 1 and 2 and the condenser across 3 and 4, and it is only necessary to provide a short-circuiting plug for insertion in 1 and 2, when

Put the World on your Dial.



The bugbears of H.F. amplification with its uncertainties and infrequent success most certainly reflects no discredit upon the principle. Inefficient apparatus plays its paralysing part too well. The employment of the four-pin valve with electrode leads bunched in the stem renders doubtful service—but MYERS with inter-electrode capacity entirely removed make H.F. work, detection and L.F. amplification reveal acute sensitivity with purity and power.

# Myers Valves

PRACTICALLY UNBREAKABLE

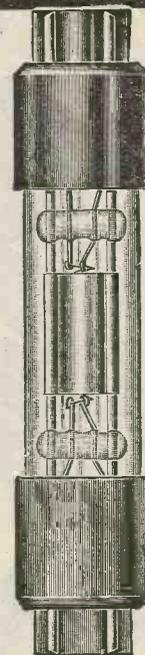
A typical letter:

Swonsea.

"I would like to congratulate you on the wonderful valves which you manufacture. They are the only distortionless and perfectly made valves on the market and they are all and more than you claim for them. . . . I was testing my one valve set between 1 and 2 o'clock in the mornings, using a MYERS valve, when I was surprised to hear telephony which I discovered to be KDKA, viz., Pittsburgh. There is one more thing I wish to say. It is this—Good luck to MYERS valves, the only perfect radio vacuum tube which does all that its makers claim for it. H.W.M."

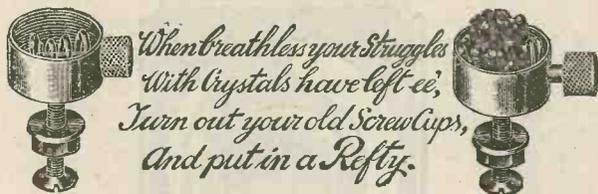
Universal, 12/6 - - 4 volts '6 amp.  
Dry Battery, 21/- - - 2 1/2 volts '25 amp.  
Plate Voltage, 2 volts—300 volts.

- LONDON—The Dull Emitter Valve Co., 83, Pelham St., South Kensington, S.W.7 (Kensington 3331)
- MANCHESTER—E. Davi & Sons, Victoria Bolt and Nut Works, Bilberry St.
- LIVERPOOL—Apex Electrical Supply Co., 59, Old Hall Street, Liverpool.
- GLASGOW—Milligan's Wireless Co., 60, Sauchiehall Street, Glasgow.
- YORKSHIRE—H. Wadsworth Sellers, Standard Buildings, Leeds.
- SOUTHERN COUNTIES—D.E.D.A., 4, Tennis Road, Hove.



By virtue of the high electronic emission of the MYERS, it is possible to obtain perfect reception when using only 2 1/2 volts on the filament.

Advertisement of Cunningham and Morrison, Windsor House, Victoria Street, London, S.W.1



*When breathless your struggles  
With crystals have left ee,  
Turn out your old Screw Cups,  
And put in a Refty.*

**WHEN YOU SHOULD FIT**

The **WatMel**

**VARIABLE GRID LEAK.**



Patent  
206098

5 to 5 Megohms ... 2/6  
50,000 to 100,000 Ohms 3/6  
Other Resistances to suit  
any circuit.

Send P.C. for Descriptive Folder.  
SEE THE TRADE MARK

**WatMel**

ON EVERY GRID LEAK.  
BEWARE OF IMITATIONS.

Extract from a letter published in  
Sept. issue of MODERN WIRELESS.

"I was unable to obtain a Watmel  
Grid Leak when constructing this set,  
but have fitted one since, as without it  
the set was unworkable." J. D. S.

While the ordinary fixed grid leak is  
not totally inefficient the constantly  
varying strengths of energy which  
is applied to the grid render it  
incapable of correct functioning  
under all conditions.

The ability to vary the difference of  
potential between the grid and the  
filament controls to a vital degree  
the electronic flow to the plate. In-  
correct adjustment of the potential  
may act as a "stone-wall" to a  
great percentage of the electrons.  
There is but one definite and positive  
method of control—you should fit  
it—Watmel—

ALWAYS.

**IMPORTANT NOTICE**  
to users of Variable Grid Leaks

The Watmel Wireless Co. wish to notify the trade  
and public that their Variable Grid Leak Patent  
Application No. 206098 was contested in the Com-  
ptroller's Court, and on Appeal; in both instances  
the Patent Grant was upheld and costs awarded.

It is the aim of this Company to protect traders', cus-  
tomers', and also its own interests by securing Patent  
protection for the novelties in its specialities, as it is  
these novelties, invented by experts and exhaustively  
tested, which are the Hall Mark of all Watmel Products.

All goods of our manufacture bear  
this mark. It is your only guarantee.

**WatMel**

**WATMEL WIRELESS CO.**

332a, Goswell Road, London, E.C.1.

'Phone: CLERKENWELL 7990.



**REPAIRS** TO HEADPHONES  
TO LOUD SPEAKERS  
TO COILS

REWOUND to any RESISTANCE & MADE EQUAL to NEW.  
PRICE QUOTED ON RECEIPT OF INSTRUMENTS.  
PROMPT DELIVERY.

**The VARLEY MAGNET COMPANY**

Established  
26 Years.

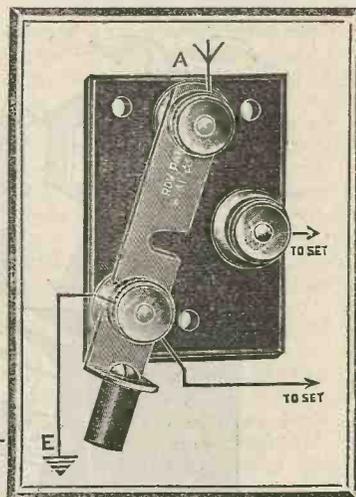
'Phone: Woolwich 888.

WOOLWICH, S.E.18.

The  
**IGRANIC**  
Earthing  
Switch

will protect both your  
home and set. All  
metal parts are of  
ample proportions  
and are heavily  
nickel-plated. The  
terminals are of a  
patented improved  
type and carry the  
spring switch con-  
tacts which ensure  
perfect electrical  
conductivity.

Mounted on solid  
ebony base with three  
fixing holes. Price 3/-



**THE VERNOB**

This useful accessory  
may be fitted to any  
tuning device in order  
to obtain fine vernier  
adjustment. The  
mechanism is simple  
and robust and there is  
nothing to get out of  
order. It is designed to  
fit 1/2" spindles, but with  
a liner will fit 3/8"  
spindles. Price complete  
with liner and 180°  
scale ... 6/-

**Small devices which  
make a big difference**

There may be no need to tell you what a difference attention  
to details makes in wireless, but we would bring to your notice  
these small Igranitic Devices which make that difference. It is  
because Igranitic craftsmen—both designers and engineers—  
devote such care to details in producing Igranitic Components,  
that we say "you will build a better set" if you use Igranitic  
Devices. Igranitic Components include: Honeycomb Coils,  
Transformers, Vario-Couplers, Biplug Coilholders, Triplug Coil-  
holders, Filament Rheostats, Battery Potentiometers, etc.  
They are obtainable of all reputable dealers, and carry a six  
months' guarantee. Write us for List Z.248.



149, Queen Victoria St., London.  
Works: Elstow Rd., BEDFORD.

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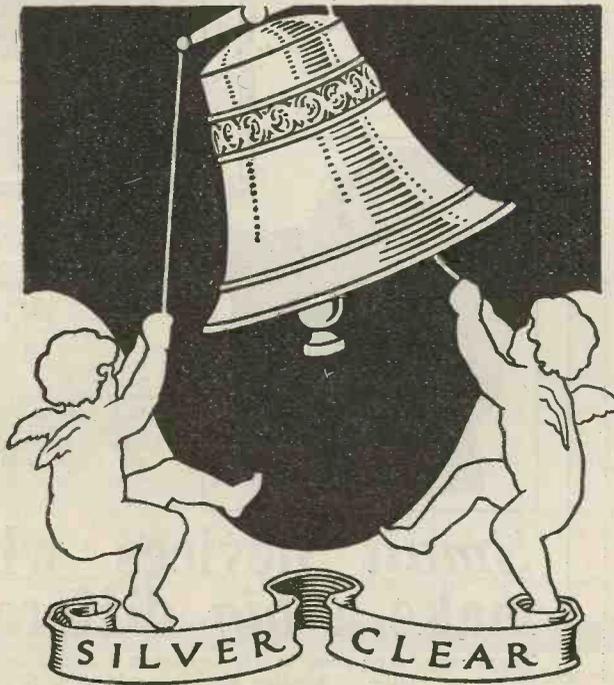


**VERNIER FRICTION PENCIL**

Designed for use with variable condensers, variometers and  
similar apparatus to convert the plain instrument into  
vernier type. For fine adjustment the pencil is inserted in  
the bush—so that the rubber ring engages with the bevelled  
face of the dials—and rotated. By sliding the clip attachment  
towards the brass pin a pencil may be converted into an anti-  
capacity adjuster. Price complete with clip, spare rubber ring  
and 3 Bushes ... 2/-

It will pay you always to watch WIRELESS WEEKLY Advertisements.

# Louden VALVES



10/-

## Silver Clear

Here is the Trade Mark by which Louden Valves are known. It was chosen because it represents the essential feature of Louden Valves—Silver Clear reproduction.

There are very good reasons why the open spiral anode of the Louden enables such clear reception to be obtained, but the best of good proofs is to buy one to-day and fit it to your set.

From the moment you switch on you will notice that your reception is clearer than it was before.

You may have become so accustomed to the "breathing" noise of your set that you do not notice it. When you fit Louden Valves you will most certainly notice its absence. You will realise why we say that Louden Valves are Silver Clear.

The plain Louden for detecting and Low Frequency Amplifying.  
The Blue Louden for H.F. Amplification.  
Filament Volts 4.8-5.  
Filament Amps 0.4.  
Anode Volts 40-50.

**FELLOWS  
WIRELESS**

Manufactured throughout in Great Britain. All Loudens are Silver Clear and free from "mush." The current consumption is very low and the life long.

E.P.S.2.

ADVT. OF THE FELLOWS MAGNETO CO., LTD., PARK ROYAL, LONDON, N.W.10.

*It will pay you always to watch WIRELESS WEEKLY Advertisements.*

it is required to receive the short wavelengths covered by the variometer, the condenser being automatically removed.

When wiring up it is advisable to connect Nos. 1 and 2 sockets only temporarily until it is ascertained which is correct to bring the turns of the loading coil in the right direction relative to the variometer. They can then be secured permanently, and the sockets being arranged as for a valve, it will then be impossible to fit the "combination" with the coil reversed.

I find this fitting brings in Chelmsford very well indeed at about 18 miles, its only fault being its size, and I intend to make up a basket coil on the same lines with condenser and four legs.—Yours faithfully,

STANLEY M. FORWOOD.

Loughton.

**"RANDOM TECHNICALITIES."**

SIR,—As an enthusiastic gramophonist as well as a wireless devotee I am unable to refrain from making a protest against the statement made by Mr. Percy W. Harris in your paper under the heading "Random Technicalities" to the effect that nothing "can be worse for trade than to have to demonstrate to likely custo-

mers a receiver which can only produce as gramophones can," and that "the potential customer will obviously remark that it is no better than a gramophone."

Mr. Harris' knowledge of wireless matters is, of course, undisputed, but I venture to suggest that when he commences to criticise gramophone reproduction he is entering a realm largely unknown to him, as, were it otherwise, I feel confident that he would never have given utterance to the statements referred to above. The chief gramophone companies have, during the past few years, made vast strides towards perfection, and I am quite prepared also to concede that given equal artistic ability before the microphone and the gramophone recorder, supplemented by careful adjustment of the receiving set in the one case and proper management of a really good gramophone in the other, there may be little to choose between the results obtained from either source. This state of affairs is, however, rarely obtained. Before the microphone the singer delivers his song, and it has gone forth to the world; he may not have been in good voice, he may have made minor mistakes, but there is no remedy. With the gramophone, however, the position is entirely different, for one can rest assured that

none of our leading companies will rest satisfied with a recording until it satisfies the very high standard of excellence which they have set themselves, and unless the execution of the particular item is as near perfection as is humanly possible.

I would, therefore, impress upon Mr. Harris the fact—and it is undoubtedly a fact which he may prove for himself by visiting any of the leading companies—that the gramophone de luxe of the present day is no longer a mechanical contrivance to be sneered at but a real musical instrument, whose reproduction can at any time equal and often surpass the best that can be obtained from wireless. So far from *real* gramophone reproduction acting as a deterrent to prospective wireless customers, Mr. Harris may be interested to learn that many of my gramophone friends have refused to take up wireless solely because of the inferiority of its reproduction as compared with that which they obtain from their own instruments. So far as concerns the wireless gramophone concerts, I agree that they do not show wireless reproduction at its best, but neither do they by any means do justice to what we gramophonists expect from our own instruments, and I suggest that the solution of the matter is that the demonstrator at the B.B.C. studio is

**THE REAL THING — not an echo or gramophone effect. With a**

**C.A.V.**

**LOUD SPEAKER**

**You hear the Musician himself**

as though actually singing or playing in your room.

Until the advent of the C.A.V. Wireless Loud Speaker, those "listeners-in" who possessed a critical musical ear were content to put up with the inconvenience of headphones in order to obtain purity of reproduction, the "loud speaker" to such people being not good enough.

120 ohms. £4 15s. 0d.    2,000 ohms. £5 0s. 0d.    4,000 ohms. £5 10s. 0d.

Write now for Illustrated Loud Speaker Folder from

**C.A. Vandervell & Co., Ltd.**  
ACTON, LONDON, W.3

WIRELESS EXHIBITION  
ALBERT HALL  
STAND No. 83  
Stand 112 (Office)

J.H.W.

not getting the best out of the instrument or that the latter itself is not up to present-day standard.

I hope you will pardon the length of this letter, but I also hope that it may perhaps lead Mr. Harris to modify his opinion on this subject. So far as concerns the turning away of customers, my own experience goes to show that this is not due to any lack of quality in the transmissions but rather to the ignorance of those responsible for wireless demonstrations in our stores.

With best wishes for the continued success of your two periodicals, both of which I have from No. 1,—Believe me, yours faithfully,  
EDWARD A. BROCKWAY.

Mr. Harris's reply:

I am still unrepentant. With regard to gramophone matters, I am not inexperienced, having visited and supervised the preparation of gramophone records in big recording studios. I also possess a good modern gramophone, and have written technical articles on reproduction, so that I feel competent to pass an opinion.—P. W. H.

**RADIO IN N.S.W.**

SIR,—Doubtless you will be interested to hear that this Division of the Wireless Institute of Australia has now incorporated with it

practically the whole of the clubs in New South Wales, and is the mouthpiece for all amateur wireless matters (political and technical) for Australia.

We now have our own club room, and excellent facilities for displaying wireless literature.—Yours faithfully,

PHIL RENSHAW,  
Hon. Secretary,  
Sidney,  
Australia.

**TECHNICAL EDUCATION IN WIRELESS**

SIR,—I have read with great interest the article on the first page of your issue of September 17, 1924, and, although I am in general agreement with the statements made, I cannot refrain from pointing out a marked exception. In our courses at the Borough Polytechnic, the technical instruction in wireless is in the hands of Mr. G. W. Sutton, B.Sc., who is a well-known amateur transmitter fully familiar with the latest practice and engaged in test work for the trade. Comparatively little attention is given in our courses to obsolete practice; much more is heard of the valve method of transmission than of spark, arc, and high frequency alternator

methods. Reception circuits which have attracted a considerable amount of general attention, such as your S.T.100, have been tried out and critically examined for volume and distortion. Members of the classes are familiar with the characteristics of the valves upon the market. And, generally, in our classes considerable time is devoted to discussion and to practical testing in the laboratory. Ample opportunity is given for discussion of up-to-date circuits.—Yours faithfully,  
J. W. BISPHAM,  
Principal.

S.E.I.

**"DORKING AND DISTRICT RADIO SOCIETY"**

SIR,—I beg to inform you that the above Society has just been formed, and will hold its first meeting on October 6.

Major G. C. Garrick has been elected President of the Society. Readers interested are advised to communicate with the Secretary of the Society at High Street P.O., Dorking.—Yours faithfully,

A. J. CHILD.  
Hon. Sec.

Dorking.



**DRY CELLS & BATTERIES FOR L.T. PURPOSES.**

**DRY CELLS.**

Size No.	Nominal E.M.F.	Dimensions overall approximate.	Weight approximate.	Rate of Discharge ampere.	Price each.
640	1.5 volts	2 5/8 dia. x 6 1/2 ins. high	2 lbs. 3 ozs.	0.1 to 0.2	2s. 8d.
948	1.5 "	3 7/8 x 3 1/8 x 7 "	5 " 8 "	0.3	6 9
884	1.5 "	4 1/4 x 4 1/4 x 8 1/8 "	12 " 0 "	0.3 to 0.5	12 0

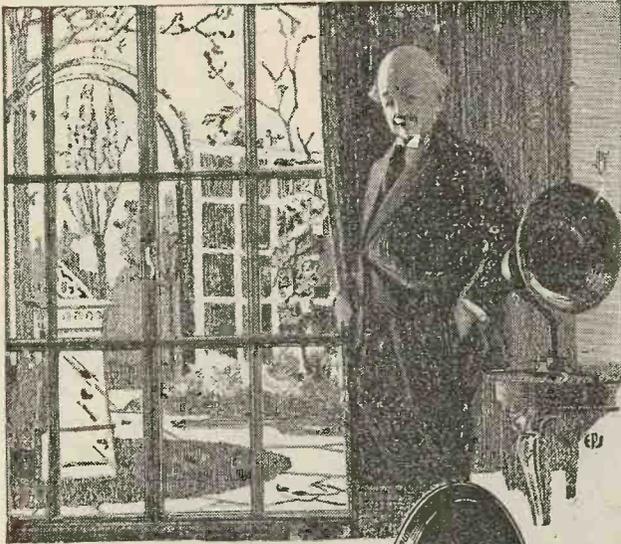
**DRY BATTERIES.**

Size No.	Commencing E.M.F.	Additional terminals at	Dimensions overall approximate.	Weight approximate.	Rate of Discharge ampere.	Price each.
907	3 volts.	4 1/2 & 6 volts.	13 x 3 1/4 x 7 3/8 ins. high	22 lbs.	0.2 to 0.3	£1 7s. 0d.
908	3 "	—	13 x 3 1/4 x 7 3/8 "	22 "	0.4 to 0.6	1 7 0
909	3 "	—	6 1/2 x 3 1/4 x 7 3/8 "	11 "	0.2 to 0.3	14 0
960	3 "	4 1/2	9 3/4 x 3 1/2 x 7 3/8 "	16 1/2 "	0.2 to 0.3	1 0 0
961	3 "	4 1/2	8 x 2 1/4 x 6 1/4 "	7 "	0.1 to 0.2	9 0

The rates of discharge mentioned in the tables are those at which the cells or batteries will give a normal output. If these rates are exceeded, the output will be reduced very considerably.

OBTAINABLE FROM ALL LEADING DEALERS.

**SIEMENS BROTHERS & CO., LTD., WOOLWICH, LONDON, S.E.18**



# Autumn Leaves

Standing at my window the other evening watching a gusty wind whirling the dead leaves round my sundial, I was forced to admit that our short summer was over. All too short it seemed to me; just a few bright days and before we knew where we were autumn had set in with winter unpleasantly close—well, not altogether unpleasantly. I rather look forward to long winter evenings. It's a restful change from being harried by the children to go and play in the garden, as they insist on my doing when it's light till ten.

In the winter they seem perfectly satisfied to sit and listen to the perfect tunes of the Volutone giving them Miss Nobody Special's latest bedtime story or the first part of the evening concert. The Volutone also is powerful enough to enable them to talk without disturbing the concert; in fact, it's proved itself a positive blessing, and at a price well in keeping with the Fellows' policy of

Quality Apparatus at Low Cost.

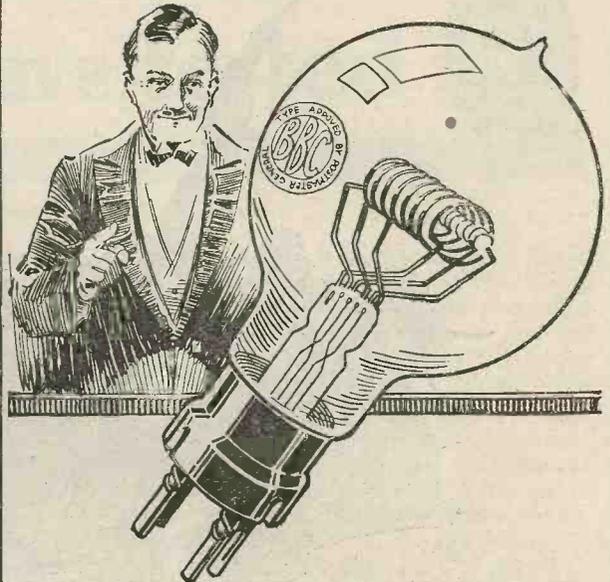
# FELLOWS WIRELESS

E.P.S.90.

Advt. of The Fellows Magneto Co., Ltd., Park Royal, London, N.W.10

It will pay you always to watch WIRELESS WEEKLY Advertisements.

## Mr. E. Conomy says:



**“Use the Valve that costs you NOTHING!”**

If you buy a Penton Low Consumption Valve now it will cost you .....	15/-
But more than this amount will be given back to you in twelve weeks by the saving in current! Let us work it out.	
Using 30 Amp-hour Accumulator and an “R” Valve with average current consumption of .75 Amps, one charge of the Accumulator lasts .....	33 $\frac{1}{3}$ hrs.
And the cost of the charge is .....	2/-
Using Penton Low Consumption Valve .15 Amp the charge will last .....	166 hrs.
And the cost is only .....	2/-
Every day you use your set, say .....	4 hrs.
In twelve weeks using an “R” Valve your Accumulator requires charging ten times at cost of .....	20/-
But using Penton Low Consumption Valve your Accumulator requires charging only twice in twelve weeks at a cost of .....	4/-
Thus you clearly save the cost of eight charges—a saving of .....	16/-

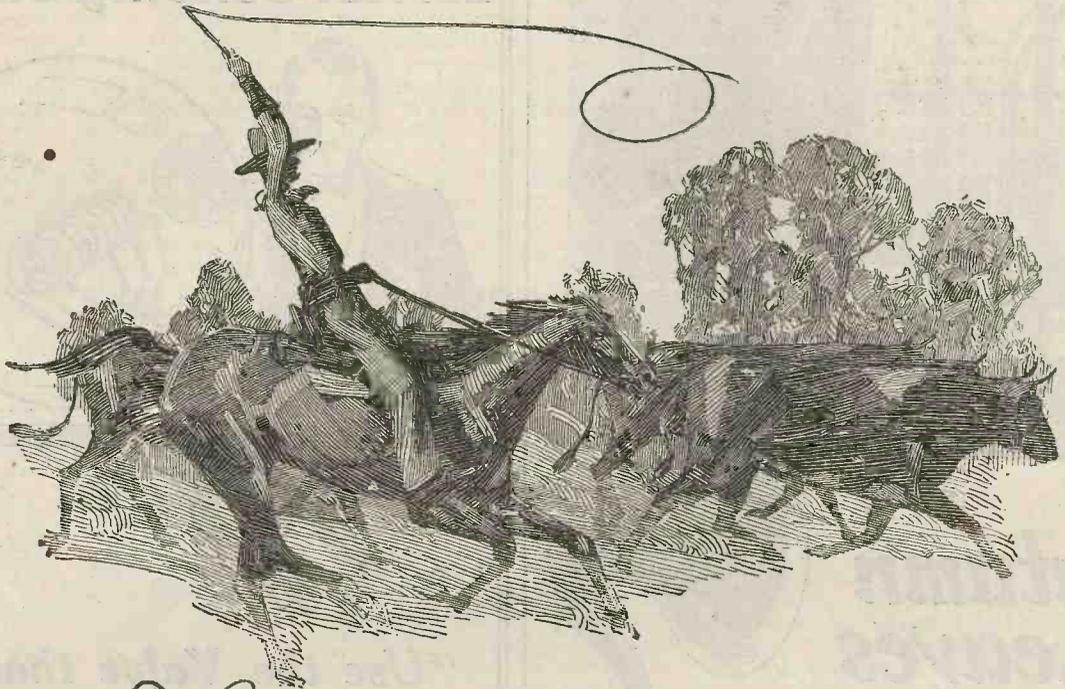
For saving's sake buy

## PENTON LOW CONSUMPTION VALVES

Type H.E.4 for 6-volt accumulators. Plate voltage 40. Filament current .15 amp. Filament volts 5.

PRICE 15/- Postage 9d.

From all good dealers, or direct from  
**PENTON ENGINEERING CO.,**  
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## The great "round-up"

NOT only out in the Wild West, but in every home where Cossor Valves are being used, a great "round up" is continually taking place. Instead of cattle, though, electrons are the victims.

In a valve, as doubtless you know, the filament, when heated, gives off an electron stream which flies off to the Grid and the Anode and causes the Valve to function correctly. If the filament is broken or the accumulator (or dry battery) so exhausted that it cannot provide the energy sufficient to light the filament, then practically no electrons are given off and the Valve refuses to operate.

Obviously then, as the electron stream is the critical factor in valve reception, the greater the quantity usefully employed the better the valve.

In the ordinary Valve the filament, running through the centre of the tubular Anode, is exposed at each end and a proportionate amount of the electron stream leaks away without being put to any useful purpose.

But look at the Cossor—see how its arched filament is almost concealed by the hood-shaped Anode. No electrons can escape from here—it is a really effective "round up" of electrons every minute of the time the Valve is in use.

When you buy your next Valve, therefore, see that it is a Cossor: no other valve can give you such a long life, such an immense volume of pure tone, and such all-round-reliability, and it is these sterling qualities which have been responsible for the immense demand for Cossor Valves during the past few months.

**PRICES.**

**BRIGHT EMITTERS.**

- P1. For Detector and L.F. use .. **12/6**
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A.C. COSSOR, Ltd., Highbury Grove, London, N.5.

## Valves

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Conducted by A. D. COWPER, M.Sc., Staff Editor.

**Marconi "Ideal" L.F. Transformers: High Ratio**

SINCE the publication of our report on the new Marconi "Ideal" L.F. intervalve transformer, low-ratio type, we have been given an opportunity by the makers of putting to a thorough test the two high-ratio types of the same series: the 4 to 1 and the 6 to 1. These are uniform in appearance with the low ratio (2.7 to 1) instrument already reported on, and have the same substantial build and high finish; as with the latter, they are completely enclosed. The makers recommend these high-ratio instruments for use after valves

of comparatively low impedance, such as L.S. valves, the primary windings being adjusted for these conditions; though the 4 to 1 ratio one can be used, if desired, after an R type of valve if the maximum practicable build-up (without appreciable distortion due to inadequate primary impedance) be required. Practical test in reception of broadcast telephony, under optimum conditions as to H.T. value and grid bias, with standard R valves and with bright-emitter valves of the L.S. type (small-power valves, i.e.) confirmed these recommendations. With an R valve as detector and with the 4 to 1 ratio

instrument, followed by a small power-valve with ample H.T. and proper grid-bias in order to avoid valve-distortion, the degree of amplification actually attained compared favourably with that given by any first-class transformer the writer has measured; whilst no noticeable transformer distortion accompanied this great build-up. With the 6 to 1 instrument the effect, though powerful, was rather harsh and unpleasant. Using these instruments as they were particularly designed to be used, i.e., in a second stage of L.F. amplification and following valves of low impedance, the performance was observed and com-

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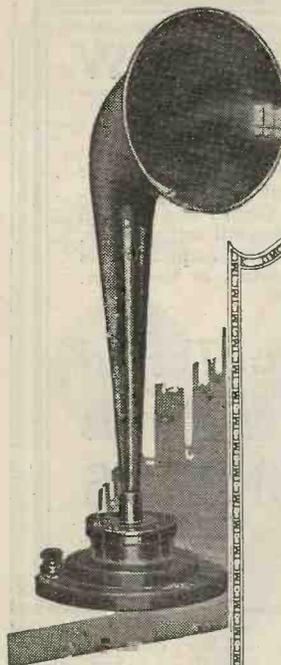
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British Empire Exhibition, Wembley, Palace of Engineering, B.E.A.M.A. Section, Stand C1 Avenue 11, Bays 6 and 7.

pared with that of other instruments in a three-valve receiver having a sensitive and selective reaction-circuit with an R valve as detector, followed by the low-ratio Marconi transformer controlling an L.S. valve, a second L.S. valve being coupled up by the second-stage transformer under test. A single 70-foot aerial, 20 feet high, in a fairly good position on high ground (though screened by trees) was used, in Essex, about 35 miles from both 2LO and 5XX.

With the direct London transmission the greatest difficulty was experienced in handling the relatively enormous audio-frequency energy resulting, even with over 200 volts on the plates of both L.S. valves, and grid-bias of over 10 volts: apart from overloading the loud-speaker it was impossible to get the last stage entirely free from the distortion, which results from overrunning the valve characteristic. The noise was, of course, overpowering at close quarters. Since 5XX comes in loudly at that point on a single valve without a tuning induct-

ance, it was not practicable to try the set on this transmission. Every main B.B.C. station (including Aberdeen) came in at good loud-speaker strength, together with several relay stations. The nearer ones were uncomfortably loud in the immediate neighbourhood of the loud-speaker. Turning to the Continental stations, a succession were tuned in after dark on the loud-speaker at good strength, Breslau, for example, being audible at 100 yards (measured) in the open with the loud-speaker turned out of the window, the German announcer being understandable at a distance of many yards. Petit Parisien was particularly noisy, as well as another French-speaking station on just over 460 metres. Finally, after Hamburg had finished heterodyning him, Madrid came in excellently. On the longer waves Eiffel and Königswusterhausen were read comfortably on the loud-speaker, and on the short, Brussels at excellent strength.

On the whole we preferred the 4 to 1 instrument in this position,

the tone being just noticeably better and the build-up but little inferior. It is evident that, given the proper equipment to handle the great signal voltages attained with these instruments, really efficient audio-frequency amplification by transformer coupling, without noticeable distortion, is within reach.

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From Messrs. Peter Curtis, Ltd., comes a sample of polished ebonite in which there is not the usual treacherous surface which may prove partly conducting. Actual trial confirmed the claim that this ebonite panel can be used without further preparation, preserving the polished surface throughout the constructional work—which, of course, necessitates considerable care in protecting it from accidental damage—and giving a finished panel of good appearance and excellent insulation-resistance. A further polish can be obtained if desired, by buffing after all constructional operations are completed.

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If you are unable to call in person and see our display at the Wireless Exhibition, drop a post-card to our office at Letchworth and we will send you literature concerning all our exhibits. We look forward to renewing acquaintances and making many new friends at the Show. Shall we see you?

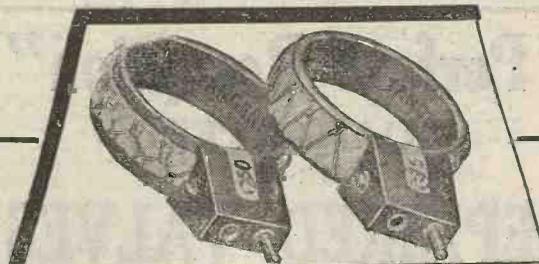
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# Information Department



SUPPLIED BY RADIO PRESS SERVICE DEPT., LTD.

**S. G. W. (ROMFORD)** asks **In the absence of a convenient main water pipe, what alternative earth connection can be used?**

(1) An old galvanised iron bath or bucket, perforated with holes, should be buried a foot or two beneath the surface of the soil, underneath the aerial and as close to the "leading-in" point as possible. A stout copper wire should be soldered to the upper edge of the bath or bucket, which should be almost filled with cinders or preferably broken coke. Three or four bucketfuls of water should then be poured in and the earth shovelled back. (2) A corrugated, galvanised iron sheet (as large as is available) should have a stout copper wire soldered to one corner, the plate being buried on its edge until the upper edge is 6 or 8 inches below the surface of the ground. The hole in which it is placed should be about half filled with cinders or broken coke, water should be poured in and the earth replaced and

stamped down. (3) If sufficient space is available, two (or more) long lengths of bare copper wire, not necessarily new, may be buried some 6 or 8 inches beneath the surface of the ground, underneath and in line with the aerial wires. The two wires should be brought together where they emerge from the ground (as near to the leading-in point as possible) and may be twisted together to form the earth lead.

**J. K. (BELFAST)** asks **What is a Lightning Arrester?**

As applied to wireless, a lightning arrester is essentially a minute gap between the foot of the down-lead and the earth-lead. The theory is that high-tension currents such as those due to lightning discharges, or even the "return currents" from earth due to a nearby cloud inducing a charge in an aerial, will jump across the small gap rather than traverse the highly inductive

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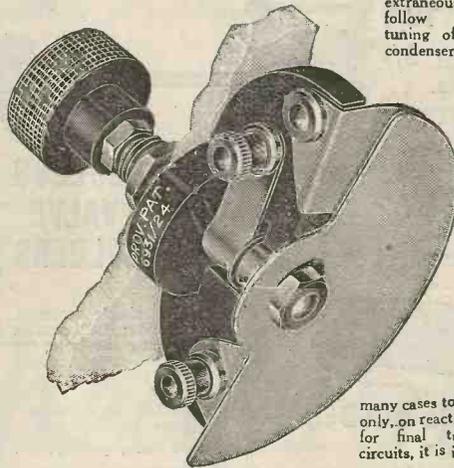
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The Colvern is presented as a really convenient, sound and neat unit, suitable for easily attaching to existing sets, (one hole fixing) and should be included in all sets in course of construction.

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The use of the vernier for final tuning is strongly advised. Its use demonstrates utmost tuning efficiency by giving complete control of the set, with greater selectivity and pure reception entirely free from the extraneous noises which follow the inaccurate tuning of large capacity condensers.



**PRICE**  
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If your local dealer does not stock the Colvern Tuning Condenser kindly send his name and address when ordering.

**COLLINSONS PRECISION SCREW CO., LTD.,**  
Macdonald Road, Walthamstow, LONDON, E.17.

Telephone: Walthamstow 532.

winding of the receiving set, which is connected to opposite sides of the gap. The received currents, on the other hand, are too feeble to jump the gap and must of necessity traverse the receiving apparatus.

**K. R. (LIVERPOOL)** states that he intends to devote himself to Transatlantic reception during the coming winter, and asks What is the best time for attempting long range reception ?

When the area between the transmitting and receiving stations has been in darkness for as long as possible. This usually means, of course, that a short time before sunrise is the most promising hour.

**J. C. (LEEDS)** asks whether the small dimensions of an Aerial can be compensated by making the down lead and earth connection in the form of a spiral ?

We have heard of quite good results being obtained upon valve receiving apparatus used in conjunction with a portable spiral aerial with the ordinary straight type of down-lead. The aerial in question consisted of about 100 feet of No. 16 S.W.G. phosphor-bronze wire, wound in the form of a spiral about 18 inches in diameter, and was primarily intended for portable work out of doors or for indoor use where an orthodox outdoor aerial could not be erected. In all cases the earth connection should be of stout copper wire and should be as short as possible.

**G. F. A. (HORNSEY)** asks the following questions :—(1) Whether it would lessen the efficiency of the aerial if a "lead in" was taken from each end as shown in his sketch. (2) With reference to a circuit in "MODERN WIRELESS," whether it makes any difference if the rheostat is connected in the negative filament lead of the positive filament lead.

(1) You should not attempt to attach two receivers to the same aerial. The aerial may be broken in the centre, if desired, by insulators so as to form two separate oscillatory systems, and a "lead in" may then be taken from each end.

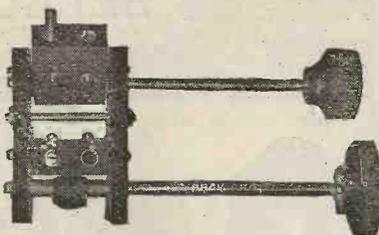
(2) With reference to the circuit you mention, it does not greatly matter whether the filament resistance is in the negative lead or the positive lead, but the former arrangement is best adopted as a standard.

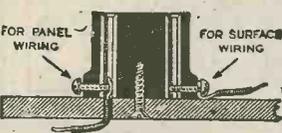
**F. T. Mc.D. (QUEEN VICTORIA ST.)** is about to instal a receiver in his house which looks on to an Electric Railway, and his aerial will be upon about the same level as the overhead electric wires, and within 100 yards of the same. He asks whether he is likely to experience much interference.

You should make every effort to erect your aerial at right angles to the power line, otherwise we are afraid you are very likely to get a considerable amount of interference if you are using a valve set, particularly if you use much low-frequency amplification.

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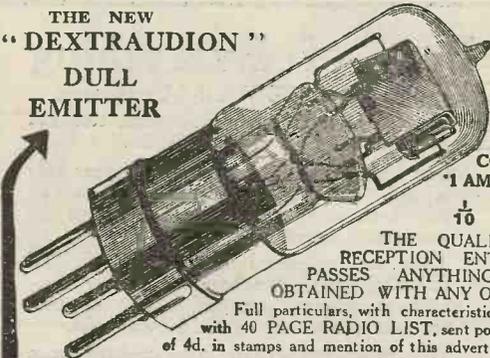
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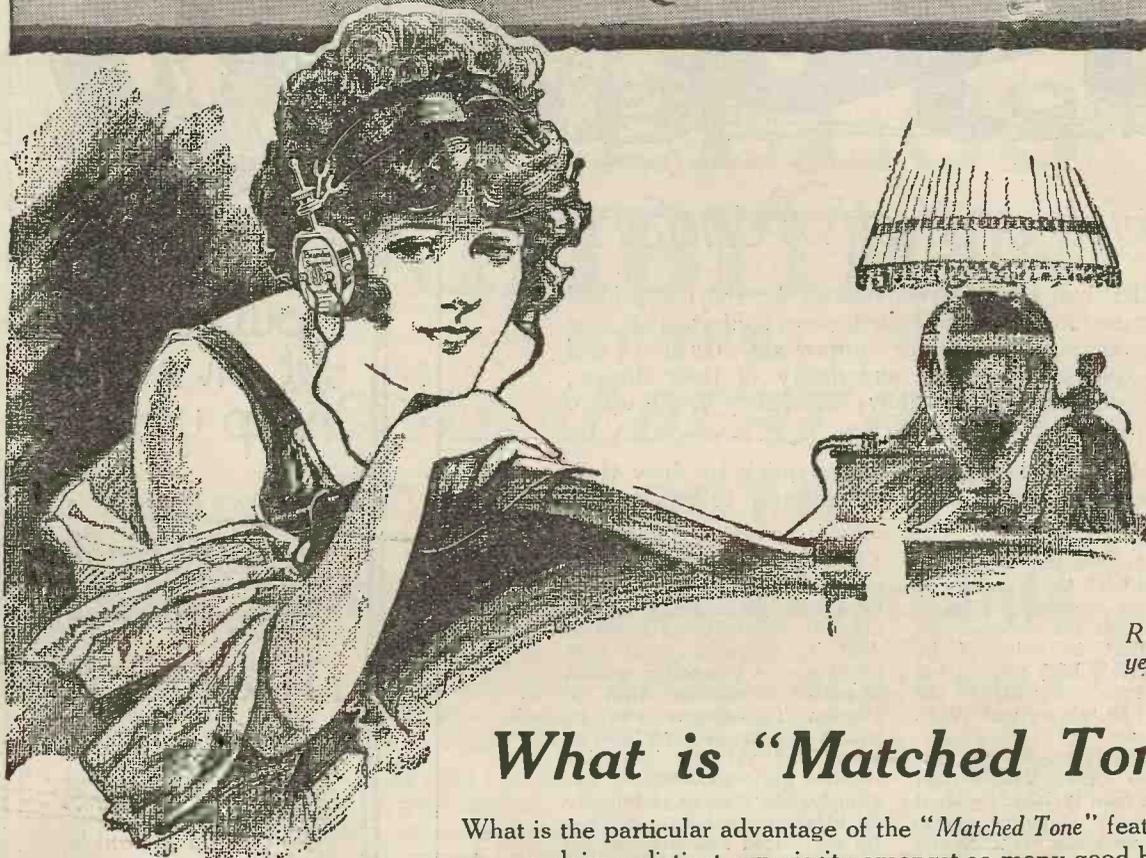
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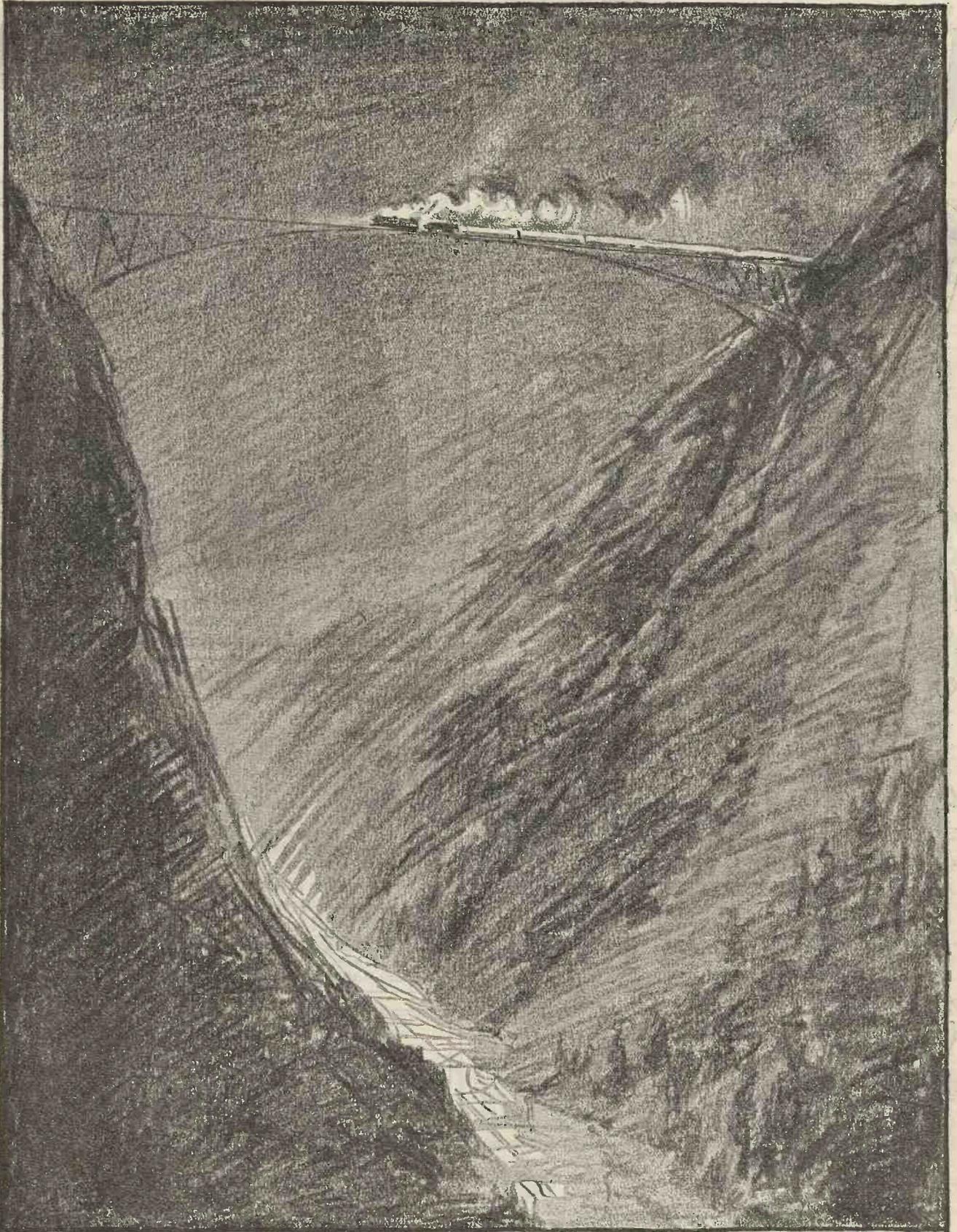
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