

SEEN "THE WIRELESS MAGAZINE" YET?

HOW TO MAKE YOUR OWN CRYSTALS

Amateur Wireless

And Electrics

Vol. VI. No. 139.

SATURDAY, JANUARY 31, 1925

Price 3d

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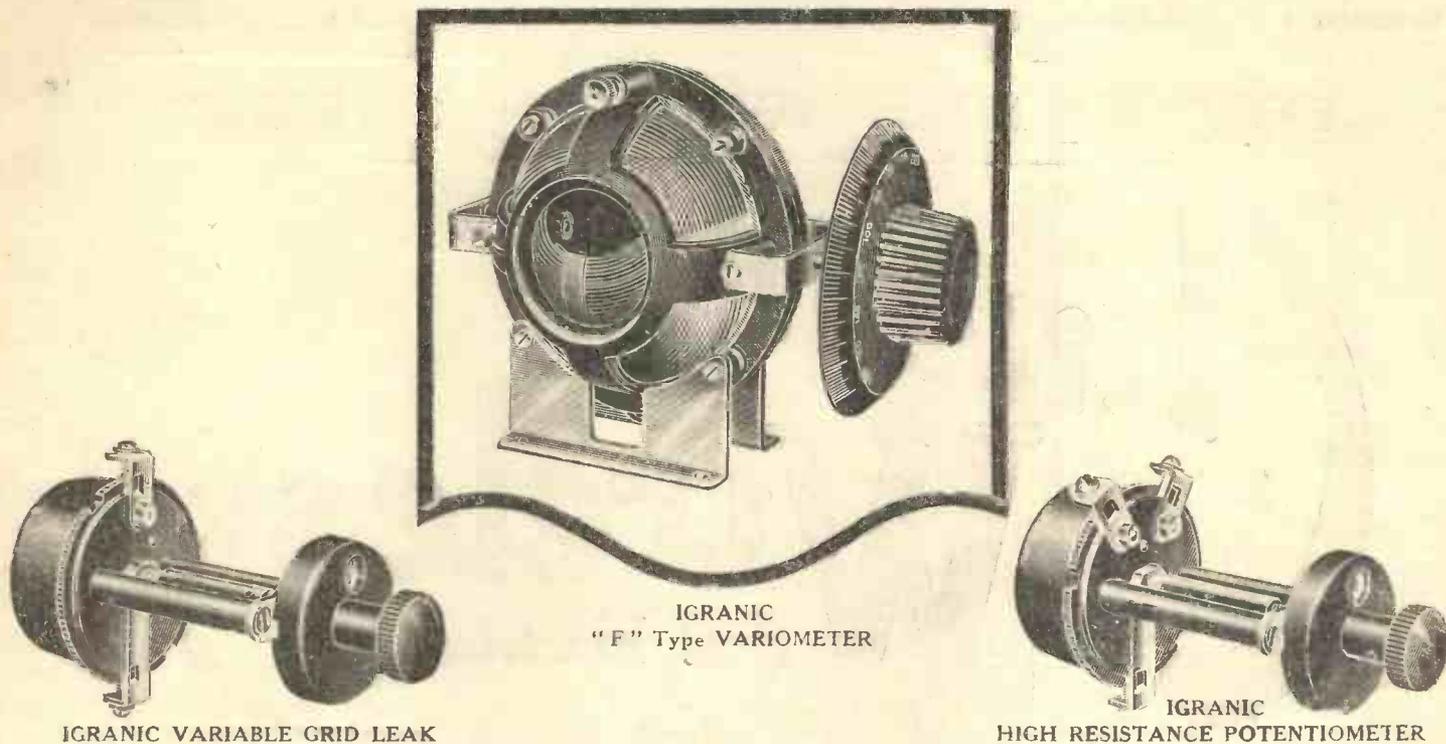
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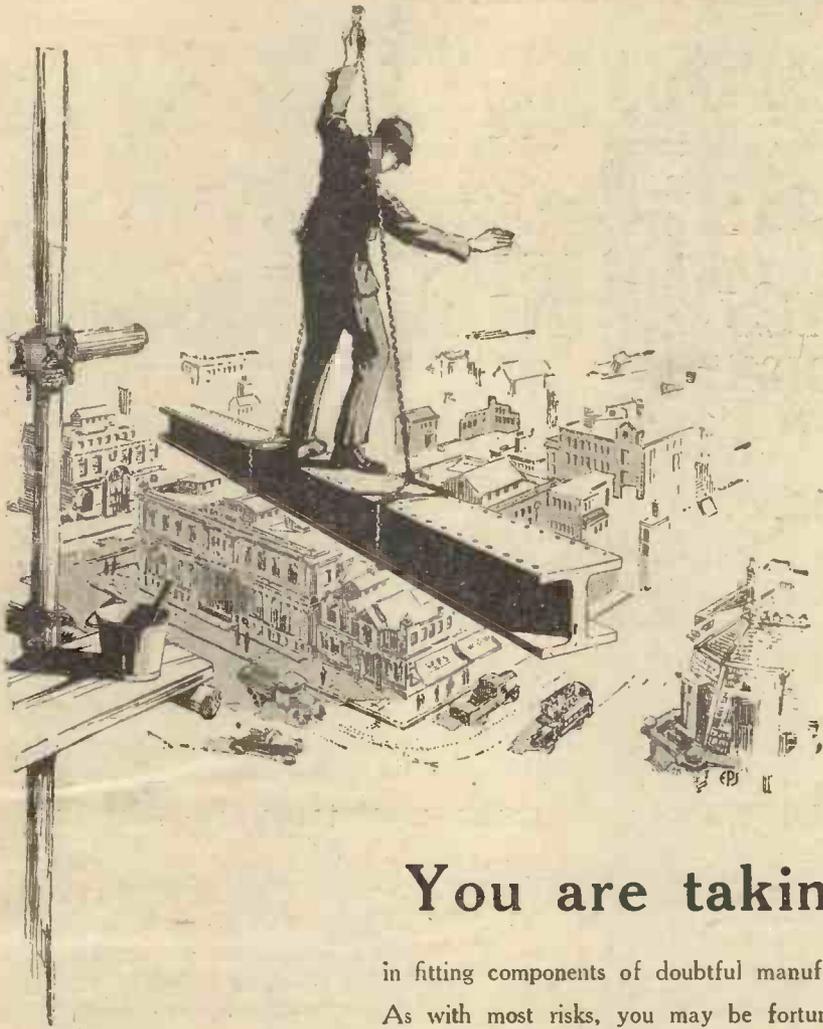


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The account recorded below is reproduced by kind permission of the Editor of the most popular daily newspaper.

That he has heard broadcasting from Madrid—nearly 700 miles away—on a simple crystal set is the remarkable claim of Mr. George L. Cross, of Cromwell Road, Prittlewell, Southend-on-Sea.

Of nearly 100 claims received by yesterday for ranges exceeding 100 miles with crystal receivers nearly 80 per cent. of the owners state that they can regularly tune in the stations they name.

Scores invite a test of their instruments, and several enclose certificates from broadcasting stations verifying their claims. Two owners send documents to show that re-radiation cannot have helped them.

Mr. Cross says that his set has no amplifiers and he is not near a multi-valve set. He states that he has received the following stations direct:

Miles Dist.	Miles Dist.
5 XX Chelmsford 15	2 YZ M'chester ... 165
2 LO London ... 35	Radio Paris ... 180
6 BM B'nem'th ... 120	5 NO Newcastle ... 260
5 WA Cardiff ... 160	Madrid 700

Mr. Cross has informed us that for these remarkable results he is indebted to

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BLUE LABEL CRYSTAL

which is the crystal he used for these experiments, and which is the crystal

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Amateur Wireless

and Electrics

Vol. VI. No. 139

January 31, 1925

HOW TO MAKE YOUR OWN CRYSTALS

VARIOUS methods of preparing synthetic lead sulphide have been given from time to time in the various wireless publications, but in some instances the processes put forward are open to criticism on the following grounds: (1) Too difficult or involving too much apparatus for the home experimenter; (2) too messy and objectionable; (3) the product is amorphous (non-crystalline) and therefore insensitive.

The writer has experimented with the production of crystalline sulphides and, although the experiments have been carried out in a chemical laboratory, there is no reason why the home experimenter should not use the same method.

The operations are: (1) The preparation of lead sulphide and (2) the crystallisation of the product.

The Preparation of Lead Sulphide

Using an iron ladle or a tin lid held by tongs over a fire or gas, melt some lead and continue heating until it is a dull red. It should here be noted that lead shot, gas pipe or composition lead failed to make sensitive crystals. No explanation of this is offered; the failure may be due to accident, but more probably to the presence of the impurity.

However, pure lead or scrap roofing lead from the builder gave successful results every time. A piece of sulphur about the size of a pea is dropped on to the hot lead. If the lead is hot enough, chemical combination takes place; the mass glows brightly and swells up into a black lump. On cooling, this lump is picked out from the molten lead with pincers, and the operation repeated with successive lumps of sulphur and more lead until sufficient material has been made.

Now comes the most important item in the production of crystals.

The black mass consists of partly crystalline lead sulphide (where it was hottest), partly amorphous lead sulphide, with a fair proportion of unchanged lead. The mass is broken down to a powder with a hammer and sifted through fine muslin or a fine sieve. The greater part

of the metallic lead will not be powdered by the hammer and will stay in the sieve, while the lead sulphide is easily powdered. However, some minute particles of lead may yet be present—in fact they will be—and this will certainly prevent the final product being sensitive. Therefore the



sifted powder is now mixed with powdered sulphur or "flowers" of sulphur and sprinkled a little at a time on the hot ladle or tin lid. It will be noticed that small particles here and there ignite.

This operation, which may be repeated with advantage, ensures the complete conversion of the lead into lead sulphide.

The Crystallisation

The crystallisation part of the process is the one which requires most care and an element of luck. The danger is that the product may be overheated in the presence of the air, with the result that the sulphide will decompose, the sulphur burning away, leaving the fatal metallic lead free.

The powdered sulphide is again mixed with a little sulphur and placed in a fire-clay crucible. The crucible actually used by the writer is known as a "London Round," 4 in. deep, made by Morgan's, Battersea, and obtainable at any chemical supply stores. A flower-pot 3 in. high with the bottom hole plugged with fire-clay, or a small pot such as chemists use for ointments may be used, though in the last case the heating must be very carefully done.

The vessel is covered with a "lid" of fire-clay and heated gradually. Heating too quickly is liable to crack the vessel. When it is becoming evenly red hot the heat may be more fierce. For heating, a blowlamp or good Bunsen burner are satisfactory. Alternatively, the crucible may be buried in a clear fire.

The heating should go on at a bright red heat for about an hour, when the

crucible is removed as conveniently as possible, allowed to cool slowly, and the contents removed, probably by breaking the vessel.

On breaking the fused mass the fractured surface should present a glistening crystalline effect. It may differ from the purchased "ites" in colour and in the size of the crystal faces. The first test is to try to cut it with a knife.

If it cuts with a shiny metallic effect it contains some metallic lead due to access of air and will be insensitive. It is well, however, to test the whole, as probably the inner portions will be good though the outer layers have suffered. The probable result, if successful otherwise, is that the specimen will be rather more crumbly and require a rather more springy contact.

The Results

The writer has prepared twenty-four batches of crystal. Of these, five were unsuccessful, due to the admixture of other substances which proved unsuitable; four were unsuccessful, due presumably to the use of impure lead (gas piping, etc.). Thus nine specimens, otherwise well prepared and good crystals, appear to be non-sensitive, due to added metals (tin, etc.).

The addition of a small amount of silver (about 1 per cent.) was a distinct improvement in the case of three specimens to which it was added. It appeared that the silver sulphide prepared on a small scale alone was somewhat inferior in detection to lead sulphide. Its value appeared to be due to the fact that it caused the lead sulphide to melt at a lower temperature (a not unusual phenomenon) and therefore less likely to decompose.

The remaining fourteen specimens were made in an identical manner but at different fusing temperatures and with different times of cooling. They were all more or less successful, some were excellent, others good in parts; in the latter case traces of lead appeared in the outer layer, due to the lid cracking, etc., their main difference being (1) colour, (2) size of crystals and (3) hardness. F. W. D.

"BURN OUTS"—A REMEDY

THERE seems to be quite an epidemic of "burnt-out" high-resistance phones and loud-speakers at the present time, and this probably has something to do with the fact that a large number of special low-impedance note-magnifier valves are in use. The steady direct current passed in the anode circuit of these valves under normal conditions is several times greater than the current in the anode circuit of an ordinary general-purpose valve.

Fig. 1 represents the anode circuit of, say, a valve note magnifier. We see that a stream of electrons constituting the electric current is (according to modern theory) drawn from the filament, through the meshes of the grid to the positively charged plate, and then passes through the

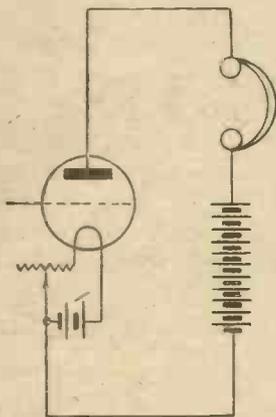


Fig. 1.—Anode Circuit of Note Magnifier.

telephones to the positive terminal of the H.T. battery. The circuit is completed, of course, through the negative pole of the H.T. battery and one terminal of the filament battery, which are connected together.

No useful purpose is served by passing this direct current through the phones or loud-speaker; it is the modulations or undulations which affect the diaphragms and produce sound.

In Fig. 2 a choke coil of high impedance is connected between the positive terminal of the H.T. battery and the anode of the valve; the phones or loud-speaker are connected through a condenser to the top of this choke and earth. This condenser must be of large capacity, so as to offer little impedance to audio-frequency currents.

Advantages

We have now obtained the following advantages: (1) Insulation and windings of phones relieved of strain; (2) phones protected from de-magnetisation due to anode current passing wrong way through windings; (3) a single lead to any room or place will suffice to connect up a loud-

speaker, providing that the room has an earth connection available, which may be used in the same way as an "earth return" in line telegraphy; (4) in reflex and other complicated circuits handling the phones will not upset tuning, as it is apt to do

with the phones direct in the anode circuit; (5) H.T. battery is not short-circuited if some metal part of the telephones is allowed to come in contact with an earthed object.

The only point against this system that occurs to the writer is that the choke, as well as shunting the direct current from the phones, will also pass some of the audio-frequency current and so weaken signals. Providing a suitable choke of high impedance is used, however, no difference in signal strength can be noticed from the ordinary arrangement where the phones are direct in the anode circuit.

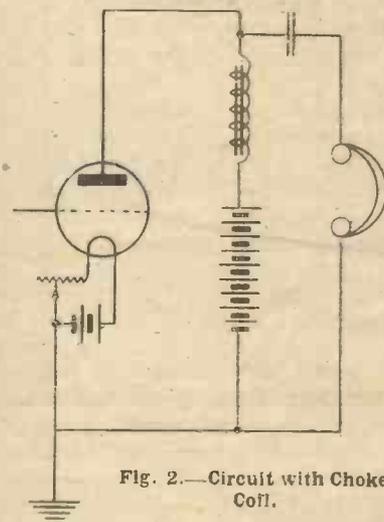


Fig. 2.—Circuit with Choke Coil.

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Building a Straight-circuit Four-valve Receiver.

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A Loud-speaker—and a Fiddle, Too!

Crystal Set with Air-spaced Coils.

Broadcasting Sound and Sight.

Crooks and Wireless. By William Le Queux.

A Reflex Set with Valve Detector.

How Can I Become a Transmitter?

A Wireless Cross-word Puzzle.

Below the Broadcasting Belt.

The secondary winding of an ex-W.D. spark coil makes a good choke, as also does the secondary winding of a good-quality intervalve transformer. Many experimenters have on hand an old transformer with a burnt-out primary which can be pressed into service. Regarding the fixed condenser, this may well be an ex-W.D. 2-microfarad Mansbridge pattern, which may be purchased for a small sum from most dealers. The writer has used the arrangement described above for some months with every satisfaction.

R. H. J. M.

Dr. W. R. Whitney, an American scientist, has stated that he imagines that the energy expended by a fly in crawling up a window pane would be equal to that impinged on a frame aerial 1 ft. in diameter in receiving signals from a transmitting station about 3,000 miles away over a period of thirty-five years' continuous reception.

Wireless, in the shape of motor vans equipped by Scotland Yard officials with receiving and transmitting sets, is adding a new terror to those already endured by fugitives from justice.

denser of the above number of plates is termed .0002 microfarad by some dealers and .0003 microfarad by others. The writer's opinion is that .00025 is about

remove four of the outer turns. This was easily done without breaking the thread with which the turns of the coil are held together. Two "taps" were then soldered

how" on a tumbler, then bound up with empire tape. The rest of the arrangement of the set is quite straightforward and is clearly indicated in the photographs and diagrams, Figs. 2 and 3.

The system of using one rheostat to control the filament of both valves is perhaps uncommon, as is also the break switch in the minus lead of the low-tension supply. It will be observed that the L.T. minus terminal is connected to the centre position of the switch. The lower contact clamps the arm of the Ormonde rheostat to the panel, thereby making contact with it as well; the upper or "off" position of the switch is, of course, "dead."

D. G. O. H.

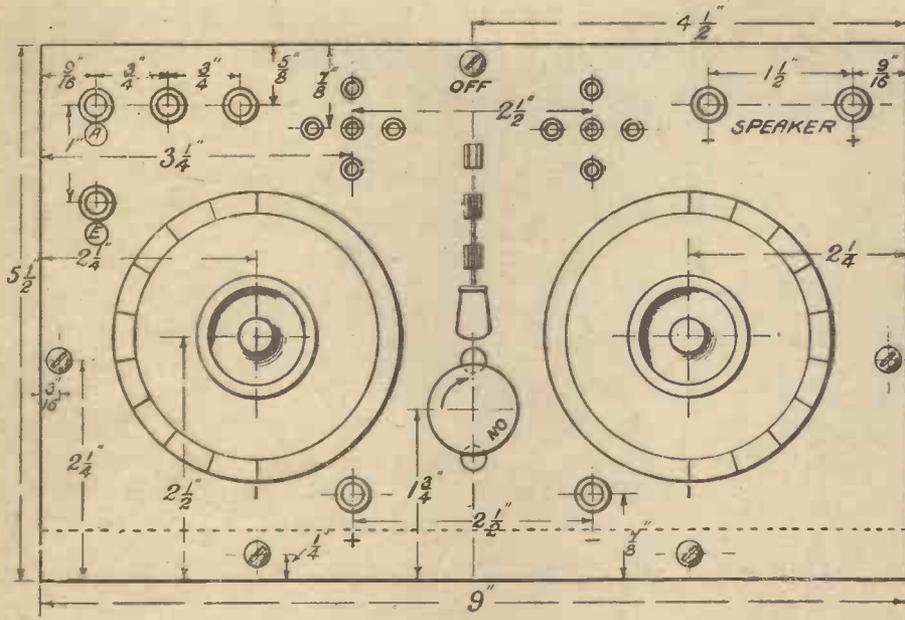


Fig. 2.—Layout of Panel.

right. A .0003-microfarad condenser will work satisfactorily, especially if it is not desired to explore the shortest waves. Whatever the exact maximum capacity of the condenser, it must be of a low minimum, otherwise it will be impossible to tune-in all British stations on one coil. A variable condenser to give a low minimum value should have ebonite ends and well-spaced vanes. The coil also should be of small high-frequency resistance and low self-capacity. The coil shown was

on 20 turns from the inner circumference and 16 turns from the outer circumference. The operation of soldering these "taps" is made quite easy if a strip of aluminium cut from a condenser vane is slipped under the turn which has to be stripped of its insulation and soldered. The solder of course will not adhere to the aluminium. The inner end of the coil is connected to the grid A, the innermost "tap" to the fixed vanes of the tuning condenser B, the other "tap" to earth and condenser

ENERGY LINKS IN THE BROADCAST CHAIN

THE energy value of the sound waves, applied by an ordinary speaking voice to the microphone at a transmitting station is approximately one hundred-thousandth of a watt. The corresponding current variations in the microphone circuit represent some few thousandths of a watt. In an ordinary telephone system this would be sufficient to transmit intelligent speech over the line for a distance of between twenty and twenty-five miles under favourable conditions.

For radiation through the ether, however, it becomes necessary to magnify the microphone currents to an enormous extent. This is done by means of a series of speech and power amplifying tubes, until finally the energy applied to the transmitting aerial represents, in the case of 2 LO, more than one hundred million times the energy value of the original sound waves.

After the radiated energy has travelled through the ether for a distance of approximately 100 miles, the power absorbed from them by a standard P.O. aerial will be of the order of one or two hundred-thousandths of a watt, which when applied to a valve detector is amplified to some thousandths of a watt—that is, sufficient to give audible reception in the headphones.

M. A. L.

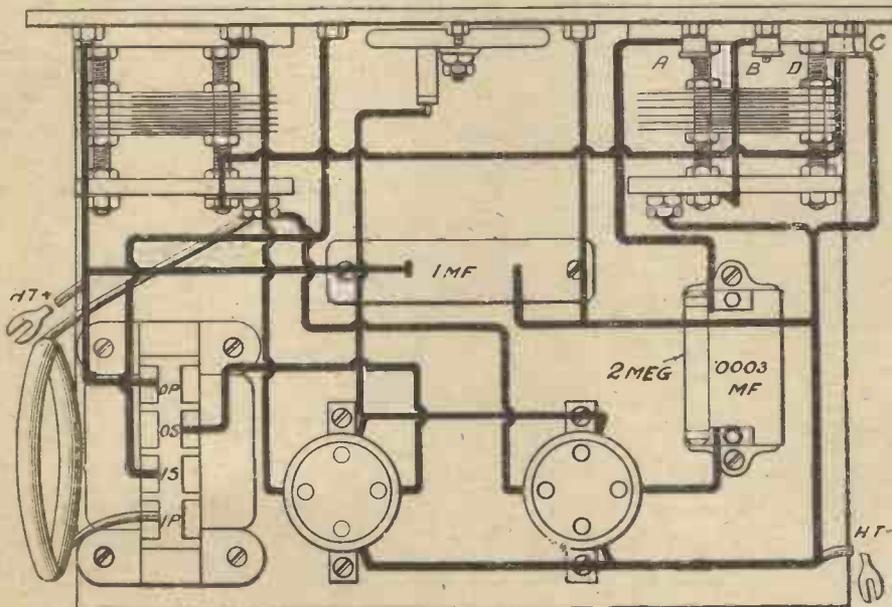


Fig. 3.—Wiring Diagram of Rehnartz Receiver.

one of a set of unvarnished coils of the basket type. The gauge of the wire is No. 22. Originally the coil had 100 turns, but it was found advantageous to

moving vanes C, and the outside end to aerial and reaction condenser D.

The choke coil consists merely of 150 turns of No. 24 d.c.c. wire wound "any-

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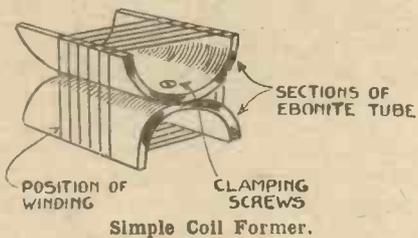
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PRACTICAL ODDS AND ENDS

Coil Former

BY splitting a piece of ebonite tubing into halves and clamping them together with screws or bolts an excellent low-loss coil former can be constructed.

When winding the coils bare wire should preferably be used, the turns being air-



spaced to a distance approximately equal to the diameter of the wire.

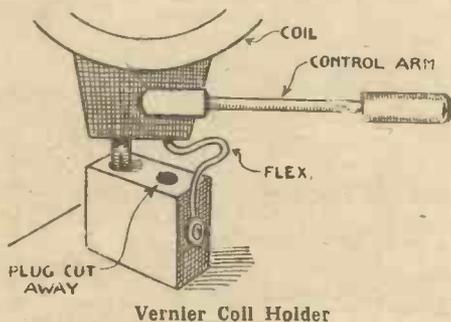
For ordinary broadcast reception tubing about 3½ or 4 in. in diameter should be used. N. V. R.

Vernier Coil Holder

AN efficient vernier control may be added to any existing plug-in coil holder by using the simple method shown in the illustration.

The holder to which the vernier attachment is to be fixed has its split plug cut away with a hack-saw or file and a flexible connection joining the socket of the coil to the connecting screw of the cut-away plug is fitted.

The coil can then be adjusted angularly as required by means of a clip-on insulated handle, which should preferably be

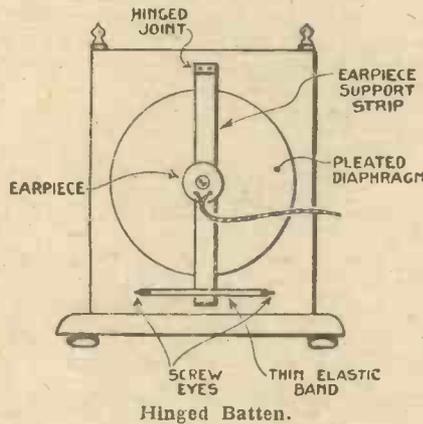


at least 6 in. long in order to avoid capacity effects when moving the coil.

The vernier device may, of course, be fitted to a basket-coil holder just as well as to the usual honeycomb-coil stand. In this case, however, the projecting arm should be sufficiently long to clear the winding. A. P.

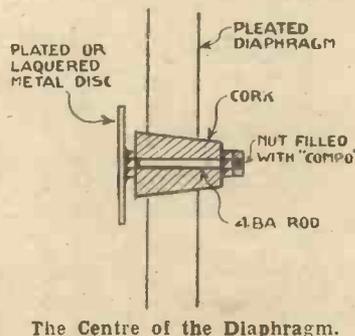
Loud-speakers

THOSE who have constructed the pleated-paper loud-speaker may have found difficulty in adjusting the pressure of the wire on to the cork in the centre of the paper diaphragm without disturbing the adjustment of the reed. The following tip may prove useful to those who have experienced this difficulty. Instead of screwing down the batten carrying the phone to the frame of the loud-speaker this is hinged at the top, as is



shown in the diagram, and a thin rubber band is placed round the batten to prevent any movement sideways. No pressure should be exerted on the phone, as the weight of this will be found sufficient for good results.

Another method of making the contact is also shown above, and this has proved

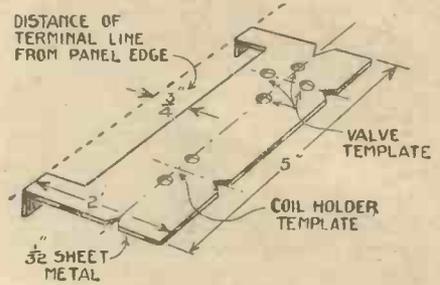


to give very good results. A second nut is soldered on to the back nut as shown in the diagram, and the hollow space filled with "bakelite" composition obtained by breaking up an old valve holder and heating the black composition to the consistency of pitch. The hole can be filled with a hot screwdriver or knife. H. B.

Panel Template

A USEFUL time-saving template may be made from a piece of sheet brass or steel as shown.

After squaring up the edges of a panel,



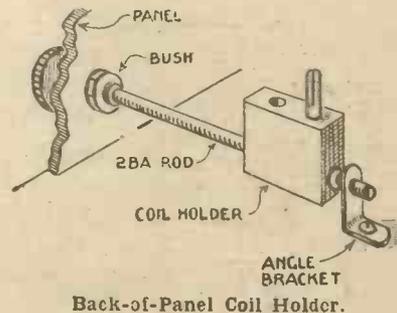
the device is placed with its two lugs against the edges of the ebonite and the lines for the terminals are scribed without the need for making any measurements from the panel edge.

To further elaborate the template, marking holes for valve- and coil-holder drilling may be added, "vee" cuts being provided for accurate location on the centre lines. R. N. W.

Back-of-panel Coil Holder

BACK-OF-PANEL coil-holder fixing is very convenient in sets built on American lines. The method of so mounting a coil holder is shown by the diagram.

A coil holder is drilled to pass a No. 2 B.A. screwed rod, which is held in a metal angle-bracket at one end and passed through a panel bush at the other, the



control knob and pointer being fitted to the rod outside the panel.

A fixed coil holder should, of course, be placed at the side of the movable holder to hold the second coil, while in the case of a set requiring a three-coil stand, two movable holders should be fitted with the fixed holder in the centre. C. A. L.



Mullard P A 2 Valve

MOST wireless enthusiasts have listened with admiration to a demonstration of an expensive set, apparently operating on a straight circuit and without an undue number of valves, and wondered why they fail to obtain equal results themselves. They next learn that the set in question had a power valve, so they buy one, and are disappointed to find that they have gained greater volume but the tonal qualities are not so good. In the early days small-power valves were not available, and the large ones made too great a demand on a dry battery (H.T. battery) to be usable by the average person; moreover, their price was high.

Types

Recently various good small-power valves have come on the market, varying in filament voltage from 3.5 to 6 volts and in anode voltage from 60 to 100 volts. There are also 2-volt types for those who use dull-emitters.

The first point of difference when using one of these new valves is that a grid bias is essential. If your set does not provide for this, a grid-bias battery should be connected between L.T. — and the terminal of the intervalve transformer that is connected to L.T. —. Connect the positive lead of the grid-bias battery to L.T. — on the set and the negative lead to the transformer terminal.

Batteries

The battery should consist of about three small dry cells, the actual number being best determined by actual trial, or, if preferred, a variable grid-bias battery can be arranged by means of tappings and a switch arm and contact studs. The grid-bias batteries are joined together in series to increase the voltage.

If more than one L.F. transformer is employed, then the power valve should be in the last one, unless grid bias is arranged for both L.F. valves. In passing it may be remarked that suitable grid bias usually improves the tonal quality of an L.F. valve of whatever type used.

In employing a power valve as a second low-frequency, then the second L.F. trans-

former must have a lower ratio than the first one—that is, if the first transformer has a high ratio of 4 or 5 to 1, then the second transformer should have a ratio of 2 to 1. It is a pity that more makers of L.F. transformers do not realise this important point. Only a few make transformers of high and low ratio, which can be coupled together to form two stages of low-frequency amplification.

High Tension

Doubtless now that these valves are becoming more widely known and their advantages realised, more commercial sets will be provided to allow for separate H.T. voltage to be given to L.F. valves. These small-power valves require a higher H.T., and it is advantageous to be able to give the detector and H.F. valves, say, 50 volts and the low-frequency valve 100

volts, otherwise in improving our L.F. by rising to a high voltage we may be interfering with the H.F. and detector valves, and possibly spoiling their life and efficiency by using too high a plate voltage. This latter remark more particularly applies to users of dull-emitters.

Advantages

There is a marked improvement in both tonal quality and in volume to be obtained by using these new valves, and those who have not tried them have a pleasant surprise in store. They require a certain amount of signal strength before they will operate to best advantage, and those living at a distance from a broadcasting station may find using them as a second L.F. the best, while those near will probably find these valves as a first-stage L.F. all that they require.

S. M. H.

ABOUT THE GRID LEAK

THE writer has often met people who have said that they failed to see why a grid leak should be insisted upon in a valve set, since their particular set functioned just as well without. Lots of sets, admittedly, will do so; in fact, they are often better behaved minus the grid leak, because quite a large amount of leakage has probably been provided when the set was assembled, in the way of flux, grease and pencil lines. The grid leak is there right enough, but under other guise.

Control of Oscillation

Strictly speaking, the grid leak is a most important factor towards the control of a set from the point of view of oscillation.

In most circuits the value of the grid leak is shown as $1\frac{1}{2}$ or 2 megohms, and the happy-go-lucky home constructor buys a fixed leak of one of these values and places it before any kind of detector valve he may have decided upon. Sometimes excellent results are obtained this way, but this would not be the case in a set using critical reaction.

A few experiments will convince any reader of the truth of this statement. Take any ordinary valve in a *non-regenerative* receiver and, using a reliable variable grid-leak, see what effect variation of the grid leak value has upon signal strength. It will be found that no perceptible difference will be produced over the whole range of the grid leak. The writer feels sure that he will be contradicted upon this statement, but provided that no reaction,

either intentional or otherwise, is used, he contends this is a fact.

If reaction is used, however, a different story has to be unfolded, and the value of the grid leak, within certain limits, becomes fixed. If the value of the leak is too low it will be found that as the reaction coil is moved up, before it is anywhere near what one might call moderately tight coupling, the set howls and the reaction coil has to be withdrawn several degrees to stop the oscillation. This is very annoying, since it should be possible to carry reaction to a much greater degree. If, however, the value of the grid leak is too high, it will be found that oscillation commences before the signal strength has really reached what it should. So between these two happenings, that of oscillation with comparatively loose coupling and oscillation before the ideal is attained, there exists a value of the grid leak which is the right one and which will produce neither of the defects above described. With the correct grid-leak value there should be no overlapping, as it were; as coupling is tightened signals should gain in strength and keep their purity until the oscillation point is reached; just inside this point is the spot to stick on. With a correct grid leak reaction can be pushed to its very limit without distortion.

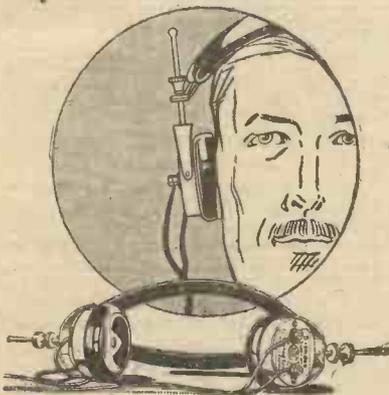
This value is, naturally, very critical, and is much easier to write about than to find. It will vary, of course, with the valve that is used and with the strength of H.T.

H. V. P.



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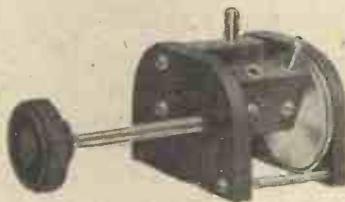
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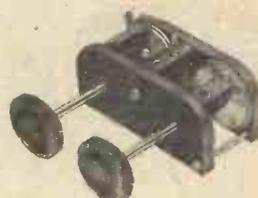


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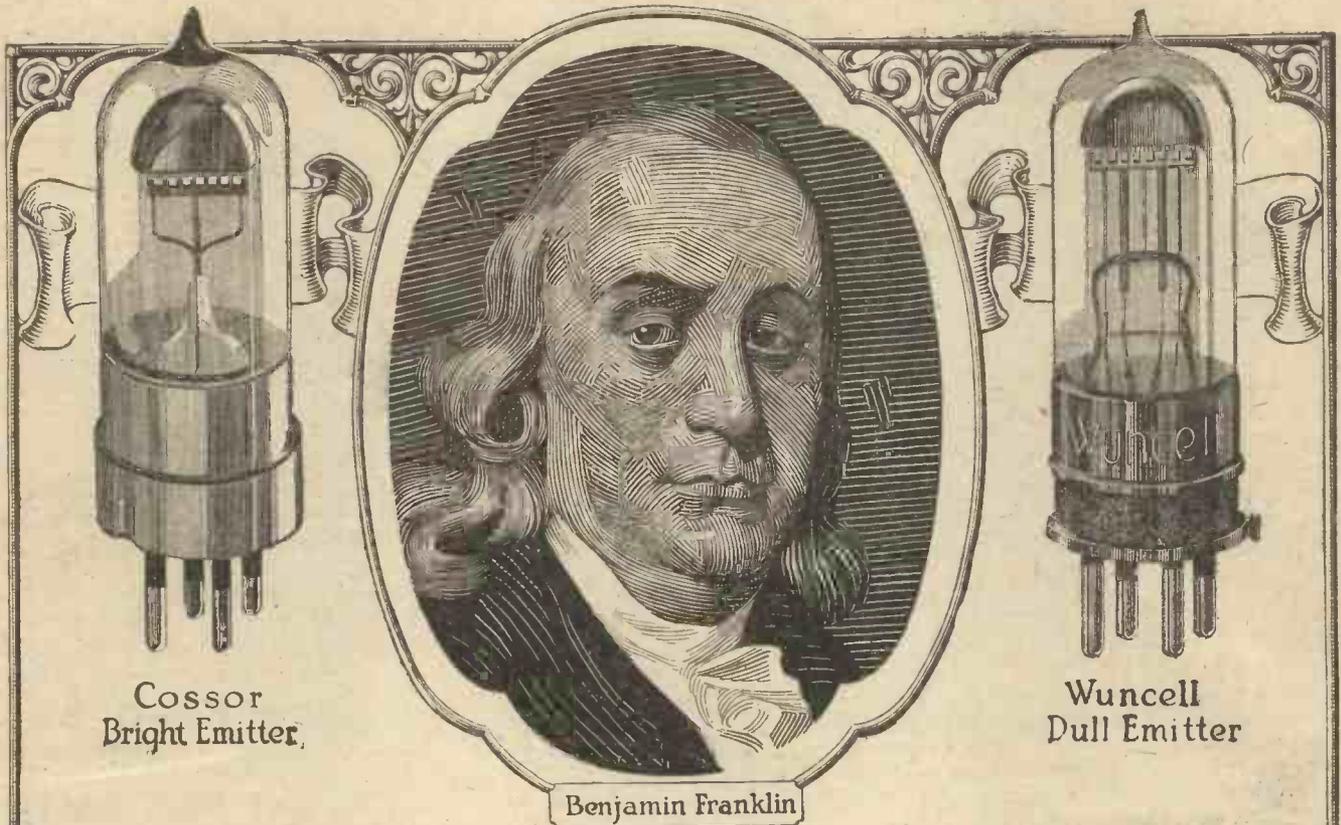
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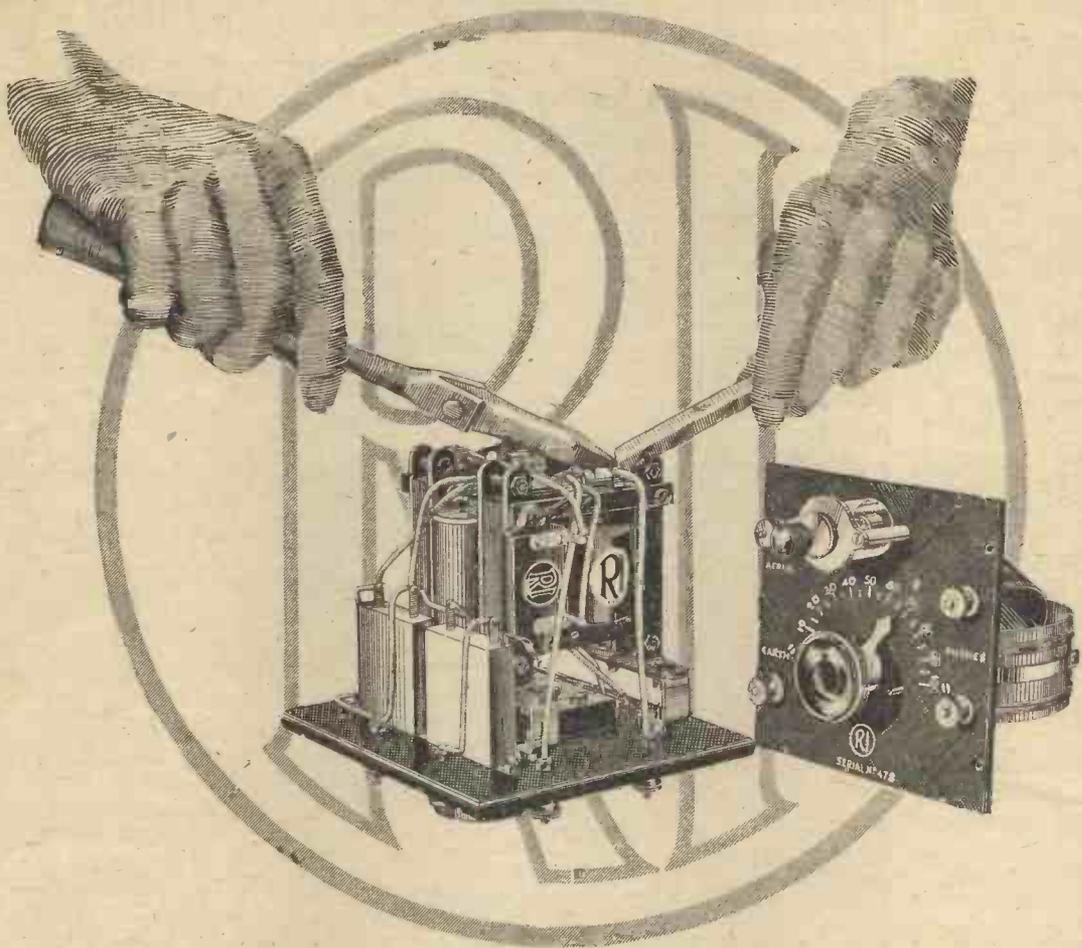
Benjamin Franklin's gift to Radio

TO all wireless enthusiasts Benjamin Franklin should be remembered as the first man ever to attempt the extraction of electricity from the atmosphere. His early kite flying experiments effectively demonstrated that in very damp weather, when the atmosphere was heavily charged with electricity, that a strong electrical current ran down the wet string.

To-day, in this country there are more than a million Benjamin Franklins busily engaged night after night in extracting electrical energy from the ether and converting it into enjoyment. Some do it by means of simple Crystal Sets, and others by means of more efficient Valve Sets. Of all the Valve enthusiasts, by far the greater proportion are Cossor users—for there is no Valve more popular in Great Britain.

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On Your Wavelength!

The Theatre Question

MY heartiest congratulations to Mr. Charlot, first, on the courageous stand which he made by allowing his revue to be broadcast in spite of all opposition and, secondly, on the amount of business which has come to him as a direct result of having done so. I do not know about you, but in my own case what I heard of the revue made me decide to go and see it at the first possible moment. The little-song "The Animals Go in Two by Two" tickled my fancy immensely, and I thoroughly enjoyed the afternoon tea-scene, played first of all in quite the normal way and then as it would be if there was some device enabling us to read people's real thoughts when they say, "Do come again soon," or "What a charming afternoon you have given us." But what attracted me most of all was the dancing. "Dancing!" you say. "What on earth do you mean? You surely have not got a television outfit?" No, I have not; but I have got a loud-speaker, and the tapping of Phyllis Monkman's light toes on the stage could be heard so plainly that one longed to be there to see her graceful movements. I think it was the patter of the dancing steps that influenced me more than anything else to decide to go and see the revue.

I hear that there is to be a meeting of the powers that be in the theatrical world soon at which the whole question of broadcast plays and revues will be thrashed out once more. Let us hope both for their sakes and for ours that they will take due account of the success which has attended the broadcasting of *Patricia* or *Charlot's Revue* and of other pieces, and that they will decide in future to co-operate with the B.B.C.

Sound Business

Personally I could never understand the attitude of those who maintained that broadcasting from the theatre would kill theatrical business. If the whole of the performance were given there would be something in this contention; but it seems to me that to whet the appetite of the public by giving them samples in the form of excerpts from something really good must result in increased business. After all, the average musical comedy or revue, at any rate, appeals quite as much to the eye as to the ear. By means of wireless we can satisfy the ear only, which makes the eye desirous of having its turn too. It seems to me that the broadcasting of short passages from a performance—provided that it is good and that it is suitable for broadcasting—must lead to a greater volume of business to the theatre itself.

Nobody ever lost money by giving away samples of a good line, and broadcasting provides an exceptional means of obtaining free of charge publicity which through any other medium would cost thousands upon thousands of pounds. So far from ruining the chances of a piece in the provinces, I am quite sure that broadcasting enhances them enormously.

Seeing Music

The heading of this paragraph looks like a misprint, but it is not. When I am using my wireless set, I often watch the playing of the Savoy Havana Band, of a soloist or of 2 L.O.'s orchestra, and it is a very interesting experience. The television apparatus in this case consists

A MEMBER of the wireless trade who has just seen the first issue of "The Wireless Magazine" writes us as follows:

"I am myself a wireless enthusiast, and have been responsible for the design of a number of circuits, and have constructed altogether about forty instruments. I am also the patentee of three wireless gadgets on the market. In telling you the above, I plead only the desire to show you that I speak with some authority when I say that yours is the brightest and most readable publication I have perused in the whole range of wireless publications."

of a milliammeter, which I always keep wired into the high-tension circuit. The way in which its pointer beats time has to be seen to be believed. As a matter of fact, if I disconnect the loud-speaker—I use a low-resistance instrument with a telephone transformer so that this does not affect the working of the set—I can often identify the tune by watching the movements of the milliammeter needle. A friend of mine once amused himself by recording dance music on the tape of a morse inker attached to his receiving set! Perhaps some day we shall find that the time of a band is tested in this way. It would be perfectly easy to do it.

When speech is coming in the behaviour of the milliammeter is very curious. It makes a fairly big dip if a syllable or a word is stressed, or if the voice is raised to a high pitch. It makes its greatest movement with the letter s, which sets up vibrations of considerable frequency. It is interesting, too, to compare the amount of modulation which various speakers produce. You nearly always find that a

person who speaks very clearly causes large movements of the pointer—and here is another possibility for using the wireless set for testing purposes. The person who so far has produced the greatest amount of modulation on my set is Mr. Bernard Shaw, who when he read a play of his some weeks ago often made the needle dip by as much as 5 milliamperes. With the milliammeter in circuit it is quite easy to read morse signals visibly instead of by ear, a prolonged dip indicating a dash, whilst a short downward bob stands for a dot.

Sunday Evening

I think I have mentioned before that Sunday evening between the hours of 5.30, when our own stations close down, and 8.30, when they open again, is perhaps the best time of all the week for picking up Continental stations. At that time there is no interference from British broadcast transmissions, whilst shipping work on 300 and 450 metres is seldom so heavy as on weekdays. If you tune in at 5.30 you are in time for the tail end of the afternoon programmes transmitted from Stuttgart, Radio-Paris and Barcelona. The last of these is a small station whose power is under a kilowatt, but I have heard him on two or three occasions, though his signals were not strong. At six o'clock the Eiffel Tower strikes up, and at seven o'clock practically all of the German stations are under way, as well as the Swedish station at Stockholm, which I have never yet managed to pick up. At a quarter past seven you have the two Swiss stations of Lausanne and Zurich, whilst at 7.40 Hilversum begins, followed twenty minutes later by the powerful stations at Rome and Copenhagen. Rome, by the way, is one of the most powerful of the European stations, being rated at 4 kilowatts.

The biggest of all is our own 5 XX, which is followed by Radio-Paris with 8 kilowatts, Königswusterhausen with 6, and the Eiffel Tower with 5. Of the rest, the most powerful are Radio-Iberica, rated at 3 kilowatts, Brussels at 2.5 and Copenhagen at 2. To show you what can be done on Sunday evenings, here are the stations which I have logged during the past three weeks: Vienna, Brussels, Copenhagen, Eiffel Tower, Bremen, Frankfurt, Hamburg, Königsberg, Breslau, Stuttgart, Leipzig, Munster, Munich, Barcelona, Seville and Rome. I may say that I never count stations as picked up unless I can tune them in so as to hear both spoken words and music clearly and without distortion due to oscillation. The German stations come in extraordinarily well, for most of them use 1½ kilowatts.

:: :: *On Your Wavelength! (continued)* :: ::

Even the relays at Bremen and Hanover are rated at 1 kilowatt and 1½ kilowatts respectively. Do not forget, too, that after our own stations have closed down on Sunday nights at half-past ten you still have programmes going on from L'Ecole Supérieure in Paris, on 450 metres, Le Petit Parisien on 340 and Radio-Iberica on 392. The first of these sometimes closes down at half-past ten, but usually he goes on for a good deal longer. Radio-Iberica never seems to go to bed at all, and Le Petit Parisien continues generally until a good deal after eleven o'clock at night. Taken as a whole, I look on Sunday as the best wireless day of the week.

Is a Licence Required?

I have just received an inquiry which even the Information Bureau will find difficulty in answering. A friend of mine who is an enthusiastic gardener has somehow formed an opinion that wireless "rays" will hasten and improve the growth of vegetation, and has accordingly installed an oscillating valve to generate oscillations of a very high frequency and arranged an aerial and counterpoise over his back garden. He does not propose to modulate the oscillations, but merely wishes to prove or disprove his theory and his natural inquiry is, "Should I take out a licence?"

My own personal opinion is that he is not liable to the Postmaster-General for the payment of a licence fee, nor is he enforced by the Wireless Telegraphy Act to apply for permission for his experiment any more than a hospital is required to obtain a licence for the use of X-ray apparatus, but perhaps I am wrong. Incidentally, I have never noticed that my own vegetation has improved since the advent of my aerial; to the contrary, it does not look so well, but perhaps this is due to the fact that the aerial gets more care than the garden.

Across the Herring Pond

Transatlantic wireless has been looking up again. The average number of stations, excluding KDKA on her short wave, which the ordinary amateur should expect to get nowadays is five, comprising KDKA, WGB, WBZ, WGY and WFY. On many occasions these normal wave stations have been purer and more enjoyable than the short-wave transmission of KDKA. WBZ at her best, as she has been lately, is an exceptionally efficient station. It is quite two years since this particular station began to be received in England, and during the time when the B.B.C. were attempting their original relays from KDKA and WGY, the Springfield station was being heard here with a purity that was really astounding when static did not spoil things. As far

as purity of tone and lack of distortion is concerned there is little doubt that WBZ leads the string of American stations.

Distorted Short Waves

It is a curious fact noted in the transmissions of short-wave stations that these seem far more liable to distortion than others working on the normal band. Though KDKA on her 60-odd metre wavelength has been received in England at times when other stations were inaudible, and may now be tuned in any night, I very much doubt if it has ever been received with what one would be justified in describing as real clarity. In most cases there is a decided distortion present, which seems to emanate from the transmitter itself rather than be caused by any interfering static impulses. Why this should be so I am quite unable to hazard a guess. Even on the one night recently during the international radio week when this station was received on a single-valve without reaction it was not pure. The huskiness, characteristic of KDKA's short-wave transmissions, must be well known to Transatlantic amateurs. It has several times rendered speech received with amazing volume so "rusty" that it could only be deciphered with the greatest of difficulty. In particular I remember the night when I was sitting up endeavouring to receive the results of the Presidential election in the U.S.A. this difficulty was very trying, and no amount of adjustments to the receiver made any difference.

A Rumour

The rumour appears to have got round that the very short wave-band, approximately that round about 50 and 100 metres, is likely to be reserved for long-distance morse communication. If this is correct it is a great pity, for many amateurs must have confidentially assumed that it would be reserved for telephony and, as amateurs may justly lay claim to have discovered the possibilities of ultra short-wave work, is a matter of universal concern. After all, static interference, which is the chief reason for the higher wave-band being difficult to work, is far less annoying on morse transmissions than on telephony. But several other interesting points also arise. For instance, how much of the benefit gained by short-wave work is due to the fact that there are so few stations working that band? What sort of a difference will it make to reception of distant stations working between 300 and 500 metres if a great number of the commercial high-power transmitters at present on the same band should be moved to 60-odd metres? There is, I think, a distinct possibility that amateur Transatlantic workers might find themselves very little

the worse for the change after everything has been considered.

What Happens on Sundays?

I don't know whether any of my readers have noticed it, but the Sunday afternoon programmes from 2 L O always seem to come through with remarkable strength and clarity as compared to other programmes. The Sunday evening programmes also appear to be particularly good, although perhaps not as consistently so as the afternoon concert. I am rather at a loss to account for this Sunday improvement, as the B.B.C. states that everything is standardised and that there should be no variation. Can it be that paterfamilias takes his afternoon nap and ceases to disturb the ether by his quietly oscillating valve, or is it that little Tommy and all his brothers and sisters have to go to Sunday school, so that the family set is left severely alone? I fear that more likely it is the former, but certain it is that the best concert of the week as regards purity and strength is always received at my station on Sunday.

A Country Life for Me

Friday's programme at 2 L O will please a good many people who like to have what is known as "descriptive" music; you know the kind I mean, where the cuckoo sounds three, and the cows low or whatever it is they do. Anyhow, we are going to have truly rural specimens of country music by Vaughan Williams, John Ireland and Roger Quilter, amongst others, though I'd like to wager also that someone will wade in with the frosted favourite, "Cherry Ripe," or "She Wandered Down the Moving Staircase," I mean "mountain side"; but one is as unpleasant as the other. I should think smocks and panniers would be the correct dress, don't you? And one good thing, Wynne Ajello and Dale Smith are the singers, while Mr. Wreford gives us the real cream of Devonshire dialects, with Mr. George Stockwin and Fred Beck to do what they term the "yokelising."

One of the Best

If there is one member, male or female, of the programme that I would cheerfully put into a lethal chamber, metaphorically speaking, it is the talker; but there is one that redeems the "lecturette" from absolute boredom in whatever part of the country he is describing, and that is Mr. Allen S. Walker. If I knew my time-table as well as he knows every stone and cathedral in this country, I'd be able to keep all my appointments without a telephone. After listening to his expositions even on old cathedrals, I could almost be persuaded to go and see them. Literally does he find "sermons in stones and good in everything."

THERMION.

WIRING MADE EASY

THE disposition of the wires in any receiving circuit plays an important part in the behaviour of the receiver. The following method of wiring will be found very helpful to experimenters and constructors.

The wires in a circuit may be divided into three classes: (1) Those at H.F. potential, (2) those at L.F. potential, and (3) those at earth potential.

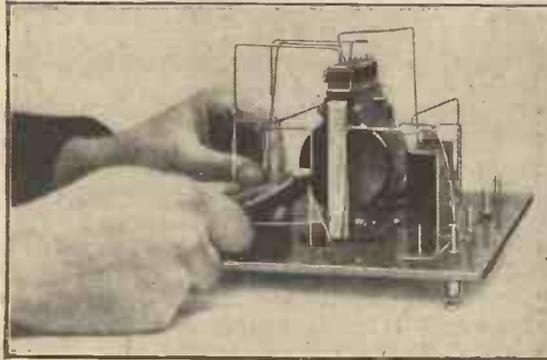
Now H.F. wires can only exist before a crystal or detector valve, L.F. wires at L.F. potential can only exist after a crystal or detector valve, and wires at earth potential can exist both before and after a crystal or detector valve.

Aerial Tuning Circuit

Take the components before a crystal or detector valve, such as the aerial tuning circuit Fig. 1. The wires joining the earth terminal to the bottom of the coil and one set of vanes of the variable condenser will be at earth potential; the wires joining the aerial terminal to the top of the coil and the other set of vanes (including the vanes) will be at H.F. potential. As another example, take the wires between an H.F. and detector valve coupled by a tuned H.F. transformer (Fig. 2).

The wire joining the plate of the H.F. valve to the transformer primary coil will be at H.F. potential; the wire joining the other end of the primary coil to + H.T. will be at earth potential because there is a continuous circuit through the H.T. and L.T. batteries to earth.

The wire joining the grid condenser to one end of the transformer secondary, the grid condenser to grid of detector valve, and the transformer secondary to one set of the variable condenser vanes (including the vanes) will be at H.F. potential; the wire joining the other end of the transformer secondary to L.T. will be at earth potential. In this special case it will be seen that the transformer must be con-



nected a particular way, otherwise the H.F. of the transformer secondary will be connected to L.T. instead of to the grid condenser.

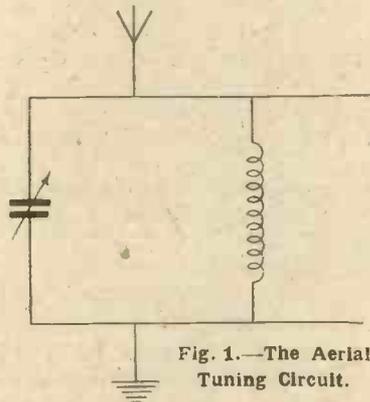


Fig. 1.—The Aerial Tuning Circuit.

The foregoing explanation is necessary in order to carry out the following systematic method of wiring.

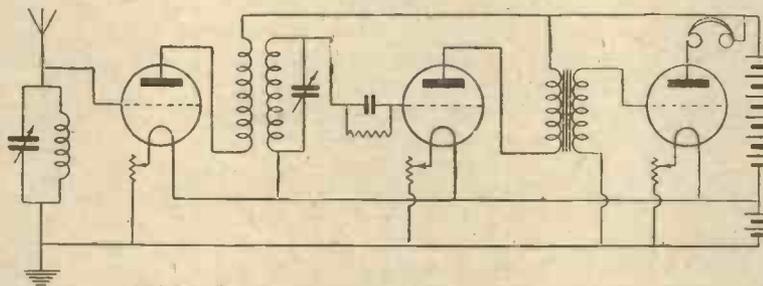


Fig. 3.—H.F.—Detector and L.F. Circuit.

Procedure

First sketch out the circuit to be wired up, which may be an experimental circuit

or a standard circuit; for example an H.F., detector, L.F. circuit, as shown by Fig. 3. Then pick out the wires at H.F. potential and re-draw them alone (Fig. 4).

Having set out the components in the desired positions on the panel, proceed to put in these wires, first keeping them well apart (at least 1 in), and if obliged to cross, cross at right angles; mark these wires for identification by tying on pieces of cotton; and then put in the remainder of the wires, keeping them well away from the batch of H.F. potential wires and H.F. potential condenser vanes; the remainder consists of L.F. and earth potential wires, which may be run quite close to each other without any interaction or loss of efficiency.

The net result of this method is that the H.F. potential or master wires are identified, kept well apart from each other and from the remaining wires, and are given the lion's share of the space available.

Wiring up on this system instead of haphazard wiring may make all the difference between a receiver working up to top-notch efficiency instead of working at poor efficiency. L. B.

DRY CELLS IN WINTER

DURING the winter months there is a natural tendency to keep the wireless set somewhere not too far distant from the domestic fireside. It should, however, be remembered that heat is bad for dry cells, and that if the high-tension battery is placed too near the fire it will have a shorter life than usual. Each of the separate units forming the whole battery is simply a small Leclanché cell in which the sal-ammoniac electrolyte has been mixed with some material to form

a damp paste. When this paste is dried out, the internal resistance increases enormously. M. A. L.

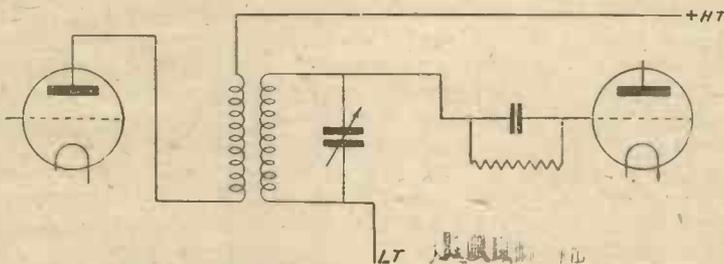


Fig. 2.—Wiring of H.F. and Detector Valves.

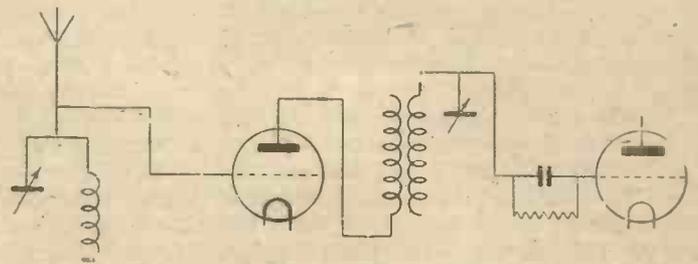


Fig. 4.—Wires at H.F. Potential.

CRYSTAL OR VALVE DETECTOR

A Simple Fitting Allowing the Use of Crystal or Valve at Will.

TO readers who possess a valve set using a tuned-anode circuit the plug-in detector shown by Fig. 1 will prove of interest. By its use a valve set can be used as a crystal set simply by pulling out the detector valve and inserting the plug-in crystal detector.

To make the detector, cut an oblong

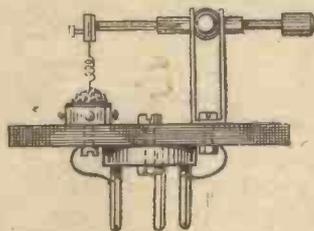


Fig. 2.—Details of Wiring.

piece of ebonite $2\frac{1}{2}$ in. long by $1\frac{1}{4}$ in. wide and $\frac{3}{4}$ in. thick. Drill three holes, one at each end and one in the middle. The end holes are for fixing a crystal cup and detector arm, the middle hole is for fixing the base. Obtain a four-pin valve base. Drill a suitable-sized hole to take an ordinary brass wood screw in the middle and screw the two parts together. Mount the cup and arm. Connect the detector arm (by means of one of the fastening screws) to the grid pin of the valve base and the crystal cup to the plate pin. The detector is now complete and only needs inserting in the valve holder in the usual way.

In use it is necessary that the valve grid condenser should be short-circuited, and for this purpose a three-way switch for grid leak and condenser can be employed. The switch has four studs, one switch arm

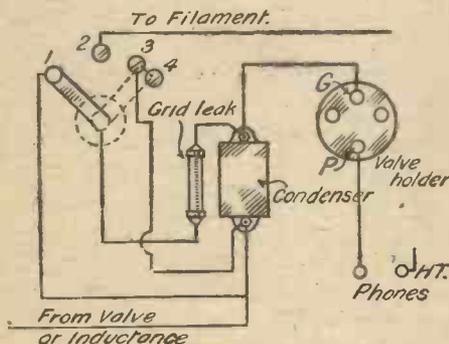


Fig. 1.—The Complete Detector.

and a simple wiring arrangement that can be attached to any existing set.

The first stud carries a connection from coil (inductance and input) side of grid condenser. The second stud is connected to the filament (otherwise earth) wire. The third and fourth studs are connected to

each side of the grid condenser respectively, being insulated from each other of course. The switch arm is connected to the grid leak. The other wiring is as shown in Fig. 2.

When the switch arm is on the first stud it places the grid leak across the grid condenser; on the second stud it carries the grid leak over to the filament or earth wire. The switch arm on the third and fourth studs (together) short-circuits the grid condenser, neutralises the grid leak and makes a through connection from output of tuned-anode valve, or from inductance to grid (catwhisker arm) of detector.

When using the crystal detector separately or in combination with other

valves, it will be seen that to cut out the grid condenser and leak, the switch arm need be only placed across the third and fourth studs, the metal of the arm automatically connecting the two sides of the condenser.

The crystal detector (as already mentioned) can be employed by itself. In this case cut out L.T. and H.T. current and place one telephone lead into the plate terminal on the set and the other lead on any earth connection. Tune in the usual way.

For use with a tuned-anode circuit (valve before crystal), if H.T. is in correct order the usual telephone connections (plate and H.T.) will be correct. H. H.

RECENT DEVELOPMENTS IN RECEPTION.—II (Conclusion)

IN another solution of the problem of the prevention of radiation, due to Mr. Voigt, the aerial and plate coupling coils are arranged at right angles to each other, somewhat after the fashion of the field and search coils used in direction finders. The aerial and plate coils correspond to the fixed or field coils of a radiogoniometer, whilst the grid coil is pivoted on the common diameter of the first two coils and corresponds to the moving search coil.

The object of this unusual disposition is to ensure that whilst the grid coil is coupled to the aerial for receiving signals and to the plate coil for reaction, the plate and aerial coils, being mutually at right angles, are not directly coupled together. The heavy currents flowing in the plate circuit of the valve cannot therefore enter the aerial. Any indirect coupling through the intermediate grid coil is prevented (a) by so winding the grid coil, and arranging its leads, as to reduce self-capacity to a minimum, and (b) by setting the normal grid potential so as to avoid any grid current.

A "Swamping" Circuit

In an arrangement invented by the Radio Communication Co., and shown in Fig. 4, the operator who carelessly pushes reaction beyond the point of self-oscillation finds that his own reception is auto-

matically swamped out. Before he can again tune in it is necessary to re-set the receiver. At the same time his neighbours are protected from the squeals and cat-calls that are the usual accompaniment of reckless "condenser swinging."

This desirable result is secured by arranging that when the set starts to oscillate at signal frequency the initial

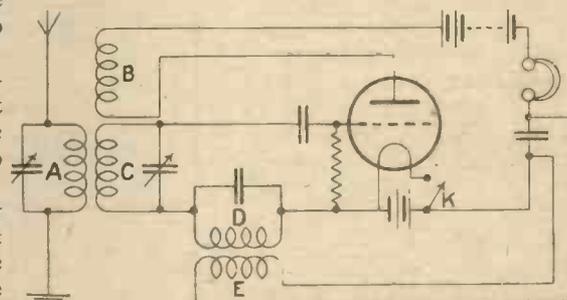


Fig. 4.—A "Swamping" Circuit.

oscillations are immediately swamped out by a new set of oscillations which, being of a very different frequency from that to which the aerial is tuned, are not radiated. At the same time they mask the incoming signals and force the operator to reset his receiver.

As shown, the plate circuit comprises two separate back-coupling coils B and E. The coil B is the ordinary signal reaction coil. The other coil E is back-coupled to a loop-circuit D, which is tuned to a much (Concluded in third column of page 190)

BUYING A SECOND-HAND SET

AN EXPERIENCE :: By ADSUM

It was all Brown's fault (as John Henry would have said). Of course his name is not really Brown. I thought it would be safer not to put his real name, so I have re-christened him; I might say I have done so several times lately when he wasn't listening.

The trouble was, Brown wanted to buy a wireless set and came to me for help. I suppose he thought I looked kind, but when it comes to acting in an advisory capacity on wireless matters there must be a limit.

The Price

Brown said he must have a set, and he wanted it in a hurry too. (Isn't it always so?) I informed him that there were shops in plenty, all itching to sell him a set from £5 to £150. All he had to do was to fork out the ready.

But I wasn't going to get out of it quite so easily, as Brown insisted that I must choose one for him and also see he wasn't overcharged. I ought to say at once that the expense is a matter of some importance, as he hails from north of the Tweed.

From what he said I understood that he wanted to hear all the programmes all over the house and dance on the lawn in summer to the Savoy bands.

Here was my opportunity. I quickly informed him that a crystal set would not do and he would want umpteen valves; thought I should put him off. Not a bit of it. He intimated in no mean language that the only part he wanted crystalline was the purity of the reproduction.

I had visions (I never seem to get any further) of resistance-capacity coupled L.F. power valves with ample grid bias, condensers and coils of all values, both large and small, huge H.T. batteries—*young cannon* in fact. Then the crash came. Fifty pounds was out of the question.

Well, what could he spend? He did not know. All he seemed to know was that he must have two detectors.

Told him they were not made that way. Did he mean detectives, and recommended a charming lady detective.

A Brain Wave

Brown had a brain wave—indeed waves of all lengths. Why not an advertisement in the *Evening Exchange*?

If I had known where all this was going to land me I should have retired gracefully.

After spoiling sheets and sheets of paper in order to cut it down to the least number of words that made any sort of sense, at last the advertisement was written. It ran as follows:

"Loud-speaker valve set (wireless). Good price given. Brown."

I pointed out that the word "wanted" wasn't wanted, as the advertisement would appear under that heading, but it was most necessary to put in wireless, as other things, such as bicycles and engines, had valves as well.

The day after the advertisement appeared the answers started to pour in. They started quite mildly, about five by the first post, but when the post-bag began to assume the proportions of a free lottery Brown said something must be done.

So we arranged them, at least some of them, in the order of the number of valves, then in order of price and in various other orders, but we got no further towards the solution till Brown suggested we should put them in a bag and draw lots.

We Set Out—

We eventually set off on a tour of inspection. Of course it was raining. It was cold rain, horribly cold. It seemed to have a wonderful way of meeting you at every corner and trickling down the back of your neck at the same time.

We had looked up the district on the map where the selected set should have its being, and journeyed by tube, fondly hoping to get within half a mile anyway.

A friendly policeman informed us that if we turned to the right, then to the left, then over the tram lines and took the second turn on the left, it would bring us to the desired goal in ten minutes.

We though we had turned right, but there was no sign of Carlton Crescent. We were re-directed, and had apparently been too energetic and gone too far.

We asked again on the way to make sure, and were told it was just over the canal bridge; but when we crossed we found the "Carlton" all right—not the one you know, but another one, not quite the same—but no sign of the "Crescent."

We went back over the bridge and, after walking for what seemed hours, discovered Carlton Street. Carlton Road also was traversed some time later in the sleet.

Further inquiries with the accent on the "Crescent" sent us turning to left and right till the lights of the Carlton again loomed into sight.

This was too much. I refused to go another step until I had tasted of the precious liquid which warms the heart of man. And we did,

—And Find a Set

The next day we managed to track a real wireless set to its lair. It was a house of many storeys and no less than two knockers and four bells.

Brown said we had better ring all of them to make sure. So I did, while he applied himself lustily to the two knockers.

Presently the door opened and we saw within. They were all ages and sizes, and when they had sorted themselves out, and the baby had been taken to the rear and Billy from the middle flat had finished with Basement Billy, and Mary from the ground floor had momentarily lulled in her somewhat spirited remarks to Mary from the top flat, we were able to make ourselves heard, and explained we had called *re* this wireless business. Whereupon that set them on again; there seemed some rivalry as to the various sets in the house, and we heard snatches of talk we could not make out, but no one seemed to want us to enter.

The trouble dawned on us when we heard Basement Billy exclaim: "Told you they was 'tecs, and Mr. Smith ain't paid 'is licence yet."

We put their minds at rest and said we wanted to look at a set which was for sale.

Top flat Mary said, "Oh! that's Mr. Wise's, who lives above us," and offered to escort us.

There were three hundred and forty steps and no lift in that house. At least I think there were three hundred and forty, but there might have been more, for I got so out of breath on the last flight.

Mr. Wise's set looked all right from the outside with three gleaming dull-emitters, but when we wanted to try it, it appeared he had neither aerial nor earth. That would not have been so bad, but he had no batteries, and the valves were duds—stuck in for show. So we gave it up and came away.

The next set we looked at was nearer earth. The owner was very sorry he had lent his loud-speaker and it had not been returned. As I had grave doubts if the set would ever work one, we passed on to the next.

Here we had a bit of luck. A kind friend on the bus overheard us inquiring from the conductor if it was a penny or twopenny, and said he lived quite close to the address we wanted and would show us the way.

And Another

He certainly did. It was quite easy. We could not possibly go wrong. We had to go straight on past some lights we could see shining brightly (it wasn't raining, for a wonder) in the distance, and it was the last turn on the left. It was. The road was quite straight, or nearly so; we started walking at nine o'clock. It

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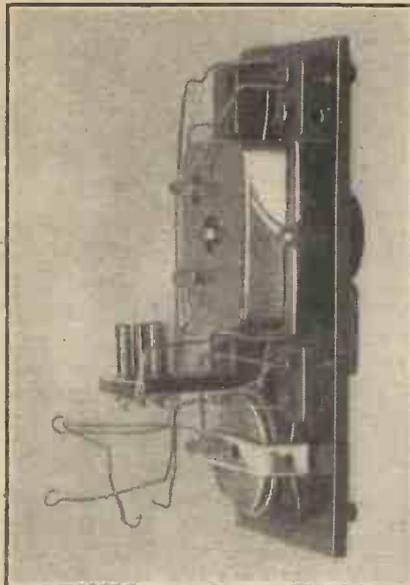


Fig. 25.—Panel without Transformer.

WE may take it that the batteries are both connected and also the aerial, earth and telephones. The H.F. switch is then thrown to the right, the L.F. to the left. The set will now function as a straightforward high-frequency amplifier and detector.

The A.T.C. dial is set for the local station (this will be found exactly the same as with detector alone). The anode-tuning condenser is next moved slowly round until the loudest signals are heard. A final careful adjustment of the dials and filament controls will produce the best results. Once the positions of the controls have been ascertained and some experience obtained, the more distant stations may be attempted. Success here will depend upon the locality and efficiency of the aerial system. On the standard aerial there will be no difficulty provided the situation is

AN EXTENSIBLE UNIT SET.—IV

USING THE REFLEX UNIT

Designed by DAVID GREY

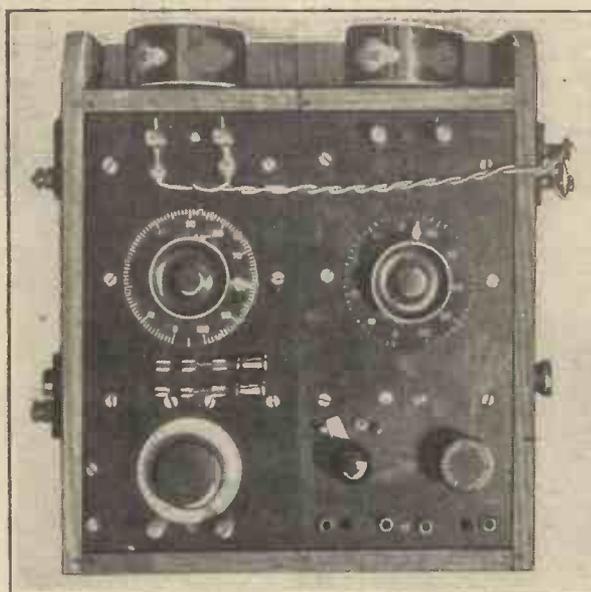


Fig. 27.—Two Assembled Units.

at least three miles from the local station. Inside this range it is impossible to eliminate entirely interference, although the eliminator to be described in a future article will considerably reduce this limit.

Using the Loud-speaker

To obtain loud-speaker strength on the



Fig. 26.—H.F. and Reflex Unit.

local station the telephone terminals are connected to the terminals at the top of the dual panel (see Fig. 26) and the loud-speaker leads to the terminals at the bottom. The lower switch is then thrown over to the right. Trial should be made as to the best connection between the telephone and dual terminals, and this when found should be noted.

Headphones cannot be put on to the loud-speaker, as this produces a considerable leakage to earth through the body of the wearer owing to the loud-speaker being included in the H.F. circuit, as can be seen in the circuit diagram. For greater strength in the telephones on distant station later articles will describe the construction of a simple low-frequency unit and a reaction unit.

D. G.

(To be continued)

"BUYING A SECOND-HAND SET" (continued from preceding page)

was half-past when we reached the lights and nearly ten when we were eventually ushered into the august presence of the "set."

It was working, all for our benefit, and Brown could not help remarking how bright the lamps were; no need to burn gas (he will insist on calling them lamps).

The owner looked proud; he might have been if noise was what we wanted. I suggested that it was not very mellow. "Oh, yes! That's because our dog got caught in the wire yesterday and upset the loud-speaker."

We could still hear raucous sounds when we were in the street and had turned the corner.

We were both getting very tired, and mutually agreed to desist from the search over the week-end and start again on the Monday.

I rang up Brown on Monday morning with what I thought was a real good excuse, but it wouldn't wash. Brown must have a set by the next week-end at all costs.

Well, we again drew blank. Some sets we passed over at once, and those which looked pretty outside had horrible insides.

One set we saw had a beautiful carved and inlaid mahogany case on tapered legs, and Brown was just on the point of closing a deal when I suggested that it would be well to have a look inside.

The owner was quite annoyed about it and thought we were pulling his leg.

He seemed to have lost all the screw-drivers he ever had, but when I produced a pocket-tool outfit and proceeded to remove the countersunk screws his face showed incredulous amazement.

At last I exposed the works, and—well, I have never seen one like it and hope never to again. The mass of cotton-

covered flex presented the appearance of a mat.

That night we decided we must think of another way of tracing the set that would really be worth having.

Brown suggested picking out the letter with the best handwriting. I remonstrated that that had nothing to do with wireless and the writer was most probably not the maker of the set, but Brown was adamant.

I refused to go looking at a set picked out in that stupid fashion, but he reminded me that my writing was like nothing on earth, so I'd better shut up.

Brown seemed to have grown somewhat larger, so rather than argue I went, and, what's more, Brown bought that set straight away. I couldn't stop him, and, what's more, I did not want to. I had had enough, and the set was really reproducing music more faithfully than any set I had ever heard.

J. H. S.

A VALVELESS WIRELESS TELEPHONE

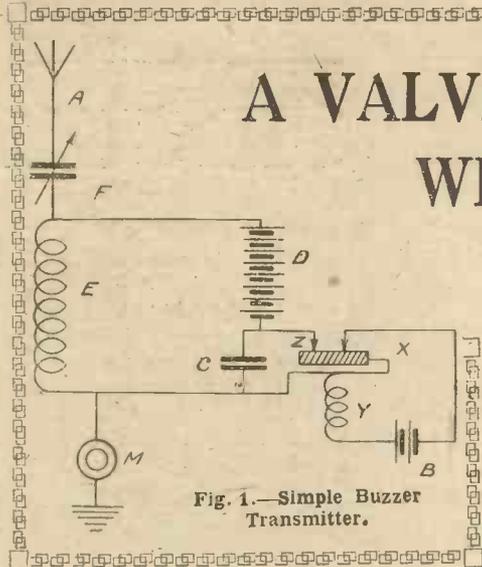


Fig. 1.—Simple Buzzer Transmitter.

It has been stated that there is "nothing new under the sun." This statement is true in part, for it is certain that many old ideas are brought to light for a second time, to be hailed as new discoveries.

This delving in the past is often time well spent. Had Marconi been content to leave the ashes of the past alone, there would never have been the great revival of short-wave wireless telegraphy which there is to-day.

In much the same way there are early forms of wireless telephones which would well repay further investigation. For instance, there is a very simple form of wireless telephone transmitter which requires no valves in its construction, and which can easily be made to give understandable speech over a distance of several miles. With some research work spent upon it this arrangement might well be developed into a commercial wireless telephone.

It is well known that feeble oscillations can be produced in an aerial if a buzzer and battery are connected across an inductance, one end of which is connected to the aerial, whilst the other is earthed. This method is, in fact, often used to excite the aerial when its wavelength is being measured.

Buzzer Telephony

With the ordinary high-note buzzer and dry cell the amount of energy which is supplied to the aerial is very small indeed. If, however, the small buzzer is replaced by a larger one, fitted with heavy contacts, it is possible to run this buzzer off a 12-volt accumulator and feed an appreciable amount of power into the coil, or alternatively a buzzer fitted with two contacts (Fig. 1) may be employed.

In this arrangement the buzzer has an armature X operated by a magnet Y, whilst the energy for driving the buzzer is supplied from the small battery B. The buzzer has a second pair of contacts Z which, when the buzzer is in operation, make and break the circuit DZE, letting the current from the battery D flow into and produce

oscillations in the coil E. These oscillations will be at radio frequency depending on the wavelength of the system AFE, but the audio frequency due to the period of the buzzer will also be radiated from the aerial.

Speech Modulation

If now a microphone is inserted either directly in the earth wire as M, or coupled to this lead by means of a transformer, then when the microphone is spoken into its varying resistance will modulate the aerial current, and this modulation will be audible in a receiver or wavemeter tuned to the radiated wave. In the telephones of the receiver two things will be heard: the high note of the buzzer and the speaker's voice. Now here is the problem: to raise the note of the buzzer to such a high pitch that it becomes quite inaudible; then a very convenient form of wireless telephone will have been evolved.

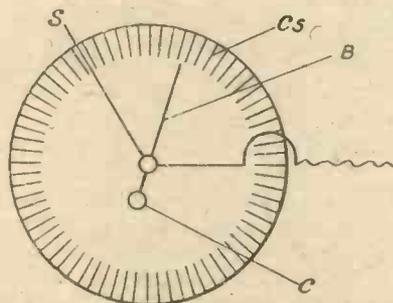


Fig. 3.—Diagram of Commutator.

At the same time it should be mentioned that the speech is not at all indistinct when using an ordinary high-note buzzer, although, of course, the buzzer note can be heard all the time that the set is in operation.

The buzzer and coil, together with a battery, might be mounted in a box, whilst a single switch is employed to switch the battery on to the buzzer and microphone. Conversation may be carried on both ways by having the two transmitters tuned to two different wavelengths, so that the receiver at one end is not affected by its own transmitter.

It is probably best, at all events at the start, to use two aerials at each end, one for the transmitter and one for the receiver.

Fig. 2 shows a method of obtaining very high frequency interruptions. A

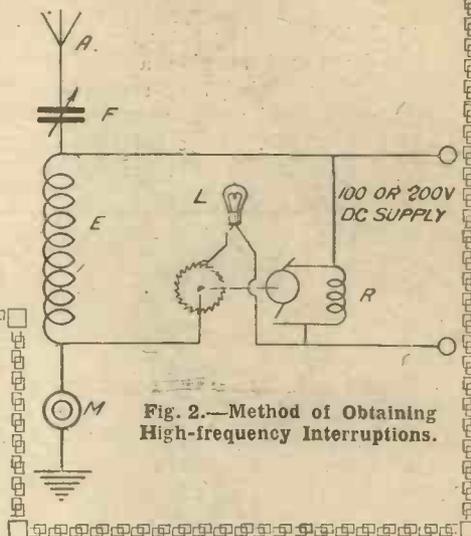


Fig. 2.—Method of Obtaining High-frequency Interruptions.

small motor R is connected across the supply mains and drives a fine toothed cog wheel at a very high speed, whilst a pointed brush is carefully adjusted to touch the top of the teeth of the cog wheel. This brush must be prevented from vibrating and so arranged that it does not span more than one section of the commutator.

Interruptions of the order of 30,000 to 40,000 per second can be obtained, and at the latter frequency these interruptions are of too high a frequency to be audible to the human ear.

Improved Results

Best results will probably be obtained if the commutator is fixed and the brush revolved as in Fig. 3, where B is the brush driven by a spindle S, having a balance weight C. The inner surface of the commutator sections CS must be accurately ground and polished, whilst the brush must be provided with some form of spring to give it constant pressure on the commutator segments. If alternate sections of mica and copper foil are used it should be possible to get 150 copper sections into an inch of circumference, so that if the inner diameter of the commutator shown in Fig. 3 was made 5 in. we should have $\pi \times 5 = 15.6$ in. of circumference, and this with 150 sections per inch would give 2,340 interruptions per revolution, or at a speed of 1,200 revolutions per minute (20 revolutions per second), it would give 46,800, which is an inaudible frequency.

The microphone has been shown, for simplicity, placed directly in the aerial. This position is quite satisfactory with the small aerial currents that will be employed, but many of the other methods of modulation are applicable to this simple valveless transmitter.

R. H. W.

Ask "A.W." for
A LIST OF
Practical Money-making Books

IN the following notes the writer has endeavoured to give a brief resumé of the characteristics of some of the more notable circuits and the advantages gained by their use. In some cases important technical details have been touched upon,

WHICH CIRCUIT S

An informative article describing the advantages and

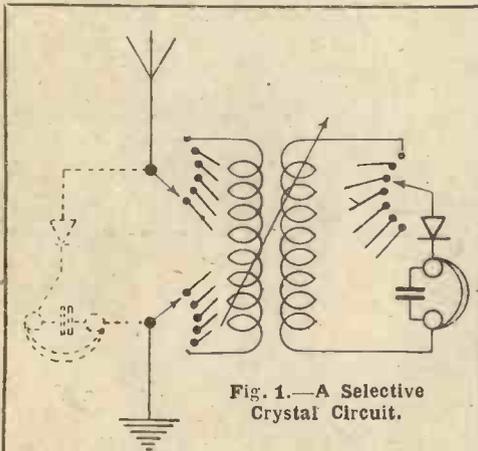


Fig. 1.—A Selective Crystal Circuit.

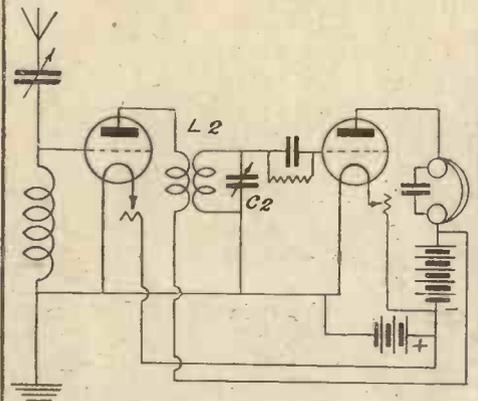


Fig. 4.—A Long-distance 2-valve Circuit.

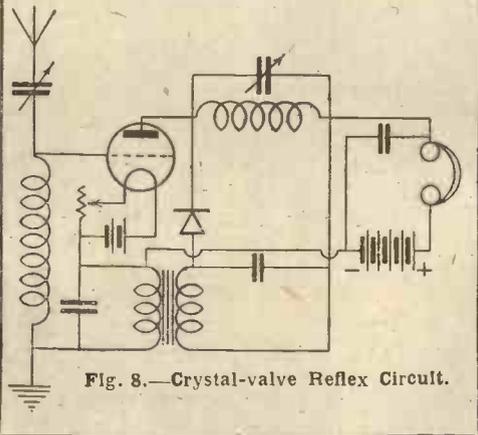


Fig. 8.—Crystal-valve Reflex Circuit.

but it is beyond the scope of the article to attempt to enter into constructional details. There are many circuits other than those dealt with here, but to mention them all would require a whole issue of AMATEUR WIRELESS, so great has been the research work in the past few years.

The receivers mentioned represent the latest practice, and it is thought that from these notes the reader may obtain an idea of the meanings of the various terms applied to different circuits and also their functions, and that possibly he might be tempted to experiment with them himself. Details for the construction of most of the receivers have been given from time to time in AMATEUR WIRELESS.

Crystal Circuits

Dealing in the first case with crystal receivers, for loud and clear reception of a near-by broadcasting station a plain tuned aerial inductance in series with aerial and earth, and a selector switch to "pick out" any number of turns of wire from the inductance with the crystal detector and telephones in shunt across the used portion of the coil, is the best type of receiver. Should interference be prevalent in a particular locality it is necessary to add another inductance coupled magnetically to the aerial-tuning inductance, the telephones and detector being shunted across this second coil. The requirements for tuning the coil are not exacting, and a selector switch to "pick out" turns of wire in steps of 10 to 25 turns will be all that is necessary. The circuit is illustrated in Fig. 1, the dotted lines indicating the plain single-coil circuit, the remainder being the loose-coupled circuit.

Practically all crystal receiver circuits are modifications of these arrangements with the exception of the auto-transformer type of circuit illustrated by the diagram Fig. 2. This is a type of receiver easy to construct and possessing selective properties very similar to the coupled circuit. Different types of crystal detector, such as carborundum with a potentiometer, and other auxiliary potentially-operated detectors, such as hessite, anatose, brookite or pyrolusite, which are

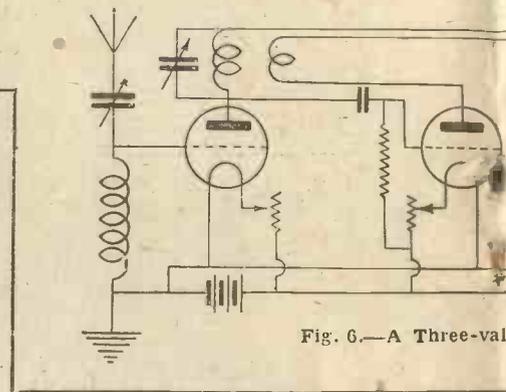


Fig. 6.—A Three-valve Circuit.

very stable detectors, may be used in any of these circuits. Such detectors are not only very sensitive, but extremely stable and reliable. Perikon detectors, in which crystals of different resistances are used in pairs, are second best as regards stability. Although galena (usually treated and sold in the form of various 'ites) is commonly used on account of its alleged superiority as regards sensitivity, it is extremely unstable, and the crystals above referred to when used with an auxiliary potential are to be preferred where a reliable rectifier is desired or when "listening-in" for long periods is to be undertaken.

A Single-valve Circuit

A plain single-valve circuit without reaction is often used by serious experimenters when it is desired to gauge the strength and quality of signals. The circuit in this case is as shown in Fig. 3. It is generally slightly more sensitive than a crystal receiver if a suitable rectifying

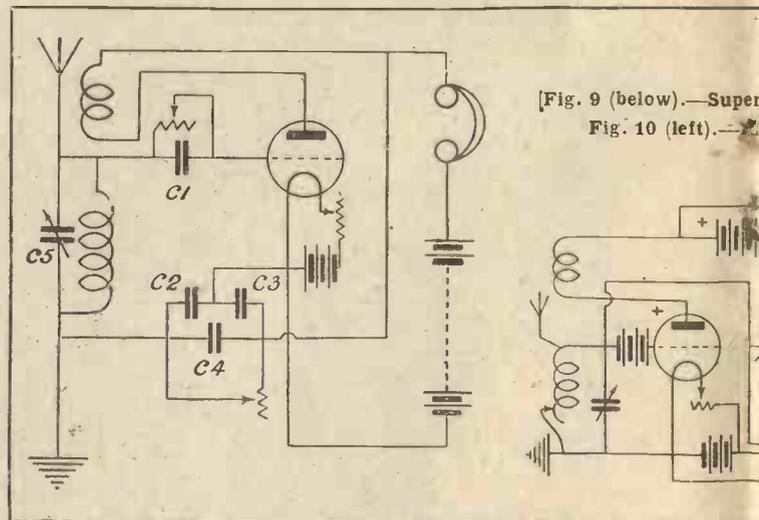
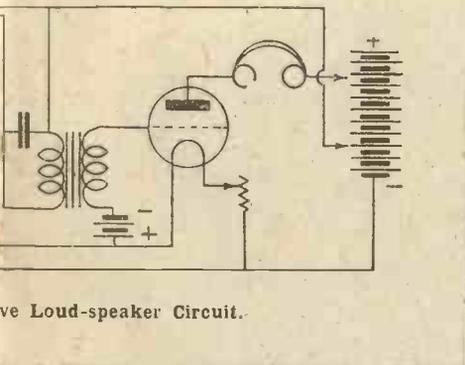


Fig. 9 (below).—Super
Fig. 10 (left).—

SHALL I CHOOSE ?

disadvantages of the most popular receiving circuits.



Loud-speaker Circuit.

valve is used, but with unsuitable valves or valves of H.T. potential or filament current it is inferior in this respect. The addition of a reaction or anode coupling (L2) to the aerial tuning inductance (L1), as indicated by the dotted lines, will often more than treble the range of the receiver for morse reception purposes. Owing to certain well-known technical reasons, the indiscriminate use of reaction coupled to the A.T.I. results in losses in quality, and the user will find that the music becomes harsh and distorted. The set becomes more selective when a reaction coil is added, and, generally speaking, loose-coupled tuners as described for crystal circuits above are not required with such a set. If bad interference is experienced the loose-coupled secondary may be introduced with advantage and the reaction coil coupled to this or the A.T.I., the former arrangement being the better for this purpose.

Two Valves for Long Distances

The addition of an H.F. amplifying

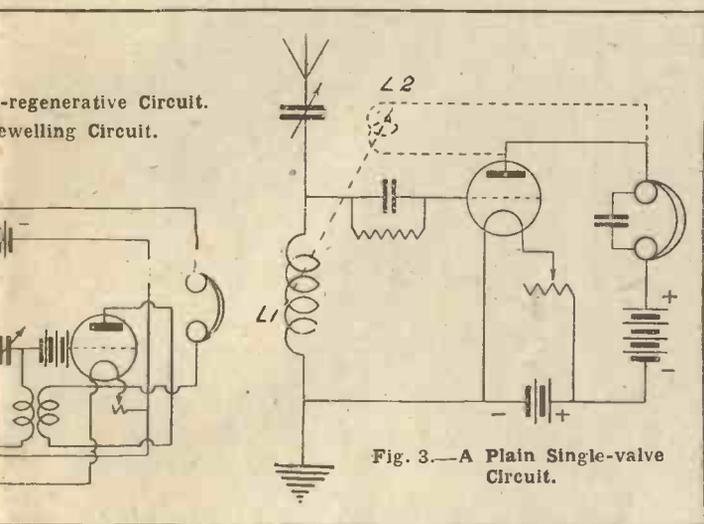


Fig. 3.—A Plain Single-valve Circuit.

valve as indicated in the diagram Fig. 4 will result in doubling the distance at which clear speech and music can be received. This again is only if a suitable valve and electrical constants are used. The value of the variable tuning condenser (C2) must be kept quite low in order to obtain maximum results and should not exceed .0001 microfarad. This value will be found sufficient for tuning most commercially-manufactured H.F. transformers (inductance L2). The circuit is extremely stable but not selective, although it is more selective than a single-valve circuit without reaction.

The use of a tuned-anode coil for coupling purposes between the valves, as illustrated in Fig. 5 renders the circuit more selective, and many experimenters claim that this is also more sensitive, but the writer has not found this to be the case. The set is liable to burst into self-oscillation, so that it is often necessary to add a potentiometer to render the grid of the amplifying valve slightly positive.

The tendency to self-oscillation may be controlled to a certain extent by dimming the filament or reducing the H.T. potential when only one H.F. amplifying valve is used, but if two or more valves performing this function are used the potentiometer must be incorporated, for the tendency to oscillate increases with the number of the valves.

A reaction coil may be coupled to the tuned anode coil L2 of the amplifying valve, and this not only provides greater sensitivity, but increases the selectivity. It is generally considered that two stages of tuned-anode coupling is the maximum manageable number of stages of this type of H.F. amplification it is possible to use, but it is often possible to use three or four stages of transformer-coupled H.F. amplification when potentiometer control is introduced in order to prevent self-oscillation.

Three-valve Circuit

A circuit as shown in Fig. 6, if built of suitable component parts and used with a suitable aerial and earth (the aerial being not less than 30 ft. high) should work a loud-speaker at good strength at

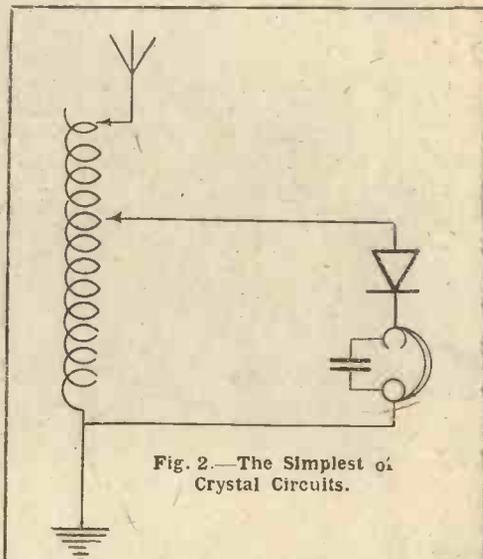


Fig. 2.—The Simplest of Crystal Circuits.

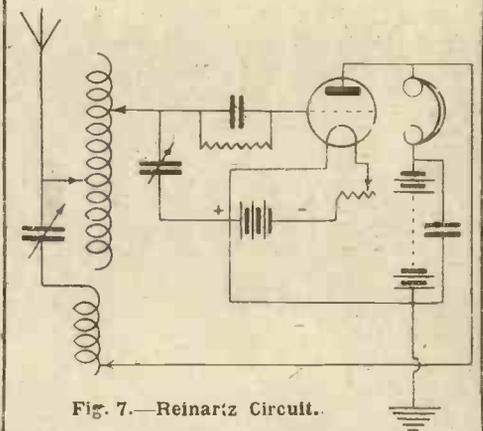


Fig. 7.—Reinartz Circuit.

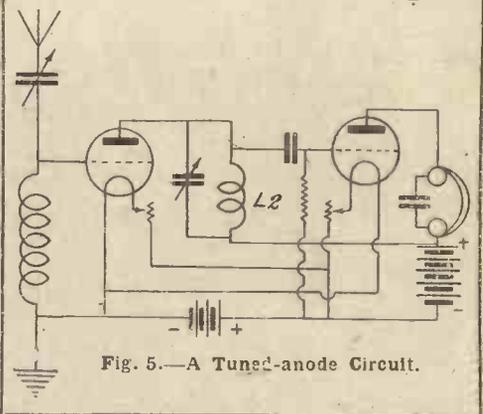


Fig. 5.—A Tuned-anode Circuit.

distances up to 15 or 20 miles from a broadcasting station. Such a circuit has been known to do this at distances of from 30 to 40 miles and even farther. It is generally advisable to use a high value of H.T. potential on the third valve anode, this value being about 120 volts. A small

grid-biasing battery of $1\frac{1}{2}$ to 3 volts should be incorporated in the set, this being used to apply a negative potential to the grid of the low-frequency amplifying valve. This "clears up" the signals and often results in greater signal strength.

The Reinartz Circuit

The Reinartz is an auto-transformer circuit with slight modifications in the method of applying reaction. Both H.F. and L.F. amplification may be added to the circuit. It is used by experimenters and persons desirous of searching very rapidly over a given band of wavelengths, its advantage being that varying the coupling of the reaction does not vary the tuning of the aerial circuit. It is, of course, fairly well known that with all ordinary circuits any variation in the applied reaction results in a variation of the wavelength of the aerial circuit, so that both the tuning condenser and the reaction value have to be varied at the same time. A Reinartz circuit is shown in Fig. 7, and it is to be recommended for the reception of wavelengths of the order of 200 metres and under where tuning becomes comparatively critical. The circuit is due to an American experimenter bearing the name given to it.

Dual Circuits

A dual circuit is one in which a valve or a number of valves perform the double function of amplifying at both high and low frequency. It is a very economical circuit to use as regards running costs, especially as several of the dull-emitter types of valve work exceedingly well in it. The valve or valves are generally used in conjunction with a crystal detector, and besides giving excellent volume for loud-speaker work, the circuit produces

exceedingly clear music by reason of the use of crystal rectification. Fig. 8 illustrates a dual circuit of this description.

The Super-regenerative Receiver

Passing from the dual circuits, we go on to the super-circuits. This class of circuit is that generally only used by the advanced amateur. It is extremely sensitive but difficult to design and manage. The super-regenerative set may consist of from one to three valves. Such a receiver is illustrated diagrammatically by Fig. 9. It is a most interesting circuit, and stations at vast distances can be received by it on a frame aerial.

The Flewelling Circuit

The Flewelling circuit is a super-circuit. It can be made up into a very compact receiver at a very low cost, the blocking condensers C2, C3 and C4 taking the place of large and expensive coils usually associated with the Armstrong super-circuit. The author has had some extremely fine results with this arrangement, as, for instance, the reception of Aberdeen, Radio-Paris and local stations in London without even an aerial. The circuit is illustrated by Fig. 10.

The Neutrodyne Circuit

The neutrodyne circuit, due to Professor Hazeltine, of America, aims at neutralising or balancing out the coupling capacities which render a number of H.F. amplifying valves an unwieldy and almost unworkable proposition. This tendency to self-oscillation has already been referred to in the earlier portion of this article. There is no howling or squealing in the receiver and distortionless reception is possible over very great distances. The principle may be adopted so that a receiver possess-

ing as many as six or eight H.F. amplifiers can be used and great sensitivity is thereby attained. No circuit diagram is given, as special components are necessary.

The Supersonic Heterodyne Circuit

This circuit is peculiarly suitable for use on very short waves. By its use wavelengths of the order of 65 metres or under may be readily tuned in. It overcomes the difficulties which are experienced in obtaining efficient high-frequency amplification on wavelengths of 200 metres and under, for, as is well known, H.F. amplification drops off considerably on these wavelengths, especially at the lower end of the scale. The Armstrong receiver is a good type for use on a frame aerial and will receive medium-power stations over many thousands of miles. Amateur transmitters have found its selective properties on short waves exceedingly useful.

Needless to say, that in a multi-valve set the coupling transformers must be matched to each other. A. J. C.

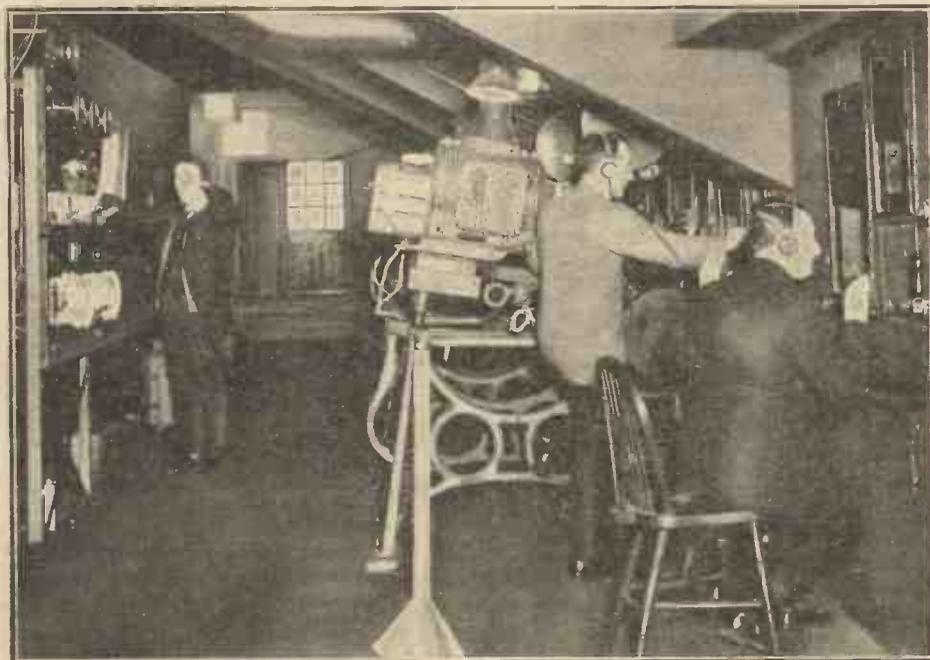
"RECENT DEVELOPMENTS IN RECEPTION" (continued from page 184.)

lower frequency than the aerial A, the latter being, of course, tuned to the incoming signals. Normally the coils ED have no appreciable back-coupling effect owing to the difference between the frequency of the circuit D and that of the ordinary signal currents flowing in the rest of the circuit.

If, however, the back-coupling between the coils B and C is increased to an excessive degree, the effect of the coils ED suddenly comes into play and forces the whole set into oscillation at the low frequency of the circuit D, with the results previously mentioned.

When this occurs the receiver can only be reset to sensitivity by first opening the switch K, thus extinguishing the valve and stopping the oscillations. The secret of the sudden change from one frequency to the other depends upon a careful adjustment of the grid to a critical negative potential, which is first determined by the makers and then sealed from subsequent interference. B. A. R.

"Designs for Model Steam Traction Engines is the title of an article appearing in the current issue of "The Amateur Mechanic and Work" (3d.), and is of special interest to all model-makers. Other articles and features appearing in the same number are: "Practical Fancy Leather Work: A Man's Purse with Flat-modelled Ornament"; "A Gramophone-record Hint"; "An Old-world Settle"; "Our Small-car Page"; "A Handy Battery Tester"; "An Efficient Earth"; "A Supplementary Variable Condenser"; "Final Adjustment for Reaction"; "Notes by the Way"; "In the Metalworkers' Shop"; "Motor-cycle Practicalities"; "Primus-pattern Oil-stoves: Hints on Management and Repair"; "Unstopping a Sink."



WIRELESS AND THE CINEMA

The operating room at the Shepherd's Bush Pavilion where the synchronisation of Andre Charlot's Revue with the pictures was tried recently.

EXPERIMENTAL TRANSMISSION.—VIII

MORE CIRCUITS DISCUSSED

IN all these circuits, which, after all, are bare outlines of the main systems employed, the aerial circuit has been shown coupled directly to the transmitter for the sake of simplicity in drawing. It has, of course, been assumed that loose-coupled circuits may be employed, if desired, as in ordinary receiving practice.

In the ordinary way, with standard circuits, there is no distinct advantage to be gained by the use of a loose-coupler. One form of such circuit, known as the "ratio-tap," is worthy of special consideration, as it enables an aerial to be more efficiently worked near its fundamental wavelength than does any other (see Figs. 27 and 30).

The anode coil L_2 (Fig. 27) is not coupled to the grid circuit, as oscillations are generated by suitably tuning this circuit; L_2 is wound with many turns of fine wire. The aerial inductance L_1 is coupled tightly to this so that oscillations are induced in it. If the circuit is to be worked on the 200-metre band, L_2 should have a "natural wavelength" of about 600 metres for best results. Tapping A controls the amount of coil directly in the anode circuit.

L_3 may, if desired, be coupled up in the usual way, and there is then no need for it to be tuned.

In Fig. 28 is shown a circuit which would at first sight appear somewhat similar to that in the preceding figure, but a closer inspection shows that the earth side of the grid coil is led through a variable condenser (value about .001 microfarad) to the positive anode supply lead instead of running direct to the negative filament connection.

The two coils must not be coupled, but it is essential that they should be absolutely in tune. It will be seen that the grid coil must be considerably larger in inductance than the aerial coil, since it

is in series with a condenser and has not the natural constants of the aerial system added to it.

The grid leak may, if desired, be placed

directly across the grid and negative filament instead of across the condenser, as shown.

The Meissner circuit is shown in Fig. 29; this is really the reversed feed-back circuit (Fig. 21) rearranged. The antenna coil is split, and the plate and grid coils are each coupled to one part but not to each other. This is supposed to lead to simple wave changing, but whether this is so is a matter of opinion.

So far we have dealt with circuits in which the coupling between plate and grid circuits was inductive. There is now the other class to be considered, in which coupling is wholly or partially capacitive, and of which Fig. 31 illustrates the general principle.

As it stands this circuit would not be very efficient unless the high-tension supply could be arranged so as to have no appreciable capacity effects to earth.

Fig. 32 shows a more practical form of a circuit, which is the same in principle as Fig. 31. Readers may probably recognise the Colpitt's circuit, which, though in great use in many stations, has not attained the popularity over here that it has in America—a popularity well deserved.

The blocking condensers C and C_1 should have a fairly high value of capacity, of the order of .005 microfarad. Provided that the insulation of C_3 is good, C may be dispensed with.

It is necessary to include a radio choke in series with the grid leak or a certain amount of radio-frequency energy will be by-passed, and difficulty may be found in making the set oscillate on low waves. Provided that its insulation from earth is sufficient there is no need to take such elaborate care over its construction as is, or should be, taken over CH in the plate circuit.

In order to minimise capacity effects to
(Continued at foot of page 202)

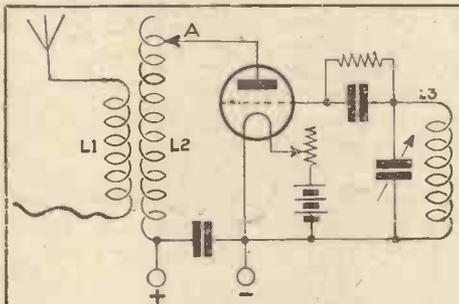


Fig. 27.—A Simple Form of "Ratio-tap" Circuit.

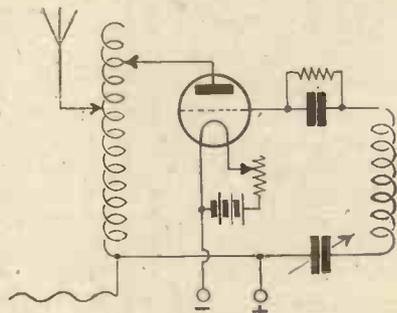


Fig. 28.—A Circuit with Series Grid Condenser.

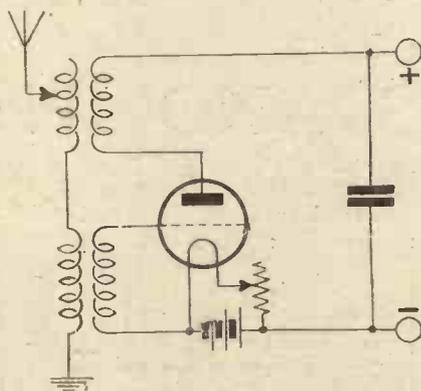


Fig. 29.—The Meissner Circuit.

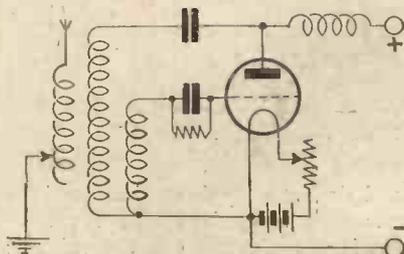


Fig. 30.—Three-coil "Ratio-tap" Circuit.

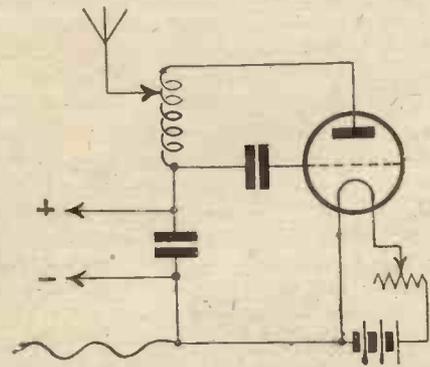


Fig. 31.—A Simple Capacity-coupled Circuit.

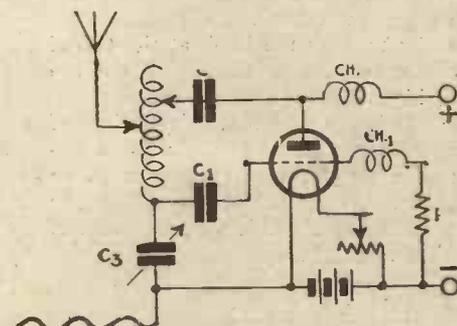


Fig. 32.—The Colpitt's Capacity-coupled Circuit.

AROUND THE SHOWROOMS

New Variable Condenser

VARIABLE condensers built up with what are comparatively thin metal vanes are always likely to become damaged by accident.

It seems to be a sensible development, then, to make condensers with more solid plates. Robustness is one great advantage of mica-dielectric condensers.

Amongst these I notice a new type called the Radiovox. This condenser takes the form of two metal cylinders, one being smaller than, and adjustable inside, the other. Its action is the same as that of a piston moving up and down in a cylinder.

Between the two cylinders is a wall of mica. The spindle of the inner cylinder is threaded and adjustments are made by a rotary motion.

The makers are the Radiovox Co., of 10-11, Jermyn Street, Piccadilly, W.

Phone Connectors

If your set is in a corner of the room it is probably not any too warm sitting by it to tune-in this weather.

There is no reason why one should not be as comfortable as possible while listening, and a simple solution of the problem is to use an extended phone lead.

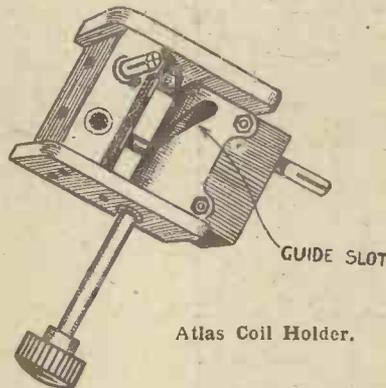
If you use more than one pair of phones you will want some kind of connector like the Fireside Fone Connector, made by Mr. H. S. Tunbridge, of 30, Campo Lane, Sheffield.

This connector takes the form of a small

bar of coloured insulating material (in red, green and blue) into which are fixed connectors to take two, three or four pairs of phones.

Atlas Coil Holder

FOR making fine reaction adjustments it is desirable to use a coil holder in which a given movement of the adjusting knob



produces a comparatively small movement of the coil itself.

I have heard this criticised on the grounds that if you start howling it takes too long to loosen the reaction coupling! My reply was that you should never get the reaction coupling as tight as that to begin with, and that readers of these notes never howl anyway.

I am all in favour of a low-g geared coil holder, such as the Atlas, made by H.

Clarke and Co. (Manchester), Ltd., of Atlas Works, Old Trafford, Manchester.

The "works" of this coil holder are indicated in the diagram. To the adjusting spindle is attached a guide rod which moves in a straight slot. As it moves, however, it also traverses the curved slot in the moving part of the holder, thus altering the position of the latter.

Efesca H.T. Batteries

MANY of the cracklings and disturbances that amateurs experience with valve sets are, I think, due in many cases to the use of too small an H.T.B. condenser or no condenser at all.

To those who (like myself!) often fail to provide themselves with a suitable condenser I recommend Efesca H.T. batteries, made by Falk, Stadelmann and Co., Ltd., of Farringdon Road, E.C.1.

Into the bottom of each of these batteries is built a one-microfarad condenser for stabilising the battery voltage. This seems to be development on the right lines.

VANGUARD.

The first West End play to be heard by wireless on its first night will be *Love's Prisoner* from the Adelphi Theatre on February 3.

Ask "A.W." for
List of Technical Books

PROGRESS AND INVENTION

Variable Condensers

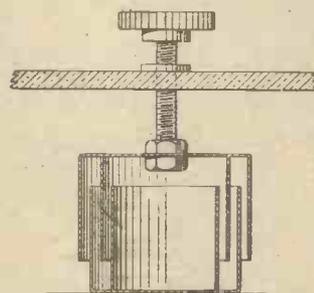
PATENT No. 218,231/24 (Moschko Barendolz, Rue de la Harpe, Paris) describes a type of variable condenser in which air is employed as a dielectric, and the plates are in the form of concentric cylinders movable in the direction of their axes on a screw thread.

Thus by turning the knob at the top of the condenser frame the cylinders are moved in and out and the capacity is varied. It is claimed that this method of moving a large number of plates is preferable to the usual rotary system, as if the axis of a vane-type variable condenser be even a little out of truth the movement of the plates will be irregular.

Evacuating Valves

THE advantages and characteristic features of the "hard" valve (that is, a valve having a high degree of vacuum)

are now well understood. Hard valves are regular and constant in their perform-



Variable Condenser (218,23/24).

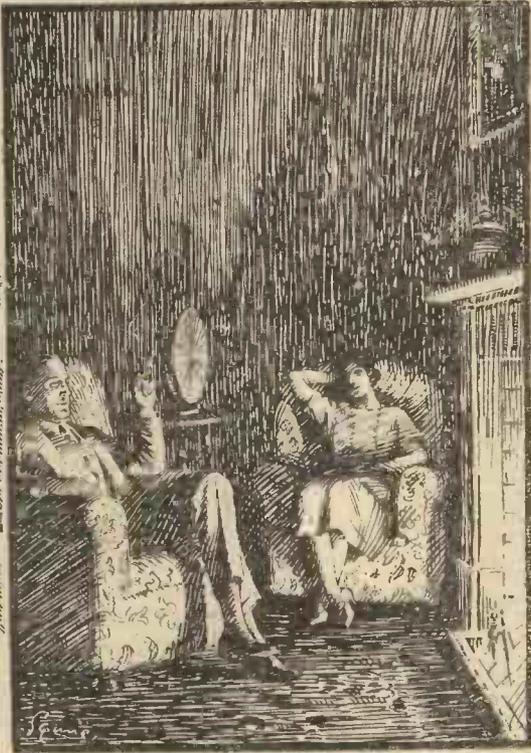
ance, and do not vary from time to time, and it is also recognised that the hard condition is very desirable if the valve is to act properly as an amplifier.

The usual methods of evacuation and the use of a magnesium "getter" for

obtaining the high degree of vacuum are costly, since great care and time is necessary.

A method of assisting the evacuation is described in Patent No. 225,694/24 (L. A. Levy, Cricklewood, Middlesex), and this may tend to reduce the cost of production. A small space in the valve is filled with highly activated charcoal, such as is used in the absorption of gases. This absorbing material is heated to a high temperature, and it is claimed that the presence of the charcoal maintains a high degree of vacuum through the life of the valve.

It is suggested that the activated charcoal should be placed in a small glass bowl or similar receptacle, connected by a side tube to the main body of the valve. Some arrangement, however, should be made so that the surface of the charcoal is presented to the vacuum, as it will thus more readily absorb any gases that may be formed.



*Here will we sit and let the sounds of music
Creep in our ears: soft stillness, and the night,
Become the touches of sweet harmony
Shakespeare, Merchant of Venice.*

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The Sterling "Primax" Hornless Loud Speaker has a pleated diaphragm mounted in a frame and supported on a graceful stand. The whole instrument is bronzed finish. It is connected to the receiver in exactly the same way as an ordinary loud speaker. Complete with 12 ft. of flexible cord. (2,000 ohms resistance.)

PRICE £7 : 15 : 0

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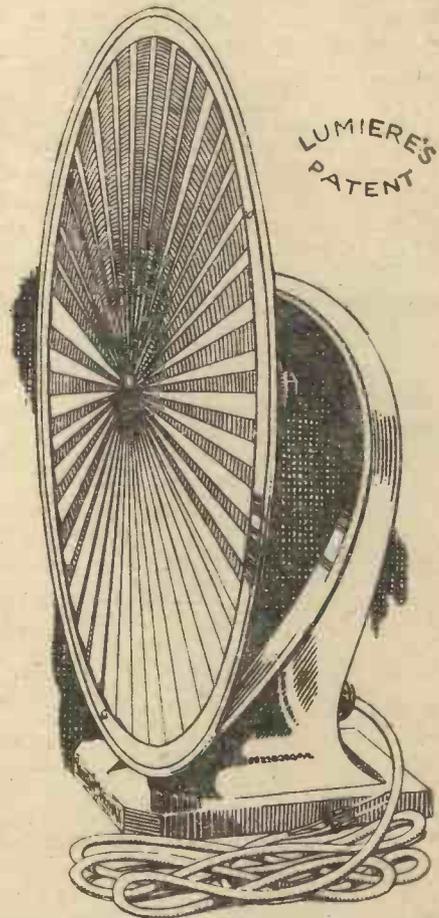
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THE FIRST WIRELESS AMATEUR

Points from Sir Oliver Lodge's Presidential Address to the Radio Society of Great Britain.

"SIR OLIVER LODGE was the first wireless amateur," said Dr. W. H. Eccles when introducing the new president to a crowded meeting of the Radio Society of Great Britain on January 21. The meeting was the occasion of Sir Oliver's first presidential address to the society, his subject being "Matter and Radiation." Amateurs were doing great work and a tremendous amount of experimenting was going on, said Sir Oliver. He

admitted that he had not thought wireless telephony possible—now it is easy. He knew that short waves were more powerful than long waves, but he had not thought that any waves would go right round the world.

Clerk Maxwell's great theory was published in 1873, and Sir Oliver spent all the summer of 1875 in studying it closely. At that time wireless existed only on paper. Some years later both Sir Oliver and Hertz found how to produce and detect electromagnetic waves, "but Hertz got there first."

"Afterwards, Mr. Marconi came along," said Sir Oliver, "and then things began to hum!"

Wireless makes use of electromagnetic waves through the ether, a medium that has elasticity and momentum. Sir Oliver said that he thought ether was very dense—a million times more dense than gold or silver.

Oscillation is due to the qualities of elasticity and inertia. Radiation is not given by an electric charge or a magnetic field alone—both are necessary. An electric charge is all electric and an electric current all magnetic; the combination of both gives electromagnetic waves.

Radiation is produced by changing the speed of electrons and there is a reciprocal action. Radiation from one aerial changes the speed of electrons in another aerial.

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0.06 Dull Emitters ... 12/6 Retail Price.
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A new Adjustable Headphone weighing only 12 ozs. with cords. Adjustable Headbands and Adjustable Diaphragms, ensuring extreme comfort and sensitivity.

1 pair .. 10/9 post 6d. 2 pairs .. 21/- post 9d.
3 pairs .. 31/- post 9d.

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207, Edgware Road, W.2. 84, Church Road, Norwood, S.E.23. Phone: Hop. 4177.

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The T.C.I. is described and illustrated in "RADIO-PLAN No. 3." Everything you have to know to be successful is lucidly explained. Expert assistance is then offered till you are satisfied.

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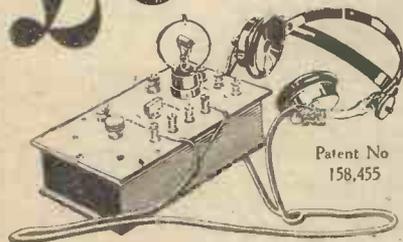
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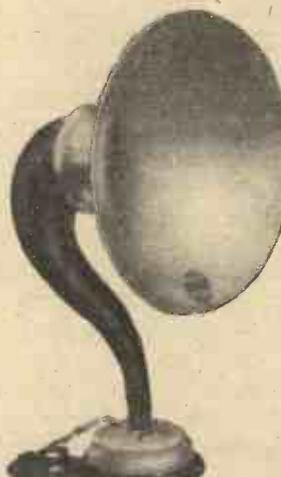
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Filament Rheostats.
With finished and lacquered brass bush for panel mounting. Resistance wire wound on insulating rod, thereby giving perfectly smooth adjustment. Each supplied with diagram giving drilling dimensions. 3/6 each.



Ebonite Condenser Dials and Knobs.
In one piece, graduated in white, 0.180", highly finished, complete with fixing screw, dial approximately 3 in. diameter. Complete, 1/3 each. Dials only, 10d. each.



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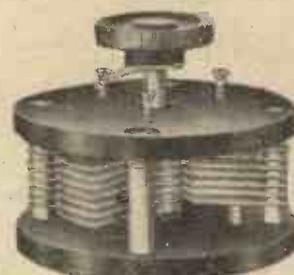
This instrument will reproduce both speech and music without the loss of its original tone and quality. Coils wound to either 120 or 2,000 ohms.

The tone arm is a heavy aluminium casting.

Excellent strengths can be obtained on an efficient 2-valve receiver within 10 miles of broadcasting station.

Total height, 20 inches. Size of trumpet, 12½ inches diameter.

PRICE £3. 10s. EACH



Variable Condensers.
(For panel mounting.)
Strongly constructed. Moving vanes are shaped to give low minimum capacity. Fitted with a stop to allow of a movement of 180° only. From 5/6 each.



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- LONDON: 100 and 102, Cannon Street.
- MANCHESTER: 16, John Dalton Street.
- NEWCASTLE-ON-TYNE: 59, Westgate Road.
- PORTSMOUTH: 49, High Street.
- SHEFFIELD: 88-90, Queen Street.



THE new station, 1YA, in New Zealand now transmits a daily programme, and appreciative messages from all parts of the Dominion have been received.

In Australia no less a sum than £7,000 is spent every year by the Amalgamated Wireless, Ltd., in research and experimental work.

The latest Paris fashions are to be broadcast by Selfridge's from Eiffel Tower on a wavelength of 2,600 metres.

Ships can now receive weather reports from the Air Ministry station on C.W. over a total distance of 4,400 miles.

A group of new stations is being erected near Montreal by Marconi's Wireless Telegraph Co. of Canada for direct communication with England and Australia by means of the new system of short-wave beam telegraphy.

Following the reorganisation of the Marconi Transatlantic station at Carnarvon, a second direct wireless telegraph service between London and New York has been opened and is now available for traffic.

The concert given recently at the Royal Opera House, Covent Garden, was heard clearly in Lausanne.

It is suggested that wireless in China should be placed under the control of America, Japan and China owing to the present wireless chaos in China.

The Japanese Government has decided to introduce a Bill making the installation of wireless sets obligatory on all merchant ships above a certain size.

Sutton (Surrey) is to have a new shopping arcade, in which concerts from 2LO will be broadcast.

A military band programme will be given on February 5.

"The Georgians" concert party will provide the programme to be broadcast on February 7.

The Golden Legend will be broadcast from 5XX on February 7.

A band programme by the Royal Air Force band, under Flight-Lieut. Amers, will be broadcast on February 1.

A comic opera programme to be broadcast on February 2 contains as its chief item of interest the first public performance of the operetta *An Arabian Morn*.

A ballad concert will be S.B. on February 3.

A popular programme will be given on February 4, which will include items by Charles Truc, Arthur Spencer, Phyllis Scott and Moira O'Keefe.

Nearly 100,000 receiving licences have been issued to amateurs in Spain.

It should be noted that the Durban station, recently opened, transmits on a wavelength of 400 metres.

Although the ban on foreign wireless goods was removed on Jan. 1, Germany has not yet proved a serious competitor.

Now that the roar of Niagara is soon to be heard by wireless, why doesn't the B.B.C. broadcast the Plymouth Sound?

M. Edouard Belin, the French scientist, has transmitted by wireless a criminal's finger-prints, his photograph and police information concerning him.

The military post at Tunis is carrying out experiments in wireless transmission on a wavelength of 92 metres.

The bookings for *Yoicks* were increased by 50 per cent. as a result of the broadcasting of this revue from the Kingsway Theatre.

Complaints have been received from listeners in Dundee that the line from London to 2DE is bad and causes crackling noises in the transmissions.

The 1925 International Exhibition of Decorative Arts, which begins in Paris in May, has put at the disposal of the French Radio-Electric Syndicate a portion of the exhibition stands. The collection will include only the finest products of the designers' and cabinet-makers' art, as the apparatus must first be submitted to the criticism of a jury.

(Continues on page 198)



THE COMPLETE SET

CONTENTS

- 8 Terminal Studs,
- 6 Multi-Connectors,
- 4 Coloured Connectors,
- 8 Discs (Black, Red and Blue).
- Phones + High Tension + Low Tension + Earth
- Phones - High Tension - Low Tension - Aerial

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EXPERIMENTERS! How long does it usually take to wire-up an experimental circuit, using a soldering iron? And the possibility of several alterations being undertaken to ensure the best results? Perhaps your enthusiasm is on the wane because of the time and trouble it costs you. Before you lose that enthusiasm build a circuit with Newey Snap Terminals. They take the worry out of wireless. Just the slightest pressure of a finger and there is perfect vibrationless contact wherever they are placed.

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On a Neutron Crystal with 2 stages of Low Frequency

Chippenham, Wills,
December 14th, 1924.

Messrs. Neutron, Ltd.
DEAR SIRS,

NEUTRON CRYSTALS.

As an enthusiastic owner of a 5-valve set, I write to tell you of my surprising results with a small Crystal set. Owing the above-mentioned set and having been connected with Wireless Theory for the last 10 years and actual practice with a set for the past 5 years, I was, as I always have been, very sceptical about results when I bought one of your crystals a week ago. The results, however, have simply astounded me.

The first night, not having the ebonite ready, I just twisted some bare wire round the end of the detector and across the end of a plug-in (standard size) c.c.l. block, the other end I connected with a pair of phone tags and condenser; a .0003 mfd. variable condenser for tuning completed my very crude "outfit."

Coupling up aerial and earth I was astounded by easily tuning 5 WA (40 miles), 6 BM (62 or 4 miles). I listened to the latter till close-down and then picked up Madrid quite easily.

Of course, my mind was immediately filled with theories of re-radiation and such things as that. I will, however, admit that I made frantic haste to have everything properly mounted and soldered the next evening, when I again repeated the same performance. Subsequent tests have proved that 5 XX (1 1/2 miles, approx.) is absolutely comfortable strength, and 2 ZY (Manchester) is also audible.

Coupling a 2-valve LOW FREQUENCY amplifier to the above-mentioned set at 1.30 a.m. this morning, I picked up Music and Solos (Soprano and Baritone) from WBZ (Springfield, Mass.), and was in good touch for about 10-12 minutes, when the signals faded away.

A continued watch was kept for 1 1/2 hours, during which time I was in touch for about 60 per cent. of the time. Not so bad for the much despised Crystal. Needless to say, I am now very much converted.

It is my hope now to be able to receive America direct with Crystal only, and with the strength that different stations have been coming in at this address I am feeling quite confident that it can be done. Needless to say, the Crystal will be Neutron.

My aerial is 100 ft. long, 34 ft. high leading-in end, 28 ft. high far end. Please particularly note that all current was switched off from the valve set during these tests, and every precaution taken to give the Crystal a "fair chance."

Very sincerely yours,
(Signed) R. A. H.

P.S.—During reception of Springfield, Mass., I distinctly heard the announcer give the call letters of the station *teke*, so that there is no doubt as to the accuracy of the reception.—R. A. H.

THIS is, we believe, the record for long-distance broadcasting reception on land. Note that the only amplifier used was a low-frequency one; interpreted to the non-technical, this means that the signals were actually received and rectified by the **NEUTRON CRYSTAL**, the two valves serving merely as note-magnifiers, and not as "range-increasers."

The original letter, a copy of which is given here, may be inspected at the NEUTRON Offices.

Here is sufficient proof of the super-sensitiveness of **NEUTRON CRYSTAL** to justify you in selecting this as your Crystal. Sooner or later you will come to it, in any case, and in deciding **NOW** for **NEUTRON**, you will easily save the price of another pair of phones, by saving the expense of further tests.

and you can get the same results with a



Concert Tested and Guaranteed.

Stocked by the best Radio Dealers. Packed in tin with silver cat's-whisker. Insist on Neutron, in the Black and Yellow Tin—or send 1/6 and Dealer's name, and this wonderful Crystal will be mailed by return. **1/6**

Sole Distributors:—V. Zeillin and Sons, 144, Theobald's Rd., London, W.C.1. Phones: Museum 3795 and 6841. Produced by:—Neutron Ltd., Sicilian House, Southampton Row, London, W.C.1. Phone: Museum 2677.

RADIOGRAMS (continued from page 196)

There has been a good deal of uneasiness among the listeners-in in South Dorset as to the effect of the new high-power Marconi station. We understand that there is no possibility of interference being caused.

Sections of the French wireless press are bitter because of the Government's refusal to permit the building of new wireless stations.

A grateful patient of the Biddulph Orthopaedic Hospital has presented the institution with a four-valve wireless set and loud-speaker.

A successful attempt was made recently at the Shepherd's Bush Pavilion to synchronise the showing of the kinematograph film of a revue number with the broadcast reception of the singing in the same number.

London, Chelmsford and Aberdeen broadcasting stations are the best for reception in India, according to a letter received from a resident in Bombay.

Wireless listeners were deprived of a familiar sound recently when Big Ben refused to work owing to the fog, rain and bad weather.

The broadcasting station at Belgrade, which was opened recently by the French Radio Society, transmits a regular daily programme on a wavelength of 1,650 metres.

The sum of fifty million crowns has been collected to provide wireless sets for hospitals in Vienna.

On New Year's Day there were fourteen broadcasting stations in Germany working on nineteen different wavelengths.

The B.B.C. has been requested by a lonely widow to find her a husband.

It is reported from Paris that American stations have been coming in so strongly recently that some of them are mistaken for French stations. United States and French amateur transmissions are often simultaneous.

Living in a district subject to violent thunder storms and high winds, an American amateur recently fixed a 50-ft. aerial in an underground channel with a lead-in to his set. The volume of reception has greatly increased, and he is picking up stations that he had been unable to tune-in before.

The French amateur station 8 TM has succeeded in communicating with many amateur stations in France, England, Spain, Switzerland and Italy, using only 1½ watts input.

There are divided opinions among the officials of the theatrical world. Some still wish to keep broadcasting at bay as long as possible. Others feel that broadcasting has come to stay, and that they may as well try to make the best terms they can.

It is announced by the B.B.C. that a scale on the piano will precede each transmission instead of the usual tuning note.

General opinion is to the effect that twenty minutes is quite long enough for a broadcast play.

"Country Pictures in Music" is the title of the orchestral programme to be given on January 30.

A musical comedy programme will be given on January 31, which will include selections by the orchestra and songs by Gwladys Newth and Stuart Robertson.

The Governor of Montserrat is inviting subscriptions to total £3,000 for the erection of a wireless station.

A well-known French scientist is carrying out experiments in the cure of cancer by means of ultra-radio frequencies.

Bournemouth has been heard quite clearly at Port Said, a distance of about 2,300 miles.

Collecting reception stamps issued by many American broadcasting stations is the latest fad in the U.S.A.

On January 9 Mr. H. J. Hinks, Director of Education of the Radio Association, inaugurated a series of talks entitled "The Elements of Wireless." The course will last twelve weeks, and the lecture takes place from 3.15 to 3.45 p.m. every Wednesday afternoon. This course is one of the series of transmissions to schools especially arranged by the B.B.C.

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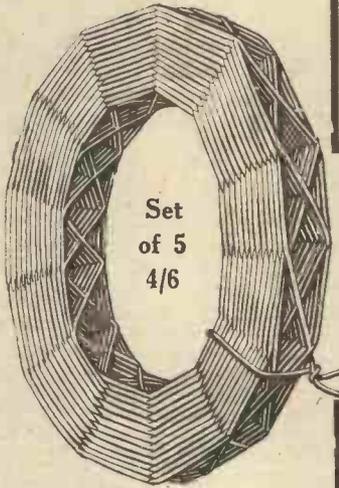
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It is in the reception of the distant stations that the higher efficiency of Reactone Tension-Wound Inductances is most apparent. It is then that the sharp tuning of Reactone Coils counts—and the unique construction that gives without shellac or wax a highly efficient, rigid and uniform inductance.

Supplied in sets of 5 (Nos. 25, 35, 50, 75, and 100), and each set is boxed. Be sure to see the name "Reactone."

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No. 150 (Chelmsford), Price 2/6.



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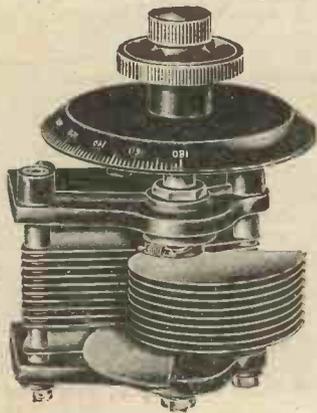
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When you see the distinctive "Hand-and-Crystal" on the carton (as shown below) your search for full sensitiveness ends.. Eye-straining, temper-ruffling "prodding" in the vain hope of getting a "better spot"; breaking into an interesting musical item because the Crystal has "gone dead"; all this is ended if you accept the invitation of the "Hand-and-Crystal" and fit Sylverex Crystal to your Detector. Sylverex Crystal gives silver-toned, perfect rectification, and is exceptionally efficient in long-distance reception. It is sensitive all over and right through and carries a definite money-back guarantee—each Sylverex being exhaustively tested on actual Broadcast transmission before despatch.

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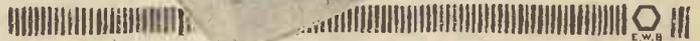
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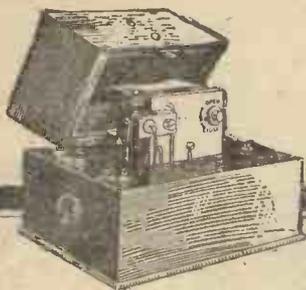
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In airtight container, with Special Cats-whisker and ful directions.



If you cannot obtain Sylverex from your Radio Dealer, send P.O. 2/- direct, with your Dealer's name and address, and we send the Crystal by return, post free. Remember, whether you buy Sylverex from your Dealer or direct, you test it at OUR expense; if you are not satisfied in every way your money is returned.





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BROADCAST TELEPHONY

NOTE.—In the following list of transmissions these abbreviations are observed: con. for concert; lec. for lecture; orch. for orchestral concert; irr. for irregular; m. for metres; and sig. for signal.

GREAT BRITAIN

The times given are according to Greenwich Mean Time.

London (2LO), 365 m. 1-2 p.m., con.; 3.15-3.45 p.m., lec.; 4-5 p.m., con.; 5.30-6.15 p.m., children; 6.40 p.m. talk; 7-7.30 p.m., time sig., news, talk; 7.30-9.30 p.m., music; 9.30-10.0 p.m., time sig., news, talk; 10.0-10.30 p.m., music. Mon. and Wed. the Savoy Bands are relayed until 11.0 p.m., and on Sat. until midnight. Sat. only, 4-5.30 p.m., con.

Aberdeen (2BD), 495 m. **Belfast** (2BE), 435 m. **Birmingham** (5IT), 475 m. **Bournemouth** (6BM), 385 m. **Cardiff** (5WA), 351 m. **Glasgow** (5SC), 420 m. **Manchester** (2ZY), 375 m. **Newcastle** (5NO), 400 m. Much the same as London times.

Bradford (2LS), 310 m. **Dundee** (2DE), 331 m. **Edinburgh** (2EH), 328 m. **Hull** (6KH), 335 m. **Leeds** (2LS), 346 m. **Liverpool** (6LV), 315 m. **Nottingham** (5NG), 322 m. **Plymouth** (5PY), 335 m. **Sheffield** (6FL), 301 m. **Stoke-on-Trent** (6ST), 306 m. **Swansea** (5SX), 481 m.

CONTINENT

The times are according to the Continental system; for example, 16.30 is 4.30 p.m., and 08.00 is 8 a.m. (G.M.T.).

AUSTRIA.

Vienna (Ravag), 530 m. (1 kw.) 08.00, markets; 10.00, con.; 12.05, time sig.; 12.20, weather; 14.30, Stock Ex.; 15.00, news, con.; 15.10, children (Wed.); 17.10, lec. (Tues., Fri., Sat.), children (Tues.); 17.30, lec. (Wed.); 18.30, news, weather; 19.00, time sig., con., news; 21.00, dance (Wed., Sat.).

Graz (relay), 700 m. Testing.

BELGIUM.

Brussels (SBR), 265 m. (1½ kw.) 17.00, orch., children (Wed. and Thurs.); dance (Tues. and Sat.); 18.00, news; 20.15, lec., con., news (opera, Mon. and Wed.).

Haeren (BAV), 1,100 m. 13.00, 14.00, 16.50, 18.50, weather.

CZECHO-SLOVAKIA.

Kbely (OKP), 1,160 m. (1 kw.) Weekdays: 09.00, 10.30, 12.30, 16.00 and 17.00, con. (Wed. and Sat.); 18.30, lec., news, weather, con. (time sig., 19.00), daily; 10.00, con. (Sun.).

Komarov (OKB), 1,800 m. (1 kw.) Weekdays: 13.00, Stock Ex., weather, news; 17.30, con. (Thurs.); 09.00, con. (Sun.).

DENMARK.

Copenhagen (Kjobenhavns Radiofonistation), 470 m. 19.00, con. (Sun., Wed., Thurs.); also tests on 750/800 m. 20.00 almost daily.

Lynby (OXE), 2,400 m. Week-days: 18.20, news and Stock Ex.; 20.00 and 21.00, news, weather and time sig.

Ryvang, 1,025 m. 18.30, Eng. lesson (Wed.); 19.00, con. (Tues. and Fri.).

FRANCE.

Eiffel Tower, 2,600 m. (6 kw.) 06.40, weather (exc. Sun.); 11.00, markets (exc. Sun. and Mon.); 11.15, time sig., weather; 14.45, 15.35, 16.30,* Stock Ex. (exc. Sun. and Mon.); 18.00, con. (not daily); 19.00, weather; 20.30, con. relayed from PTT (Fri.); 22.10, weather (exc. Sun.).

* On 1st and 15th of each month at 16.45.

Radio-Paris (SFR), 1,780 m. (2 kw.) Sundays: 12.45, orch.; 13.45, news; 16.45, con.;

20.30, news, &c.; 21.00, dance music. Weekdays: 12.30, orch., Stock Ex., news; 16.30, markets, Stock Ex., con.; 17.45, Stock Ex., news, women; 20.30, lec., news, con.; 21.00, dance (Thurs.). *Le Matin*, Paris, provides a special con. every 2nd and 4th Saturday in the month at 21.00 or 22.00 G.M.T.

L'Ecole Sup. des Postes et Télégraphes (PTT), Paris, 458 m. (400 w.) 14.00, lec. relayed from Sorbonne University (Thurs.); 15.00, outside relay (Sat., irr.); 15.45 and 17.00, lec. relayed from Sorbonne (Wed.); 16.00, outside relay (irr.); 20.00, Eng. talk (Tues.); 20.30, lec. or con., almost daily, con. relayed by F. L. (Fri.); 20.45, lec. (Sun.), organ recital 3rd Sun. each month; 21.30, con. (Sun.).

"Le Petit Parisien," 345 m. (500 w.) 21.30, con. (Sun., Tues., Thurs.), dance (Sat.).

Lyons-la-Doua, 550 m., 10.30, gramophone con.; news, etc. (irr.).

Radio-Lyon, 287 m. (2 kw.) 12.00, 17.15, 20.30, news; con. (irr.).

Toulouse Aerodrome (MKD), 1,525 m. 09.42, 19.42, weather.

Station du Pic du Midi, 350 m. (300 w.) Testing.

GERMANY.

Berlin (2), 503 m. (1½ kw.) 08.00, sacred con. (Sun.); 09.00, markets, news, weather; 10.00, factory con. and tests; 10.30, educat. hour (Sun.); 11.15, Stock Ex.; 12.00, time sig., news, weather; 13.15, Stock Ex.; 14.00, lec. (Sun.), markets; 14.30, children (Sun., Wed.); 15.00, Esperanto (Sat.); 15.30, orch., French (Tues.); 17.30, lec., women; 18.00, French (Mon.), lec. (Tues.); 18.30, lec., Engl. (Thurs.), theatre news (Tues.); 19.30,* con., weather, news, time sig.; 21.30, chess (Mon.), dance until 23.00 (Thurs., Sat., Sun.). * If opera relayed, at 18.30.

Berlin (Telefunken Co.), 750 m. (1 kw.) 10.30, 19.00, con., tests (irr.).

Eberswalde, 280 m. 22.15, con. (Mon.) 3.150 m.: Telegraphen Union, 06.45-18.45, news, con. (Fri., irr.).

Königswusterhausen (LP), 2,450 m. (5 kw.) Wolff's Buro. Press Service: 06.00, 20.00, 2.800 m. (5 kw.): 10.30, con. (Sun.), Esperanto lec. 4,000 m. (10 kw.): Express News Service, 06.00-20.00 (daily); lec. (Tues. and Fri., time irr.).

Bremen, 330 m. (1 kw.) Relay from Hamburg.

Breslau, 418 m. (1½ kw.) 10.15, Stock Ex., weather; 11.00, factory con. (weekdays), classical con. (Sun.); 11.55 (Sun.), time sig., weather, Stock Ex.; 14.00, news (weekdays); 15.00, children (Sun.); 16.00, orch., children (Fri.); 17.00, shorthand (Sat.), Mah Jongg (Wed.); 18.30, Esperanto (Mon.), Engl. (Thurs.), lec. (other days); 19.00, con., weather, time sig., news; 20.30, dance (Sun.).

Cassel, 292 m. (1½ kw.) Relay from Frankfurt.

Dresden, 280 m. (1½ kw.) Relay from Leipzig.

Frankfort-on-Main, 470 m. (1½ kw.) 07.30, sacred con. (Sun.); 10.10, Stock Ex.; 10.55, time sig., news; 15.00, children (Sun.), Stock Ex. (weekdays); 15.30, con., women; 16.00, con. (Sun.); 17.00, markets, lec., children (Wed.); 17.30, relay of opera (Fri.); 18.00, lec. (daily), shorthand (Wed.), Esperanto (Fri.); 18.30, educat. hour; 19.00, lec., Engl. (Mon.); 19.30, con. (daily), jazz band (Thurs.); 20.30, time sig., weather, news; 21.00, dance or late con. (not daily).

Hamburg, 395 m. (1½ kw.) Sunday: 07.55, time sig., weather, news, lec., women; 10.00, sacred con., lec.; 12.00, con.; 13.00, chess, lec.; 15.00, children; 16.00, con.; 18.00, Engl. conv.; 19.00, sport, weather, news, con. or opera; 21.00 onwards, as weekdays. Weekdays: 06.25, time sig., news; 07.30, theatre news; 11.55, time sig.; 12.10, Spanish lesson; 14.00, political news, markets; 15.00, women; 15.30, lec., Esperanto; 16.05, orch.; 17.00, con., lec.;

18.25, lec., Engl. conv. (Tues. and Fri.); 19.00, weather, con. or opera; 21.00, weather, markets, news; 21.50, news (in English), dance (not daily).

Hanover, 296 m. (1½ kw.). Relay from Hamburg.

Königsberg, 463 m. (1½ kw.). 08.00, sacred con. (Sun.); 10.15, markets; 11.55, time sig., weather; 13.15 and 15.00, markets; 15.30, children (Tues., Wed., Sat.), orch.; 18.30, lec., Esperanto (Thurs., Sat.); 19.00, con. or opera; 20.00, orch., lec., weather, news, dance (Thurs., Sun.).

Leipzig, 454 m. (1½ kw.). 08.00, sacred con. (Sun.); 10.00, educat. hour (Sun.); 11.00, markets, orch., time sig.; 15.00, markets; 15.30, orch., children (Wed.); 16.30, lec. (Tues.); 17.30, lec. (Tues.), experimenters (Wed. and Sat.); 18.00, lec.; 19.00, lec. (irr.); 19.15, con. or opera, weather, news; 21.00, con. (not daily).

Münich, 485 m. (1½ kw.). 10.30, lec., con.; 13.00, news, weather, time sig., snow forecast; 14.00, con., lec. (Sun.); 15.30, orch. (16.00 Sun.), children (Wed.); 17.00, agric. talk (Mon.), con.; 18.00, lec., Engl. (Mon. and Fri.), Italian (Tues.), Russian (Sat.), Esperanto (Thurs.); 19.30, con.; 20.30, news, weather, time sig.; 21.00, late con. (Sun.), lec. (Tues.), dance (Sat.).

Nuremberg, 340 m. Relay from Munich.

Munster, 410 m. (1½ kw.). 11.00, sacred con., news (Sun.); 11.30, news (other days); 11.55, time sig.; 14.30, markets; 15.00, children (Sun.), lec. (weekdays); 18.40, weather, lec., time sig.; 19.20, women, con. or opera, news, dance (Sat.); 21.00, English, Spanish or Esperanto, news, dance (Sat.).

Stuttgart, 443 m. (1½ kw.). 10.30, con. (Sun., other days irr.); 15.00, time sig., orch., news (Sun.); 16.45, markets, time sig., weather, orch., children (Wed., Sat.); 18.30, lec., English humour (Fri.); 19.00, con. or opera, news; 20.15, time sig., late con.; 21.15, news, etc.

HOLLAND.

Amsterdam (PCFF), 2,125 m. Daily: 07.55-16.10 (exc. Mon. and Sat., when 10.10-11.10), news, Stock Ex., time sig., 09.55 and 16.10. (PX9), 1,070 m.: con., 20.40 (Mon.). (PA5), 1,050 m.: 19.40, con. (Wed.).

Hilversum (NSF), 1,050 m. (1½ kw.). 18.55, children (Mon.); 20.40, lec. and con. (Fri.); 19.40, con. (Sun.).

Ymuiden (PCMM), 1,050 m. 19.40, con. (Sat.).

Vossegat (Bé), 1,050 m. 12.30 and 19.40, weather.

Soesterberg, 1,050 m. 19.26, weather.

HUNGARY.

Buda-Pesth (MT1), 950 m. Half-hourly from 06.45, news, Stock Ex.; 10.00, con.; 11.30 news (daily).

ITALY.

Rome (IRO), 425 m. (2 kw.). 16.00, orch.; 19.35, news, con.; 20.15, lec., con.; 21.00, dance (irr.).

(Radioaraldo), 624 m. (500 w.). 10.30, news; 11.00, time sig., con.; 14.20, Stock Ex.; 19.00, con.

Centocelle (ICD), 1,800 m. (6 kw.). 15.00 and 19.30, news, con.

NORWAY.

Christiania, 440-500 m. Testing, daily, about 19.30.

JUGO-SLAVIA.

Belgrade, 1,650 m. (2 kw.). 17.30, con., news, weather (Tues., Thurs., Sat.), weather, news only (Mon., Wed., Fri.).

PORTUGAL.

Lisbon (Aero-Lisboa), 375-410 m. 20.30, tests, music, speech (irr.).

Monsanto (CTV), 2,450 m. (15 kw.). Tests, music (irr.); 13.00 and 23.00, weather.

RUSSIA.

Moscow, 3,200 m. 13.30, speech or lec. (Esperanto) on last day of each month.

(Concluded on next page)



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The Living Artistes

UNTIL you use a Eureka Concert Grand you will never realise how perfectly music can be broadcast. The Eureka is an exceptional transformer—unique in appearance and without parallel in performance. Its immense windings—more than 2½ miles of wire are used—its non-laminated core—its handsome coppered steel case and hermetically sealed interior—these are features which combine to make it the aristocrat of Transformers.

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Fisher Street, London, W.C.1. *Use Second Stage*

Supreme **EUREKA** for Tone

"BROADCAST TELEPHONY" (cont. from page 201)
SPAIN.

Madrid (EAJ₂), Radio-España, 335 m. 18.00, con.
Madrid (Radio-Iberica), 392 m. 21.00, weather, Stock Ex., time sig., con., news Sunday: 16.30, con.
Barcelona (EAJ₁), 325 m. 17.00 and 21.00, con.
Seville (EAJ₅), 350 m. 18.30, lec., con., news.

SWEDEN.

Stockholm (SASA), 427 m. (500 w.). 18.45, news, con. (daily). Sundays: 10.00, relay serv. from St. James' Church.
Boden, 2,500 m. Testing.
Gothenburg (SASB), 290 m. (500 w.). Will open towards end January.
Malmö (SASC), 270 m. (500 w.). Will open shortly.

SWITZERLAND.

Geneva (HB₁), 1,100 m. (500 w.). 13.15, lec. No Sun. transmissions.
Lausanne (HB₂), 780 m. (500 w.). 07.05, weather; 12.30, weather, markets, time sig., news; 16.00, children (Wed.); 17.55, weather, news; 20.15, con. (exc. Wed.), dance (Thurs. and Sat.).
Zurich (Höngg), 670 m. (W.L. not definitely fixed) (500 w.). 11.00, weather; 11.55, time sig., weather, news, Stock Ex.; 15.00, con.; 17.15, children (Mon., Wed., Fri.); 18.00, weather, news; 19.15, lec., con., dance (Fri.); 21.00, news. Sundays: 15.00 and 19.15, con., news, weather.

A "DAFFODIL DAY" is being organised in London for February 28, on behalf of the Ellen Terry Homes for Blind Defective Children. Offers of help should be addressed to Dame Ellen Terry, 3, Upper Woburn Place, W.C.1.

CHIEF EVENTS OF THE WEEK

SUNDAY, February 1.

London and 5XX	3.0	The Band of H.M. Royal Air Force.
London and 5XX	9.0	De Groot and the Piccadilly Orchestra.
Birmingham	8.30	First Special Radio Service.
Manchester	3.0	Chamber Music and Song.
Newcastle	7.30	Philharmonic Concert.
Glasgow	9.0	Recital by the Bach Choir.

MONDAY

London and 5XX	7.35	Comic Opera Programme.
Birmingham	8.45	The Night Watchman.
Bournemouth	7.35	"Bournemouth calling Italy."
Manchester	7.35	Light Symphony Concert.
Newcastle	7.35	Variety Night.
Belfast	7.35	Welsh Night.

TUESDAY

5XX	7.30	Plays and Chamber Music.
London	7.30	Ballad Concert. S.B. to all stations.
5XX	9.0	Love's Prisoner, relayed from the Adelphi Theatre.
Glasgow	8.0	The Scottish Orchestra.

WEDNESDAY

Birmingham	7.30	Chamber Music.
Bournemouth	8.0	Winter Gardens Night.
Cardiff	7.30	Operatic Evening.

THURSDAY

5XX	7.30	The Dream of Gerontius.
London	7.35	Military Band Programme. S.B. to other Stations.
Newcastle	7.35	"Shakespeare, Scene and Story."
Aberdeen	7.35	Scottish Night.

FRIDAY

London and 5XX	7.30	Popular Classics.
Newcastle	7.30	"By the Glowing Embers."
Aberdeen	7.30	An Evening with the Composer Purcell.

Glasgow	8.30	Old Favourites.
Belfast	7.30	Belfast Philharmonic Society Concert.
Nottingham	7.30	"An Elizabethan Evening."

SATURDAY

5XX	7.30	The Golden Legend.
Birmingham	7.30	The Lord Mayor's Distress Fund Concert.
Cardiff	7.30	"The Spirit of Dickens."
Bournemouth	7.30	The Golden Legend. S.B. to 5XX.
Manchester	7.30	Dickens' Birthday Programme.

EXPERIMENTAL TRANSMISSION" (continued from page 191)

earth, the battery may be directly connected to the counterpoise through the variable C₃.

It is better to omit this connection and to carry a tapping from the inductance to the earth. The oscillator circuit as employed at FL is shown in Fig. 32a.

KENNETH ULLYETT.

(To be continued)

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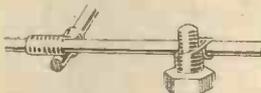
DAILY GRAPHIC

ONE PENNY

RADIO MILLER'S IMPROVEMENTS

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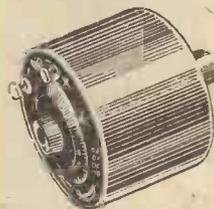
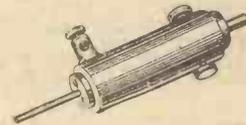
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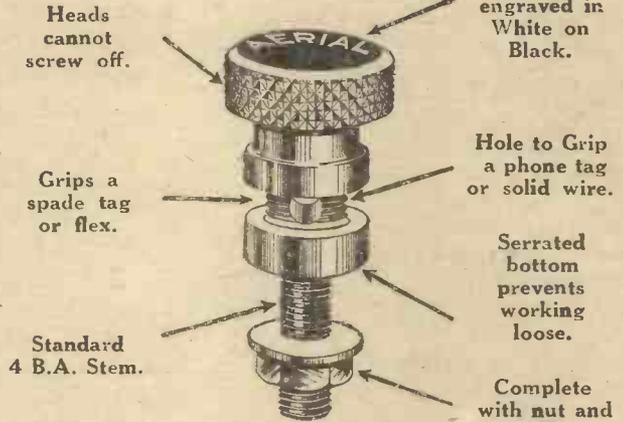
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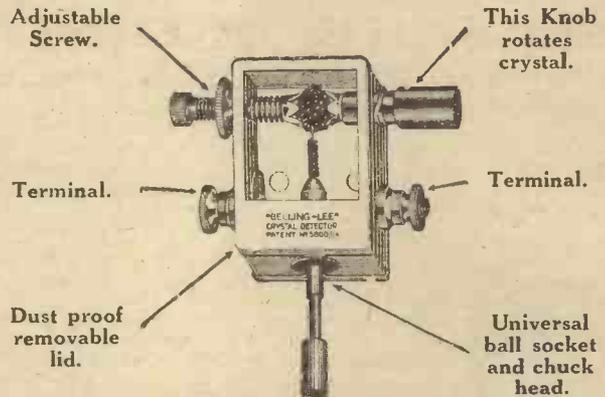
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Sealed Valves

SIR,—With reference to the new method of testing filaments of valves before breaking the seals, may I ask that manufacturers be careful in connecting up in those boxes where two wires are brought to the outside of the box from the filament legs.

A few days ago I had a Cossor valve by post, and upon submitting it to the test could get no current through. As it was required particularly, I broke the seal to satisfy myself that it was useless, and found one of the internal wires nowhere near the valve leg it was intended for.—A. H. W. N. (St. Mary's).

An Emergency Connection

SIR,—With reference to "An Emergency Connection," by S. W., in "A.W." No. 137, this method should not be attempted with transformer-coupled amplifiers.

A little consideration will show that in the latter case the effect of making the connection mentioned would be to short-circuit the H.T. battery through the transformer windings, probably with disastrous results to transformer or battery, or both. Possibly the contributor was thinking only of amplifiers of the resistance or

choke-coupled type, but even with these circuits the H.T. battery will discharge itself through the grid leak, and therefore the method advocated by S. W. should not be used for long periods. The H.T. battery should be disconnected from the set when the latter is not in use.—J. F. J. (London).

"150-700 Metre Crystal Set"

SIR,—With reference to an article entitled "A 150/700-Metre Crystal Set" described in No. 137, I beg to point out a slight error in the diagram Fig. 5, page 103. There is a connection omitted between the variable condenser side of the telephones and the secondary coil s.—H. B. R. (Altrincham).

Russian Broadcasting

SIR,—From the last issue of the Moscow paper *Pravda* to hand (dated January 11) I extract the following programme of the transmissions from the Central Radiotelephonic station for the present week. As the times appear to be regular, this pro-

gramme may serve as a guide for the coming weeks. The wavelength is 1,500 metres.

Sunday, January 11, 3.45-4.30, lecture; 6.30-7.15, news; 7.15-8, concert; 10-11, concert. January 12, 4-4.15, market reports; 6.30-7.15, news. January 13, 4-4.15, market reports; 6.30-7.15, concert. January 14, 4-4.15, market reports; 6.30-7.15, news. January 15, 4-4.15, market reports; 6.30-7.15, concert. January 16, 4-4.15, market reports; 6.30-7.15, news. January 17, 4-4.15, market reports; 6.30-7.15, concert. The times are Moscow time, which is three hours in advance of G.M.T.—H. L. (Chelsea).

Other Correspondence Summarised

W. B. S. (Dornoch, N.B.) would like to know if the church service which he received at 1 a.m. on January 12, on a wavelength of about 380 metres, was transmitted by W G Y, New York.

W. K. (Putney) suggests that a larger section be devoted to wireless in this year's Wembley Exhibition.

O. H. W. (Hants) has obtained excellent results with his one-valve set, built from instructions given in No. 124.

J. W. (11A, Hebers, Middleton, Manchester) has back numbers of "A.W.," which may be obtained from him by any reader desiring them.

P. V. B. (Salop) inquires the identity of 5 SH.

(Continued on page 206)

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and Telephony" ::**

The most Practical Handbook for the
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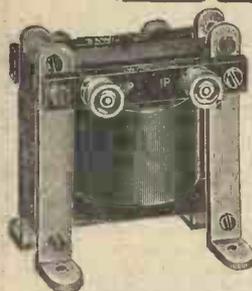
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- 3/16 Ebonite, 6 x 6 and 7 x 5 each 1/8; 8 x 6 and 9 x 6 each 2/6; 10 x 8, 3/6; 12 x 9, 5/-; 12 x 12, 6/-
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.001, .0001, .0005	10d.
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.006, 1, 3; .01, 1, 9; .02, 1, 9.	

H.T. BATTERIES

60 v.	7 6	30 B.C.C.	5 6
30 v.	4 6	9 v.	2 6
60 B.B.C.	3/11		

ACCUMULATORS

2 v. 40 amps.	9 6	6 v. 60 amps.	27 6
4 v. 40 amps.	16 6	6 v. 80 amps.	33 -
4 v. 60 amps.	18 6	4 v. 80 amps.	38 6
4 v. 80 amps.	23 6	6 v. 105 amps.	38 6

Hart's Stocked. All High Quality.

EDISON BELL
.0001 to .0005 Fixed... 1/3
.002 to .006 ... 2/-
.001 ... 1/3
.003 with Grid Leak 2/6
Variometer ... 10/6
Twin Detector ... 5 6

LOUD SPEAKERS
Sterling Dinkie ... 30/-
Dragon Fly ... 25/-
Junior Amplion ... 27 6
Dr. Nesper ... 21/-
Sterling "Baby" ... 55/-
C.A.V. Tomtit ... 30/-

POLAR CONDENSERS
.001, .0005, .0003 each 10/6
2-way CV(junior)stand 6/-
2-way Universal ... 11/-
Others not Obtainable.

STERLING SQUARE LAW
(With Vernier).
.001 ... 30/-
.0005 ... 25/6
.00025 ... 23/-

DR. NESPER HEADPHONES
Adjustable diaphragm, detachable receivers, double leather covered headsprings, long flexible cords, nickel plated parts. Very comfortable fitting to the head.
SEE TRADE MARK.
4000 ohms ... 13/3
Post 6d. pair.

LISSEN
Variable Grid Leak ... 2/6
Anode Resistance ... 2/6
Lissen Minor ... 3/6
Lissenstat ... 7/6
Do. Universal ... 10/6
2-way Switch ... 2/9
Series Parallel ... 3/9
T1 Transformers ... 30/-
T2, 25/-; T3, 16 6; Coils: 25, 4/10; 30, 35, 40, 4/10, 50, 5/-; 60, 5/4; 75, 5/4; 100, 6/9.
5 point switch ... 4/-
Lissen choke ... 10/-
Aux. Res. ... 1/3

DUBILIER FIXED
.001, .002, .003, .004, .005, .006, Fixed ... 3/-
.0001, .0002, .0003, .0004, .0005 ... 2/6
Type 577, .01 ... 7/6
Grid Leaks, each ... 2/6
Anode Resistance 50,000, 70,000, 80,000, 100,000, on stand complete ... 5/6

IGRANIC
Coils: 25, 5/-; 35, 5/-; 50, 5/2; 75, 5 6; 100, 7/-; 150, 7/10; 200, 8/8; 250, 9/-; 300, 9/5; 400, 10/3; 500, 10/6.
Fil. Rheostat ... 4/6
Potentiometer ... 7/-
30-ohm Rheostat ... 7/-

GENUINE N & K
No. 3, Latest Model... 17/6
NEW MODEL "D."
Very Fine Valve.
4,000 ohms ... 15/1
All stamped N. & K.

ALL VALVES ON POST SENT AT PURCHASER'S RISK.

BRIGHT EMITTER
12/6
B.T.H., Ediswan, Marconi, Mullard, Cossor, Myers. Green and Red Ring, etc.

.06, DER, ARDE, etc.
Myers, Cossor, Mullard, Ediswan, Marconi, etc. Valves sent by post (purchaser's Risk)

GOSWELL ENGINEERING
2-way Cam Vernier ... 9/-
3-way " " ... 12/6
3-way Ordinary ... 7/6
2-way Panel ... 3/-
3-way Panel ... 5/-

HEADPHONES
4000 ohms
Sterling ... 25/-
B.T.H. ... 25/-
Brands Matched ... 25/-
Brown's Featherweight 25/-
G.R.C. ... 20/-
Brunet, New Model 16/11
Telefunken ... 17/11

SPECIAL. To callers only. To customers purchasing 20/- worth of our own goods at full prices, we supply a first-class pair of 4,000 ohm phones for 5/- as an advertisement only.

REACTONE COILS
For Chelmsford ... 2 6
For Broadcasting ... 4/6

Terminals ... 1d., 1 1/2d., 2d.
Phone W.O. Pillar
Nickel ditto ... 2d.
Switch Arms, 7 1/2d., with Studs ... 10 1/2d.
Coil Stands 2 way, 1/9, 2 3. 3 way, 3 8 1/2
Cam Vernier, 5 3, 5/6. 3 way, 7/6, 12/6
Valve Holders, 10d., 1/- All makes stocked
Aerial 7/22 100 ft., 1/11. Tape ditto, 2/-
Switches (panel) DPDT 1-, SPDT 10d.
Crystal Sets BBC and 5XX 7/11, 9/11, to
Fibre Strip 36" x 1", 2d. Wander plugs, pr. ... 2d.
DPDT 1/4, SPDT, 10d.; on china base Rheostats C. and S., 1 3; Ormond 1 8
Valves: Dutch, 4 9; "R", 4 9; .06, 11/-; "Metal" R, 6 2; Phillips, 6/11; "Metal" .06, 11 6; Radio Micro ... 11 6
Ebonite Coil Plugs 4 1/2d., 5d.; shaped 7d. up
Basket Holders to 1/-; BBC or 5XX
Basket Coils (5) 25, 35, 50, 75, 100, set 1 9
Flush Panel Sockets and Nuts, 4 for 5d.
Variometers, ... 1/3, 1/6, 2/3, 3/11, 4/6
Ditto Inside Winding, worth 10/-, for 6/11
Micrometer Detector, 1/7; Various 9d. to ... 5/-
Variable Square Law Condenser. 0005 5 11
Chelmsford Coils, 1/-; Holders ... 9d.
Shorting Plug and Socket, 3d.; Grid Leaks ... 10d.
Red and Black Twin Flex 6 yds. 10d.
Doz. ... 1 6
Ebonite Bushes, 1d.; Battery Links, 3 for ... 2d.
H.F. Transformers BBC, 2/6; 5XX 2 9
Valve or Stop Pins and Nuts, ... 2 a 1d.
Valve Sockets and Nuts, ... 1d., 1 1/2d.
Phone Cords, 6 feet 1/-, and ... 1 6
Empire Tape, 6d. doz. yds., Lead-in 10 yds. ... 1/-
Shellac 5d. Rheostat DE or R ... 2/2
Boxes, Special line with lid 8 x 6 ... 2/11
1 1/6 Square Bus Bar Hank 6d., 18 ... 5d.
Bell Wire, 10 yds. ... 6d.
7 Drills ... 1 2
Wonder Aerial 110 feet ... 3 6
(Phosphor Bronze 49 strands)
N. & K. Pattern Phones ... 8 6

K. RAYMOND

WIRELESS DEPOT
27, LISLE STREET, W.C.2
'PHONE' GERRARD 463

No responsibility accepted on post orders unless cheques and postal orders are crossed and made payable to the firm. Moneys sent must be registered

RIGHT OPPOSITE
DALY'S
GALLERY DOOR

HOURS OF BUSINESS:
DAILY - 9 to 7.45
SUNDAYS - 10 to 1

CORRESPONDENCE (continued from page 204)

A. K. (3, Union Road, Tufnell Park, N.7), having back numbers of "A.W." since No. 1, would be pleased to let any reader have which one he requires, providing postage is sent.

"Radio Fan" (Kent) has received all the main stations of the B.B.C. and four Continental stations on his one-valve reflex set.

In a headphone advertisement appearing on page 156 of our January 24 issue, inserted by Messrs. Simpson's (Brighton), Ltd. (Dept. 987), 94, Queen's Road, Brighton, Sussex, a very unfortunate mistake was made. The illustration showed an old-type phone, whereas it should have represented a pair of phones with a distinctly different type of fitting to the headband. As a matter of fact the correct form is shown in an advertisement by the above company to be found on page 107 of the first issue of "The Wireless Magazine," now on sale.

WE REGRET

That, owing to pressure on our space this week, we are compelled to hold over the "Information Bureau" page. All queries addressed to us are answered by post providing a coupon (p. 207) and stamped addressed envelope are sent us.



Ipswich District Radio Society

Hon. Sec.—MR. H. E. BARBROOK, 22, Vernon Street, Ipswich.

At a meeting held on January 4 the secretary reported that, having received several letters from the B.B.C. referring to complaints from listeners-in in the Ipswich district, he recommended that an investigation should be undertaken on the occurrence of "blind spots" and "fading of signals" observed in connection with the broadcasting station, and suggested that observations on these points by amateurs and those interested in broadcast reception might be invited through the society. Reports will therefore be welcomed and should be forwarded to the secretary.

We have received from the above society a "Blind Spots" and "Fading Form," for which we thank them.

Dublin Wireless Club

Hon. Sec.—MR. A. C. BRIDLE, Hillsdene, Portmarnock, Dublin.

A MEETING was held on January 8, when Mr. D. L. Findlay was in the chair. Mr. W. A. Beatty delivered an interesting lecture on "Inductance and Capacity."

Ilford and District Radio Society

Hon. Sec.—MR. F. W. GEDGE, 157, High Road, Ilford.

UNDER the title of "Gadget Night" a most successful and well-attended meeting was held on January 6.

Beckenham and District Radio Society

Hon. Sec.—MR. A. WEST, 3 Manor View, Beckenham. The above society is holding an exhibition, and full particulars may be obtained from the secretary.

Coventry and District Co-operative Radio Society

Hon. Sec.—MR. A. CURTIS, West Orchard, Coventry. On January 15 the chairman, Mr. F. Clegg, lectured on a circuit suitable for a three-valve receiver for loud-speaker work, and concluded with a demonstration. Two types of loud-speaker were tested, one the usual trumpet type and the other of the pleated-paper pattern, which gave the members an opportunity for comparing the merits of each. Officers for the year commencing next June were elected.

Hackney and District Radio Society

Hon. Sec.—MR. G. E. SANDY, 114 Parnell Road, E.3. The annual general meeting was held on January 5, when officers were elected for 1925. The remainder of the evening was devoted to a sale of the society's spare apparatus.

Groydon Wireless and Physical Society

Hon. Sec.—MR. H. T. P. GEE, 51 Chancery Lane, W.C.2.

ON January 13 Mr. A. T. Dale opened a discussion on "The Operation and Characteristics of a Valve." He explained the part played by electrons in the operation of the thermionic valve. Mr. C. Harrison also brought along some special basket coils of the type on which New Zealand has been successfully heard. He explained their construction.

ANNOUNCEMENTS

"Amateur Wireless and Electrics." Edited by Bernard E. Jones. Price Threepence. Published on Thursdays and bearing the date of Saturday immediately following. It will be sent post free to any part of the world—3 months, 4s. 6d.; 6 months, 8s. 9d.; 12 months, 17s. 6d. Postal Orders, Post Office Orders, or Cheques should be made payable to the Proprietors, Cassell & Co., Ltd.

General Correspondence is to be brief and written on one side of the paper only. All sketches and drawings to be on separate sheets.

Contributions are always welcome, will be promptly considered, and if used will be paid for.

Queries should be addressed to the Editor, and the conditions printed at the head of "Our Information Bureau" should be closely observed.

Communications should be addressed, according to their nature, to The Editor, The Advertisement Manager, or The Publisher, "Amateur Wireless," La Belle Sauvage, London, E.C.4.

BROWN A₂ REED TYPE 21/- EARPIECES EACH

or complete with headbands and cords, 42/- per pair. These are brand new unused goods not Ex W.D. Suitable for making the "Amateur Wireless" Pleated paper Loudspeaker as described in "A.W." October 25th, 1924, gives wonderful results. 3" Lengths of wire screwed to fit reed with nut to lock, 6d. each. **GOODMAN'S, 78, SPENCER RD., WEALDSTONE.** SEE PAGE 208 FOR LOUDSPEAKER ATTACHMENTS



This is the way to increase your salary

"You will be pleased to hear that my salary has been doubled and that this goes with an appointment on the Architectural Staff of perhaps the most important public body in London. I can only attribute my success to your admirable tuition."

Many thousands of such messages from grateful students have been received by the International Correspondence Schools, the originators of

SPARE-TIME STUDY BY POST

The I.C.S. Diploma is known, valued, respected in every country. It is an insurance against unemployment and wins prosperity and happiness for its owners.

Sir Harold Bowden, Managing Director of the Raleigh Cycle Co., Ltd., Nottingham, says:

The Diploma of the I.C.S. in the hands of an ambitious man can carry him far, as it has carried thousands. To possess this qualification is proof of a sound, thorough, and specialised education in the subject representing that man's vocation.

The I.C.S. originated spare-time technical training by post 33 years ago, and is by far the largest institution of its kind in the world. It has teaching centres in eleven countries, and students in fifty.

Write to-day for full information as to how the I.C.S. can help you in your chosen vocation. There are 300 I.C.S. Courses, of which the following are the more important groups:

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| Advertising | Engineering | Salesmanship |
| Architecture | (all branches) | Showcard Writing |
| Building | French and Spanish | Textiles |
| Commercial Art | General Education | Window Dressing |
| Commercial Training | Plumbing | Woodworking |
| Draughtsmanship | Professional Exams. | Wireless Telegraphy |

International Correspondence Schools, Ltd.
160 International Buildings, Kingsway, London, W.C.2.

THE CRYSTAL SUPREME

VALPO

THERE is no question about it! "VALPO" stands in a class alone above all other Crystals. Test ours and you will hear the proof of our pledge. Read what the following eminent gentlemen say:—

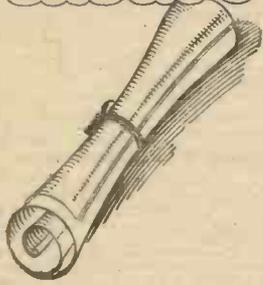
Henry C. Braun, Esq., the well known expert and scientist writes:—"I tested practically all the advertised Crystals under identical conditions. As a result I have now adopted the 'VALPO' Crystal for research and experimental work."

Messrs. Holmes & Jameson of the Wireless Laboratories say:—"A general sensitivity test proved that of 36 points selected on a 'VALPO' Crystal 97 per cent. were sensitive to a high degree."

PRICE 1/6, Complete with Silver Catwhisker. Of all reliable Wireless Stores, or post free direct from—
MERTON DAVIS, PARNELL & CO.,
359 STRAND, LONDON, W.C.2.

Trade Enquiries Welcomed. Phone: Regent 4232.
Agents:—Birmingham: Priestly and Ford, 3, Carrs' Lane; Belfast: Saffern and Co., Ltd., Shankhill Road.

Insure against loss



EVERY wise man insures against loss, whether it be by fire or burglary—whether it be at his home or his place of business.

And so it should be in Radio. You can suffer severe losses in signal strength through a low grade leaky panel. Currents which should only travel along the wires in the circuit arranged for them can make short cuts across the panel and spoil the results,

The only certain remedy is to make sure that your panel is of the finest possible quality. That is why it will pay you to use panels of Red Triangle Ebonite—for we can positively guarantee them leakproof and able to withstand all the most rigorous tests possible to apply. Sold only in sealed envelopes in a smooth velvet finish ready for immediate use without tedious sandpapering.

If your dealer is out of stock, send your order direct, we can despatch by return of post.

Remember!

Even experts admit that it is impossible to judge the electrical qualities of ebonite by its appearance. Be wise therefore, and insist on seeing the Red Triangle label on the package before you buy. There is none "just as good."

12 Stock Sizes :

6 x 8	3/-	7 x 10	4/3	8 x 12	6/-	12 x 14	10/6
6 x 18	8/-	8 x 6	3/-	10 x 12	7/6	12 x 16	12/-
7 x 5	2/3	8 x 10	5/-	10 x 24	15/-	12 x 18	13/6

All 1/4-in. Thick and Sold in Sealed Envelopes.

Special Sizes :

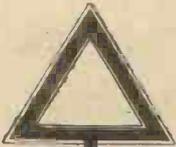
All Concert-de-Luxe, 16 x 8 x 1/4	8/-	Resistoflex, 12 x 8 x 1/4	6/-
Transatlantic V., 22 x 11 x 1/4	15/-	Anglo-American, 36 x 9 x 1/4	20/-
All Britain, 16 x 9 x 1/4	9/-	Neutrodyne Tuner, 12 x 10 x 1/4	7/6
S.T. 100, 12 1/2 x 9 1/4 x 1/4	7/-	Neutrodyne Receiver, 12 x 10 x 1/4	7/6
Puriflex, 14 x 10 1/4 x 1/4	9/2	3-Valve Dual, 24 x 10 x 1/4	15/-
Transatlantic IV., 16 x 8 x 1/4	8/-	Harris Crystal Set, 9 x 5 1/4 x 1/4	4/4

Any Special Size Cut per return at 1/4d. per Square inch.

PETO-SCOTT Co., Ltd.,

Registered Offices, Mail Order and Showroom,
77, CITY ROAD, LONDON, E.C.1.

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



Red Triangle Ebonite

P.S. 2166



THE only Genuine American Crystal on the British Market. It has been used by the American public for over 5 years. Price per box - - 1/6

B. METAL RADIO CRYSTAL

Mined, tested and packed by the Dayton Radio Mfg. Co., Dayton, Ohio.

Wholesale Agent for London & district : P. BERNEY, 35, Oxford Street, London.

Sole European Distributors : LONDON RADIO STORES, 11, BATH STREET, GLASGOW.

AGENTS WANTED IN ALL BROADCAST AREAS.



The light car of LOUDSPEAKERS



A motoring expert of my acquaintance once told me that he always mentally classified motor cars in three categories—Cars, Light Cars, and the smaller fry, which, he used to say, looked more like motorized perambulators than anything else.

As a Loud Speaker expert it struck me that in this line a very similar state of things existed.

You have the full-size Loud Speaker, the Fellows Junior, and the smaller fry which you can hardly recognize as Loud Speakers, and usually consign to the nursery. In fact, the children like them very much.

When I run round to any friends of mine who aren't lucky enough to have wireless, I always take my Portable Three and the Junior with me. Just to give them a bit of a concert.

And unless I tell them, they don't dream for an instant that the Junior isn't a full-sized instrument. After all, why should they ?

It's over 18 inches high, it has an adjustable diaphragm, its volume fills any ordinary-sized room with ease, and its tone is perfect.

Its appearance, too, is just the same as any of the big speakers, and it's not so very much smaller either. Its price, though, is—

Only 30/-

Nucleo Fellows



Yeates, Ltd., 20, Store St., Tottenham Court Road, London, W.C.1. Well equipped demonstration and Sales offices of Fellows Wireless Products. Wholesale and Retail.

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

E.P.S.96

Amateur Wireless

COUPON Available until Saturday, February 7th, 1925

Three of the Best —

HERE are three of the very best. Real Master Valves for perfect long-distance and pure tone reception.

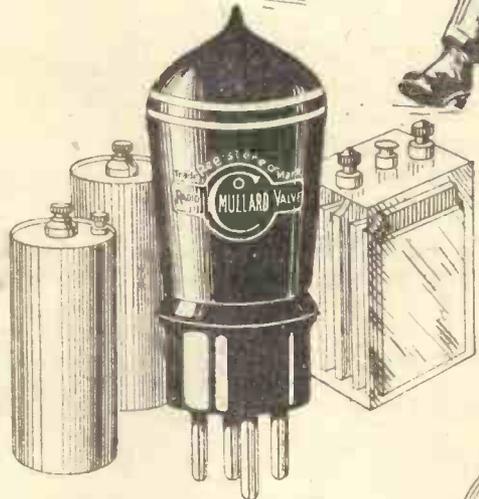
Make your own choice, and be assured of valve satisfaction.



BRIGHT FILAMENT VALVES.

(for 4-volt batteries).

Mullard H.F. Red Ring Valves for H.F. AMPLIFICATION AND DETECTION ... 12/6 each
 Mullard L.F. Green Ring Valves for L.F. AMPLIFICATION 12/6 each
 (Recommended for Reflex and Dual Circuits)
 Leaflet M.8 gives full information.



DULL FILAMENT VALVES.

Mullard H.F. Double Red Ring Valves for H.F. AMPLIFICATION.

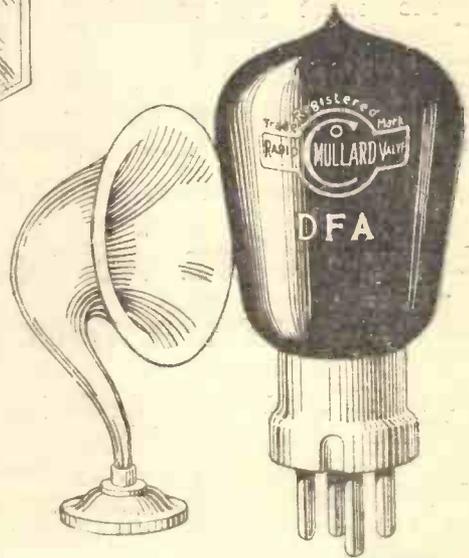
Type D.3 for accumulators ... 21/- each
 Type D.06 for dry cells ... 25/- each

Leaflet V.R.20 gives full information.

LOUD-SPEAKER VALVES.

Mullard D.F.A.0 for 4-volt batteries ... 30/- each
 Mullard D.F.A.1 for 6-volt batteries ... 35/- each

Leaflet V.A.4 gives full information.



ALL THESE VALVES BEAR THE HALL MARK OF

Mullard

THE MASTER VALVE

LISSENIUM

Have your receiver ready to search for distant stations

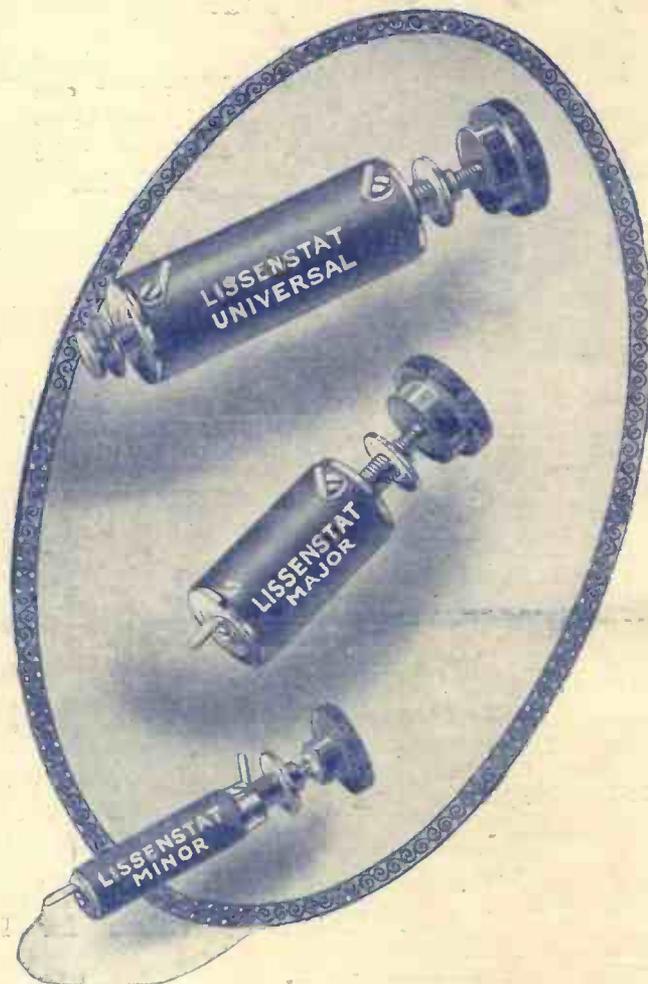
Make it so by fitting LISSENSTAT control. This splendid device gives greatly improved control of fine detection, so absolutely essential in tuning in on long-distance telephony LISSENSTAT control is smooth, finely graduated, noiseless all the time—so perfectly can you control the electron emission of your valve that you are able to get right on to the very spot you want. And after finding it, you can leave the LISSENSTAT, and the current flow will be constant and unfluctuating.

WITH LISSENSTAT CONTROL YOU CAN FEEL FOR THE POINT OF CRITICAL DETECTION—AND UNERRINGLY FIND IT.

LISSENSTAT MINOR (patents pending) is replacing many thousands of inefficient rheostats, provides LISSENSTAT control at a popular price ... **3/6**

LISSENSTAT MAJOR (patents pending) gives the most acute tuning possible ... **7/6**

LISSENSTAT UNIVERSAL (patents pending)—with its protective device for dull emitters ... **10/6**



The distinction between a good leak and a poor one.

With an indifferent variable grid leak the charge left on the grid will leak away too quickly, and poor detection will result. You can be sure of getting every shade of sensitivity by fitting the LISSEN Variable Grid Leak—the charge which accumulates on the grid can be closely regulated so that the free negative grid potential is always at the correct value for the best operation of the detector.

Smooth out your loud speaker distortion by putting a Lissen Variable Grid Leak across the secondary of the last transformer, or across the loud speaker itself—first position is better.



Every value required of a leak is minutely covered. LISSEN ONE-HOLE FIXING, OF COURSE **2/6**

LISSEN VARIABLE ANODE RESISTANCE, 20,000 to 250,000 ohms ... **2/6**

Don't Mix your Parts— there is a LISSEN part for every vital place.

Advertisement of LISSEN LIMITED, 16-20, Woodger Road, Goldhawk Road, Shepherd's Bush, London, W.12.