

LONDON'S NEW STATION—SPECIAL ARTICLE

A DISTORTIONLESS LOUD-SPEAKER SET

Amateur Wireless And Electrics

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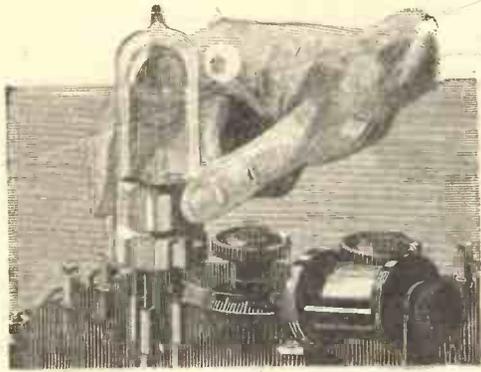
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THE one principal factor that determines the length of life of any valve is the temperature at which the filament is run. If such a discovery were possible, a "cold" valve requiring no heat—from electric batteries or otherwise—to drive off its electron stream would possess an indefinite life.

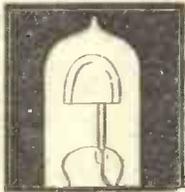
* * * * *

It was with this thought at the back of our minds that we set about designing the Wuncell Valve. At all costs filament temperature must be kept down to the very minimum. That our efforts have been crowned with complete success can be gauged from the fact that when the Wuncell is working in daylight its glow is practically invisible—while even in the dark it is merely comparable to the dull red embers of a dying match.

* * * * *

Wuncell exclusive advantages featured:

No. 2



THE patent features which have built up such a reputation for Cossor Bright Emitter Valves are fully retained in the Wuncell. As every experimenter knows, the whole secret of valve reception depends on the correct use being made of the electron emission from the heated filament. In Valves with ordinary straight filaments much of this emission escapes from each end of the tubular Anode. In the Cossor, however, the hood-shaped Anode almost entirely encloses the Grid and the arched filament. Little, if any, of the electron stream can escape.

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* * * * *

The Wuncell Valve gives exceptional results because it has been built upon radically different lines. Instead of obtaining low consumption by thinning down the wire used in the filament at the risk of fragility, the Wuncell filament has been specially manufactured to throw off a greatly increased electron emission. As a result, considerably less heat (or battery current) is required to operate it.

* * * * *

Before you buy your next Valve be sure to see the Wuncell. Examine the filament for yourself—compare it with any other Dull Emitter and you will readily understand why it has such a phenomenally long life. After all, it is the length of time that a valve lasts that will count most with you.

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W.1 For Detector or L.P. Amplifier
W.2 (With red top) for long distance reception
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W.R.1 Corresponding to W.1
W.R.2 Corresponding to W.2
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*Fitted with internal resistance so that Valve can be used with 2-, 4-, or 6-volt Accumulator without alteration to Set.

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* * * *

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Amateur Wireless

and Electrics

Vol. VI. No. 144

March 7, 1925

SELECTING A VALVE

WHEN one goes to the average retailer to purchase a valve one does so all in good faith, for it is difficult to persuade that individual to test other than the filament of any valve selected. Of course this is one of the most delicate parts of the valve and liable to fracture,

receiver and probably produce hissing and crackling noises. For this test a megger or some other form of insulation-testing set should be used. With this, the insulation resistance between the filament and grid and between the filament and plate should be tested, when the former should exceed 15 megohms and the latter 10 megohms.

trace of gas left in the valve, electrons will start from the filament to the anode, but during their passage will collide with gas molecules which will cause one or more electrons to be forced out of these molecules. These electrons will join with the general stream towards the anode.

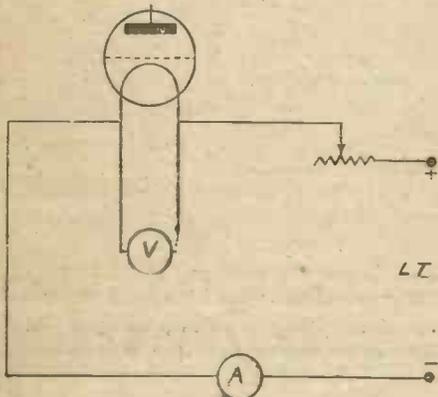


Fig. 1.—Test for Current Consumption.

but a valve can be perfect in its filament and yet be worse than useless when put into a receiver. In the circumstances details of a few tests which can be made will no doubt be of interest to readers of this journal.

Simple valve tests can be divided into two classes, (a) mechanical and (b) electrical. The mechanical tests are chiefly of a visual character, as noting the disposition of the electrodes. It may be found that filament and grid are in contact or that the anode is displaced, and in this latter connection it should be remembered that the spacing of the electrodes is chiefly responsible for the shape of the characteristic curve. Sometimes we find that the anode and grid supports are weak and actually break away or become displaced on gently tapping the glass bulb. Details of a few electrical tests are given below, but no attempt has been made to cover testing the characteristic curves, as it is felt that these do not come within the scope of this article.

Insulation Test

Sometimes the insulating material on which the four connections are mounted is faulty. Such a fault would cause very poor results when the valve was used in a

Filament-current Test

With valves of a similar type the filament current for a given voltage should be the same within narrow limits. Fig. 1 shows the connections for making a test to prove this; the diagram is otherwise self-explanatory. Insecurely attached filaments can be detected during this test by tapping the valve, when the fault will make itself apparent by a varying current being shown on the ammeter.

Backlash Test

This test is made in order to ascertain the degree of the vacuum of the valve, which is another main factor in the characteristic curve. The testing circuit is shown in Fig. 2. Now a valve with a perfect vacuum will allow all the electrons emitted from the filament to be attracted to the anode, which is positive with respect to the filament. The grid of the valve in the circuit shown, having a negative

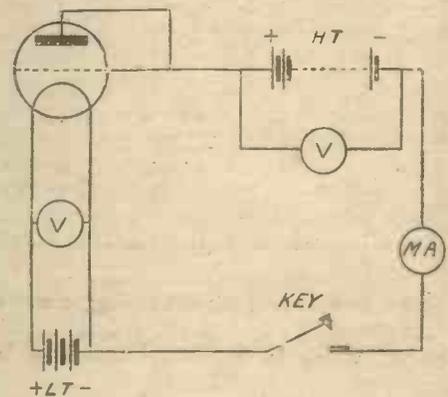


Fig. 2.—Backlash Test.

This causes the gas molecule to become positive, due to the freed electrons, which are now attracted towards the grid, resulting in a current flowing in that circuit which is indicated by the galvanometer. Thus the amount of current in the grid circuit will register the amount of gas present in the valve.

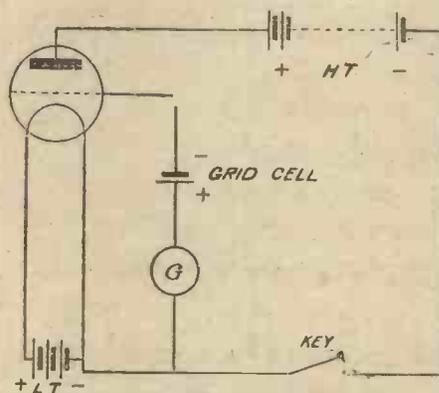


Fig. 3.—Electron-emission Test.

potential due to the cell provided for the purpose, chokes the emission to a certain extent and no current will flow in the grid circuit due to the repulsion of electrons from it. If, however, there is a slight

Filament-emission Test

Any given filament of particular construction will emit a definite number of electrons proportional to the temperature of the filament for a known value of high tension on the anode. The connections for this test are shown in Fig. 3, from which it will be noted that the grid and anode are connected together and a high-tension battery of known voltage connected between the anode and negative end of the filament. A key and milliammeter is also connected in this circuit. If the key is closed the circuit is completed and a current due to the electron emission flows and is indicated by the milliammeter. A given emission for a known value of anode volts is kept as a standard.

The foregoing tests are the more important, and it is hoped these few remarks will enable experimenters to test their valves.

S. J. M.

TUNED EARTH CONNECTIONS

IN these days of many thousand miles reception on one valve it is detail efficiency that counts, and one of these details well worthy of attention is an efficient low-resistance earth connection.

Trouble taken over this point not only gives greater signal strength, but, what is more important, it improves selectivity. It is in the matter of fine tuning that the amateur scores who has a low-resistance aerial-to-earth circuit.

Multi Earth Connections

Now it is often found, where trouble has been taken to obtain a number of different earth connections, that the results obtained by using them all in parallel are no better than—indeed in some cases distinctly inferior to—those obtained when one alone is used. The reason for this is not difficult to discover. As the different earth wires vary in length, so will their natural wavelength vary, so that when all the earth leads are attached to the set, the high-frequency oscillations in the aerial will be offered several alternative paths of different frequency to earth. This, as is well known, leads to inefficiency and broad tuning.

Now how should we tune all our earth connections up to the same natural wavelength, which is, in fact, often done in the case of transmitting sets. This can be effected either by putting condensers

in series with the longer earth leads, or by adding inductance to the shorter ones. The latter method, which is that used by the writer, is the cheapest and perhaps the best. The coil *L* (see diagram) may conveniently be a helix of bare aerial

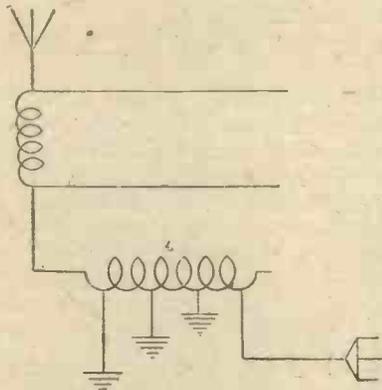


Diagram showing Tuned Earth Leads.

wire, and if this is made 5 or 6 in. in diameter twenty turns will be ample. One end of this coil should be connected to the earth terminal of the set. The different earth leads may now be temporarily attached to the coil by means of clips at varying distances from the end, the earth with the shortest lead requiring most inductance in series with it.

If a counterpoise is also being used,

this will require most inductance of all in order to bring it into balance. The most difficult part of all is getting the earths into balance, and to do this the experimenter will have to rely on his own judgment to a certain extent.

Earth Leads in Tune

Apart from the fact that the shortest earth lead and the counterpoise will need the most inductance in series with them, the only guide as to when the earths are all in tune with each other is that the tuning of the set will be finer, signal strength slightly greater (especially on a crystal), and the set will oscillate more readily. Another result will be the possibility of reception on shorter wavelengths than before.

The writer uses a buried earth (an old galvanised pail), a main water-pipe and two other water-pipe connections, a gas-pipe and a counterpoise. The counterpoise requires most turns in series with it, next comes the buried earth, then the main tap earth, after that the two other water-pipe connections, and finally, with least inductance of all, the gas-pipe. Using a direct-coupled single-valve set, 100-ft. single-wire aerial, and this multiple earth connection, the writer is able to tune down to KDKA without any trouble.

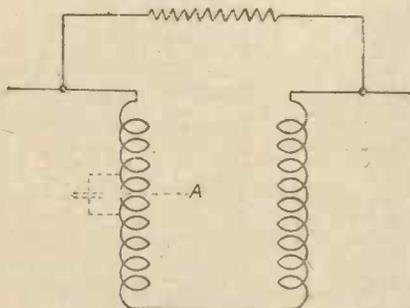
R. H. J. McC.

LOUD-SPEAKER "BURN-OUTS."—A REMEDY

HERE is a tip for anyone unfortunate enough to have his loud-speaker "burn out" in the middle of a particularly interesting programme. The idea is to connect a high-resistance, or a choke coil of high impedance, across the terminals of the instrument, which will in many cases start working again in a way which may at first seem very puzzling. A variable anode resistance (of the compressed carbonised pellet type) screwed up to the position of least resistance or the secondary winding of an old intervalve transformer may be pressed into service. Sometimes even placing the fingers across the loud-speaker terminals will have the same effect, although this is apt to be rather painful if a power valve with a good high-tension voltage is being used for low-frequency amplification.

The reason why this idea is effective can be best explained by reference to the diagram, which represents the magnet coils of the loud-speaker. If the wire breaks about the middle of one of these coils

(which it generally does), say at the point marked *A*, the path of the direct anode current necessary for the functioning of the valve is broken, and consequently



Method of Remedying Defective Loud-speaker.

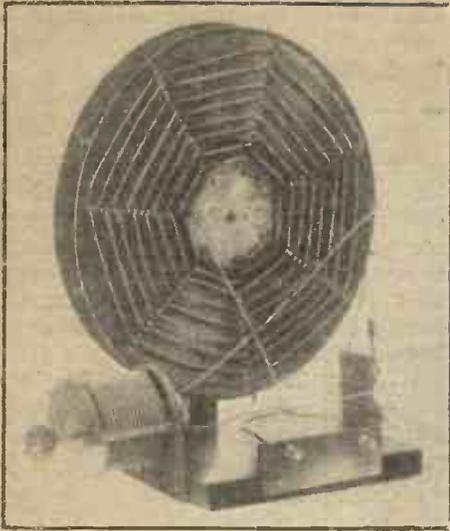
nothing is heard from the instrument. Now this winding consists of several thousands of turns of fine enamelled or otherwise insulated copper wire lying in close proximity to one another. Therefore if the winding is broken about the middle

the capacity between the two halves is quite considerable owing to the thinness of the insulating medium and the comparatively large surface of the copper exposed. This capacity (shown dotted in the diagram), while offering no path to direct current, will pass fairly easily the audio-frequency pulsations normally present in the anode circuit and which affect the loud-speaker diaphragm at sound frequencies. The effect, then, of connecting a resistance or choke across the loud-speaker is to allow the direct current from the high-tension battery to flow through the anode circuit of the valve, while choking back to a great extent the undulations in this current which work the loud-speaker.

R. H. J. McC.

Your lead-in counts in the wavelength of your aerial. Be sure it is well insulated.

It is a good idea to have a series-parallel switch for your aerial condenser.



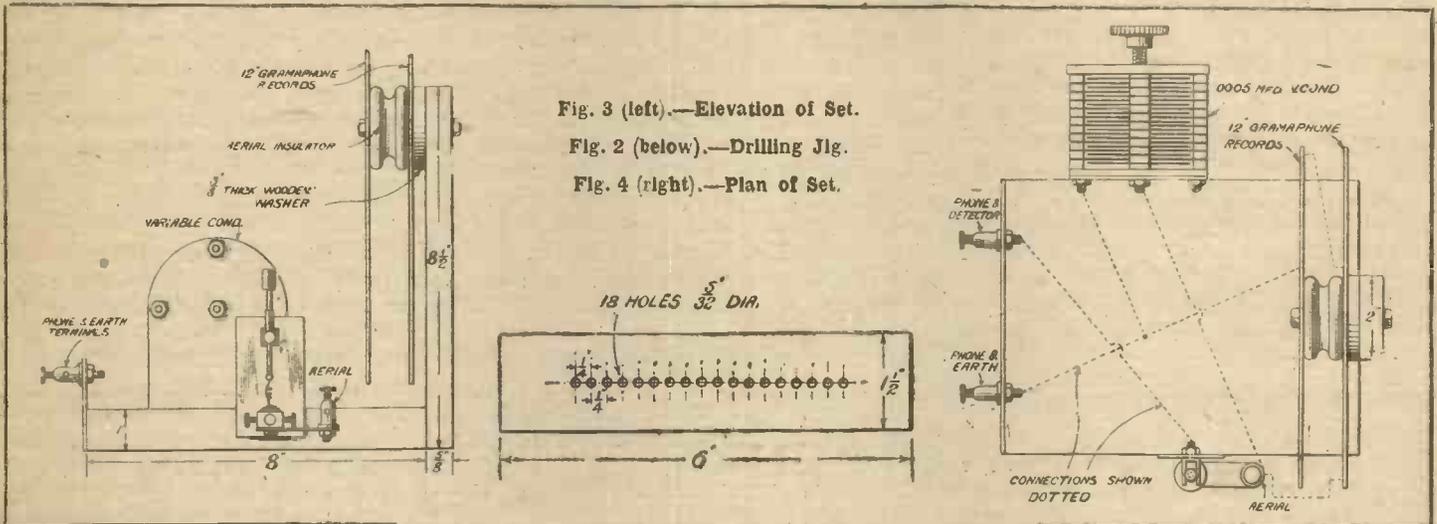
CRYSTAL SET WITH MULTI-STRAND INDUCTANCE



MUCH has been heard lately about the efficiency of multi-strand wire for carrying high-frequency currents compared with ordinary single-strand wire. The crystal set shown has coils which are wound with 7/22 bare aerial wire. The

site side of the record to prevent the drill breaking the record when it comes through. The jig and the backing piece of wood are clamped in position or held in a vice during the drilling operation. The 7/22 bare aerial wire is then laced

through the holes so as to form a basket coil, starting at the outside and leaving about 6 in. at the start and finish for connecting up. Both coils are wound in the same direction, and mounted with the windings in the same direction, on the



winding of the coils requires a good deal of patience, but the results obtained from the set are the loudest that the writer has heard. Ordinary flexible wire would be equally suitable.

The formers for the coils are two 12-in. diameter gramophone records, each record having seven equally spaced radial rows of holes drilled in it as shown in Fig. 1. There are eighteen holes in each row $\frac{5}{32}$ in. in diameter and $\frac{1}{4}$ in. pitch. The holes were drilled by means of a simple jig made out of a piece of three-ply wood (Fig. 2). The holes were first marked off and drilled in the piece of wood, which is then used as a jig for drilling the records.

The jig is placed in position for the first row of holes on the record, and a $\frac{1}{2}$ -in. thick piece of wood is placed on the oppo-

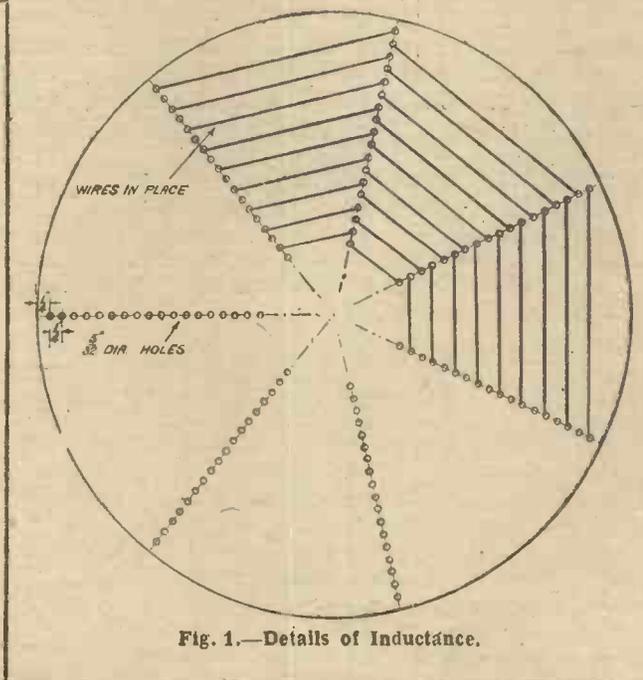


Fig. 1.—Details of Inductance.

wooden upright as shown in Fig. 3, an ordinary bobbin aerial insulator being used to keep the coils separate. A piece of 2 B.A. screwed rod and two nuts are used to fix the complete assembly to the upright.

The only other parts required to complete the set are a crystal detector, two telephone terminals and a .0005-microfarad variable condenser. These are mounted on pieces of gramophone record, which are in turn fastened to the baseboard, which is 1 in. thick and 8 in. square.

The completed set is shown in Figs. 3 and 4 and the photographs.

The wiring throughout is carried out with 7/22 aerial wire.

Either of the circuits shown in Figs. 5 or 6 can be tried out by having suitable wander clips

(Concluded at bottom of next page)

RECORDING YOUR MORSE

THE recorder which it is proposed to describe in the following article will doubtless appeal to amateurs on account of its simplicity of construction; this at the same time is combined with a high degree of efficiency. As will be seen, it makes use of the reed phone described in No. 123 of "A.W."

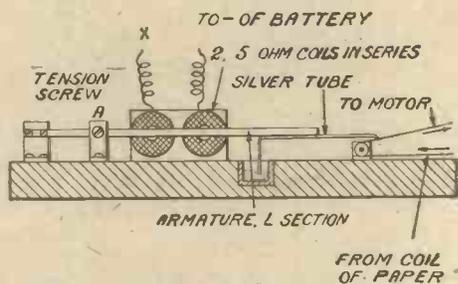


Fig. 1.—Sectional Elevation of Recorder.

Its cost is trifling, since practically everything required for its construction can be found on every amateur's workbench. At the present time there is much scope for the recording of morse transmissions, since there are always high-power, high-speed stations working, and many amateur stations, for those who are favourably situated. For those who do not know morse much of the interest of wireless is lost when they hear these transmissions and cannot understand them. With this recorder and any efficient two-valve set, good reproduction is obtained from most of the European high-power stations.

At speeds as slow as thirty words per minute recording is done with ease, while with a little care and delicate adjustment speeds up to one hundred words a minute can be obtained. This instrument is the result of a considerable amount of experimenting in order to simplify it as far as

possible. The recorder, as stated, employs the reed phone as a relay. If desired, a Brown "A"-type phone can be used instead.

Operation

The telephone is operated directly from the receiver, each dot or dash causing a short or long buzz in the relay and thus causing a temporary increase in the average resistance at the relay contacts. This variation in resistance is sufficient to serve the purpose, and is more easily obtained than a definite make and break.

The movement of the pen is controlled by a P.O. buzzer magnet and a light steel armature. Fixed at one end of the latter is a short length of silver capillary tube. The armature is under gentle tension away from the pole ends, being adjusted by the tension screw A (Fig. 1). The silver tube is soldered to the armature, and is so shaped that one end dips into the ink in the pot, while the other rests on the paper strip as nearly perpendicularly as possible.

A second-hand gramophone motor is used for drawing the tape along, and guide pulleys are provided, that nearest the pen being adjustable so as to enable the pressure of the pen on the paper to be varied. The extension fitted on the phone reed is made of very thin sheet brass, .008 in. thick, bent U shape. This gives a light but rigid arm. The other arm of the relay is made of brass sheet .01 in. thick, small silver contacts being fitted to each arm. Further details of the relay can be gathered from the sketch Fig. 2.

It will be found that a movement of $\frac{1}{16}$ in. at the pen point is required to give clear readable signals.

The ink was an item which at first gave much difficulty. Ordinary ink is useless, as it dries in the pot and in the pen,

leaving sediment. The best results are obtained from a mixture consisting of $1\frac{1}{2}$ oz. of glycerine and as much $\frac{1}{2}$ in as can be piled on a threepenny piece. This has been standing now for five months with the occasional addition of a few drops of water.

When not in use a pot should be placed

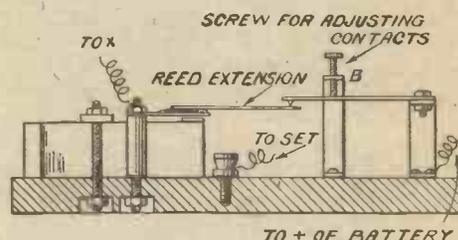


Fig. 2.—Sectional Elevation of Relay.

beneath the pen-point to catch the ink, which slowly siphons out at the rate of one drop every eight or ten hours.

A 1-volt dry cell is found sufficient to work the pen. The magnets consist of two 5-ohm coils in series wound on soft iron pole-pieces.

The Recorder in Use

The method of operating the recorder is as follows: The fixed contact on the relay is advanced by means of the screw B (Fig. 2) until the circuit is just closed on "no signals." Upon the fineness of this adjustment depends the efficient working of the instrument. The local-circuit current is switched on and the armature is drawn over to the magnet poles. As stated above, signals will cause vibrations at the relay contacts, thus reducing the current in the local circuit and releasing the armature. As each signal ceases the pen returns to its normal position, giving an undulating record.

With the above remarks for guidance a very efficient recorder can be made without any expense or intricate material. It could be improved in several points of detail, which will doubtless suggest themselves to those who may construct this instrument. In conclusion I may say that an identical instrument to the one described above has functioned successfully on my two-valve set (1 H.F., 1 Det.) for the past six months.

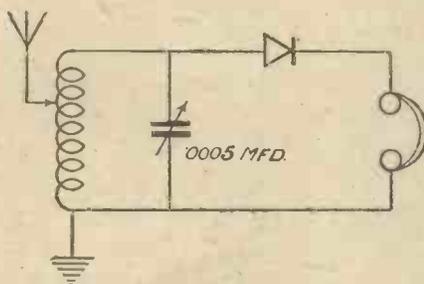
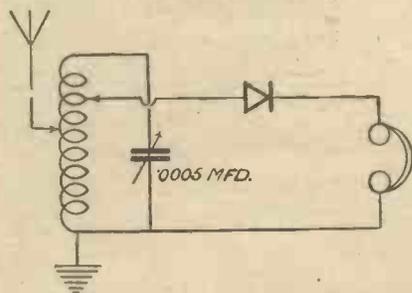
W. B. T.

"CRYSTAL SET WITH MULTI-STRAND INDUCTANCE" (Continued from preceding page.)

on the aerial lead and the metal crystal cup. The circuit Fig. 5 has already appeared in "A.W.," but without the variable condenser, and this addition considerably improves the tuning, which is very sharp.

The results, as stated before, are very good, and on an outside single-wire aerial 45 ft. long and three miles from 5 SC the signals are audible about 8 ft. from the telephones.

D. P. M.



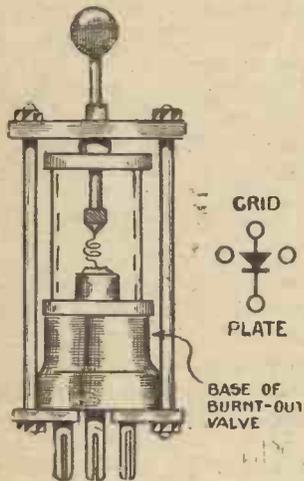
Figs. 5 and 6.—Two Circuits suitable for the Crystal Receiver.

Many people think that since Mr. George Grossmith has been appointed to advise on the programmes side of the B.B.C., Mr. Arthur Burrows is not taking the same active interest that he was. Mr. Burrows continues, however, as director of programmes of the B.B.C. He is almost the only official on the programmes side that has not changed his duties since broadcasting began.

PRACTICAL ODDS AND ENDS

Plug-in Detector

A CRYSTAL detector of the plug-in type is very convenient if the valve should burn out, as the detector can be plugged in the valve holder.



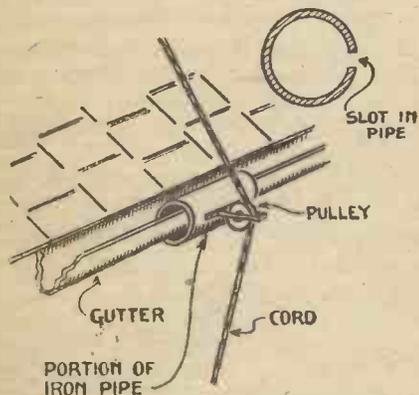
Plug-in Detector.

A simple detector of this type is shown in the diagram. The method of construction is clearly shown, and a diagram of connections is given. It is, of course, necessary to remove the H.T. battery from the circuit and short-circuit the H.T. terminals.

A. B.

An Aerial Tip

WHEN the aerial pulley is fastened to a chimney-stack it is often difficult to prevent the aerial cord from fouling the gutter.



Fixing the Aerial Cord.

A small pulley bolted on to a short length of slotted iron pipe will prevent any swaying of the cord. The pipe is

slipped over the edge of the gutter, and the pulley will then keep the cord in place. The slot should not be made too large or the pulley arrangement will not be a fixture.

The diagram should be self-explanatory.
M. B.

Soldering Fine Wires

DIFFICULTY is often experienced in attempting to solder two fine wires, especially when a soldering-iron having a large bit is employed.

The best plan is to place a small piece of tinfoil round the joint, dab on some flux and flick a lighted match underneath.

The heat of the match will be sufficient to melt the "solder," and a firm job should result.

L. C.

A Crystal Hint

AFTER a lengthy search for the sensitive point on a crystal it is very annoying when the catwhisker is jogged out of position and the search has to be carried out all over again. Many crystals suffer from the disadvantage that they possess but few sensitive spots, but the fact that these spots are good makes it worth while to retain the specimen.

When a successful search for the sensitive point has been made, some method is desirable in order to keep it.

A drop of sealing-wax should be put on the crystal after the catwhisker has been placed in position on a sensitive spot, care being taken that the detector adjustment is not disturbed. Provided that the wax is not put on too hot, no ill-effects will be caused, and a permanent detector will result.

K. U.

A Novel Loud-speaker

A MATEURS who are interested in the reproduction of pure undistorted speech may be interested in this type of Johnsen-Rahbek loud-speaker.

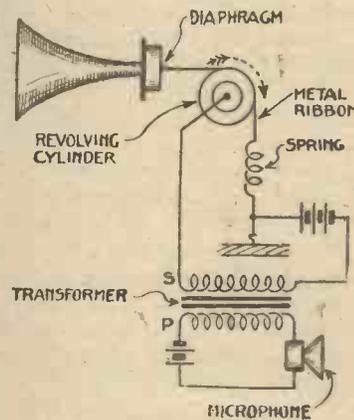
In the circuit diagram a microphone is shown in the input circuit, but these terminals could, of course, be connected to the output of the receiving set.

The cylinder is made of a non-conductive or badly conductive material such as lithographic stone. A metal ribbon passes over this and is attached at one end to the speaker diaphragm. A battery of about

100 volts maintains a potential difference between the ribbon and the cylinder.

The variation of the speech currents causes a varying amount of friction between the drum and the metallic band, thus producing sound waves by the pull on the diaphragm.

While this sort of loud-speaker is, of



Novel Loud-speaker.

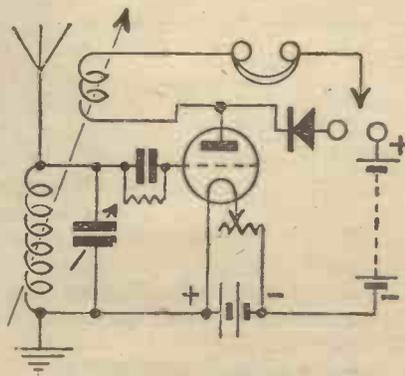
course, rather difficult to construct, the inventors claim to have obtained excellent results and exceptional purity of tone reproduction.

D. L.

Valve to Crystal

FOR the reception of local broadcasting it is not always necessary to use a valve detector, and it is often convenient to have some sort of switching arrangement to change from valve to crystal.

The diagram shows a very convenient form of switch in which it is possible to use either a valve with reaction or a loosely-coupled crystal circuit.



Changing from Valve to Crystal.

When the crystal is used alone it will be necessary to couple the reaction tightly to the aerial coil for the best results. B

Ask "A.W." for List of Practical Money-making Books

EXPERIMENTAL TRANSMISSION.—X

MODULATION

SO far no method has been described for interrupting or modulating the emitted waves for telegraphy or telephony transmission.

The waves naturally transmitted by any of the oscillators previously described will be of the undamped C.W. nature (provided that the high-tension current is direct and uninterrupted) and as such will only be audible if the autodyne or heterodyne method of reception is employed. If it is only desired to emit such waves, it is necessary only to employ a telegraphic key to form the code characters in the normal way.

Key Connections

The key may be connected in many different ways, namely:

(1) In the plate circuit, so that the anode current cannot flow when the key is up, and hence no oscillations are produced. This method is very effective for low-power transmissions, as it is decidedly economical, but for large transmissions there is the obvious disadvantage that the key is at high potential to earth and may cause serious shocks; lag effects may also be introduced by this method in large transmitters.

(2) The key may be connected in the grid circuit so that the latter is broken when the key is not depressed, or it may be placed in series with the grid leak so that the latter is only connected across the condenser or to the filament when the key is down. If it is connected in the grid circuit where the current is comparatively small, current will still flow in the plate circuit when the key is open unless by opening the key a negative potential is put on the grid sufficient to stop the plate current.

The key may be so arranged that, when depressed, it shorts a sufficient number of turns in the grid circuit to stop oscillation.

(3) The circuits can be so arranged that the key opens both grid and plate circuits simultaneously, as in Fig. 41.

(4) The key may be so arranged that either aerial or earth are disconnected when the key is up, so that although oscillations are continuously being generated, no wave motions will be set up. Tappings off the aerial inductance may be taken so that the included number of turns will be shorted either when the key is up or down as arranged. This is known as the "marking-and-spacing-wave" method, since oscillations are always being maintained, but the waves emitted when the key is up are thus slightly detuned (about 5 per cent.) and are thus inaudible at the

receiving end. This method has the disadvantage from the operator's point of view that power is being continuously absorbed and also that, as two waves are going out, he is occupying a broader band on the ether.

Where it is desired to work stations

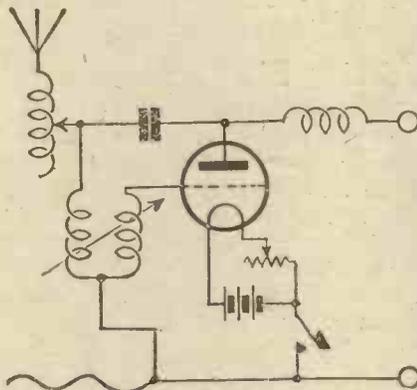


Fig. 41.—Keying Two Circuits Simultaneously.

during broadcast hours this method should be employed, as although C.W. is theoretically inaudible on a set not employing the heterodyne method of reception, clickings will be heard by near-by receivers when the aerial or power circuits are broken or closed.

The marking-spacing-wave method obviously has not this disadvantage, as a change of wavelength is inaudible to such receivers.

(5) A method that was much employed in army transmitters was to arrange matters so that a fixed resistance was connected in the filament circuit having a high enough resistance to reduce the fila-

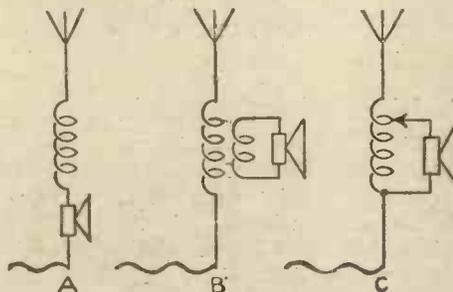


Fig. 42.—Three Methods of Aerial Modulation.

ment temperature so that no oscillations were produced. The key was connected in parallel with this and the filament increased in brightness as the key was depressed, and so oscillations were produced. Lag effects may be introduced, and so the method is not to be particularly recommended.

If it should be desired to transmit code

signals with a C.W. set that may be audible to a receiver not employing the autodyne or heterodyne methods of reception, all that is necessary is an interrupter that will make and break the circuit (at any of the points mentioned in the five sections above) at any audible frequency.

Any of the normal methods of keying may be used for this tonic-train or I.C.W. (interrupted-continuous-wave) method.

Telephony Modulation

The experimenter who has established a satisfactory valve-oscillating system will very soon turn his mind to the question of modulating the radio-frequency output so as to be able to transmit radio telephony. His final circuit will embody all of the following principles, as they represent broadly the only possible effective methods of modulation.

(1) Aerial-absorption control in which the microphone is coupled to the aerial circuit, either directly or by means of some absorbing element.

(2) Grid control; that is the potential of the grid of the oscillating valve is controlled by the voice through a microphone system.

(3) Constant-current control, in which the anode-supply current is made to fluctuate with the impressed speech.

The principle of aerial-absorption control is illustrated in (a), (b) and (c) of Fig. 42, in which (a) the microphone is connected directly in the earth lead, and (b) is coupled inductively to the aerial circuit, or (c) in which it is tapped across a few turns of the aerial inductance. C is probably the most practical scheme of the three, but the characteristics of the methods are the same in each case, and may be treated *en masse*.

The obvious disadvantage to the scheme is that if powers greatly in excess of about 5 watts are used the microphone will pack or become heated, and will then cease to function or else burn out.

Control on this system is particularly effective, since there is no iron in circuit to cause distortion, and many experimenters have devoted themselves to the task of employing this method on high powers.

Microphones may, of course, be used in parallel to minimise heating-up effects, and many weird and wonderful contrivances were constructed on the multi-microphone principle, especially in the days of arcs and Chaffee gaps when aerial modulation was the only known means. Contrivances of this sort, however, are of a complicated nature.

KENNETH ULLYET.

(To be continued)



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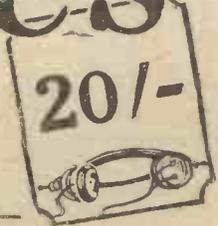
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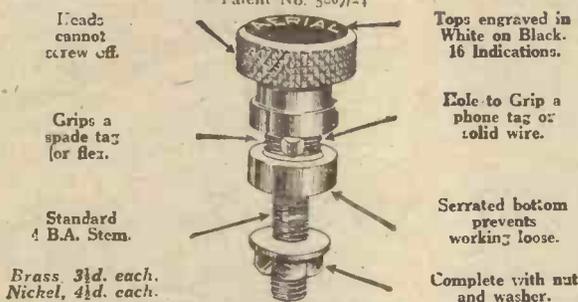
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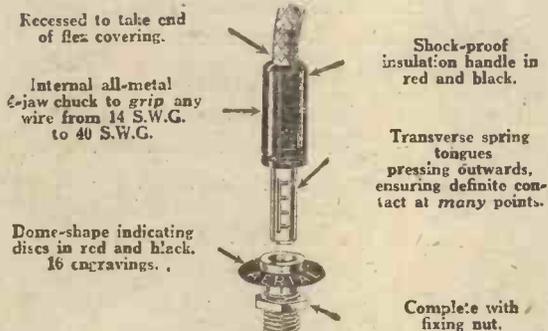
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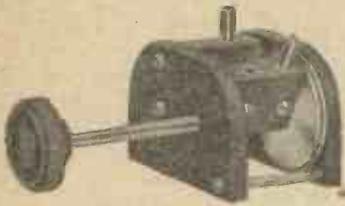
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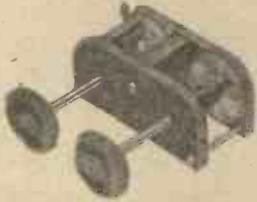
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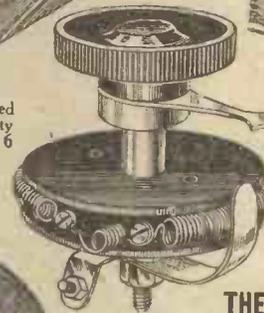
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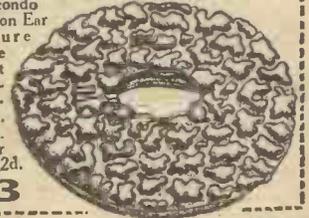
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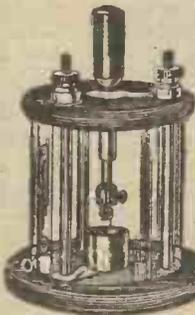
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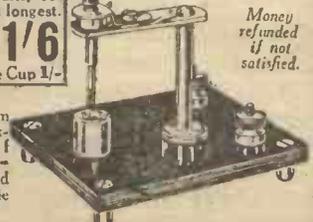
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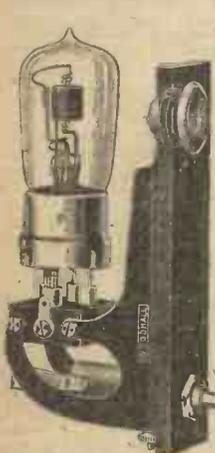
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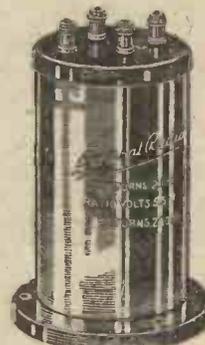


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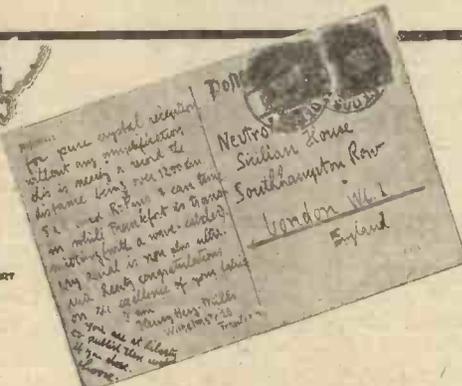


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(Signed) HENRY HERZ-MILLS, Wilhelmstrasse, 20, Frankfort o/M.

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On Your Wavelength!

Pipless Valves

ALL the American manufacturers now appear to be turning out as standard articles valves which have no "pips." This is a very great advantage to the user, for, as many of us know by experience, the most vulnerable part of the valve, like that of an electric-light bulb, is the pip. Somehow or other you do not notice it as you reach across the set to change a coil or to make an adjustment. Your hand strikes it and bang goes the valve. The pip at the top of the valve is the result of the method generally used for the final sealing of the bulb. There is no particular reason why the pip should be at the top of the bulb, and it appears that American makers are placing theirs at the other end so that when the valve is assembled it goes inside the cap and is thus out of harm's way. It is to be hoped that our own makers will adopt the same idea, for, besides making valves less liable to breakage, the absence of the pip gives them a particularly neat appearance.

How Valves "Go"

I suppose that there is no wireless man who has not "done in" a certain number of valves in his time. It is rather interesting to keep a record of the ways in which they meet their ends. I generally keep a rough record of the doings of each of my valves, which begins with its original curves, records the number of hours that it is used, and ends with a brief account of the way in which its fate overtook it.

Of eleven valves which have ended up in the dustbin in recent months, I find that one was accidentally dropped, one was burnt out by an overdose of current in a moment of temporary insanity, two developed sagging filaments which came into contact with the grid, rendering them useless, and the remainder expired quite naturally by burning out after doing various amounts of good work. You will notice that this list of casualties does not contain a single broken pip. I appear to have been lucky in this respect of late, though I can remember finishing off several valves in earlier batches by accidents of this kind.

I have also had broken leads within the cap, and in the case of dull-emitters I have known filaments lose almost all their emission as the valves became very old. When this happens to a dull-emitter, by the by, and the usual remedy of leaving it for some time with the filament just glowing and the high-tension battery switched off fails, the valve will usually function pretty well as a bright-emitter—for a time, at any rate.

I should add that when I speak of the

dustbin I do so metaphorically, for as a matter of fact the caps and pins of old valves should always be kept, since they can be put to a variety of useful purposes. A further point is that valve repairing has become nowadays such a fine art that unless a "toob" has been flattened out by a steam roller it can usually be made to work once more. There are several firms which fit new filaments at very reasonable cost, and one, at any rate, will provide even a new bulb for a modest sum. This means that there is still hope so long as the cap, the pinch, the plate and the grid are in existence. By the way, it does not occur to everybody that when a weary filament sits down upon the grid, one course is to send the valve to be re-filamented.

Repaired Valves

I used to be rather sceptical about repaired valves, for some of those that I have had done when the process was in its early days were not particularly successful. When you sent up a valve to be repaired it came back *looking* very much like its old self, but its performances upon the set were different as different could be. Now I am quite converted to valve repairing—in the case of bright-emitters at any rate.

Not long ago I made a rather severe test which gave surprising results. Here is the form which it took. The characteristics of three new valves of different makes were first of all recorded; the filaments were then deliberately burnt out and the valves were sent off to be repaired. On their return they were put through the same set of tests as they had undergone when new and in every case they came through with flying colours. It was not, of course, to be expected that the curves would be identical; they were not; but everyone of them was perfectly satisfactory and one valve had actually been improved. One thing that I noticed about the new filaments was that they were remarkably economical in their current requirements. Two of the valves after repair used less current than they had in their new state. I cannot claim to have tested the merits of re-filamented dull-emitters, but friends who have done so tell me that they obtain quite good results with them. So far as I know the repairing process is confined to valves of ordinary shapes and sizes and those of the test-tube pattern cannot be dealt with.

Those High Notes

I wonder if you found during the excellent programme given the other week by the Barnardo Boys that your set could not deal properly with the music of the

sleigh bells. The notes produced were very high pitched indeed, and these are a searching test of the efficiency of the low-frequency components of the set. I do not suppose that two receiving sets in a hundred could bring them in with their proper tone. On my own set they were not bad, though one realised that some of the notes approached very nearly the highest limits with which it could deal. Some friends tell me that on their sets the bells produced sounds which resembled sharp clicks rather than notes.

The trouble is that we have not so far been able to design either low-frequency transformers or telephone receivers which can deal equally well with notes of low, medium and high pitch. They respond much better to notes in the middle of the scale than to those on its upper and lower ends. It is largely for this reason that the organ does not come in well on many sets; its deep pedal notes are hardly heard at all, so that the music has not its proper fullness. The designers of both transformers and receivers are hard at work upon this problem. The instruments that we have to-day are infinitely better than those of even eighteen months ago, and there is no doubt that before long we shall have wireless receiving sets capable of dealing adequately with all the frequencies of speech and music. Still, on the whole, they are not so bad now, are they?

Interference Again

I have been having a very bad time lately owing to the misdeeds of my neighbours, several of whom have just installed valve sets in place of crystals. One fellow in particular has nearly driven me mad, for on the last two evenings he has been testing out a set for two or three hours on end during broadcasting hours. Obviously the thing is not working properly; I do not think that he has ever heard anything with it, for his howls always become loudest during the intervals. He has not heard the announcer state that next item will be given in two or three minutes' time, and he imagines that his tuning has gone wrong. Therefore he seizes his controls and turns them first in one direction and then in the other, causing alarm and despondency amongst all his wireless neighbours.

This kind of thing is most unfair. One selfish person has utterly ruined several good programmes for an entire town, in which there are hundreds of receiving sets. I do not think that it is deliberate; I believe that people simply cannot realise that the squeaks which they hear can possibly be audible to others. If you have a set which is liable to oscillate, do please remember that every squeak or howl of

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

yours is audible within a radius of three or four miles. Another point is that it is not cricket to try out experimental sets on broadcast transmissions if they are of kinds that are likely to produce oscillation. For experimental purposes you can always be sure of finding something going on either 600 metres, where the ships are never silent, or on 800, on which wavelength the air stations work. If all wireless men would try to impress upon their friends, especially upon those who have just taken to valves, the necessity for being careful and considerate to others, we should, I think, find that there was very much less interference due to radiation.

5 XX and Radio-Paris Again

Certain remarks of mine in these columns recently have drawn from Capt. Eckersley a reply concerning the possibility of tuning out 5 XX in favour of Radio-Paris. It is perhaps unnecessary for me to emphasise the fact that my remarks were directed to "The Man in the Wireless Street," and not to experts, but I am glad to hear that the B.B.C. are able to select Radio-Paris while 5 XX is working. I should like to hear a programme from Radio-Paris relayed from 5 XX. Capt. Eckersley emphasises a point I made myself when he states that there is "A great deal between the Man in the Wireless Street and the expert operating a really selective set. The contents of these columns are not intended mainly for the experts. Perhaps I have been mistaken, but it has been my impression that the B.B.C. also did not cater mainly for the expert, being rather ambitious to serve the inexpert broadcast listener—the Man in the Wireless Street. Nothing that Capt. Eckersley states in any way controverts my own remarks that the average listener cannot eliminate Radio-Paris in favour of 5 XX without constructing a set specially for the job—or buying one at a probably prohibitive price.

Why the Fuss?

But, after all, why all the bother? Very few of the remarks concerning 5 XX and Radio-Paris are made in a grousing sense. We all knew that when 5 XX came into being Radio-Paris was likely to disappear from our ken. We were even warned to that effect and we accepted the chance. Capt. Eckersley now admits the fact that reception of Radio-Paris is difficult when 5 XX is working; that is all that we need, for it coincides with our own experience. It is when the experts begin to tell us, as they have done, that there is no difficulty that we begin to wonder and that the question becomes one of sufficient interest to occupy valuable space in wireless periodicals. With Capt. Eckersley's admission the controversy ends.

Regarding the construction of receivers which will be sufficiently selective to eliminate Radio-Paris, there is no controversy and never has been. A good aerial with reaction, a really satisfactorily arranged coupled circuit, and a well-designed tuned-anode is probably the ideal. Personally, for general reception I use a set comprising two stages of H.F. This set covers a wave range of from fifty to several thousand metres. It will not cut out 5 XX in favour of Radio-Paris unless alterations are made which impair its efficiency over the other ranges.

Use a Wave-trap.

But probably the best thing the average listener can do if he wishes to listen to Radio-Paris is to construct a wave-trap. With a wave-trap it will be found that almost any set will cut out 5 XX and bring in Radio-Paris. It is rather curious that so few listeners use a wave-trap on this range, for it helps tremendously in the task of eliminating much of the morse that is so prevalent over a thousand metres. In conclusion, I am glad to be able to say that Radio-Paris is now becoming more easy to get here. Whether alterations are being made in the power or tuning I do not know, but there is no doubt that the transmissions from this station are improving rapidly. Before long it seems probable that only very close proximity to 5 XX will prevent listeners receiving Radio-Paris with ease. If I have said anything to upset Capt. Eckersley's feelings I hope he will accept my apologies, for there is no greater admirer of his work and knowledge than myself.

Accumulator Charging in Excelsis

I had, what was for me, quite a pleasant experience the other evening. I was sitting by the receiver and spending a pleasant half-hour or so "around the stations," when a neighbour knocked at my front door and inquired whether Mr. Thermion would kindly call around and see his set because he had attached the mains to the gear to supply H.T. and there was rather a lot of hum. Needless to say I went. I simply love to visit scenes of trouble, and this particular visit promised to be particularly interesting. When the amateur dabbles with the electric-light supply mains without knowing exactly what he is doing things always promise to be exciting.

I smelled trouble directly I entered the house. It took the form of a very faint burning rubber smell—a thing to which I have a great aversion. I immediately and without further parley switched off the set, which was undoubtedly humming both to the ear and to the nose. A little investigation showed that his true negative wire was joined to the earth negative—that was

the cause of the nasal hum. The apparatus consisted of a neon tube with a pair of 1,000-ohm chokes joined up and bridged by two 2-microfarad condensers. An extra pair of chokes put the audible hum right. But the crowning moment of the evening was when my neighbour gravely informed me that he was charging a set of accumulators through this neon tube and innocently asked whether that would make any difference! Five milliamperes to charge a 60-ampere-hour accumulator.

Cleaning the Aerial

I have noted with some interest that many amateurs make a habit of religiously cleaning their aerial wires once a week. I say religiously, because the operation generally takes place on a Sunday morning. Now whilst it is true that the surface oxidation on a copper wire increases the H.F. resistance of the aerial, it is doubtful whether any amount of cleaning will improve matters, because it is obviously not possible to clean between the strands, where the London atmosphere attacks the copper just as thoroughly as it does the outer surface. Much saving of labour would result if the discriminating amateur installed enamelled wire aerials instead of bare copper in the first instance. With such an aerial the maximum of H.F. conductivity is obtained and the wire will literally last for ever if it is erected with due care being taken not to crack the enamel.

Dundee "Bitters"

No, this is not a new drink, but another educational innovation of the town where the marmalade comes from, and personally I think the introduction of talks on scientific subjects into the magic of the Children's Hour is like giving them that hated "preserve" marmalade instead of jam; don't you? Still, as the modern child has a healthy disbelief in fairies and all the other myths we elders revelled in, perhaps a lively chat on the ways and habits of triangles, germs, or atoms may prove more exciting than its appears. These are to be tried every Thursday. Then we elders are to have three afternoons of classical music as a regular feature: very interesting, very praiseworthy, meritorious, but, all the same, marmalade.

Dancing Round the World

If any youngsters catch Cardiff on Saturday night they won't have a leg to stand upon by the time the programme is finished, for the national dances of Spain, Russia, Finland, Poland, to say nothing of Japan and Czecho-Slovakia, are written more, I should say, with a view to listening than to dancing to them. Anyhow the young people can try what they can do.

THERMION.

SOLVING THE CURRENT-SUPPLY PROBLEM

The second and concluding article describing how both plate and filament current may be obtained from the mains.



Obtaining Plate Current

PERHAPS the greatest bugbear to the amateur in these days of dull-emitter valves is the supply of plate current. H.T. dry batteries deteriorate even if not used, and they are a source of anxiety and annoyance. The lighting mains may again provide a solution of the problem with an expenditure which need not exceed 15s. and a negligible running cost. The most timid of amateurs may install the gear without fear of damaging his valves.

The Apparatus

The method is illustrated diagrammatically in Fig. 4. It consists of using a neon tube for the purpose of limiting the current supplied by the mains to the anodes of the valves. The apparatus described also comprises a smoothing circuit which will eliminate the ripple caused by the rotating commutator of the dynamo at the generating station. The neon tube (or Osgrim lamp, as it is known in the trade) has the peculiar property of passing more current in one direction than in the other, so that two different voltages are obtainable according to which way the tube is inserted in the holder. When the glow is

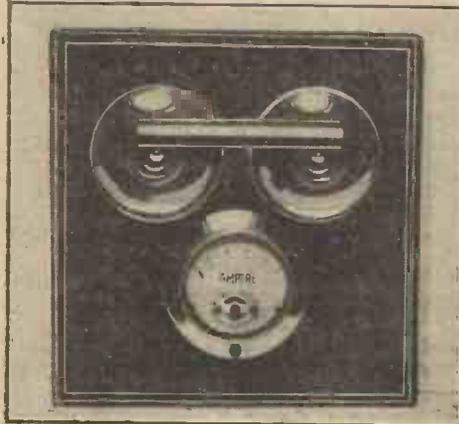


Fig. 8.—Switchboard.

seen around the large electrode (generally in the shape of a spiral hive-shaped wire or a letter of the alphabet) the voltage may be from 65 to 70 volts, whilst if it is around the smaller electrode it will be in the neighbourhood of 50 volts. Some dealers supply the tube without the resistance for wireless purposes generally, but for this particular purpose the resistance should be obtained. It must be explained that should the resistance be omitted the tube may discharge intermittently and thus cause troublesome noises. This is owing to the "threshold" effect of the

tube, a consideration of which is beyond the scope of this article.

It is impossible to damage the valve filaments when using this device, as the tube will not pass more than 50 milliamperes when on full load. The tube is also interesting, as it is possible to read C.W. signals by its flashes when two stages of L.F. amplification are used, and, furthermore, it will readily show when the detector is oscillating, as the glow will decrease in brilliancy when this is the case.

The condensers should be of good quality (it is wise to purchase new ones for the job); the chokes need not as a rule exceed a resistance of 2,000 ohms—in fact 500 ohms is generally sufficient. Ordinary telephone chokes will suffice. The method is strongly recommended, for no more H.T. battery troubles will be experienced and much unnecessary expense will be saved. The diagram Fig. 5 shows a method of obtaining multiple stages of voltage by placing a number of the tubes in series and parallel.

Another Method of Lighting Valves Direct

A further method of lighting the valve filaments by a direct means is shown in Fig. 6. This consists of utilising the current passed by the room lights, but it has its limitations inasmuch as there is danger of burning out the valves should any person switch on an extra light on the same circuit when the set is in use. Furthermore, if the set is switched off the lights will also go out unless an extra switch is provided to short-circuit the control switch.

We have seen that one valve requires approximately .6 ampere, so that sufficient lamps must be in the switch circuit to pass this amount of current. In the case of a single-valve set, as illustrated, two 60-watt lamps on a 240-volt circuit will suffice, so that those amateurs who have such a set installed in a room where there are two such lamps for lighting purposes will be able to run their set without adding to the lighting bill. All that is required is a clip bridge to press into the switch contacts. Such a device is illustrated in Fig. 7; it is connected by two flexible leads to the L.T. terminals of the set.

Accumulator Charging

If accumulators are used the problem of getting them charged is gener-

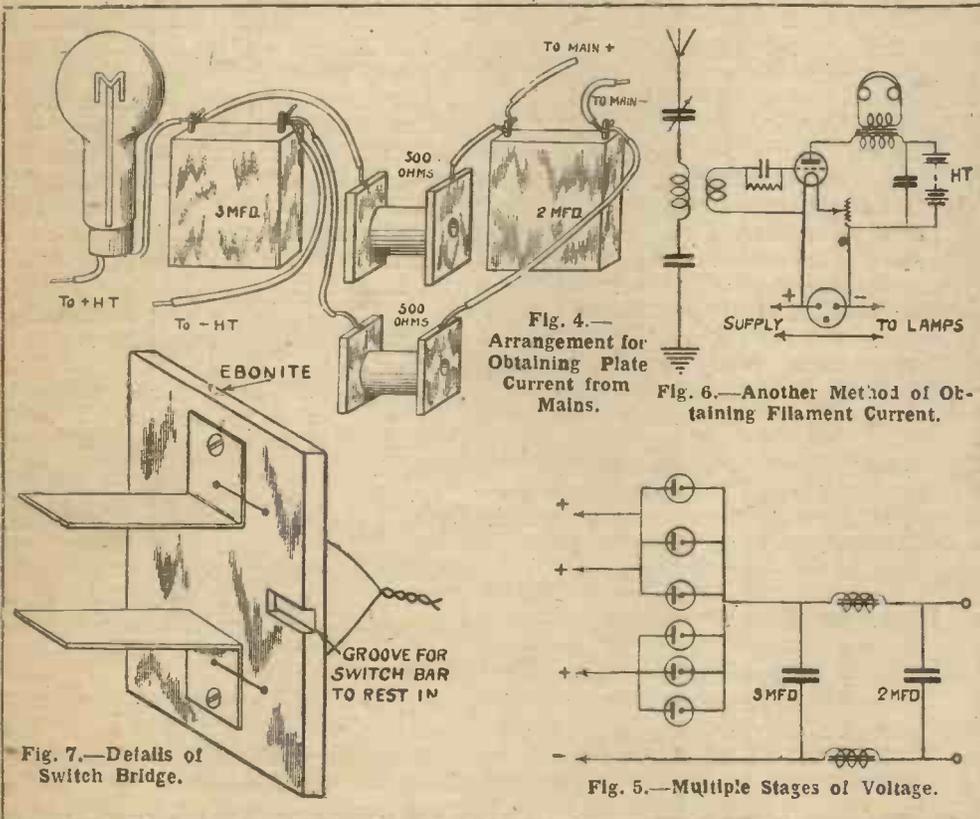


Fig. 4.—Arrangement for Obtaining Plate Current from Mains.

Fig. 6.—Another Method of Obtaining Filament Current.

Fig. 5.—Multiple Stages of Voltage.

Fig. 7.—Details of Switch Bridge.

ally an important one, as the cost and labour of getting them to the charging station are a consideration.

There are one or two devices on the market whereby it is claimed that the batteries can be charged without adding to

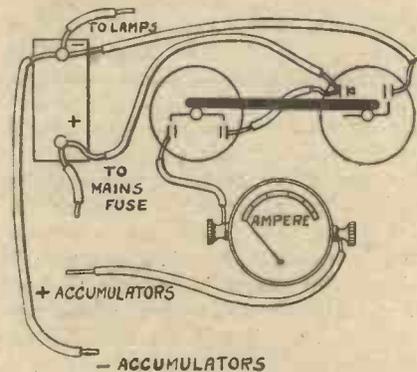


Fig. 9.—Wiring Details of Switchboard.

the lighting bill. These consist of a switch and an ammeter, as shown in the photograph Fig. 8. These devices have the disadvantage that unless upwards of half a dozen lamps are run normally, the charging, etc., is extremely slow. The switch is simply placed in the mains lead on the negative side of the lighting supply (if the earth is negative) and the current passed by the lamps utilised for charging purposes. The switch, which is of the tumbler type, is what is known as a double-pole switch, with the difference that one switch is inverted and the wiring carried out as shown in Fig. 9. It will be seen that when the switch bar is in the up position the accumulators are on charge, whilst when in the downward position the house lamps are connected and the accumulators isolated. The method is, of course, useful for charging small accumulators intended for dull-emitter valves, but care must then be taken that the charging rate does not exceed that stated by the makers of the cells.

The Motor-generator Set

Further methods of charging are through lamps or other resistances, and by means of a small generator driven by a motor. As regards the former method, this is expensive unless current is available at power rates. For instance, a 40-ampere-hour accumulator charging at the rate of 3 amperes per hour (assuming that 100 per cent. efficiency is obtainable, which is not possible) will cost on an average about 5s. for charging.

The most economical method is to charge by means of a small rotary converter or a motor coupled to a small generator which will generate current at the required voltage. As an example we will assume that we are going to run a ¼-h.p. motor off the 240-volt mains, the current being at ordinary lighting rates of 6d. per unit.

The formula to use when calculating the power consumed by a motor is $I =$

$\frac{B.H.P. \times 746 \times 100}{E \times K}$. K is the efficiency factor, in this case 70 per cent. We have therefore $\frac{1}{4} \times \frac{746}{1} \times \frac{100}{1} \div \left(\frac{240}{1} \times \frac{70}{1} \right)$ which equals just over 1 ampere. We

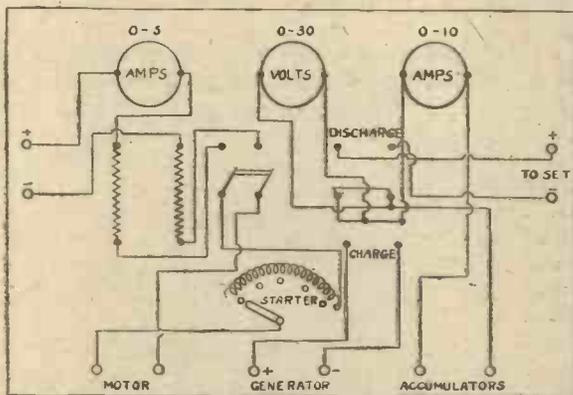


Fig. 10.—Wiring Diagram of Motor-generator Charging Set.

will assume that our accumulator is of 40-ampere hours actual capacity and requires charging at a 4-ampere-hour rate. We will therefore require to run the motor from 10 to 15 hours. Taking 15 hours as

a basis for working, we have to take 15 ampere-hours from the mains. As power equals volts x amperes, we have 240×1 , which equals 240 watts per hour for 15 hours. Hence 240×15 equals 3,600 watts, or 3½ Board of Trade units at 6d., which is 1s. 9d. per charge.

If power is obtainable at power rate, say 1½d. to 2d. per unit, the cost is, of course, proportionately lower, for at 2d. it will be 6½d. per charge.

The drawback to this method is perhaps the capital outlay involved, this being somewhere in the neighbourhood of £12 for new apparatus, but surplus Government stores of this nature are still obtainable at very low figures.

The sketch Fig. 10 illustrates diagrammatically a suitable arrangement of the gear for charging accumulators by means of a motor-generator set.

It is hoped that the foregoing notes will be of assistance to those amateurs who have found the questions of power supply the "fly in the ointment" of wireless.

A. J. C.

BOSPHOR PRONZ "REPLIES"

I HAVE burnt out three pairs of telephones recently and am undecided what to do.

We always advise red-headed people to give up wireless unless they are prepared to listen-in with their heads under water.

How can I obtain a really suitable accumulator for my valve set?

By buying one from a dealer who sells cells.

What kind of interference shall I get from a tramway which runs parallel to my aerial before it turns the corner?

You may hear a humming noise in your phones now and then. The biggest nuisance, however, will be that you will often mistake the conductor's ticket-punching bell for the Greenwich time signal.

I possess a three-valve set with which I experience a considerable amount of trouble. Please tell me where the fault lies.

The fault may lie in the set itself, in the aerial, in the earth, in any two of these three things, or in the whole three. As your set is a three-valve set the trouble most likely lies in all three.

Is it advisable to use as reaction coil a coil which is somewhat larger than the aerial-tuning coil?

Certainly, if you wish to make somewhat of a name for yourself amongst your wireless neighbours.

What is a blocking condenser?

You see them at a railway terminus. Train stoppers is another name for them,

although some enthusiasts prefer the term platform insulators.

Does an accumulator really cause a lot of trouble?

Really it does now. Listeners-in are continually running them down.

To what station does the call-sign LUX belong?

Port Sunlight.

Why is it necessary for there to be valves in a valve set?

For the same reason that it is necessary for there to be i's in idiot. See?

What is the name given by the Americans to a reaction coil wound on a skeleton former?

A rib tickler.

How can I tell if my set is oscillating and so causing interference to other listeners-in?

By placing a damp finger on the aerial terminal. Should you not desire to damp your finger in company, the nose of a dog in good health makes an effective substitute.

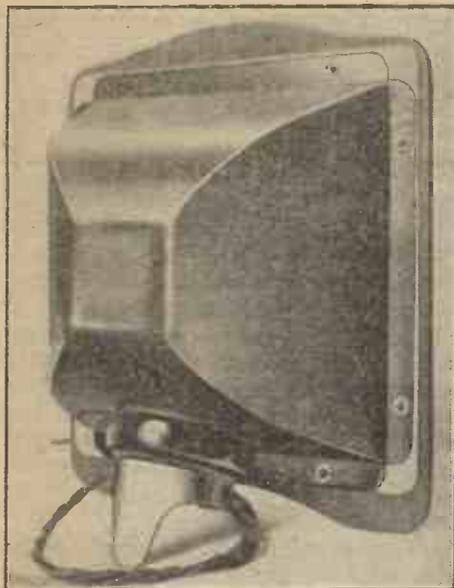
Is there any truth in the theory that wireless waves travel more easily eastwards than westwards?

None whatever. The propounder of this theory was mistaking wireless waves for waves of emigration.

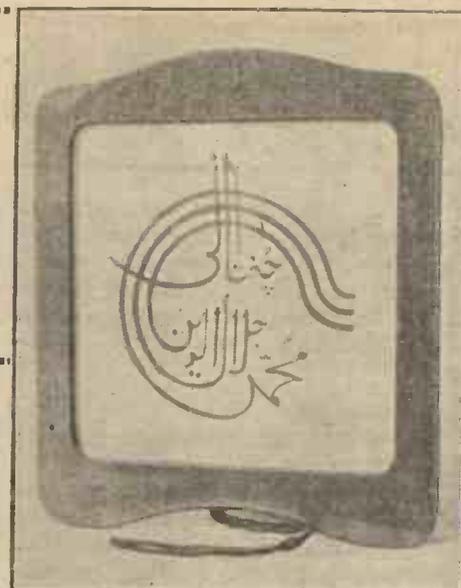
Is it correct that listeners-in will soon be compelled by law to fix corks on their aerial wires to prevent harm to birds?

No. The great objection is that every listener-in would have a terrible influx of visitors with dull-emitter noses.

MAKING A REFLECTOR LOUD-SPEAKER



Back View of Loud-speaker.



Front View of Loud-speaker.

$\frac{1}{8}$ in. thick. It is polished on one side, while the second side, which faces the horn, is blackened. The shape of the frame can be altered to suit the taste of the reader, but the one shown will be simple to make. Between the wooden frame and the back of the loud-speaker is fixed a silk screen. The screen consists of a piece of silk glued on a cardboard frame $\frac{1}{2}$ in. wide and cut from a piece of cardboard 7 in. square.

IN designing the loud-speaker described below it was considered that the construction of a circular horn was not possible without a fully equipped workshop. It was therefore decided to make it square. The bowl-shaped back of the loud-speaker is made by cutting a piece of tinned-iron

The Earphone

The earphone used should be preferably fitted with an adjustable diaphragm, although an ordinary phone will serve for the purpose. The cap of the earphone

and provides a third leg for the loud-speaker. It is cut from a piece of sheet brass, the free ends being screwed together.

The parts of the loud-speaker are assembled as shown in Fig. 3. The wooden frame *w* and the horn *B* are

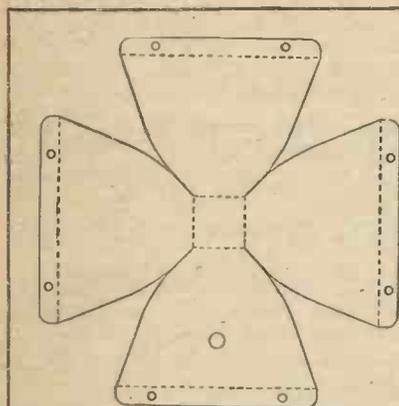


Fig. 1.—Pattern for Reflector.

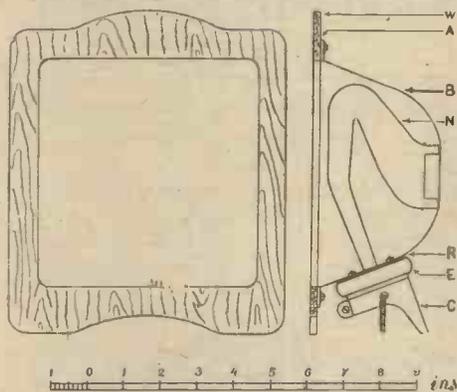


Fig. 3.—Front and Side Elevations.

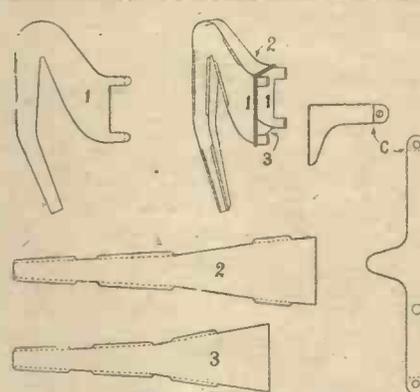


Fig. 2.—Parts of Horn.

of the shape shown in Fig. 1 and then soldering the edges together.

The neck, which conducts the sound from the phone, is made by soldering four metal pieces together, the details of which are given in Fig. 2. Having made the neck, it is fixed in position by soldering the four projections and the narrow end into the bowl-shaped back as shown in Fig. 3. The mouth of the neck is stiffened by soldering No. 18 square tinned-copper wire all round its edges.

The horn is finished by coating its outer surface with black enamel, the inner surface being left uncoated.

The Frame

The wooden frame is cut out of a piece of three-ply mahogany,

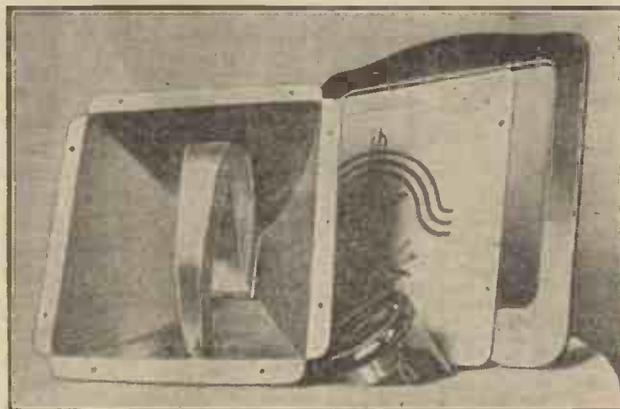
is filed flat before it is fixed to the horn and has a rubber washer between.

A clip, details of which are given at *c* in Fig. 2 is fixed round the earphone,

screwed together with the cardboard frame *A* in between them. The earphone *E* provided with the clip *C* is screwed into the ebonite cap, which is fixed to the horn *N* by screws and nuts with a rubber washer *R* between them.

This loud-speaker gives excellent reproduction and is free from resonance and other horn effects; it also gives ample volume for a medium-sized room. Its small size makes it specially suitable for a portable receiver, as it can be packed in a box $7\frac{3}{4}$ in. by $8\frac{3}{4}$ in. and $3\frac{3}{4}$ in. deep.

M. J. C.



The Loud-speaker Before Assembly.

A New Zealand amateur, Z4AG, has been received in England on a single-valve Reinartz receiver.

THE CRYSTAL IN THE REFLEX SET

THESE observations are intended primarily for owners of reflex sets employing crystal rectification, though they will undoubtedly prove of interest also to those who use a crystal detector following a stage or two of H.F. amplification.

Comparative Tests

The results of some recent comparative tests with crystals of many kinds by the writer have led him to the conclusion that for good all-round reception following H.F. amplification a perikon combination is infinitely better than an "ite" and cat-whisker. There may be those who will indignantly exclaim that this is wrong, but their experience will most probably have been with perikon detectors of a certain common type that do not allow of light, though firm, contact between the crystals. Experimenters are earnestly invited to try out this combination again in apparatus capable of giving finer adjustment. They will undoubtedly be surprised at the much better results obtained.

Perikon Detectors

The first perikon arrangement to be tried by the writer was with a cheap type of detector with zincite-bornite crystals. The results in a simple crystal set were inferior to those obtained with good specimens of the synthetic galena varieties with metal contacts. As a matter of fact, the writer has very seldom got good results with perikon in any crystal set.

The great superiority of the perikon arrangement over the crystal-whisker combination is encountered only in valve sets with one or more stages of H.F. amplification. In such conditions the results are really surprising, and with reflex circuits it will be found that the set becomes more

stable and reaction can be more definitely brought into use than is the case when the crystal-whisker detector is employed.

This will be more easily realised from the fact that in a 2-valve reflex set giving two stages of H.F. amplification, distant stations were more easily brought in and at greater strength. In many instances reception was often possible with the perikon detector when nothing could be heard with the other. Madrid (Radio-Iberica), for instance, was tuned in recently and reception was good and clear. On switching over to a crystal-whisker detector, which gives excellent results ordinarily, Madrid was gone and could not be coaxed into audibility. Slight retuning still brought nothing. A change back to perikon, and, lo! Madrid was still there.

A further striking instance occurred a few days ago when the writer had the

good fortune to receive an American station, again with the perikon detector in use. Changes were made from one detector to the other, as was done in the case of Madrid, with the same results as before.

In receiving the local broadcasting station there is still the same superiority, and apparently it is possible to tune nearer to a station's wavelength with the perikon rectifier than with the crystal-whisker detector; in this possibly lies the secret.

Testing Apparatus

A brief description of the simple apparatus used by the writer in these tests may be of interest. It consists of three upright L-shaped strips of fairly springy brass (two 1 3/8 in. by 1/2 in. and one 1 in. by 1/2 in.), the feet of each being about 5/8 in. long. Slots cut in the tops of the two longer strips allow crystal cups to be dropped in and secured by their own screws. This permits of quickly changing the crystals.

The shortest strip may be rather stiffer than the others, and through this, near the top, is drilled a hole to clear the threaded shank of a contact stud or valve socket which is used for adjusting the pressure between crystals. Over this hole is soldered a nut to take this adjusting screw. The three uprights are secured by screws through their "feet" to an ebonite or other base. The springy brass permits of firm but light contact between the crystals.

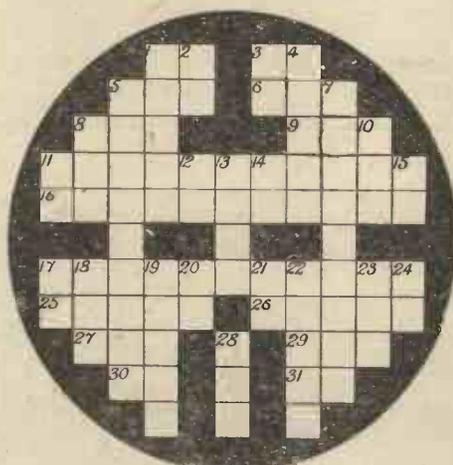
Different lots of crystals bought at different stores were used, so it would seem that these astonishing results were not due to a freak crystal. The crystals were changed from time to time, but the results were always approximately the same.

J. D. S.

THE "VALVE" CROSS-WORD PUZZLE

CLUES

- ACROSS
- 1 What we try to do in reception
 - 3 God willing
 - 5 A drill
 - 6 A nut
 - 8 2 of 1/2
 - 9 All re-arranged
 - 11 Sent out
 - 16 A store
 - 17 What watts are
 - 25 What a valve shows
 - 26 A pile
 - 27 A barrier
 - 29 Nearly real
 - 30 A valve
 - 31 Ends concerts



DOWN

- 1 To remove fastenings backwards
 - 2 A pair of terminals
 - 3 A current
 - 4 A famous electrician
 - 5 A make-shift grid leak
 - 7 Cells
 - 8 A big spark
 - 10 A sign of the Zodiac
 - 11 Begins talk
 - 12 In dismay
 - 13 Starts muddles and ends them
 - 14 Half coil
 - 15 Nearly dry
 - 17 Excellent
 - 18 Aged
 - 19 Subdues
 - 20 Small hours for U.S.A. reception
 - 21 Copper
 - 22 Often a pipe
 - 23 A period
 - 24 German
 - 28 Added to 5 (across) makes it very cold
- (The solution will be given in our next issue.)

CONNECTING WITH FLEX

FLEXIBLE stranded copper wire is highly efficient for winding coils or wiring up various components in a set. It frequently happens, however, that when flexible leads are used the strands fray, break off and the wires have to be bared again.

This can be avoided by taking a little care in making the connections and by making some form of protection for the stranded ends.

The wires should be bound with a short length of fine-gauge wire, formed into a loop, and tinned with a small quantity of solder.

If the loop is not wanted the wire can be tinned without completing it and the result is a permanent tag with which connection can easily be made.

U.

IMPROVING PHONES

A SLIGHT modification to phone earpieces with the object of improving their tone is suggested by a French experimenter. He says it is a good plan to pierce the diaphragms with a small hole—say about 1/8 in. in diameter. The result, he claims, will be a fineness and clarity of tone not to be had otherwise. He says that he has used this idea both for wire and wireless telephony receivers with great success. The experiment is well worth trying, for at the worst it could only result in a diaphragm being spoilt, which could be replaced for a few pence.

The idea is apparently that the natural period of resonance of the diaphragm is altered by the presence of the hole. It would be a good idea to have a number of diaphragms at hand, drilled so that their frequencies differ.

D.

OUR INFORMATION BUREAU

RULES.—Please write distinctly and keep to the point. We reply promptly by post. Please give all necessary details. Ask one question at a time to ensure a prompt reply, and please put sketches, lay-outs, diagrams, etc., on separate sheets containing your name and address. Always send stamped, addressed envelope and attach Coupon (p. 424).

Submarine Wireless

Q.—Can a submarine use wireless?—S. A. (W. 4).

A.—Yes, but only when on the surface. Under-sea working has been attempted but has not succeeded in general practice. The fact that German submarines were forced to come to the surface to use wireless was one of the means by which we were enabled to track them down. Many special D.F. stations were erected in this country for the purpose, and proved very useful.—U.

Variable Grid Leaks

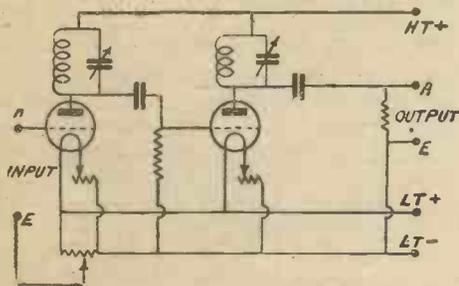
Q.—Is it advantageous to replace a fixed grid leak with a leak which is variable?—P.P. (E.10).

A.—A good variable grid leak is generally better than the fixed type. The latter may happen to suit the particular type of valve it is bought for, but where valves are changed over it is generally found advisable to make a change in the value of the leak.—U.

H.F. Amplifiers.

Q.—Please give a circuit showing how I can add two stages of high-frequency amplification to my two-valve receiver (detector and note magnifier). It is not desired to alter the wiring of my receiver, but it is intended to use the same H.T. and L.T. batteries. The tuned-anode system of amplification is to be used, and it is desired to use a grid potentiometer to prevent oscillation.—R. D. (East Farleigh).

A.—A circuit diagram is given showing how two stages of H.F. amplification may be added to your existing set. No modification of the original wiring is necessary, and common H.T. and L.T. batteries are used. No switching

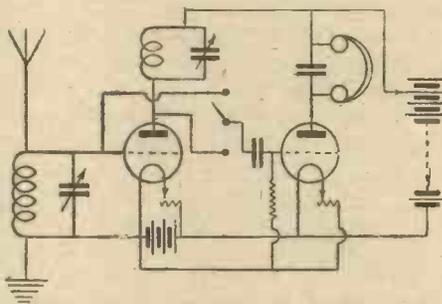


H.F. Amplifier.

arrangements are shown since switching in high-frequency circuits is not advisable, and it is a simple matter to wire up the H.F. amplifier in place of the aerial and earth connections. These two wires are then connected to the input terminals of the amplifier. A potentiometer is shown, and the addition of this simple device will greatly facilitate searching for distant stations. The anode tuning condensers should have a value not greater than .002 microfarad, though if the anode coils are exactly in tune (and "matched" coils can now be easily obtained) a dual condenser may be employed which tunes both coils simultaneously. The second grid leak and condenser shown are in the grid circuit of the detector.—U.

Switching in H.F. Circuits

Q.—I notice that in a reply to H. S. (S.W. 17) in No. 141, you show a circuit diagram in which the grid condenser and leak are disconnected when the single-valve detector is used alone. I have tried this circuit and find that, with ordinary valves, the strength of



Cutting Out the H.F. Valve.

signals is not equal to that usually obtained when the condenser and leak are present.—V. B. (West Bromwich).

A.—The strength of signals will depend entirely on the valve employed. Should it be desired to use the leaky grid method of rectification the circuit shown above may be used, in which the leak and condenser are employed. It should be noted that if these connections are employed a central insulated stud must be used in the switch, or else the H.T. battery will be shorted when changing over.—U.

Specific Inductive Capacity

Q.—What is the meaning of the letters S.I.C.?—K. G. (Sanderstead).

A.—The property of a dielectric by virtue of which it is able to store up electrical energy is known as its "specific inductive capacity," usually denoted by the letters S.I.C.

Another name for the S.I.C. is dielectric constant.—U.

Inductance of Single-layer Coils

Q.—Please give a simple formula for calculating the inductance of single-layer coils.—J. B. (Anglesey).

A.—This may be found approximately from the formula:

$$L \text{ (mics)} = \frac{(5DT)^2}{W + D} \times \frac{1}{1,000}$$

Where D = diameter in inches.

T = number of turns.

W = length in inches of portion wound.—U.

A Tuner Problem

Q.—I should like to know why a loose-coupled tapped tuner that I possess does not tune to such a high wavelength on my single-valve set as it does when used in conjunction with my two-valve H.F. amplifier and detector.—D. C. (New Cross, S.E.14).

A.—Without a more exact knowledge of the receiver it is difficult to state why this should be so. If the difference is more marked on short waves than on long, it is probable that the self-capacity of the two-valve H.F. amplifier is higher than the capacity present

in the single-valve set. This would account for the difference in tuning, but the presence of self-capacity in a set is not so marked on long wavelengths, and the peculiarity would not be so noticeable.—U.

Lightning and Outdoor Aerial

Q.—Is there any possibility of danger from the use of an outdoor aerial?—N. F. (N. W. 10).

A.—In general, no. A properly safeguarded aerial is a potential protector of property. If the aerial were properly struck it would doubtless be entirely destroyed. Nevertheless an earthing switch should be fitted to by-pass static charges that accumulate and that would otherwise strain the insulation of the set.—U.

A Long-wave Tuner

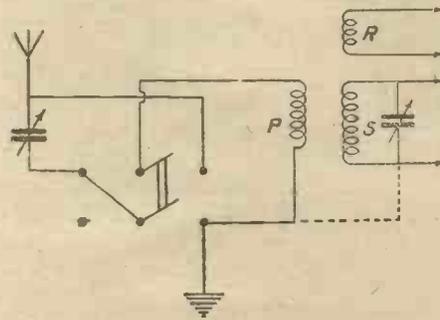
Q.—What weight, gauge and type of wire is suitable for winding a "pile" coil for long wavelengths. The diameter of the former is 2 in., and eight equal tappings are to be taken.—K. F. (Tonbridge).

A.—No. 34 s.w.g. d.s.c. copper wire will be suitable, and about 2½ oz. will be necessary if all wavelengths from 1,600 to 23,000 metres are to be covered.—U.

Selectivity

Q.—I am greatly troubled by jamming and interference on my five-valve set, and should like to make my single-coil tuner really selective. The use of a wave-trap is not desired as it introduces too many extra complications.—W. H. (Ponders End, N.16).

A.—Selectivity is impossible if a single-coil aerial system is used in conjunction with a



A Selective Tuner.

five-valve set, and the use of a loose-coupled tuner is essential if it is not desired to use a wavetrap. A diagram is given showing the connections for a loose-coupled tuner. A series-parallel switch is used with the aerial tuning condenser so that the tuner can be used either for long or short waves. The reaction and secondary coils are loosely coupled to the primary coil, but the coupling between the reaction and secondary windings should be tighter than the coupling between reaction and primary coils. In this manner radiation will be reduced. The connection shown dotted between the primary and secondary coils may be used if capacity effects are noticeable. Both tuning condensers should have a value of about .0005 microfarad.—U.

AS the result of several years of experimenting with most types of receivers, the writer has been driven to two strong opinions. The first is rather startling. It is that attempts to secure stages of radio-frequency amplification on the B.B.C. band of wavelengths is in practice a waste of so many valves.

Best Use of Valves

That this opinion is not very far wrong, the writer considers, is proved by the results of reception competitions conducted in America. In these the Reinartz receiver, without high-frequency amplification, is consistently at the top of the lists for D.X. (long-distance) results. A line of reasoning in support of the contention seems to be as follows. No amount of high- or low-frequency amplification can magnify signals that the first valve does not receive. Given an efficient collector of energy, an efficient valve adjusted so as to be at the very brink of oscillation, is the most sensitive device known to science for responding to that energy. The output at the plate or anode of the valve

A DISTORTIONLESS

The features of this receiver are great selectivity and purity of reproduction, these being due to

tainly not reach the valve and appear in the plate circuit as amplified high-frequency oscillations or as rectified energy.

Losses are due in the main to leakage, resistance, eddy currents and dielectric absorption, and high-frequency oscillations are more subject to loss through these causes than low-frequency alternations. Also, presumably, amplified high-frequency alternations are rather more than less likely to suffer dissipation of energy by reason of the causes of losses that must be present in every circuit to a certain degree.

If these conclusions are accurate it seems more expedient to rectify the received oscillations with the first valve and then amplify at a comparatively safe low

frequency than to multiply the risks of loss by directing high-frequency oscillations from one circuit to another, as occurs when attempts are made to amplify short-wave high-frequency oscillations.

H.F. v. L.F. Amplifier

Put another way, the opinion offered is that the amount of amplification of radio-frequency oscillations obtained is, in practice, barely enough to outweigh the losses that are at present unavoidable in high-frequency circuits. Therefore a greater output is obtained

will always be a magnification of the energy received. This is the case whether the valve is adjusted to rectify the received oscillations or not. Whether rectified oscillations are amplified to the same degree as those not rectified is of little consequence so long as it is agreed that the output is greater than the input and therefore fit to be passed on to another valve or cascade of valves.

Next there seems to be no doubt that a valve adjusted to the very brink of oscillation does not lose any sensitiveness because it is adjusted to rectify. Minute high-frequency pulses that reach the tuning device are easily absorbed by losses in the circuit, and what is lost will cer-

from a given number of valves by amplifying at low frequency straight from the detector valve without any loss of sensitivity, which means range of reception.

It should be noted that these remarks have been specially directed to wavelengths below 600 metres.

L.F. Amplification

The second opinion refers to low-frequency amplification or the method of obtaining it. The writer is of opinion that no present-day transformer is anything like distortionless when the voltage swing is at all considerable, yet one of good make is nearly enough perfect when the load is small, such as when immediately following the detector valve receiving long-distance signals; then the voltage step-up is of great advantage.

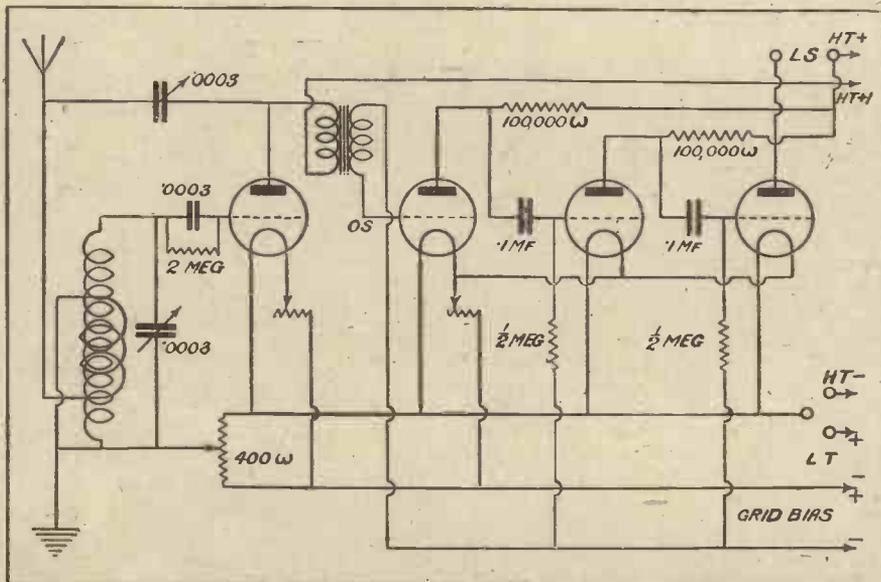


Fig. 1.—Circuit Diagram showing Values of Components.

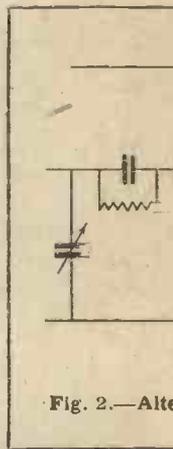
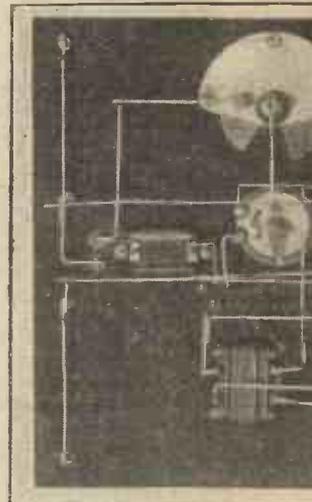


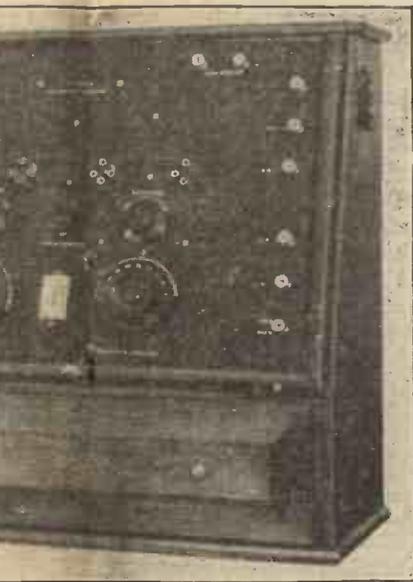
Fig. 2.—Alter



View

S LOUD-SPEAKER SET

the use of a low-loss tuner, fine reaction control and the resistance-capacity method of coupling.



Complete Receiver

For the later stages of amplification the resistance-capacity method is absolutely distortionless.

It was to incorporate these conclusions that the four-valve set here described and illustrated was designed. The results seem to justify the conclusions. Under suitable conditions, all B.B.C. stations can be received on the loud-speaker, including several relay stations and many of the Continental stations. Also American broadcasting is satisfactorily received. The set was tried and compared on the same aerial with a five-valve set that incorporates two high-frequency valves, detector and two resistance-coupled amplifiers. It received every station tuned-in on the latter with greater volume in each case, while the time required for tuning it is considerably

less owing to the fact that there is only one tuning control in addition to the reaction control.

To obtain the desired results there is incorporated in the set, firstly, a low-loss tuner, and then a system of obtaining reaction that gives fine control, enabling the point of oscillation to be very closely approached whilst still maintaining reasonable stability.

Reaction Control

The tuner selected was the new Igranic aperiodic coil with an Ormond variable condenser with vernier across the secondary, as it was thought that the greatest selectivity would thus be obtained. Control of oscillation is obtained on the Reinartz principle. This comprises a small reaction coil tightly coupled to the tuning inductance, to which it is also connected at the earthed end. The other end of the reaction coil is connected to the plate or anode of the first valve with a variable condenser in series. This variable condenser controls the reaction effect. The reaction coil is, in practice, also the aerial aperiodic coupling coil, these being one and the same.

The Circuit

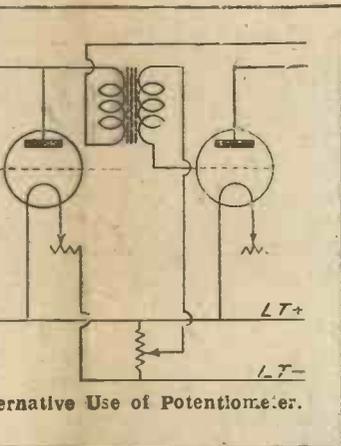
Fig. 1 is a complete theoretical diagram of the circuit and shows the values of the components. The potentiometer shown is a luxury and is not

absolutely necessary. If the set is to be used within ten miles or so of a transmitting station this potentiometer will be more usefully employed for the return of the secondary of the transformer. This arrangement is shown diagrammatically in Fig. 2; it gives excellent control over the strength of signals. The lower end of the tuned circuit is then permanently connected to low-tension positive.

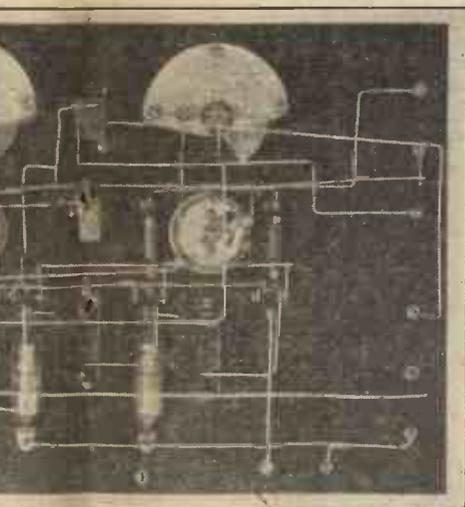
If this arrangement is not incorporated and the set is subsequently found liable to "blast" with certain valves, this can be effectively cured by the simple expedient of reversing the low-tension leads.

The layout of the panel is shown by Fig. 3.

The only values missing in the theoretical diagram are the numbers of turns in the two windings of the Igranic coil used. Should any reader desire to make his own tuning coil, suitable numbers of turns, on a 3-in. former, are 16 turns for aperiodic coupling and 50 turns for the tuned circuit. A completely successful coil for receiving 5 X X was made by converting an ordinary 250 Igranic coil of the new type in which



Alternative Use of Potentiometer.



View of Back of Panel.

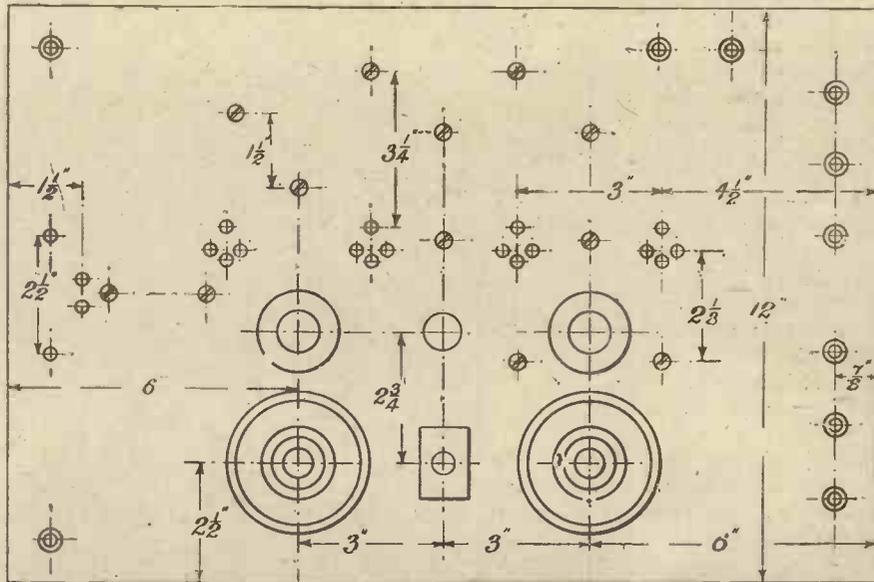


Fig. 3.—Lay-out of Panel.

the coil is lashed by thread to the metal angles of the plug attachment. The thread was cut away, the side screws removed and also the strip of celluloid material. This left the coil with the plug hanging to its ends. Thirty turns of No. 26 d.c.c. wire were then neatly wound on the outside of the coil in one layer, the ends being temporarily secured by passing beneath the outside turns. The coil was then reassembled as before.

The tuning of the set is comparatively simple, there being just two controls with no coils to adjust. Before switching on the local batteries the reaction condenser should be set at minimum. Here it should be mentioned that it is necessary

to be generous with the adjustment of the rheostat controlling the last three valves. Even if 4-volt valves are used with a 6-volt accumulator this rheostat will require to be three parts on.

Next increase the value of the reaction condenser until the oscillation point is reached and, keeping as near to this point as possible, slowly search with the tuning condenser until the required station is found. Accurately tune in the station with the vernier, and then judiciously tighten reaction; the closer to the oscillation point this can be set the louder will signals come in.

Low-consumption valves are advised with a B.T.H. B4 or a Marconi-Osram DE5 in the last stage. These valves take only .25 ampere. It is essential that valves working at the same nominal filament voltage should be used in the amplifying stages, which are controlled by the one rheostat.

H.T. Supply

The high-tension supply for this set calls for special attention. Although there are 100,000-ohm resistances in the plate circuits of two of the valves, four valves take more high-tension current than the average battery is meant to give. If ordinary batteries are used, their lives will be short, therefore it is more economical to purchase such a battery as the Burndept "super." Other well-known firms also market double- or triple-capacity batteries. At least 100 volts pressure will be required on the three amplifying valves, and 60/80 volts on the detector valve, depending on the make. The amount of grid bias required, if any, will also depend on the valves used, and can be supplied by flash-lamp batteries.

The following is a list of the components used in making up the set:

Ebonite panel 18 in. by 12 in.; sixteen valve legs; ten terminals (large); two ter-

minals (small); Igranic aperiodic coil (300 to 600 metres); plug and socket for coil; two rheostats with porcelain bodies; Burndept low-frequency transformer; Ormonde .0003-microfarad variable condenser; Ormonde .0003-microfarad variable condenser with vernier; Edison-Bell .0003-microfarad fixed condenser with 2 megohm leak; two Dubilier anode resistances (100,000 ohms with clips); two Dubilier leaks $\frac{1}{2}$ megohm with clips; two Mansbridge condensers (1 microfarad); square wire transfers, screws and leads, etc.

The plug sockets shown on the side of the cabinet are connected by flexible wire to the loud-speaker terminals. A similar set of sockets on the opposite side are connected to the aerial and earth terminals. The flex connections from the terminals pass through holes in the panel to the rear, as will be seen in the photograph on the preceding page. D. H.

AROUND THE SHOWROOMS

Insulating Covering

ONE disadvantage of using bare wire for connecting up a set is that the different circuits cannot be easily followed. Perhaps a more serious object is that the "skin" resistance is likely to increase after prolonged exposure.

Both of these disadvantages can be overcome by covering the wire, after the circuit has been completely connected up, with a liquid insulating compound called Celas.

This compound is applied to the bare wire with a brush; it soon dries on contact with the air. It is made in four colours—red, green, blue and yellow—and can thus be used for differentiating between different parts of a circuit.

In use I have found Celas to be both neat and effective. It is made by Headson's, of 183, Helmsley Road, Newcastle-on-Tyne.

Cheaper Phones

AS the demand for apparatus and components becomes steadier and manufacturers are better able to judge exactly the market for any particular product, we may expect to see prices lowered all round.

A week or two ago I noted the reduction in the prices of valves. Now I am able to write appreciatively of the reduction in the price of 25s. phones, which has been lowered to 20s.

Cheaper valves affect only one section of listeners, but cheaper phones affect everybody, for whether you have a crystal or a valve set you must have phones with which to listen.

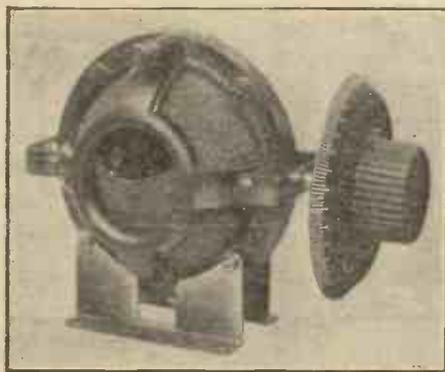
Igranic Variometer

It is well known that the efficiency of a variometer depends on the self-capacity

and dielectric losses, and that the wavelength range depends upon both these things and the air gap between the two windings.

The ideal variometer would be entirely self-supporting; that is, there would be no dielectric material to support the windings.

Variometers can be made that have very little dielectric material; such, for in-



Igranic Variometer

stance, as the Igranic F-type shown by the photograph.

In this variometer the stator is protected by a skeletonised former, which also affords ample mechanical support. The rotor is entirely self-supporting, and no moulded composition enters into its construction.

The result is an efficient and selective instrument, in which the dielectric losses are kept at a minimum.

This variometer is supplied by the Igranic Electric Co., Ltd., of 149, Queen Victoria Street, E.C., complete with knob and dial, and fixing brackets that can be mounted in four different positions.

Chaslyn Hydrometèr

VOLTMETERS are of no use for gauging the amount of "juice" left in an accumulator; the readings are too misleading. The only satisfactory instrument to use is a hydrometer, an instrument that shows the specific gravity of the electrolyte.

Hydrometers are of various types, and perhaps the best for the amateur wireless enthusiast to use is one that is self-reading.

Such a hydrometer is the Chaslyn, an American product handled in this country by J. H. Collie and Co., of 8, Harrington Street, Liverpool. I believe that the price is 5s.

The Chaslyn is a syringe-type hydrometer containing three beads—white, green and red. When acid has been sucked up into the hydrometer, the state of the accumulator can be gauged from the positions of the beads.

If all three beads float, the battery is fully charged. If the white bead sinks, things are still all right. If the green sinks, the charge is getting low; while if the red bead sinks, you should run the battery round to the charging station at once.

Louden Valves

AT last English valve manufacturers are beginning to compete with the cheap Continental product.

I note with interest that an English firm is now able to sell valves—Louden valves—at 8s. 6d. each.

It seems that we are not so far from the days of 5s. valves as we might suppose.

Let us hope that manufacturers will be able to reduce valve prices still further during the next few months. VANGUARD.

AN EXTENSIBLE UNIT SET—(Concluding Article)

THE WAVE-TRAP UNIT



IN the description of this, the last unit of the set, it is unnecessary to go into details of construction as precisely as hitherto. The unit follows the same general principles as the others. The shell is prepared in exactly the same way. The panel is marked and drilled in accordance with Fig. 43, A being 4 B.A. clearance and countersink, B 6 B.A. clearance and countersink, C 6 B.A. clearance and D $\frac{1}{4}$ -in. clearance.

The following is a list of the necessary parts to build this unit: One ebonite panel 8 in. by 4 in. by $\frac{1}{4}$ in.; one variable condenser .0005 microfarad; one potentiometer (300 ohms resistance); two flashlamp batteries; four coil plugs; one coil plug with base (see Fig. 40); four 4 B.A. countersink-head screws $\frac{1}{2}$ in. long; two 6 B.A. countersink-head screws $\frac{1}{2}$ in. long; one Igranite coil (L75); $17\frac{1}{2}$ in. 2 B.A. screwed brass rod; connecting wire, etc.

The variable condenser in this unit can be of the usual type air-dielectric pattern shown in the illustrations, as room is not required to mount a valve behind as is the case in all other units. The assembly is evident from the photographs, so that no explanation is necessary. Fig. 44 is a pictorial diagram of the wiring circuit, while Fig. 45 is the theoretical circuit of the whole set of four units without regard to actual positions of components in separate units or the incorporation of the several switches.

In Use

To eliminate interference with the wave trap the set

trap is then turned slowly until the signal fades and disappears. The set can then be retuned at will to the required wavelength. A final slight readjustment of the wave trap may be necessary. It is not claimed for this simple form of trap that it will eliminate very loud signals if the signals which it is desired to receive are on a wavelength very close to the former; it will, however, go a long way to reduce the interference in every case, and in conjunction with a sharply tuned H.F. circuit it will be possible to cut out all but the loudest signals as might, for instance, come from a local B.B.C. station within half a mile or so.

The potentiometer will be found invaluable for tuning in very weak signals and in stabilising the high-frequency valve. The method of applying the voltage bias to the grid is one of several, and it will be advantageous to try other ways until the best arrangement is found to suit the particular valve in use. The method shown has been successfully tried out with the ordinary bright-emitter valve and should therefore be made a starting-point for experiment. The potentiometer will be found most generally useful when the set shows a tendency to oscillate audibly. A slight adjustment of the control will then save complicated readjustment of the tuning controls. Both the foregoing refinements, if they may be so called, make the set more selective and more sensitive.

There is, of course, no reason why other units should not be added as the constructor finds need for them.

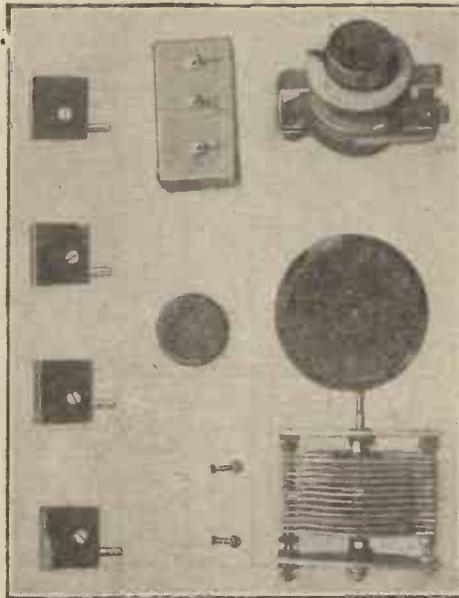


Fig. 40.—Component Parts of Wave-trap Unit.

is tuned in the usual way to the signal it is desired to cut out. For simplicity this can be done with the detector alone in operation. The dial of the wave

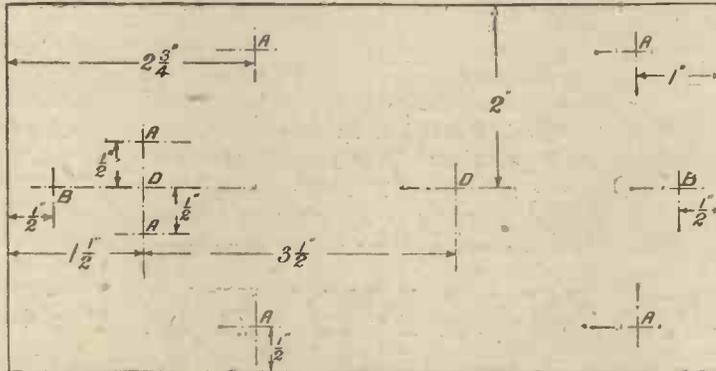


Fig. 43.—Lay-out of Panel

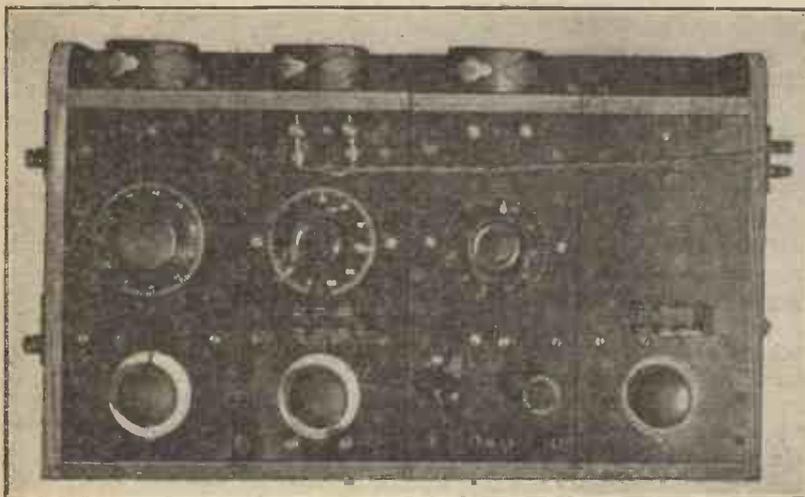


Fig. 41 (left).—The Extensible Unit Set with the Four Units Built Up Into a Complete Set.

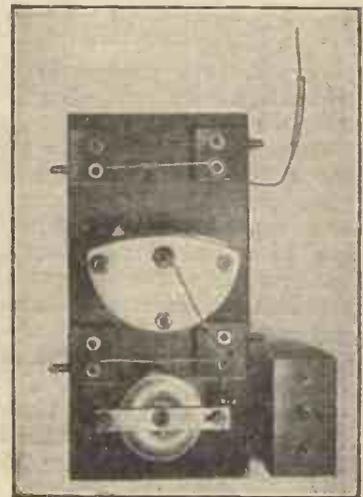


Fig. 42 (right).—Back of Wave-trap Panel showing Connectors, etc.

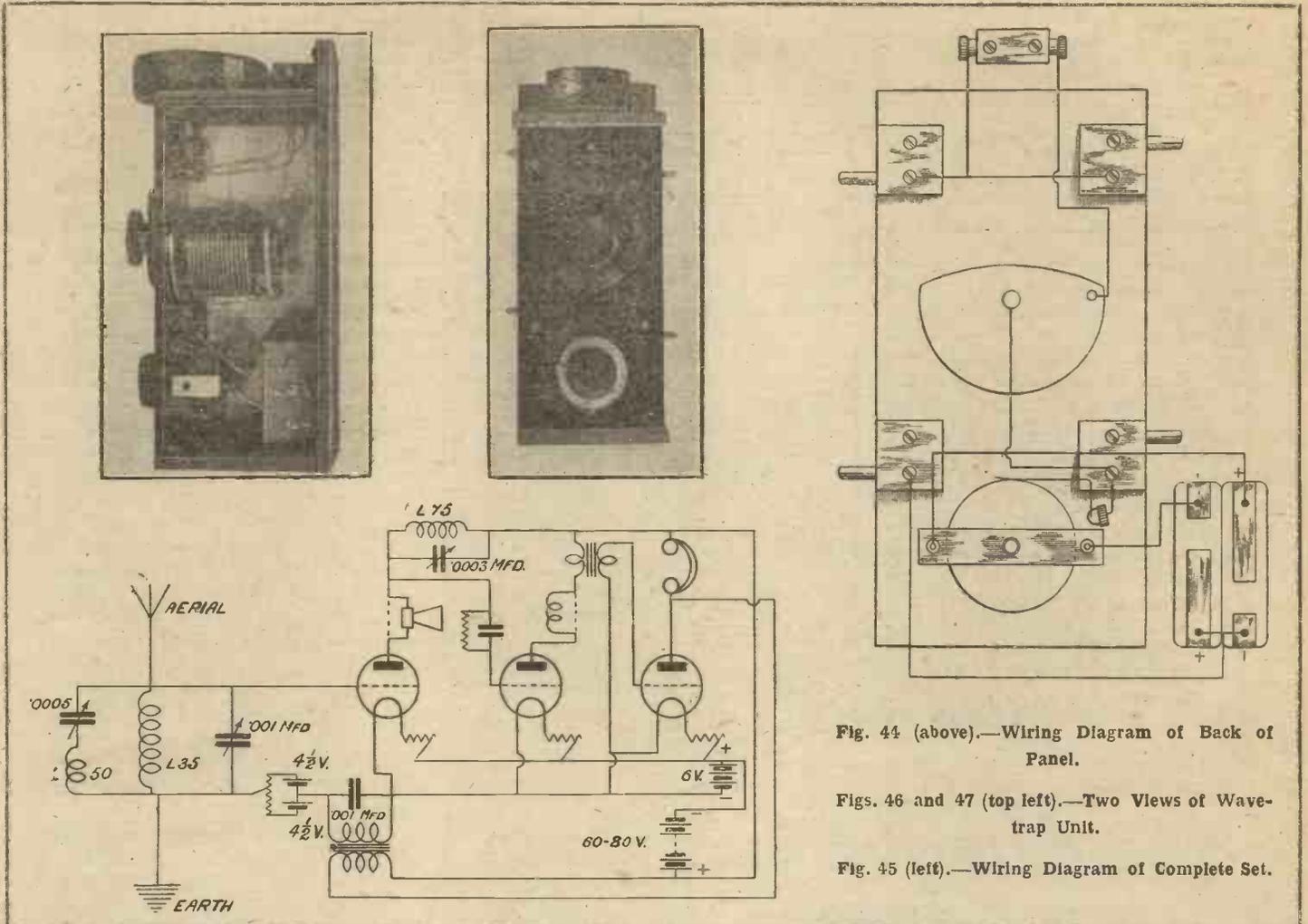


Fig. 44 (above).—Wiring Diagram of Back of Panel.

Figs. 46 and 47 (top left).—Two Views of Wave-trap Unit.

Fig. 45 (left).—Wiring Diagram of Complete Set.

Another H.F. unit, for example, may be plugged in its appropriate position in the set, or a second L.F. panel to work a loud-speaker when it is not desired to use the reflex circuit. A crystal might be mounted on the detector panel with a switch to

change over from valve to crystal. Endless improvements and additions will suggest themselves to the constructor. The writer has found it an excellent plan to make a unit, shell, panel and connectors for experimental purposes. The experi-

mental unit can be coupled into the set in any position and taken out again in a few seconds without any interference with the connections of the standard set or disarrangement of the parts comprising any of the units. DAVID GREY.

PROGRESS AND INVENTION

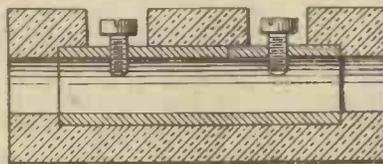
Wire Connector

THE use of solder to join wires in an experimental receiver is not always desirable, since a rapid change of connections is often necessary.

Many types of connector to overcome this difficulty have been tried, but have been inconvenient in use or expensive to construct. A connector is needed which can be manufactured cheaply in large numbers and which will provide a good electrical and mechanical connection, together with ease of operation.

Quite a neat type of wire connector is described in Patent No. 226,957/23 (Glover and Co., Ltd., Trafford Park, Manchester), which is in the form of a length of metallic tubing having two screws to clamp the inserted wires.

An insulated covering is provided, since the joint of two wires is usually in a conspicuous position and likely to "short" to some other part of the receiver.



Wire Connector (Patent No. 226,957/23).

Various methods of insulating the connector are described in the specification, but it is necessary, of course, to employ an insulator that can easily be moulded into the shape required if it is to be a commercial success.

Loud-speaker Improvement

MANY attempts have been made to obtain a sufficiently fine adjustment of the magnets in a loud-speaker in order to balance the natural pull on the diaphragm by means of magnetic tension. Patent No. 226,310/23 (The British Thomson-Houston Co., Ltd., Crown House, Aldwych, W.C.2) describes a new method of adjusting the tension of the moving diaphragm. The magnet is mounted on a screw thread, as is usual in adjustable loud-speakers, and the diaphragm is supported at its edges by three or four screws, instead of being clamped between the phone cap and the case.

By adjusting these screws the diaphragm may be pulled taut or held loosely in position, and its natural period is thus altered.



Names famous in combination. No. 5.

Darby and Joan

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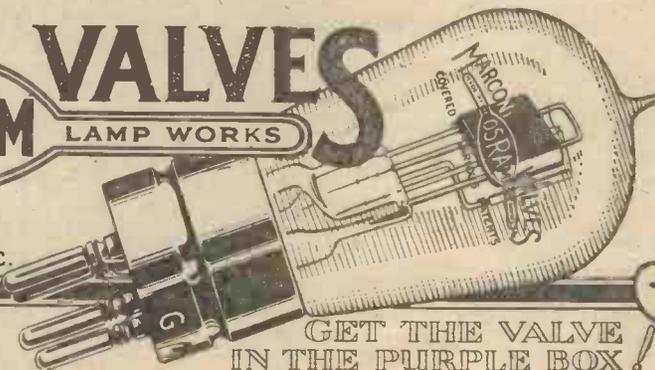
†G.P. = General Purpose.
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2 LO's NEW TRANSMITTER

Interesting Details of the B.B.C.'s West End Transmitting Station

MANY small items have been published from time to time regarding the British Broadcasting Company's new transmitting station, which is now in the final stages of completion.

In order to give listeners a more concise idea of this undertaking, the following brief explanation, by kind permission of Capt. P. P. Eckersley, chief engineer of the British Broadcasting Company, will be of great interest.

The Station

The station consists of two rooms, namely, the power or machine room and the transmitting room. In the power-room there are two 12-kilowatt motor-alternator sets with automatic starting gear, each capable of generating 500 volts at 300 cycles, for supplying power to the transmitter, and two motor generators of 10½ B.H.P. 32 volts, 400 amps, for battery charging. These also have automatic starting gear, and all the machines are worked by remote control from the transmitting room. A switchboard some 15 ft. long has the necessary switches, fuses and meters for the control of the power supply.

Transmitter

The transmitting room contains a 12-kilowatt Marconi-type Q transmitter. This consists of four panels, namely, rectifier, independent oscillator, master oscillator and modulator, containing in all fifteen valves of various types. Behind the rectifying panel there are two step-up transformers for transforming the output from the alternator to the voltage necessary for the operation of the set.

The battery-charging board, which consists of two panels, one for battery charging and the other for machine input, is situated conveniently near the transmitting panels, thus facilitating the lighting of valves from this board.

Adjoining this room is the battery-room, containing two complete batteries of eleven cells, each of 800 ampere-hours capacity, for lighting the filaments of the modulators, master and drive oscillating valves. Some idea of the power that is dissipated in filament lighting can be obtained from the fact that these batteries discharge at a rate of 90 amperes.

All music lines and control lines running direct from the control room at Savoy Hill terminate on a jack-board in the transmitting room, which is placed close to the modulator.

Masts and Aerial

The masts are very imposing structures of the steel-lattice self-supporting type, and taper from a base of 20 ft. square to

2 ft. square at the top. The tops of the masts are approximately 220 ft. above the street level.

The aerial is of the twin-sausage type, leading up to each side of the first mast from the roof of the transmitting room and then on a heavy-gauge stranded wire to the second mast, the halyards being secured through a winch at the foot of the mast. The two legs of the aerial are led into the transmitting room and are secured by means of tail wires to two anchors at the side of the transmitting room, the lead-in being brought to a large pot insulator on the roof.

Double Power

The set is rated at 12 kilowatts, as against 6 kilowatts of the existing main stations (with the exception, of course, of the high-power station at Chelmsford), and embodies all the improvements which have brought these stations to their present state of perfection.

It should be noted, however, that although this station is double the input power of the other stations, this does not mean that reception will be double the strength, but the range will, it is expected, be greater than the present 2 LO, possibly one-and-a-half times the present range.

The power is supplied from the alternators and passes through inter-locking oil-immersed switch gear (this switch gear is to prevent the filament switch being taken out before the power switch is broken, or the power switch being put in before the filaments are alight) through a choke to the high-tension transformers and also to the filament-lighting transformers, which are also oil immersed. The oil used in these transformers has a very high flash point to ensure against danger of leakage to earth. The power switch being made, connection is then established through the transformers on to the plates of the rectifier valves, of which there are four. These valves are of two-electrode type.

In the case of the rectifier filaments, the voltage is transformed down to 18 volts. The power which is supplied to the valves is rectified and passed through the smoothing equipment at the back of the panel. This smoothing equipment consists of two large iron-core chokes weighing approximately 4 cwt. each and a bank of condensers. This ensures that the high-voltage applied to the set is absolutely without ripple. The power is led to the independent oscillator, master oscillator and modulator panels by means of heavy-gauge copper and thus on to the plates of the valves.

Oscillator

The independent oscillator is a separate oscillatory circuit using one 3-electrode valve of the MT₂ type. This circuit is tuned to the same wavelength as the master oscillator, with an input of 1-1½ kilowatts. This oscillator works independently, but, being coupled to the master oscillator, acts as a buffer and so prevents any possible fluctuation in wavelength due to the aerial swaying in a strong wind or other causes.

It has been said by some listeners that they are certain that the wavelength of the transmitting station has varied three or four metres between transmissions, and also during transmissions, but this can hardly be accurate, as the engineers are constantly checking the wavelength during all transmissions and would detect any alterations. Further, the drive circuit prevents any fluctuation whilst transmission is going on.

The panel for the master oscillator is similar to the independent oscillator in structure, but with two MT₂ valves in parallel. The input to the valves is approximately 3 kilowatts, of which about 2 kilowatts is radiated from the aerial. On the top of this panel is a very large iron-core speech choke similar in size to the smoothing chokes in the rectifying panel.

Modulator

The modulating panel consists of seven main-control valves run in parallel and one sub-control valve. This ensures that maximum modulation is obtained without distortion. The sub-control valve acts as a low-power magnifier between the control room and the modulator valves. This valve is coupled by a resistance-capacity coupling to the grids of the main control valves.

The station is now being tested, and if the results are satisfactory the change over from the present transmitter will be made almost immediately.

A New Zealand amateur, Z 4 A G, transmitting on a wavelength of 80 metres, has been received in England on a single-valve Reinartz receiver.

Wireless enthusiasts in Bristol are urging that a local relay station is almost a necessity. Cardiff is too far away to give satisfactory crystal reception.

The station at Washington, N K F, is making a special series of tests for the benefit of amateurs on a wavelength of 1,400 metres.

Louden Valves



Filament Volts 4.8-5
 Filament Amps. 0.4
 Anode Volts 40-80



"A thousand melodies unheard before."—ROGER.

If you would appreciate to the full the delicate texture and beauty of stringed music, fit your set with Louden Valves.

They have a long life. They are economical to use, and they cost only eight shillings and sixpence; but their outstanding quality is the "Silver Clear" reproduction which they give.

No other valve made combines all these advantages in the same degree.

That is why the Louden Valve is coming so rapidly to the forefront of popular favour.

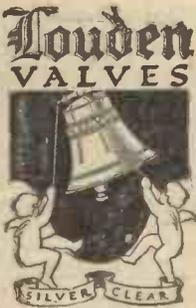
Fit them in your set, and you will be delighted with the results.

The Plain Louden for Detecting and Low Frequency Amplifying.

The Blue Louden for H.F. Amplification.

All Loudens are Silver Clear and free from "mush." Their current consumption is very low and their life long.

Price 8/6.



Louden Valves - Silver Clear

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

E.P.S.41.



Cutting Out the H.F. Valve

SIR,—In a letter published in No. 142 issue under the above heading and over the initials P. S. B. (Newcastle, Staffs), the writer states that he uses a three-pole double-throw switch for cutting out the H.F. valve, which is, I imagine, tuned-anode coupling. I think he has wired up his switch incorrectly, and a two-pole double-throw switch will cut out the valve, including filament. The centre terminal should be connected to the grid condenser, while one of the side ones goes to aerial and the other to the plate of the H.F. valve.—G. W. (Bromley).

"Seeing Music"

SIR,—With reference to C. E. W.'s criticism of THERMION in No. 141, it is perfectly obvious that a milliammeter connected in the H.T. lead of a L.F. amplifier would fluctuate. If there was no fluctuation no signals would be heard, as it is the variation in the steady plate current which affects the telephone diaphragm.

Also, I can assure you that a dip of 5 m.a. does not cause "appalling overloading" nor yield "very distorted reception."—E. E. H. (London, E.).

Atmospheric Conditions

SIR,—With reference to the remarks of THERMION on varying atmospheric conditions in No. 142, I feel sure that a good deal of useful information could be obtained, and possibly some light thrown on the present somewhat obscure subject of fading and night distortion, if amateurs could be induced to participate and co-operate in a properly-organised series of observations and reports over certain fixed periods.

The tremendous difference in reception that can be caused by the state of the atmosphere is particularly noticeable when one is using a set which has to be forced to the limit of its power to bring in distant signals. Under such conditions there are many stations which can only be picked up clearly on a good night, as we say.

I am beginning to formulate a theory that these atmospheric effects are by no means general (from every direction at once), but frequently seem somewhat directional. I should be interested to know whether THERMION has ever noticed this, or can confirm it in any way. What I mean to say is this: Suppose on a given night signals emanating from the north are extraordinarily good, it may be found that signals coming from the south are much more difficult to pick up than usual.

If this point could be definitely determined it might be found that there was some relation between prevailing wireless conditions and the numerous "depressions,"

which, according to the weather experts, are constantly assailing our shores.—B. H. R. (Sale).

Other Correspondence Summarised

A. H. B. (Stamford Hill), referring to a paragraph in "On Your Wavelength" in No. 141, states that he received the Canadian station Montreal (CKAC) during the Transatlantic tests of December.

E. S. P. (Kenilworth) has received all B.B.C. stations and many Continental stations on his one-valve convertible regenerative set made from instructions given in No. 138.

A. T. N. (Clapton) wishes to draw attention to the considerate treatment he has received from the Economic Electric Co., Ltd. They promptly replaced a faulty "Dextraudion" valve in spite of the fact that he had had it in use for some months.

R. W. (Poplar) has repeatedly picked up KDKA, Pittsburg, on his one-valve modified Flewelling set, using a counterpoise of Electron wire with the aerial switched off.

G. L. (Newark), referring to Capt. Eckersley's letter on "Radio-Paris and 5XX" in No. 141, states that he regularly receives Radio-Paris when 5XX is working on his three-valve set.

Calcutta has a new broadcasting station, transmitting on 425 metres. Other stations in India are operating at Bombay, Madras, Colombo and Rangoor.

FILAMENT SAFETY AND VERNIER CONTROL

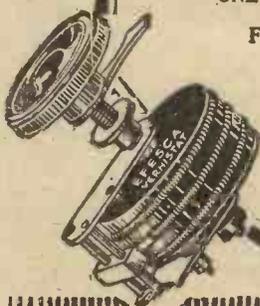
The Efesca Vernistat makes your valves safe against an accidental burn-out through too rapid switching-on, because three complete revolutions of the knob are required to bring in or out the whole 5 ohms resistance. The Vernistat provides the most delicate filament control yet invented and should be used wherever a separate rheostat is employed for H.F. and detector valves. Ask your wireless dealer to show you the complete series of

EFESCA

ONE HOLE FIXING COMPONENTS
WHOLESALE ONLY:
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And at Glasgow, Manchester and Birmingham.

EFESCA VERNISTAT (Patent)

Unique Construction, Smooth and silent in operation. Resistance 5 ohms, 6/- each, as illustrated.



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YESTERDAY—TO-DAY—ALL DAY— EVERY DAY—WILL DAY

EBONITE

Many a good wireless set has been utterly ruined by being built up on a panel of cheap and faulty ebonite. Why risk a failure? Make a resolve to have your panel cut dead true to your own size from our famous Ebonite.

PRICE 4/6 per lb. ordinary finish, or 5/- per lb. matt finish.

H.F. Transformer Formers, Turned Ebonite, 1/6 each.

The A.B.C. Wave Trap Ebonite Former, Cut Ready for Winding, 3/- each.

McMichael Valve Holders for Wood Panel Mounting, 2/- each.

Wood Base Mounting Coil Ends, 1/3 each.

IF YOU WOULD SECURE IMMUNITY FROM LEAKAGE IN YOUR SET HAVE YOUR PANELS CUT TO YOUR SIZE FROM OUR FAMOUS EBONITE. ORDINARY FINISH, 4/6 PER LB., MATT FINISH, 5/- PER LB. AMERICA EASY ON ONE VALVE.

MAKE NO MISTAKE IN YOUR SELECTION. Do not keep wasting money on crystals of unknown repute.

GET A CRYSTAL THAT HAS STOOD THE TEST OF TIME.

DAYZITE REGD.

Sold only boxed with Silver Cat's-whisker, 2s. 6d. each, postage 3d. extra. Makes excellent contact with Zincite for a Perikon Detector.

We had a call from a delighted customer recently who stated he received 2LO at Brussels quite distinctly on a DAYZITE crystal.

Write at once for our new catalogue, post free by mentioning "Amateur Wireless."

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WIRELESS IN PARLIAMENT



From Our Own Correspondent.

THERE appears every likelihood of strong opposition to the Wireless Telegraphy and Signalling Bill when, at some future date, it comes up for second reading in the House of Commons. Mr. Johnston, a Labour member, is to move the rejection, and Capt. W. Benn and a number of other Liberal members have put down the following motion for its rejection: "That this House declines to give a second reading to a Bill which gives immense powers to a Government department, inflicts excessive fines for infringement of regulations made under such powers, creates new rights of search which unduly infringe the personal liberties of the subject, while at the same time discouraging scientific research and experiments in this new industry."

Licences

Lord Wolmer informed Sir F. Wise that the total number of annual broadcasting licences issued from November, 1922, when the broadcasting service was introduced, up to the end of last month, was about 1,942,000, including the renewals of expired licences. Of this total about 1,200,000 were now current. The total revenue collected was £1,108,000, of which about £50,000 accrued to the British Broadcasting Company. Payments to the company in respect of licence fees were made by monthly instalments in arrear, and the total amount paid to them up to February 1 was about £500,000.

Sir William Mitchell-Thomson informed Mr. Crawford that on February 20 2,181 amateur "sending" licences were in force and 126 applications were under consideration. From June 1, 1924, to the end of January, 1925, 265 applicants were granted such licences and 126 refused.

Answering Capt. Garro-Jones, who asked whether the present facilities given to amateur wireless experimenters, which terminated at the end of April, should be extended and the right given to work in the day-time and to use a wave-band of between 180 and 200 metres, Sir Wm. Mitchell-Thomson said that special facilities had been given during the winter months to a number of experimenters for the use of higher power than that authorised in their licences in order that they might take part in organised experiments in transmission between this country and the United States and other countries. He understood that the winter months were the most favourable for such experiments; but if there was a desire on the part of the organisers of the experiments to continue them during the summer months, he would be happy to consider any definite proposals which they might submit.

Test ANY Loud Speaker of other make against this



Also the "New" Junior-de-Luxe with highly finished metal-ribbed wood horn ... £3 5 0.

50/- "New" AMPLION JUNIOR

THE "New" AMPLION Junior may not, of course, come out best against them ALL, but it will hold its own EASILY and CONCLUSIVELY against "twice the size" and "double the price." Because of this exceptionally meritorious performance the "New" Junior has quickly become so great a favourite that it has been necessary to provide for an enormously increased output. All who desire "BETTER RADIO REPRODUCTION," with a reasonably moderate outlay, will be glad to know that quantity supplies are now forthcoming and that therefore they can secure just what they want — by ordering now an

The World's Standard

AMPLION

Wireless Loud Speaker

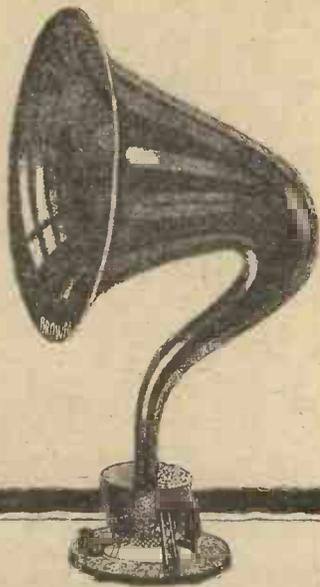
Obtainable from AMPLION STOCKISTS and Wireless Dealers everywhere.

ALFRED GRAHAM & CO. (E. A. Graham),
St. Andrew's Works, Crofton Park, London, S.E.4.

Demonstrations given during Broadcasting hours at

WEST END SHOWROOMS:
25-6, Savile Row, W.1.

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Remember the Skylark!

MANY who have heard the Brown H.2 Loud Speaker are amazed that such a small instrument can give such a volume of pure and undistorted sound.

To those, we would say, Remember the Skylark! One of the smallest of our songsters—yet his tuneful melody can always be heard from afar. Volume in a Loud Speaker is dependent upon correct design and not upon mere size. When you select the Brown H.2 you obtain the fruition of many years of experimental work devoted entirely to the science of sound reproduction. In fact, the very first Loud Speaker ever built for wireless was a Brown.

Prices

H.2 12 inches high.
120 ohms £2:5:0
2000 ohms £2:8:0
4000 ohms £2:10:0

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15 MOORFIELDS, LIVERPOOL
67 HIGH ST., SOUTHAMPTON

Brown
Wireless Apparatus

Gilbert Ad. 2375



CZECHO-SLOVAKIA is to have a wireless exhibition at Prague from March 22 to March 29.

Rome wireless enthusiasts have for some days past been receiving the Western Electric Company's concerts from Schenectady at great strength on simple sets.

The British Broadcasting Company have arranged to devote half an hour every Friday afternoon for the purpose of transmitting talks to school children in Bradford.

The Long Eaton Council have agreed to invite a wireless company to give a demonstration with a view to providing a wireless receiving set in the public park.

There has been a remarkable rush for wireless licences in the West Riding of Yorkshire since the new Wireless Bill was announced. Nearly 2,000 licences were taken out in Leeds last week.

The Royal Air Force Band will give its second "Request" programme on March 13, all its items being chosen from a list of the most popular numbers it has broadcast.

In Scotland a large majority of the population live in tenement dwellings, and ground-floor residents are complaining about the tremendous advantage which the "top-flat" man has with an aerial that is 20 or 30 ft. above the highest they can have.

A new type of broadcast, to be known as "phono-flights," is being tried by the Glasgow station. The intention is to take listeners on tours of various parts of the British Empire, in which, with speech, music and drama, a picture will be given of the Colonies to-day, along with glimpses of the early pioneering struggles of the past.

Since the publication of the proposed new legislation, applications for wireless licences in Swansea have increased tremendously. Six hundred and twenty-three licences have been granted in two days.

The Postmaster-General is to be asked by the Radio Society to receive a deputation on the new Wireless Bill.

Notices have been served on nearly 200 wireless users in Edinburgh to remove within fourteen days, under threat of prosecution, acrials which have been placed across the city streets.

Ten representations on the subject of the destruction of racing pigeons by wireless acrials have been received by the Post Office.

The scheme for an Empire chain of wireless stations is now within sight of early completion.

In view of misleading statements concerning the lengthening of broadcasting hours, the British Broadcasting Company announce that nothing definite has been settled.

A programme of chamber music will be broadcast on March 5, items being given by Mr. John Coates and the Philharmonic Pianoforte Quartet. Mr. Coates will sing a group of modern English songs and a group of foreign songs, including works by Brahms, Schubert, Beethoven and Weckerlin.

The council of the Institution of Electrical Engineers have asked the Postmaster-General to defer any immediate further proceedings with the Wireless Bill in order that they may have an opportunity of submitting their views to him. They point out that the new provisions are likely to prove detrimental to the progress of wireless telegraphy.

An international conference of the League of Health was held recently at Singapore, and it is proposed that a weekly telegram summarising the most important information regarding the prevalence of epidemic disease in the Far East and elsewhere should be broadcast throughout Australasia.

An S.B. programme of "Ballads Old and New" will be broadcast on March 10, which contains orchestral selections of songs by favourite composers such as Tosti, Wilfrid Sanderson and W. H. Squire, and two special selections, one of old-time ballads and another of old music-hall songs, both arranged by Mr. Robert Chignell.

Another instance of the usefulness of the Marconi direction-finder in locating a ship in distress was provided during recent heavy gales, when the mail steamer *Sarthe*, having developed engine trouble while crossing the Bay of Biscay, was compelled to ask for assistance. The *Sarthe's* call was received by the *Demerara* and the *Port Darwin*. The *Port Darwin* carried a Marconi direction-finder, with which she took a bearing on the *Sarthe* and set her course accordingly. The *Demerara* made use of the *Port Darwin's* direction-finding equipment in checking her own position, and she too was able to set an accurate course towards the *Sarthe*. Fortunately no lives were lost.

(Continued on page 416)



Plug-in H.F. or Neutrodyne Transformers

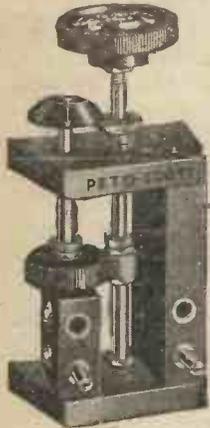
The latest Peto-Scott H.F. Transformer with windings in six slots. Very selective tuning and particularly efficient for long-distance work. Only the highest grade ebonite used in its construction. 300 to 600 metres - each 7/- Chelmsford and Radiola - each 7/- Matched in pairs at no extra cost. Similar type but wound specially to Mr. Harris's Specification for use in the Six Valve Anglo-American Six and matched.

7/- each.

21/- set of three.

Slow Motion Coil Holder (3 coil).

For Panel mounting or Cabinet mounting. Knob gives vernier movement. Essential for accurate tuning. Superior workmanship ... 15/6 Two Coil Holder, 10/6



Back of Panel Coil Holder

As used by Mr. Percy Harris, Mr. Barber, and other authorities. The only satisfactory method of mounting coils at rear of panel. Friction drive gives vernier movement. Indication in front of panel shows position of moving coil. Price 12/6



Valve Holder

For American-type Sets where components are mounted on baseboard. Complete with soldering lugs 1/3

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Essential for providing the very low capacity required for tuning neutrodyne transformers. One hole fixing. Price 5/6



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For panel mounting. Very neat. Complete with nuts. 1/2



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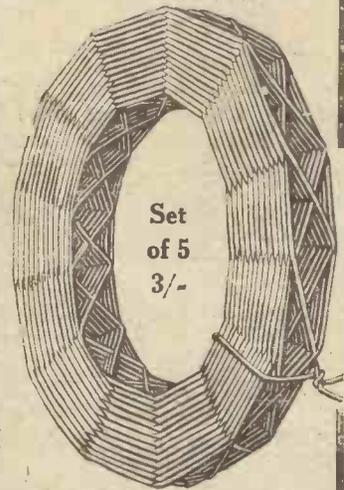
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With tension-winding we are able to dispense with all ebonite, empire tape, or other substances which introduce additional self-capacity, and at the same time secure a unique low-capacity formation that makes TUNING SHARPER, SIGNALS STRONGER, and REACTION READIER.

The Tension-wound formation of Reactone Coils gives them greater rigidity, complete uniformity, and thin structure (better for coupling). They are the only correctly tension-wound, former-less Coils.

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



3/-

No. 150 (Chelmsford), Price 1/3.
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Reactone TENSION-WOUND Inductance Coils

Ask your Wireless Dealer: In case of difficulty send P.O. (adding 3d. for postage) with your Dealer's name and address, to The Manufacturers:

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Wholesale from V. Zeitlin and Sons, 144, Theobald's Rd., London, W.C.1. Agents wanted in all Broadcasting Centres.



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into a

LOUD SPEAKER

with "THE

GRAMAPHIX"

A most efficient device to which ordinary headphones are clipped by simple pressure on the spring clips.

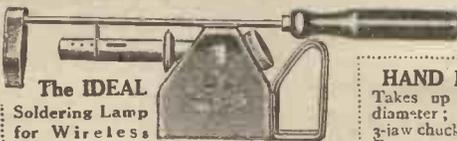


HORNS TO MOUNT ON GRAMAPHIX: Straight Horn (Bell 10 in.), 6/-
Swan-necked Horn (Bell 11 1/2 in.), 15/-
Small Curved Horn (Bell 8 1/2 in.), 7/6.
Post 9d. extra.

The Gramaphix requires (according to distance from the Broadcasting Station) at least one stage of low-frequency amplification to give satisfactory volume.

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Straight or hatchet shaped Soldering Irons to use with above, 1 - extra. Postage 3d. extra.

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Postage 9d. extra 5/9 Set of Six Twist Drills Post Free 2/-



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DON'T TICKLE THE CRYSTAL—USE

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FOOL-PROOF DETECTOR

Provisional Patent 24791/24

Continuous reception in any position at all times, owing to the special design of both crystal and catwhisker always in contact.
GUARANTEED TONE—VOLUME—PURITY

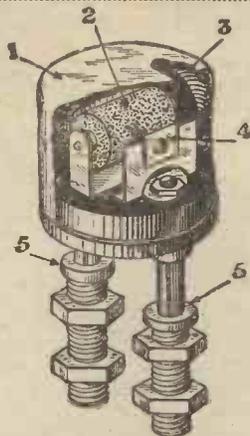
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2. Special "Harlie" super-sensitive crystal.
3. Ebonite wheel for rotating crystal. No fumbling about adjusting, just turn the wheel—simplicity itself.
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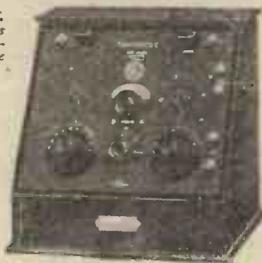
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£1 Only

Send to-day, together with your order for the "Tonyphone," and this wonderful set, which receives all B.C. stations, will be *delivered complete*, including all accessories. You pay a further £ each month afterwards. The total cost is only £15 9s or if you prefer, £14 5s. cash.

"Tonyphone" Super Two-Valves

Complete with Accumulator, H.T. Battery, Aerial, pair 4,000 ohms Headphones, and two Valves—one High Frequency and one Detector. All Royalties paid.



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NEW!

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POST FREE

A dull emitter at B.E. price!

THE introduction of the "Luminax" makes it possible, for the first time, to obtain a Dull Emitter Valve at the same cost as the extravagant Bright Emitter type.

Fit "Luminax" Dull Emitter Valves to your set, and every accumulator-charge will last three times as long.

"Luminax" Dull Emitter Valves are British-made and of standard design. They have a filament voltage of 1.8 and a filament amperage of only .22. As a general purpose valve the "Luminax" is unsurpassed and can be used successfully in all three stages.

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Dull Emitter Valve

From all Wireless Dealers, or 12/6 post free from:

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LUMINAX ELECTRIC SUPPLIES CO., LTD.

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Chakophone No. 7 Set
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The Set you can be proud of

4-VALVE Set COMPLETE

No Extras Whatever.

£26:11:9

Carriage Paid.

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Full particulars free on request.

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FIXED CONDENSER

Each supplied with two Clips

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

PRICES:

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M.H. made and guaranteed are the components that you need.



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), 465 m. Hull (6KH), 335 m. Leeds (2LS), 346 m. Liverpool (6LV), 315 m. Nottingham (5NG), 326 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 (Radio Wien), 530 m. (1 kw.). Daily: 08.00, markets (exc. Sun.); 10.00, con.; 12.05, time sig.; 12.20, weather; 14.30, Stock Ex. (exc. Sun.); 15.00, news, con.; 15.10, children (Wed.); 17.00, lec. (Tues., Wed., Thurs., Sat.), children (Mon., Fri.); 17.20, women (Tues.); 18.00, news, weather; 19.00, time sig., con., news; 21.00, dance (Wed., Sat.).

Graz (relay), 675 m. Testing.

BELGIUM.

Brussels, 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) (250 w.), 1,100 m. (250 w.). 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), 1,180 m. (1 kw.). Weekdays: 13.00, Stock Ex., weather, news; 17.30, con. (Thurs.); 09.00, con. (Sun.).

Strasnice 430 m. (1 kw.). Testing.

DENMARK.

Copenhagen (Kjobenhavns Radiofoni station), 475 m. (1 kw.). 18.35, notices, lec., con.* (Tues., Thurs., Sat.). * This con. is also relayed by the Aalborgshus ship station on 510 m.

Lyngby (OXE), 2,400 m. and 2,700 m. Weekdays: 18.20, news, Stock Ex. (2,700 m.); 20.00 and 21.00, news, weather, time sig. (2,400 m.). Sundays: 15.00 and 20.00, news (2,400 m.).

Ryvang, 1,190 m. Concert, 14.00 (Wed.), 15.00 (Sun.), 19.00 (Fri.), 19.30 (Tues.).

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); 18.45, Paris fashions

(in English)—temp—(Wed. and Sat.); 19.00, weather; 20.30, con. relayed from PTT (Fri.); 22.10, weather (exc. Sun.). Frequent tests on 1,500 m.

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

Radio-Paris (SFR), 1,780 m. (3-4 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.). Tests probable on 1,125 m.

L'Ecole Sup. des Postes et Télégraphes (PTT), Paris, 450 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.).

Lyon (Radio Sud-Est), 87 and 440 m. Testing.

GERMANY.

Berlin (2), 505 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.

Königswusterhausen (LP), 2,450 m. (5 kw.). Wolff's Buro. Press Service: 06.00, 20.00, 2,900 m. (5 kw.): 10.30, con. (Sun.), Esperanto lec. 3,150 m.: Telegraphen Union, 06.45-18.45, news, 4,000 m. (10 kw.): News, 06.00-20.00 (daily).

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

Breslau, 418 m. (1½ kw.). 10.15, Stock Ex., weather; 11.00, factory con. (weekdays), sacred con. (Sun.); 11.55 (Sun.), time sig., weather, Stock Ex.; 14.00, news (weekdays); 15.00, children (Sun.); 16.00, orch., children (Fri.); 16.45, con. (Sat.); 17.00, shorthand (Sat.); 18.00, Esperanto (Mon.), Engl. (Thurs.), lec. (other days); 19.00, con., weather, time sig.; news; 20.30, dance (Sun.); 21.15 (Mon.).

Cassel, 288 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.); 18.00, lec. (daily), shorthand (Wed.), Esperanto (Fri.); 18.30, educat. hour; 19.00, lec., Engl. (Mon.); 19.30, con. (daily), jazz band (Fri.); 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., chess; 12.00, con., lec.; 16.00, children; 17.00, 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.; 12.20, Engl. (Wed.); 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.), Spanish (Mon. and Thur.); 19.00, weather, con. or opera; 21.00, weather, markets, news; 21.50, news (in English), dance (not daily). Will shortly be increased to 5 kw.

Hanover, 296 m. (1½ kw.). Relay from Hamburg. Also own con., 16.00.

Königsberg, 463 m. (1 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. (700 w.). 07.30, 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). Will shortly be increased to 5 kw.

Münich, 485 m. (1 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.).

Munster, 410 m. (1½ kw.). 11.00, sacred con., news (Sun.); 11.30, news (other days); 11.55, time sig.; 14.30, markets; 15.30, 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.).

Nuremberg, 340 m. (800 w.). Relay from Munich.

Stuttgart, 443 m. (1 kw.). 06.30, time sig., weather (weekdays); 10.30, con. (Sun.); 15.00, time sig., con., news (Sun.), children (Sat.); 16.45, children (Wed.); 18.30, lec. (weekdays); 19.00, con. (daily); 20.15, time sig.; 22.00, weather, news, dance (Sun.).

FINLAND.

Haelsinki, 400 m. (temporary w.l.). Testing daily.

HOLLAND.

Amsterdam (PCFF), 2,125 m. (1 kw.). Daily: 07.55-16.10 (exc. Mon. and Sat., when 10.10-11.10), news, Stock Ex. (PX9), 1,070 m. (400 w.): con., 20.40 (Mon.).

Hilversum (HDO), 1,090 m. (2½ kw.). 17.40, children (Mon.); 19.40, lec. (Fri.); 19.40, con. (Sun.); relay of Mendelberg orch. (Thurs.); con. (Sun.); 19.55, Radio talk (Wed.); 21.40, lec. (Sun.).

Bloemendaal, about 345 m. 09.40 and 16.40, sacred service (Sun.).

ITALY.

Rome (IRO), 425 m. (3 kw.). Weekdays: 16.00, orch., Stock Ex.; 19.30, time sig., news, con.; 20.15, news, Stock Ex., con.; 21.10, dance, weather. Sundays: 09.30, sacred con.; 15.45, children, Stock Ex.; 16.15, orch.; 16.45, jazz band, con., dance.

Milan, 650 m. (temp. W.L.). Testing shortly.

JUGO-SLAVIA.

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

NORWAY.

Christiania, 320 m. (500 w.). Testing, daily, about 19.30.

POLAND.

Warsaw (Radiopol), 390 m. 17.00, tests.

PORTUGAL.

Lisbon (Aero-Lisboa), 375-410 m. 21.30, tests, music, speech (Wed. and Fri., irr.).

RUSSIA.

Moscow Central Wireless Station, 1,450 m. Sundays: 12.45, lec.; 15.30, news and con. Weekdays: 13.00, markets; 15.30, news or con. Sokolniki Station, 1,010 m. Sundays: 14.30, con.; 17.00, lec. and con. (Tues., Thurs., Fri.).

Trades Union Council Station, 450 m. 17.00, con. (Mon., Wed.).

SPAIN.

Madrid (Radio-Iberica) (3 kw.), 392 m. 22.00, weather, Stock Ex., time sig., con., news.

(Continued on page 420)

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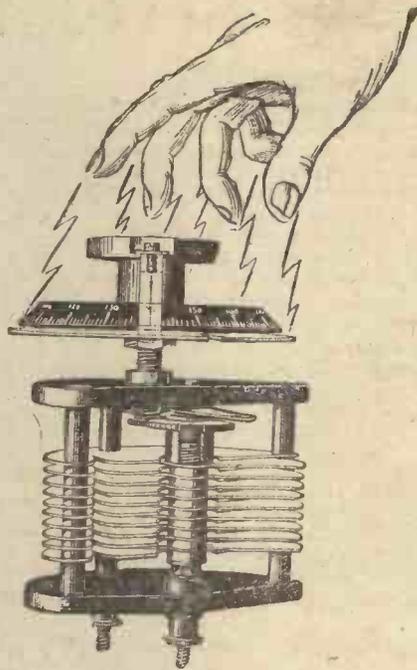
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"BROADCAST TELEPHONY" (cont. from page 418)
 Barcelona (EAJ1), 325 m. 18.00, lec., Stock Ex. markets, con. or relay. of opera; 20.30, news and con.

Seville (EAJ5), 350 m. 18.30, lec., con., news.

SWEDEN.

Stockholm (SASA), 430 m. (500 w.). Sundays: 09.55, sacred service; 16.00, children; sacred service; 19.00, con., news, weather. Weekdays: 11.30, weather, Stock Ex., time sig.; 18.00, lec. (irr.); 19.00, con., lec., news, weather.

Gothenburg (SASB), 290 m. (500 w.), also 700 m. 10.00, fishery reports (700 m.); 11.55, time sig.; 19.00,* programme s.b. from Stockholm.

Malmö (SASC), 270 m. 11.00, weather; 19.00,* programme s.b. from Stockholm.

Boden (SASE), 2,500 m. 18.00, con. (Tues., Fri., Sun.)—temp.

* Local programmes are also broadcast at times.

SWITZERLAND.

Geneva (HB1), 1,100 m. (500 w.). 13.15, lec. No Sun. transmissions.

Lausanne (HB2), 850 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 (Höggg), 515 m. (500 w.). 11.00, weather; 11.55, time sig., weather, news, Stock Ex.; 15.00, con. (exc. Sun.); 17.15, children (Mon., Wed., Thurs., Sat.); 18.00, weather, news (exc. Sun.); 19.15, lec., con., dance (Fri.); 20.45, news.

"A THREE-VALVE EXPERIMENTAL RECEIVER." Owing to the pressure upon our space we have been obliged to hold over the concluding instalment of this article.

CHIEF EVENTS OF THE WEEK

SUNDAY, March 8

London and 5 X X 3.0 Organ Recital.
 Birmingham and 5 X X 9.0 The Opera Pagliacci (Leoncavallo).
 Cardiff 8.10 British National Opera Company.
 Manchester 3.0 Symphony Concert.
 Newcastle 3.0 Chamber Music.
 Aberdeen 9.0 Recital of Ancient Hebrew Melodies.
 Cantata, *The Crucifixion* (Stainer).

MONDAY

London and 5 X X 7.30 Symphony Concert.
 Bournemouth 7.30 Wagner Evening.
 Manchester 7.30 Symphony Concert.
 Newcastle 7.30 The Dance Music Tradition.
 Glasgow 7.30 "A Night in Holland."
 Belfast 7.30 Operatic Programme.

TUESDAY

5 X X 7.30 *Evening Standard* Concert.
 London 7.30 Ballads Old and New. S.B. to all Stations except 5 X X.
 Liverpool 7.30 The Liverpool Philharmonic Society's 10th Concert.

WEDNESDAY

London and 5 X X 7.30 A London Programme.
 Birmingham 8.30 Old English Music.
 Cardiff 7.30 *Tannhäuser* (Wagner).
 Manchester 7.30 "The Seven-Thirty Revue."
 Newcastle 7.30 Garden Scenes from Opera.
 Belfast 7.30 Symphony Concert.
 Hull 7.30 *The Dream of Gerontius* (Elgar).

THURSDAY

ALL STATIONS 8.0 The Musical Miracle Play Relayed from the Royal Opera House, Covent Garden.

FRIDAY

London and 5 X X 7.30 The Band of H.M. Royal Air Force.
 Cardiff 7.30 Song Cycle "The Fair Maid of the Mill" (Schubert).
 Aberdeen 8.0 "An Hour with Elgar."
 Glasgow 7.35 "Scots Night."

SATURDAY

London 8.30 "A New Feature by Old Friends."
 Bournemouth and 5 X X 8.0 "Pictures"—Well known paintings brought to life.
 Aberdeen 7.30 The Catterall Quartet.

"How to Remedy a Leaky Roof" is title of a timely article appearing in the current issue of "The Amateur Mechanic and Work" (3d.), and will doubtless prove of great use to many readers. Other articles and features appearing in the same number are: "The Sealing-wax Art," "Simple Terra-cotta Work," "Re-fixing Loose Switch Blocks," "A Corner Umbrella-stand," "Our Small Car Page," "A Long-distance Two-valve Set," "What Crystal Do You Use?" "Fixing Wireless Tackle: The Cleat," "Connecting Tags for Wire Ends," "Notes by the Way," "Gilt Titles for Home-bound Books," "Domestic Lubrication," "Fittings for a Doll's House & Kitchen Range and a Boiling Stove," "Motor-cycle Practicalities," "Making Money by Inventing," "How a Weather-house Works," "Questions and Answers," etc. etc.

ANNOUNCEMENTS

"Amateur Wireless and Electric." 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. 6d.; 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.



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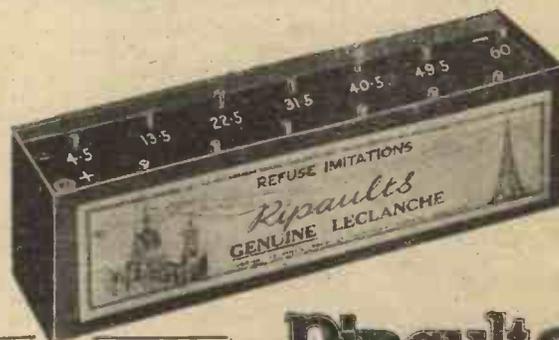
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CLUB DOINGS

Crewe and District Radio Society

Hon. Sec.—MR. R. PEACH, 81, West Street, Crewe. The first meeting was held on February 11, when the officers were elected. New members will be cordially welcomed.

Coventry and District Co-operative Society

Hon. Sec.—MR. A. CURTIS, West Orchard, Coventry. On February 11 the members submitted papers on "Soldering and Tapping," which the secretary read to the meeting. A monetary prize was offered for the paper which secured the most votes, and was awarded to Mr. Izeley.

Kensington Radio Society

Hon. Sec.—MR. H. JOHNSON, 36, Cromwell Grove, W.6.

The monthly meeting took the form of a debate, with the president, Dr. Gordon Wilson, in the chair. The subject was "Different Means of Obtaining H.T. Supply." Numerous questions were put and answered.

Gork Radio Association

Hon. Sec.—MR. T. A. CONROY, M.A., Smithville, Sunday's Well Rd., Cork.

On February 9 an interesting lecture-demonstration on the wiring of a set was given by Mr. A. Smith. A soldering and wiring demonstration followed, and members' questions were dealt with.

Coventry and District Co-operative Radio Society

Hon. Sec.—MR. A. CURTIS, West Orchard, Coventry. The meeting held on February 4 was principally devoted to members' queries, and concluded with a brief lecture by the chairman, Mr. Beaumont, on the discovery of wireless waves and the subsequent developments.

Beckenham and District Radio Society

Hon. Sec.—MR. A. WEST, Manor House, Ilich Street, Beckenham.

On February 19 a representative of Messrs. Dubilier, Limited, explained the whole process of manufacturing condensers, and illustrated his talk by means of a very comprehensive selection of slides.



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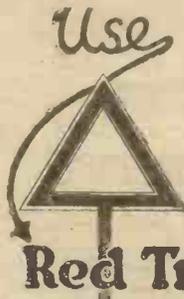
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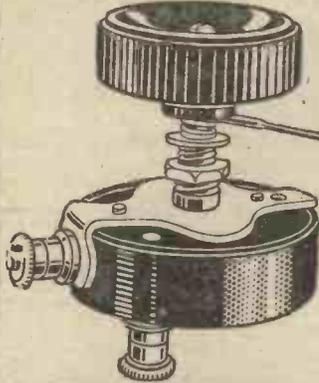
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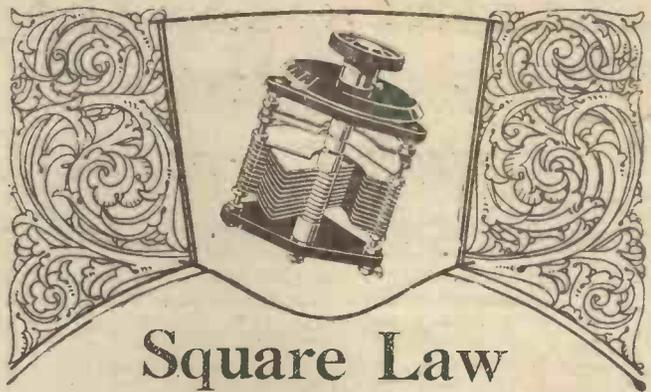
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" 3	300-450	6d.
" 4	400-550	7d.
" 5	500-750	8d.
" 6	600-1,000	9d.
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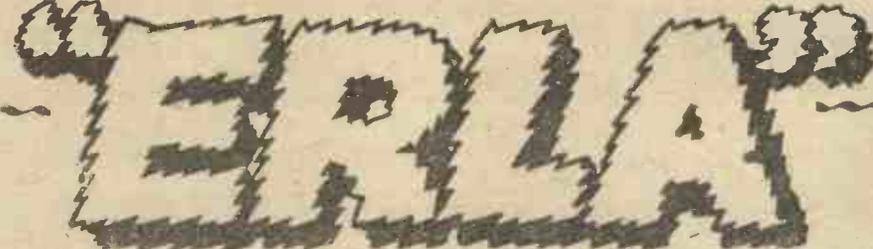
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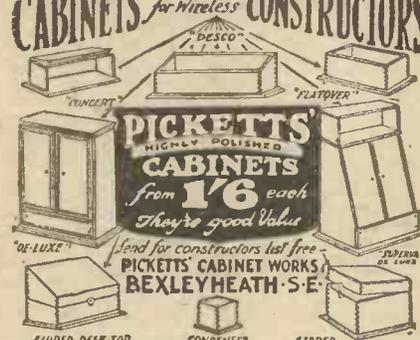
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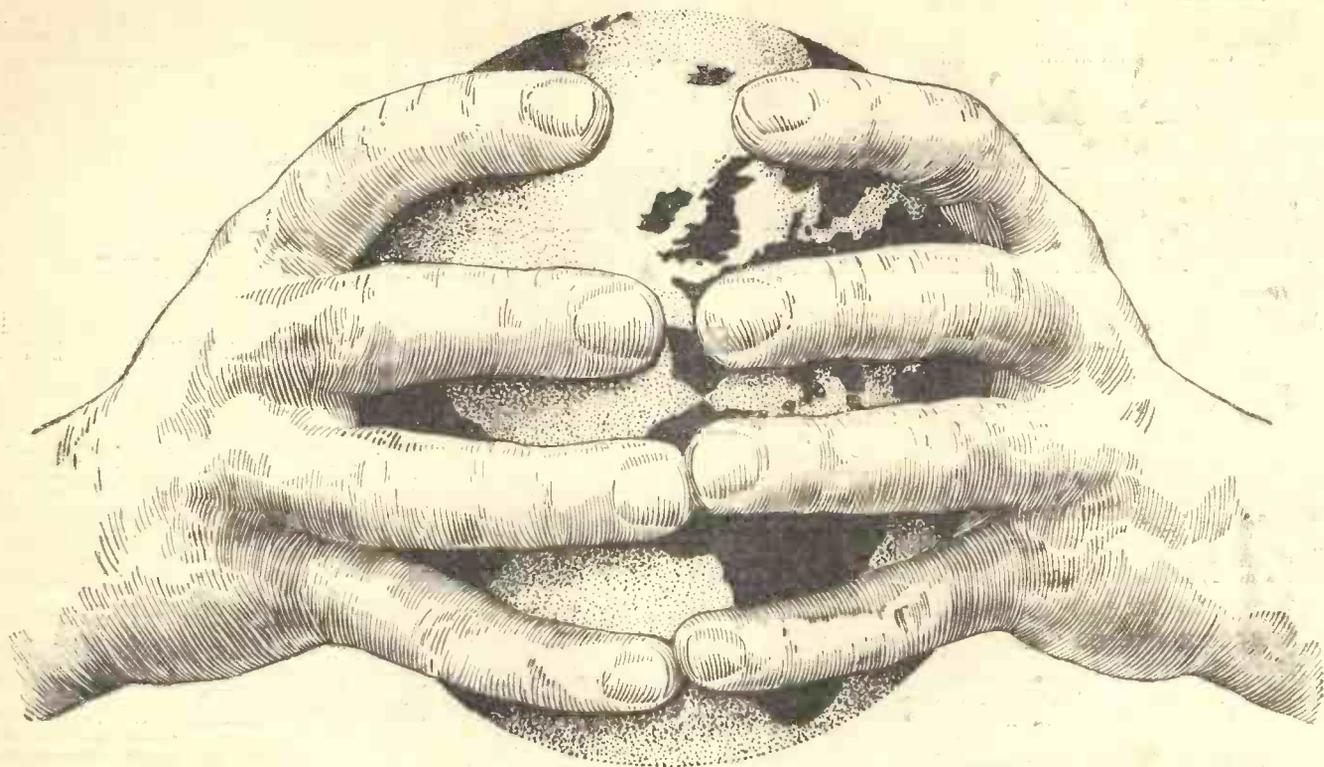
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WE are introducing an additional range of "LISSENIUM" coils. To distinguish the series from the well-known and standard "LISSENIUM" coils, we are calling this new series of coils "LISSENIUM X" coils. The first number to be put on the market, and now ready, is a No. 60 coil.

This "LISSENIUM X" coil has two tapings. The tapings are nearer that end of the winding which is connected to the socket, "A" tapping being nearer to the end than "B" tapping. In all circuits where one of the tapings on this coil is used, connections should be tried to both terminals separately to see which tapping gives the best results.

SELECTIVITY.

Great selectivity is a noticeable feature of this new "LISSENIUM X" coil. There is now a use for a tapped plug-in coil which will provide the user with the means of alternative connections called for to keep pace with the development in radio circuits.

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Aperiodic Aerial Tuning.

You can adopt this method of tuning with your existing receiver by simply taking your aerial off its present terminal and connecting it to either of the two terminals on the "LISSENIUM X" coil. Best results are usually obtained when the tapping point on the coil is nearest the earth terminal.

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This new "LISSENIUM X" coil is the only coil which can be used in "Neutral-Grid" circuits similar to that described by Mr Cowper. The H.F. amplification obtained with this new "LISSENIUM X" coil is remarkably stable, because the coil is so designed that on one or other of the tapping points a neutral point is provided which balances out the unwanted capacities.

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It will be noticed that in all circuits in which this new coil is used, reaction control is exceptionally smooth, and is very much finer than usually obtained.



WHY WE FIRST MADE A No. 60 COIL.

A No. 60 coil in the new series has a very wide application. For instance, this coil can be used in aerial, anode, and reaction circuits. That is, in a one H.F. tuned anode receiver to cover broadcast wavelength, the three coils necessary could all be No. 60 "LISSENIUM X." This coil is

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OTHER NUMBERS WILL BE INTRODUCED.

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Amateur Wireless

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Vol. VI No. 145.

SATURDAY, MARCH 14, 1925

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PRACTICAL ODDS
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SIDELIGHTS ON THE
SUPER CIRCUITS

SIMPLE INDOOR
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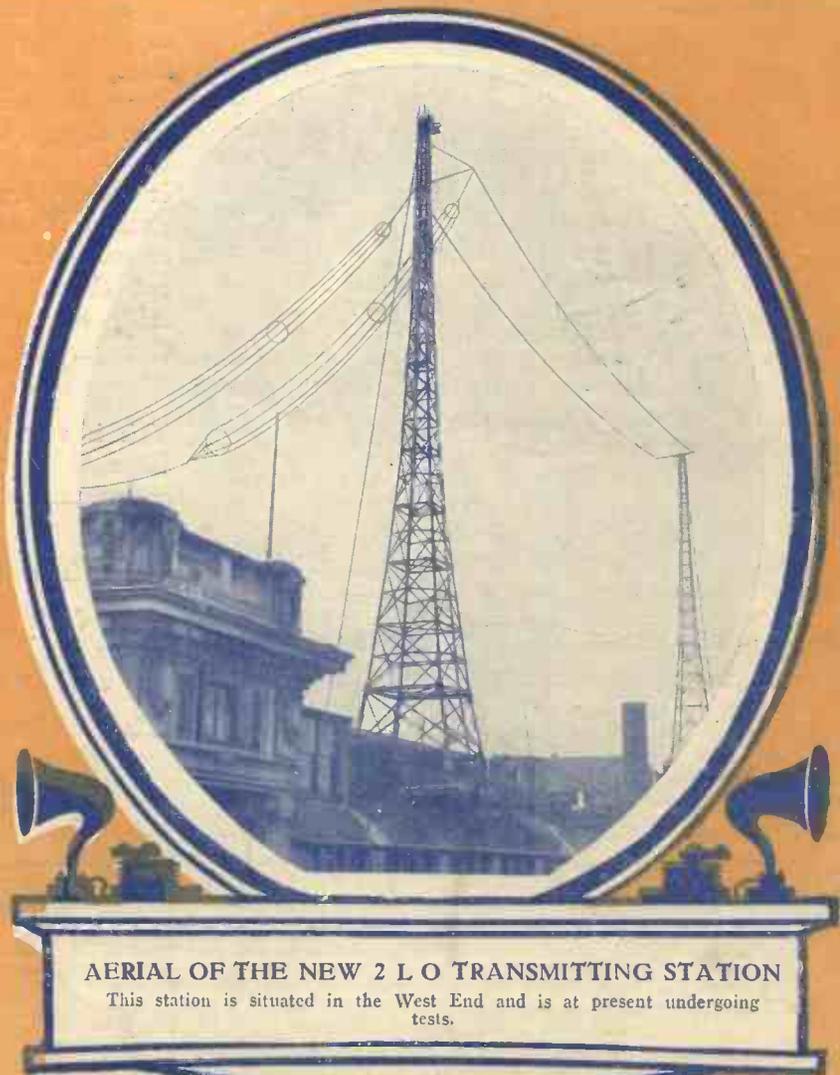
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No. 1



THE man with a multi-valve Set using bright emitters can replace his valves one by one as they become useless by Wuncells W.R.1 and W.R.2. These are the only dull emitters on the market that can be used with a 2-volt, 4-volt or 6-volt accumulator without any alteration to the Set.

Every W.R. type of Wuncell has incorporated in its base a special resistance which can be short-circuited when not required by the screw shown above. When all the bright valves have been replaced by Wuncells these resistances can be short-circuited and the accumulator altered to give 2 volts with a greatly increased capacity. Full instructions for this simple alteration are supplied with every Wuncell valve:

Prices:

W.1 For Detector or L.F. Amplifier
W.2 (With red top) for long distance reception
18/- each

*W.R.1 Corresponding to W.1
*W.R.2 Corresponding to W.2
20/- each

* Fitted with internal resistance as above.



ECONOMY —real and false

THE point is just this: Can you afford *not* to use Wuncell Dull Emitters.

Or, let us put it in another way. You own, perhaps, a 3-valve Set. Now the average bright emitter valve consumes about .7 of an ampere every hour. Three of them, therefore, will consume 2.1 amps. every hour you are using them. If your accumulator is rated at 6 volts 30 amp. hours (that is a good average size) you will get about 15 hours' use from it on a charge.

The cost for this may be anything up to 2/-. Eight shillings for a month's broadcasting—practically £5 per year. Not much when compared with the pleasure you obtain, but still quite an appreciable item in the family exchequer.

* * * * *

Now let us see what you would be paying if you used Wuncells. First of all you would re-connect your accumulator to give 2 volts only by connecting all the cells in parallel instead of series. This will triple its capacity and give you 2 volts 90 amp. hours, but the charging cost won't be any higher.

Wuncell Valves function best at 1.8 volts and consume .3 of an amp. per hour—your 3-valve Set, therefore, will consume .9 amp. per hour, and your accumulator will last six weeks on one charge.

In other words, you get 5 weeks' broadcasting for nothing every time you get your accumulator charged if you are using Wuncells. And they will save their cost in a couple of months or so.

* * * * *

That is not all. The filament of a bright valve is naturally incandescent. It glows at a white heat and becomes brittle. No matter how careful you are, sooner or later the filament breaks and your valve is useless . . .

But see the Wuncell working. You'll have to look pretty hard before you will realise that the filament is glowing. In daylight it is almost invisible. In fact, it is the nearest approach to the cold valve yet produced.

Isn't it obvious that such a low temperature must mean an exceptionally long life? And to make the Wuncell even stronger, we have inserted a centre support to the filament. No wonder *Amateur Wireless* reported that its filament "is practically unbreakable."

* * * * *

So you'll readily admit that not only do you save quite a considerable amount in running costs, but you get a valve that is likely to last at least three times as long as the ordinary bright emitter. Surely this is real economy.

Cossor Wuncell Valves

THE ONLY DULL-EMITTER VALVES SOLD IN SEALED BOXES

Advertisement of A. C. Cossor Ltd., Highbury Grove, N.5

Gilbert Ad. 2398

ENORMOUS POSSIBILITIES exist for the CRYSTAL SET...

COPY.
The Cottage, Bradshaw,
Nr. Bolton,
Lancs.
February 15, 1925.
Messrs. Tungstalite, Ltd.
Dear Sirs,
I enclose results with Gold Label Tungstalite of last Sunday between 6.30 and 8 p.m. I then received Manchester so loud that phones could be heard about 3 feet away. I also received Cardiff (160 miles away) as well as several continental stations. These results were received on the crystal alone, the Gold Label Crystal being excellent.
Yours faithfully,
C. S. PRINCE.

as these
bona-fide
reports
conclusively
prove.

COPY.
RECOVERY AGENT,
68, Railway Street,
Nelson.
January 15th, 1925.
Messrs. Tungstalite Ltd.
Sirs,
May I testify amongst other amateurs to the success of Tungstalite Blue Label. On a crystal set costing but 2/6 I get Bournemouth (220 miles) and Newcastle regularly (100 miles). They are distinct and clear, every word distinguishable. Wishing you every success,
I am,
Yours truly,
ARTHUR BARRETT.
P.S. The above is on two pairs of phones.

And any expert will tell you that the first and essential condition of success is the use of a *SYNTHETIC* crystal.

The Only guaranteed *SYNTHETIC* crystal is

TUNGSTALITE

Regd. No. 447149

TUNGSTALITE will make all the difference to your set—see that you obtain one to-day.

BLUE LABEL



1/6

GOLD LABEL



2/-

OBTAINABLE FROM ALL DEALERS AND FROM

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LONDON:
47 Farringdon
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YORKSHIRE:
41 Call Lane,
LEEDS

PHONE: HOLBORN 2557

LONDON: Messrs. Brown Bros., Ltd., Gt. Eastern Street; Messrs. Houghtons, Ltd., 88, High Holborn. MANCHESTER: Messrs. Franks (Wholesale), Ltd., 3, South King Street. NEWCASTLE-ON-TYNE: Messrs. Payne & Hornsby, Ltd., 6, St. Andrew's Buildings, Gallowgate. SCOTLAND: Messrs. Robb Bros. (Glasgow), Ltd., 69a, West Nile Street. NORTHERN IRELAND: Messrs. D. H. Macleay, 7, Howard Street, Belfast.

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GETTING THE BEST FROM A REFLEX

THE trouble with many reflex sets is that they don't "reflex." Let me explain. One often hears the puzzled owner of such a receiver complain: "I get just as good results with the catwhisker off the crystal." Consider for a moment the typical single-valve reflex circuit shown in Fig. 1. It is obvious that when the catwhisker is lifted the crystal and transformer primary are out of circuit. It is also obvious that if signals are being heard in the phones rectification must be taking place somewhere, and with the crystal circuit broken this rectification must be attributed to the valve. It also follows, if the signals are just as good with the crystal and transformer out of action, that no advantage is being obtained from the reflex arrangement.

Undesirable Conditions

This is a highly undesirable state of affairs. In the first place, the valve is not amplifying, and, in the second place, it is probably not even detecting efficiently owing to the absence of grid condenser and leak. It may be that, although signals can still be received with the catwhisker lifted, they are considerably stronger with the crystal adjusted, but considerable distortion takes place when the circuit is working as a reflex. In this latter case the rectification is only partial.

Characteristic Curves

Fig. 2 shows a typical grid-volts-anode current curve and also shows how grid current commences to flow when the grid is made positive. It is obvious that rectification must take place if the valve is worked at either point A or B. Unless excessive H.T. voltage is used (when the curve would be moved bodily to the left) or the accumulator is accidentally reversed (giving the grid a considerable positive potential) the valve will seldom be operated at point B. On the other hand, unless the H.T. voltage is very low (when the curve will be displaced to the right) or too much negative grid bias is used, rectification will not often be due to the valve being worked at the lower bend of its curve, point A.

In the majority of cases the return lead from the grid circuit goes to the L.T. negative terminal, as is the case in Fig. 1. This results in the valve being worked at

point C (Fig. 2), or if a rheostat is included in the negative filament lead, at a point slightly to the left of C.

At the first glance it would seem that this is an ideal point at which to work the valve, as the "curve" here is perfectly straight, and it might be expected that,

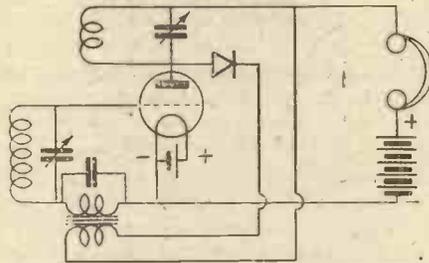


Fig. 1.—Typical Single-valve Reflex Circuit.

with the grid voltage fluctuating equally on either side of zero, an equal fluctuation of anode current about point C should follow and distortionless amplification result. Such, however, is not the case.

It is known, of course, that the electrons emitted from the filament are attracted to the anode by virtue of the positive potential of the latter with respect to the filament. Now when the grid is made positive with respect to the filament it has all the qualities of an anode, on a small

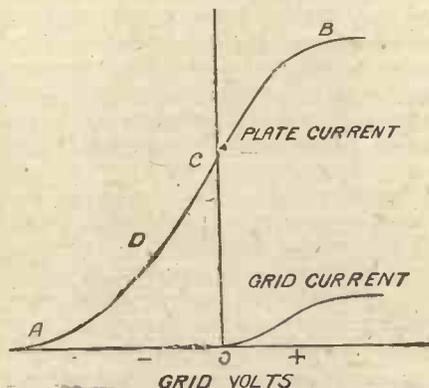


Fig. 2.—Grid-volts-anode Current Curve.

scale, and acts in exactly the same way. In other words, in addition to controlling the flow of electrons to the anode proper, it attracts a proportion of the electron flow to itself.

Grid Current

Just as we speak of the electron flow to

the plate as the anode current, we call the smaller stream flowing to the grid the grid current. This grid current is clearly indicated in Fig. 2, and it will be noticed that it is much less in volume than the anode current. It is of the order of micro-amperes only.

Although so small, the grid current is of the highest importance in reflex circuits, as it may greatly modify the action of the valve. Referring again to Fig. 1, a little consideration will show that when grid current is flowing, a high resistance leak exists between grid and filament, which will clearly increase the damping of the grid oscillatory circuit.

Distortion

When we operate a valve at, or near, point C of Fig. 2 what happens, therefore, is this: when an incoming oscillation makes the grid more negative, the grid circuit is very lightly damped and the anode current is considerably decreased, but when the grid becomes positive with respect to the filament, grid current commences to flow, the damping of the grid circuit is increased, and the positive half of the oscillation is decreased in amplitude. Therefore the fluctuation of the anode current about point C is asymmetrical and distortion results. As the reduction of the anode current due to the negative half-cycles is greater than the corresponding increase caused by the positive halves of the oscillations, the signals are more or less "rectified" and are heard in the phones even though the crystal (which it is intended should alone do the rectifying) is not in circuit.

If the circuit merely comprised an H.F. valve and a crystal detector the distortion caused by the existence of grid current would be of little importance. As it would be the function of the crystal to suppress either the positive or the negative halves of the oscillations, we could easily arrange that it was the distorted positive half cycles that were so suppressed. In fact, in straight circuits the H.F. valves are often intentionally worked on points a little to the right of C in Fig. 2, the idea being to utilise the damping caused by the flow of grid current to stabilise the valves and prevent self-oscillation.

(In the interests of scientific accuracy,

Continued at bottom of next page)

SPRING-CLEANING THE SET

THE wireless amateur does not pursue his hobby long before he discovers that if success is to be attained and, more important still, maintained, he must pay strict attention to the apparently simple details. Many sets have been unjustly condemned and trustworthy components placed under grave suspicion simply because of the omission to keep a sharp eye on the tiny details which can, and certainly do, make all the difference between poor reception and that good healthy "punch" which signifies the "all clear" of the wireless set.

The Dust Fiend

Perhaps the most persistent enemies of the set are dust and dirt. Bear in mind that in wireless reception you are dealing with most minute currents, and the tiniest obstacle placed in the path of the nimble electrons will side-track them away from the path of rectitude which lies through your phones or loud-speaker. It is a good plan to have a regular spring-cleaning of the set—that is to say, a thorough overhaul of the whole business from aerial to earth.

Aerial

Start with the aerial first. Let it down and give it a new lease of effectiveness by wiping away all the soot, grime, etc., which you are certain to find if the wire has been erected any length of time. Be careful to use a dry duster or, at any rate, a non-greasy one. (You will be able to filch one out of the kitchen.) Do not overlook the insulators and be sure to

replace any that may be cracked. Also give an eye to the hauling gear and the stays and strainers to the post.

Lead-in

The lead-in is often a cause of leaky signals, and in this case it is often damp which is the culprit. The proper way to insert a lead-in tube is to have it enter at an angle upwards from the outside and not to pass in horizontally. This will prevent rain creeping through during a shower. The ideal lead-in is fitted with a weather cowl over the connections, which keeps one of the most important joints in the set quite dry in all weathers. If, however, your lead-in is exposed, slack off the aerial and clean thoroughly the exposed end of the wire and make secure again. The earthing arrangement is quite as important, and a little attention on the same lines will be well repaid.

You can now tackle the set itself. Proceed systematically and test every connection and every joint, remembering that a dud joint or a slack terminal will be fatal, when you connect up again to see what effect your cleaning down has had on the efficiency of the set.

Components

Dust will lurk in the smallest corner, and it is a good plan to go carefully over every component with a feather. Personally I find a pipe-cleaner very handy for poking out corners. Slip the feather between the condenser plates and into the valve sockets. If you use a crystal, take special pains to clear away any minute

particles of the metal which may have been deposited on the panel. This is a constant source of annoyance when the crystal is gripped in a spring fork instead of the ordinary cup.

Avoid touching important joints and components with the bare fingers as much as possible, as the slightest film of the natural grease of the skin will have a bad effect. Having been over all the components, clean thoroughly the panel itself and interior of the cabinet.

Phones

Finally give a little attention to the headphones. Screw off the earpieces carefully and remove every particle of dust from the surface of the diaphragms. It is worth while to have some small chamois leather bags made to slip over the earpieces when not in use. These are quite easily made and no doubt you will be able to persuade one of the fair sex to run them together for you and perhaps prevail upon her to make a real satisfactory article by putting a little piece of elastic round the necks of the bags to hold them snugly.

All these apparently trivial items will take up quite a little time, but they are well worth doing, especially if you find that the set is gradually losing efficiency. I have known many cases of bad reception cleared up by such a "spring-clean" as outlined, and in all cases of doubt it is as well to make certain that the trouble is not a speck of dust in some obscure place before disembowelling the set.

G. W. M.

GETTING THE BEST FROM THE REFLEX" (continued from preceding page)

let it here be said that in sets employing several H.F. stages followed by a valve detector, distortion due to grid current is undesirable; but even in such cases a great deal of such distortion disappears during the process of rectification.)

Double Duty

It must be remembered that in a reflex circuit we require the valve not only to amplify the H.F. oscillations, but to magnify the low-frequency currents as well, and in an L.F. amplifier grid current is absolutely fatal to good results, as both halves of the cycles must be preserved intact and free from any kind of distortion. Therefore, for successful reflex amplification we must choose some such point as D (Fig. 2) at which to work our valve, so that while on the one hand the negative half-cycles will not cause the operating point to move down as far as the bend at A, on the other hand the positive half-cycles do not cause grid current to flow.

Secret of Success

To put it briefly, the secret of successful reflex operation is to remember that the valve is expected to act as an L.F. amplifier and to treat it as such. Sufficient H.T. should be provided to allow a sufficiently long straight portion of the characteristic curve to lie to the left of the zero-grid-volts line, while enough grid bias should be used effectively to prevent any grid current flowing. The valve also should be chosen with some care. It by no means follows because a certain valve gives good results as an H.F. amplifier, or is an excellent detector, or works well as a note magnifier, that it will do well in a reflex circuit. Many valves, especially those of the "soft" variety, will work admirably as detectors but make very poor amplifiers. Good H.F. valves may have an insufficiently long straight characteristic to allow of distortionless L.F. amplification, while many valves that give a good account of themselves when used on the L.F. side have too large a capacity for efficient H.F. amplification.

A good reflex valve will almost always belong to the "general-purpose" class, the many special H.F. and L.F. valves, designed specifically to occupy one particular position in the set, being, as a rule, unsuitable for the double duty.

And now a final word of warning: Do not expect too much from a reflex. This type of circuit has its advantages, and they are considerable, but it has also its limitations. Whatever may be said elsewhere, and whatever the evidence (in the shape of exceptional reception) that may be brought forward to prove the contrary, let it here be stated that the reflex is *not* the ideal long-distance receiver—at least, on the broadcast wavelengths. Instances of remarkable ranges with such sets could no doubt be quoted, but such cases are few. Probably the detector with reaction excels the single-valve reflex in point of mere distance, but for economically working a loud-speaker within a reasonable distance from a broadcast station the reflex receiver cannot be improved upon.

J. F. JOHNSTON.



Fig. 4.—Low-loss Coil.

TRY THE SHORT WAVES!

This article gives precise and simple instructions to enable you to receive on short wavelengths.

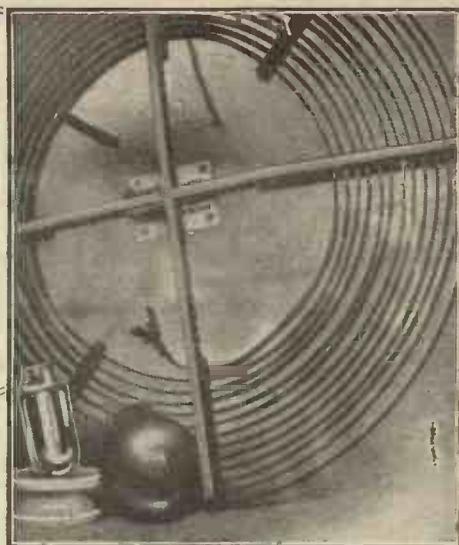


Fig. 5.—Another Type of Low-loss Coil.

THE more that is known about short waves, the greater appear their advantages. It is the purpose of this article to give a few hints for receiving and transmitting on these short waves.

In the first case, let us run through the various component parts which are common to all sets and see how they may be improved or modified to meet the demands of these short waves.

The Aerial

The first to be considered is naturally the aerial. How can this be improved? Firstly, it should not be longer than about 60 ft. or 70 ft. (This is not essential but

us set about reducing these sources of loss therefore. Refer to Fig. 1, which shows an average aerial arrangement. It will be observed that losses occur at each end and at the lead-in, due to capacity to earth. This method is therefore not satisfactory.

Fig. 2 shows an improved arrangement. Ebonite tubes or rods about 12 in. long are inserted in series with the insulators already in position, and have the effect of reducing the capacity losses at this point due to the thicknesses of the dielectric. Incidentally this reduces the leakage path, but this is more or less constant for all wavelengths. Observe the lead-in

need any attention providing it is of low resistance and is made up of thick wire well connected to the water pipe or other object employed as earth.

Inductance Coil

We will next consider the coils. It is here that most of the losses occur. Referring to Figs. 3 and 4 we see an example of a low-loss coil which is made up as follows: A piece of stiff brown paper is

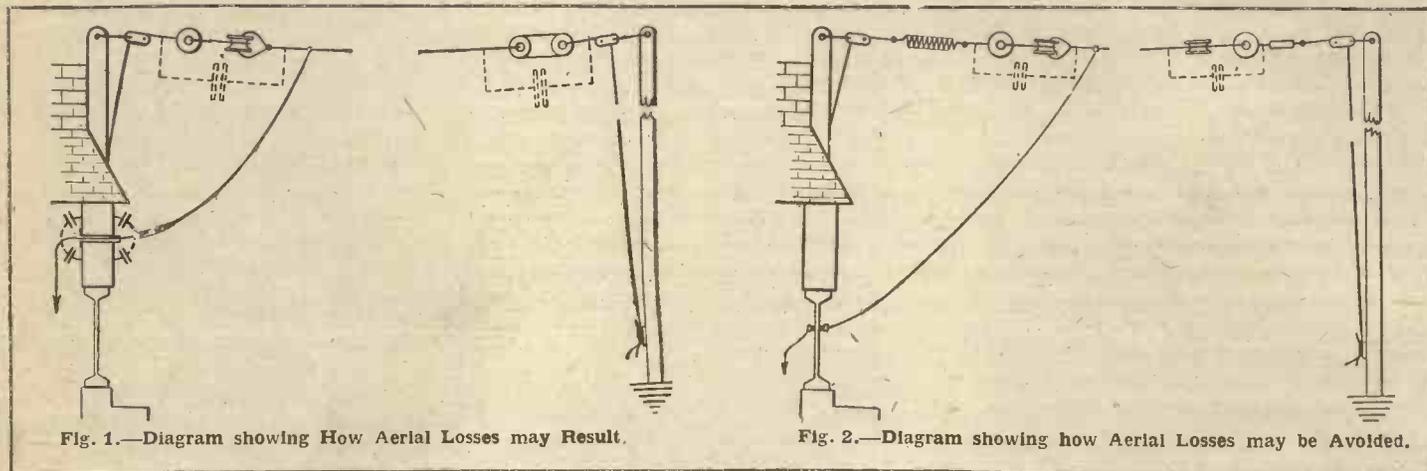


Fig. 1.—Diagram showing How Aerial Losses may Result.

Fig. 2.—Diagram showing how Aerial Losses may be Avoided.

preferable.) A single wire is quite sufficient, and particular care must be taken as regards the insulation. As is well known, the frequency of the received signal increases as the wavelength is reduced. Most people know that a capacity has the property of being able to pass a current of an alternating character, whereas it will withstand—within limits—the application of a direct current. Alternatively a high-frequency choke—a coil of wire generally wound single-layer fashion—will do just the opposite. It will pass the direct current but resist or choke back the alternating current.

Now the incoming signal is of the alternating variety. Hence any capacity will not stop this current in any way. Where is there capacity present in the aerial? At the insulators and at the lead-in. Let

which, instead of coming through a brick wall via a lead-in tube, is passed through a small hole in the window pane. Insulation is again improved here at the same time.

Having attended to the aerial itself we can proceed further. The earth will not

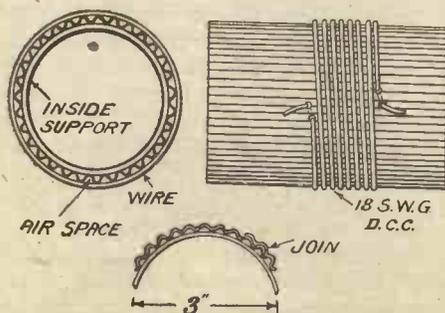


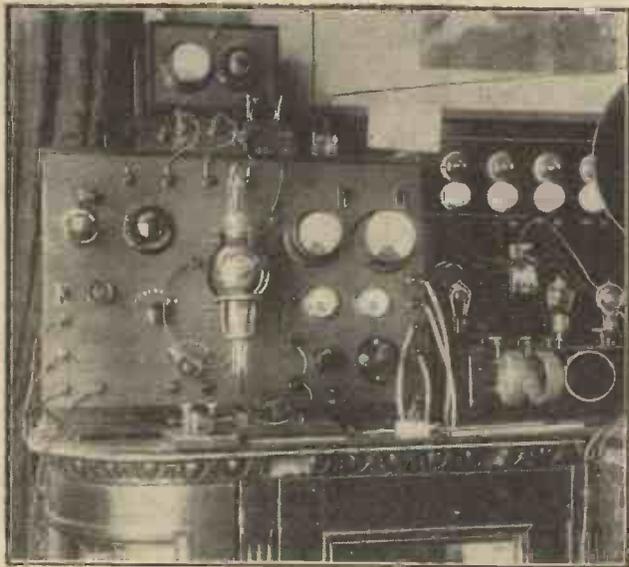
Fig. 3.—Method of Winding Low-loss Coils.

rolled round a former of suitable size, say, 3 in. or 4 in., and glued into position. Around this is rolled a piece of corrugated paper, such as is used for packing purposes. This is also stuck down. When it has set, carefully remove the former from the tube and immerse the latter in hot paraffin wax until it is thoroughly impregnated with wax. Shake off all the superfluous wax and allow to cool. When cold return the former (for support) and carefully wind on the requisite number of turns, using d.c.c. wire of about No. 18 gauge, tappings being taken in the usual manner where necessary. Fix the end turns by drilling holes in the tube and inserting the ends of the wires as shown. Remove the former, and the low-loss coil is complete. The photograph, Fig. 5, also

(Continued at bottom of first column on next page)

TRANSMITTING STATION 6TD

THE station 6TD, owned and operated by Mr. K. Palmer and situated in Llansantffraid, Montgomeryshire, is illustrated in the first photograph. It is the result of a great deal of experiment and patience with an earlier transmitter shown by the second photograph. When this latter transmitter was first in use



6TD's Present Transmitting Apparatus.

6TD informs me that he was very keen on the transmission of music and speech. The commencement of his serious experimental work was when 5SI reported that his *music* (the italics are his own) was louder on 220 metres than on 440, and it was suggested that the "juice" going into the harmonic of 220 metres would be much more useful if it could conveniently be put into the fundamental wavelength of 440 metres.

"TRY THE SHORT WAVES!" (continued from preceding page)

shows another construction of low-loss coils and is also very good. It is generally used for transmission purposes, however, and will be dealt with later, as will also the two valves shown in this photograph.

Next we can turn to the variable condensers. Not much can be done here, but use makes which are well known and preferably about .00025 microfarad capacity, with vernier adjustment and an extension handle for anti-capacity purposes. The movements must be just right, not too stiff or too loose, and there must be no back-lash present whatsoever. Otherwise the tuning will be found extremely difficult.

A. G. W.

(To be continued)

Subsequently the old instrument was adapted to 220-metre transmissions, and then showed an aerial reading of .15 ampere with an input of 10 watts. This could be relied upon to carry fifty miles on a good night.

It was entirely owing to the kind assistance of 5SI that 6TD was within a fortnight logging the reception of French amateur stations and building receivers for shorter and shorter wavelengths, until now he is receiving down to 45 metres and winding coils for 30 and studying for 5 metres!

To return to the old transmitter, this was a reversed-feed-back uncoupled circuit and was fed by a dry battery of 360 volts. This latter, however, proved an expensive luxury, for the heavy drain considerably curtailed its useful life, and an M.L. generator of 500 volts at 20 milliamperes was installed.

During the experiments with the old transmitter, which was finished in February, 1924, it was found that the set was abnormally sensitive to the H.F. choke, and, to quote the words of 6TD, "one evening, in changing a choke when the room was fairly noisy, it was not noticed that the set was screaming and the filament of a T15 valve was blown through his wrists."

Long-distance Work

About the end of March, 1924, 6TD settled down to long-distance work. On Sunday, April 6, 1924, Switzerland was worked from 6.30 to 7.40 p.m. in daylight. During the ensuing summer the circuit was loose-coupled; first a reversed-feed-back circuit was tried in this manner and then a Hartley circuit. The inductance was also wound through ebonite strips instead of on a combed tube and the lead-in was caged, a noticeable improvement resulting. By the middle of November, 1924, a new panel was made up to take a Mullard 0/150 valve and a Mortley generator of 1,000 watts at 80 milliamperes was installed for the Transatlantic tests. Test radiations with the object of reaching U.S.A. were carried out in December and 1AUR was worked on December 7.

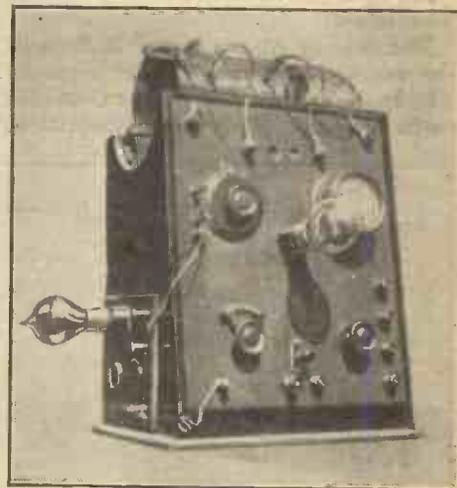
This new set has the advantage that when the big 0/150 valve is not wanted, a small valve is hung up on a valve holder by the side of it, and the 0/150 valve leads

replaced by others to a small valve. A switch throws into use the M.L. generator instead of the Mortley machine and another changes over the filament accumulators. Absorption modulation is used for local telephony.

Aerial System

The aerial system at 6TD comprises an aerial 38 ft. high with four wires on spreaders 12 ft. long. The aerial is 55 ft. long and has a counterpoise of six wires about 60 ft. long.

6TD tells an amusing story about the address of his station. It was late at night and he had been endeavouring to communicate his locality to a Belgian station. Over and over again he pumped out "Llansantffraid" in morse. At length there was a longer period of silence from



The Early Transmitter.

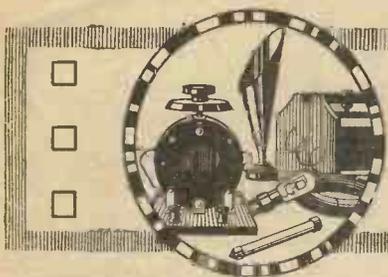
the answering station, and then: "Sorry O.M. don't understand English swear words." A. J. C.

NON-CORROSIVE FLUX

RESIN dissolved in methylated spirit with the addition of a couple of drops of glycerine makes an excellent soldering flux. A single drop on a piece of wire is quite sufficient to make a neat job, and it is absolutely non-corrosive—an important point where wireless construction or repair work is concerned. M. A. L.

A traveller who broadcast an address recently was met, on arrival at the B.B.C. studio, with a message from the secretary of a learned society, which informed him that, four years ago, the society conferred its Fellowship upon him but had never been able to trace him until his name appeared in the programme.

PRACTICAL ODDS AND ENDS



A Novel Catwhisker

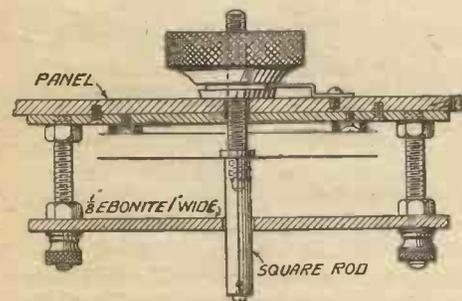
AN original catwhisker can be made from the grid of a burnt-out valve. Grids are usually made of nickel or molybdenum, are springy and, being inoxidisable, make efficient catwhiskers. The extremities of the grid must be cut slantwise in order to form an efficient point contact with the crystal. Any method of mounting may be applied to this type of catwhisker. S. S.

Gramophone Adaptors

THOSE enthusiasts who use a gramophone loud-speaker adaptor with a metal horn will obtain a considerable improvement in tone by giving the interior of the horn a couple of coats of enamel, and also by fitting one or more rubber bands round the outside. This latter prevents any jarring of loose seams during reproduction. C. W.

Mica Variable Condensers

WHERE a large-capacity variable condenser is desired the type of condenser in which a metal disc is moved on a screw thread in front of a mica-covered disc is the best. There is, however, the possibility that the mica may be scratched by the moving plate, and for this reason it is desirable to have the plates moving only in a direction parallel to the axes of the discs. A method of accomplishing this is shown in the diagram. It will be seen that the moving vane is mounted on a short length of square rod and is thus prevented from rotating. The



Details of Condenser Mounting.

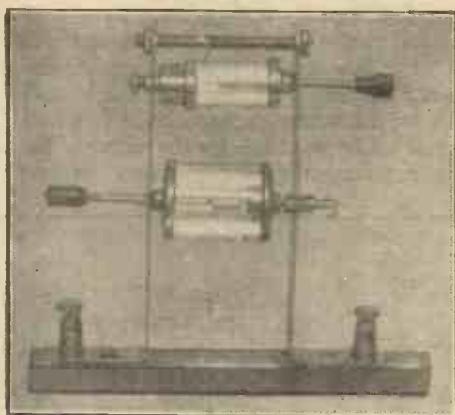
rotation of the knob simply varies the distance between the plates, so that there is no possibility of the dielectric being damaged.

A length of flex is connected to the screw at the base of the square rod in order to make connection to the moving plate. A. H.

Comparing Crystals

TO the crystal enthusiast who experiments with various grades of crystal and to the valve enthusiast interested in reflex circuits the following piece of apparatus should prove of interest and of practical use.

Two 5-in. strips of Meccano strip are mounted on a piece of ebonite and any



Comparing Crystals.

spare crystal detectors mounted between them as shown in the illustration.

A piece of 4 B.A. rod is passed through the two top holes in each support and fastened in position by two nuts, which serve to adjust the tension on the detectors. Two terminals are then mounted through the angled portion of each of the strip bases. Two leads may then be taken from the appropriate position in any experimental circuit, and a rapid comparison of the crystals on test made by simply lifting the catwhisker from one crystal and making contact with the other. W. A.

A Simple Polarity Indicator

A POLARITY indicator is such a common gadget that it seems useless to attempt to describe a new one. All that is needed is a burnt-out incandescent electric lamp (a car headlamp is a suitable size).

The bulb should be held immersed in a pail of warm water and the pip struck off with a file or other light tool. When the pip is removed the water will rush in to fill the globe owing to the vacuum. If the water is very pure a little salt should be added through the hole left by the pip. The bulb should now be dried, and while supported with the hole upwards a piece of paper should be placed over

the hole and covered with molten sealing-wax. This sealing-wax cap may now be firmly fixed in position with Seccotine. It now only remains to solder leads to the contact points of the cap.

When it is desired to test the polarity of a circuit, this simple gadget is connected up by means of the two leads.

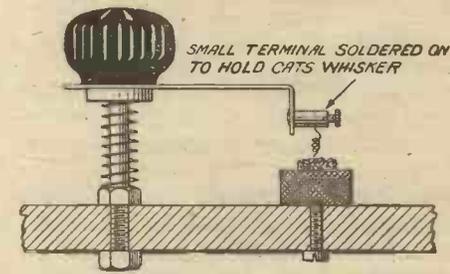
Bubbles will be seen to rise from one of the leads in the water and the wire to this is the negative. E. N. F.

Short-wave Work

SINCE it is a known fact that a C.W. circuit can cause an aerial tuned to one of its harmonics to radiate, it has been suggested that this may be the method of facilitating the transmission of short waves. The idea would be to connect to the first circuit a second closed circuit tuned to the same wavelength as the aerial and coupled to it. This auxiliary circuit would, according to the suggestion, favour the maintenance in the aerial of the oscillations for the short waves to be transmitted. Some such system might be equally suitable at the receiving end, and it is certain that the amateur will welcome any suggestion that will facilitate the reception of waves below the 100-metre mark. S. S.

Mounting the Catwhisker

VARIOUS methods of mounting the catwhisker in crystal detectors have been described from time to time, but perhaps one of the neatest and handiest methods is shown in the diagram. A midget telephone terminal has its shank filed off, and



Novel Catwhisker Holder.

is then soldered to the brass mounting spring of the detector.

It is possible by this means to test various types of catwhisker, the change being made in a minimum of time by simply loosening the screw, slipping the whisker out and replacing with another.

H. G.

SIDELIGHTS ON THE SUPER CIRCUITS

The first of two articles explaining in a simple manner the principles of super circuits.

IN the ordinary or "straight" type of multi-valve receiver each valve is arranged in series, or in cascade as it is sometimes called, with the others. That is to say, the plate or output circuit of the first is connected to the grid or input circuit of the next, and so on in regular succession.

In reflex or dual circuits the received high-frequency energy, after passing through a valve in the ordinary way, is first rectified, either by means of a crystal or by a second valve, and the resulting low-frequency currents are then fed back to the grid of the same valve to be re-amplified. The result is that one valve is made to do practically the work of two—that is, it amplifies both high- and low-frequency currents simultaneously.

circuit of April, 1913. In spite of being twelve years old, it is practically identical with most of the reflex circuits now in general use. It will be noticed that the plate circuit is loosely coupled to the crystal detector K through a high-frequency transformer T, the secondary of which is tuned by a condenser C, shunted in turn by the crystal and a by-pass condenser D.

The Reflex Action

Radio-frequency energy from the aerial A is fed to the grid of the valve and sets up amplified currents of the same frequency in the plate circuit. These currents are transferred across the H.F. transformer to be rectified by the crystal, the resultant low-frequency currents flowing

by the rectified currents from the crystal reach the filament direct, and the grid via the grid inductance coil, which opposes very little resistance to their passage. They are not short-circuited across the condenser E because this offers an infinitely large impedance to low-frequency currents, although it readily bypasses the original radio frequencies. No confusion can arise on the grid, which responds simultaneously and independently to both impulses alike.

In the plate circuit the rectified currents pass through the H.F. transformer primary, and then through the phones back to the filament. Owing to their relatively low frequency and to absence of an iron core they set up practically no magnetic flux across the transformer windings,

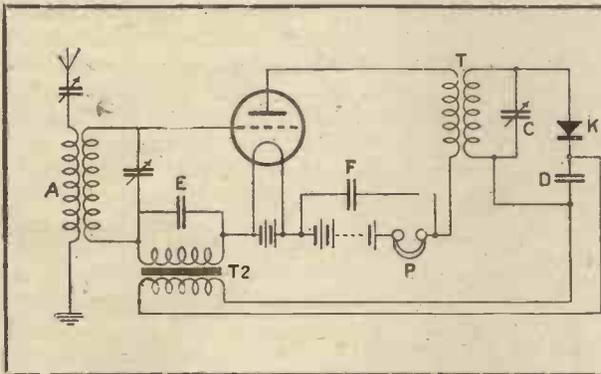
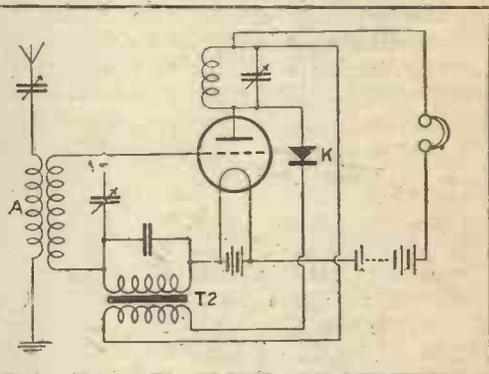


Fig. 1 (left).—The Original Telefunken Reflex Circuit.

Fig. 2 (right).—The Round Reflex Circuit.



Although dual amplification has now become so popular amongst wireless amateurs, particularly in this country, as to be considered commonplace, it was in fact the first notably ingenious departure from the ordinary or standard type of receiver, and may therefore fairly be regarded as the first of the so-called "super" circuits.

The First Reflex

The earliest mention of the method is contained in a British patent issued to the German Telefunken Company in 1913, shortly after the date of the original discovery of the principle of reaction or back-coupling between the grid and plate circuits of an oscillating valve. There is, in fact, a sufficient similarity between (a) ordinary reaction and (b) reflex back coupling to support the view that one followed the other as a natural inventive sequence. The difference lies in the fact that, in ordinary reaction, currents of the same frequency are fed back from plate to grid, whilst in a dual circuit currents of different frequencies are so treated.

Fig. 1 illustrates the original reflex

through the primary of the iron-cored transformer T2. The secondary of this transformer is inserted in the grid circuit of the valve, and the voltages induced therein by the currents from the crystal are consequently applied across the grid and filament, and reappear as amplified notes in the telephones P.

Beginners are sometimes puzzled as to why the currents of different frequency, flowing simultaneously in the grid and plate circuits, do not interact upon each other, and so give rise to confusion in the phones. In order to clear up this point, we will follow the sequence of events.

The incoming radio-frequency currents reach the grid direct, and the filament via the condenser E. They do not flow through the secondary windings of the transformer T2 owing to the high impedance of the latter. The amplified radio-frequency currents in the plate circuit pass through the primary windings of the H.F. transformer T, and so back to the filament via the by-pass condenser E.

The low-frequency voltages set up in the secondary of the feed-back transformer T2

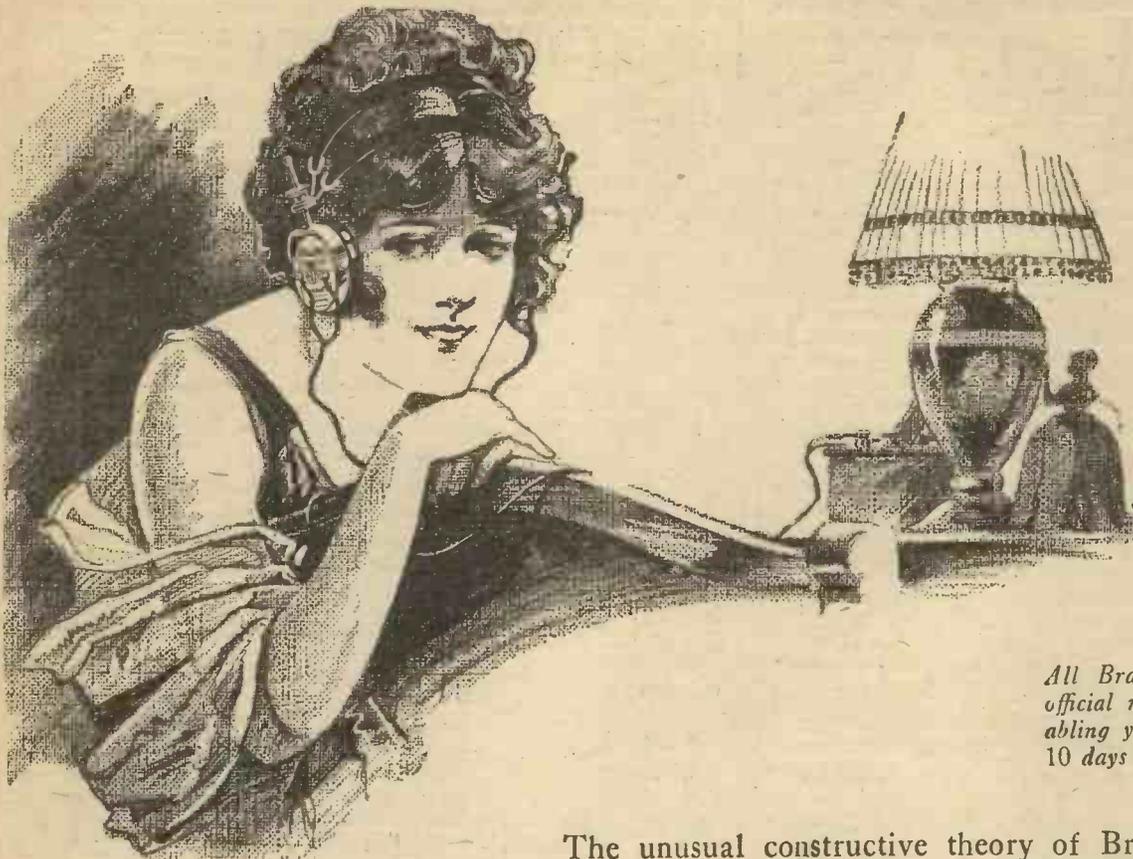
so that no L.F. energy passes from the anode to the crystal circuit.

It will therefore be seen that the high- and low-frequency components are carefully separated wherever this is necessary to avoid interaction or confusion. In actual practice a certain amount of high-frequency leakage takes place across the L.F. transformer windings (owing to capacity effects), as well as some transfer of low-frequency energy between the coupled circuits.

Fig. 2 represents another early type of reflex circuit developed in the year 1915 by Captain Round. Here the crystal K and primary of the L.F. transformer T2 are shunted directly across a tuned-anode coupling, an arrangement which has since been very generally adopted. The high-frequency input is amplified by the valve and sets up voltages across the plate condenser, which are passed as rectified current-pulses by the crystal into the L.F. transformer windings, and so back on to the grid. The reamplified L.F. currents flow directly through the plate coil into the telephones.

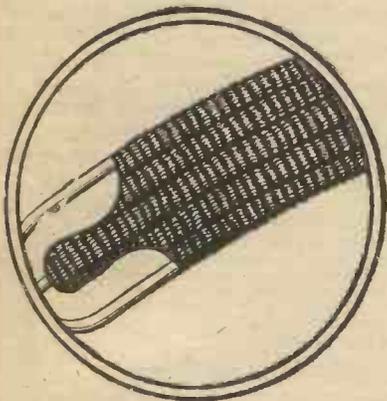
M. A. L.

(To be concluded)



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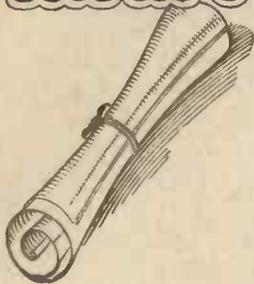
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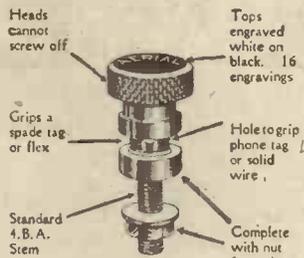


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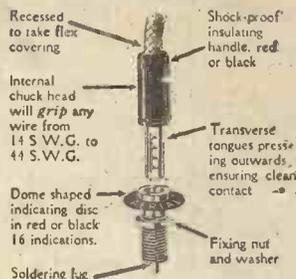
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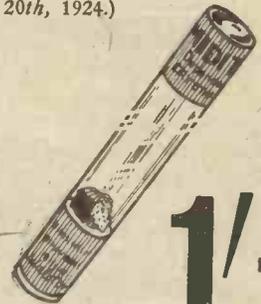
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On Your Wavelength!

Catching It!

THE B.B.C. seems to have been coming in for a great deal of criticism of late from all kinds of quarters. When one considers the enormous number of listeners, and the variety of their tastes and interests, it is obvious that a good deal of grumbling must occur whatever kind of programmes are put on, for it is an utter impossibility to make every programme pleasing to everyone. Personally I am rather surprised that there has been so little criticism. New aerials are going up everywhere, but I have never yet come across a case of existing aerials being taken down. In fact, the most confirmed grumblers that I know are amongst the best customers of the charging station! It is curious that they should listen so assiduously to programmes which, they are never tired of asserting, are not worth listening to. There are possibly certain things in a great many evenings' entertainments that do not appeal to you. That is only natural and to be expected. But remember that you are not *compelled* to listen to them. That is one of the great advantages of wireless; you can pick and choose just what you like from any programme.

A Comparison]

To be quite just, let us compare our own programmes with those given in other countries. I imagine that by this time a very large number of readers of AMATEUR WIRELESS must have picked up and listened to transmissions from the great American stations. Tuning in a station in the New World is a feat which always produces a thrill through the sheer wonder of it all. Speech and music are coming to you over three thousand miles of land and water. You sit entranced, listening to the words or to the musical sounds that your set brings in. But have you ever "come down to earth," so to speak, whilst listening to America and asked yourself whether, considered purely and simply as a programme, the thing that you are hearing is really worth listening to? Next time you receive American broadcasting on one of those favourable nights when signals are strong and not interfered with, set yourself the task of criticising the programme. I think that you will have to admit that if the B.B.C. stations were to send out the same kind of thing night after night you would rise and grouse with the best of them about the quality of broadcast programmes.

Nearer Home

If you have not heard American stations you have most probably picked up some of those from the Continent, for large num-

bers of them are within the range of a single-valve set, and some of them may be heard under favourable conditions even on a crystal. How do they compare with our own? Germany is always supposed to be the home of music, and one would naturally expect the programmes transmitted in that country to be something rather startling. But are they? Listen on next Sunday evening to Hamburg, Breslau, or any other easily tuned-in German stations and see for yourself.

In France the programmes are usually exceedingly attractive; but the French receive nothing like the service that we do. Paris, for example, is the broadcasting centre of France. Those who live near the capital have a good deal to listen to, but dwellers in distant parts of the country can hear little or nothing in the way of telephony unless they install expensive multi-valve sets. Speaking generally, all foreign programmes are on the high-brow side except for the comparatively short periods in which they transmit dance music. All things considered, then, it seems to me that we have a very great deal to be thankful for, and that though improvements could be made, and doubtless will, we possess by far the finest broadcasting service in the world.

Paderewski

It is great news to hear that Paderewski is to broadcast from the London station between 9 and 10.30 on Sunday, March 15. The piano is one of the best of all musical instruments from a wireless point of view, since on anything like a proficient set it is reproduced to perfection. Listeners will therefore have the opportunity of hearing the master's playing as it really is. Such an occasion is a wonderful one both for the owner of a wireless set and for the great musician who is able to bring his art right into the homes of millions of people. I do not know how many people will hear Paderewski on that night, but one can be pretty certain that wireless folk living all over the western part of Europe will tune in to 5XX or to one of our lower-powered stations; if, therefore, we put the audience at round about five millions we shall probably be making a conservative estimate of the numbers.

Fresh Fields

I have recently been staying down in the country in a little town in the west in which I had not been for twelve months. When I was last there I noticed that there were hardly any aerials to be seen, and on making inquiries I found that there were only three wireless receiving sets in the place. Now there must be hundreds, for one sees aerials everywhere, and

several shops have added a thriving business in wireless bits and pieces to their ordinary trade. Wireless was slow in coming to this town, because somehow or other it obtained in the early days of broadcasting an evil reputation as being a blind spot. The reason is, I think, to be found in the fact that there is no broadcasting station within fifty miles and that unaided crystal reception is therefore out of the question except with particularly efficient sets. As a matter of fact, this town is amazingly well placed as regards broadcast reception, for with even a single valve London, Birmingham, Cardiff, Bournemouth and Manchester come in at big strength, whilst Glasgow, Newcastle, Aberdeen and Belfast are only a little weaker. Curiously enough, Radio-Paris, though much farther away than 5XX and using less power, comes in with almost the same strength as the Chelmsford station. His tuning is very much the sharper of the two. Though the two transmissions come from almost the same direction and are both powerful, it is not at all difficult to get either of them without the other provided that the receiving set is reasonably selective.

Wear and Tear

What interested me most was the performances of a set which I had given to my host on my last visit. He, I should say, though he is an all-round handy man, has not very much knowledge of wireless. When we switched on and tuned in I was surprised, to find that the set was not doing nearly so well as it was when first installed. Its owner was inclined to put this down to the fact that he had substituted dull-emitters for bright. This, however, I could not accept, for I am a very strong believer in the more economical type of valve, which if properly used gives just as good results as its greedier brother. After taking a look round, I produced a penknife, with which I dealt faithfully with every valve in turn, opening out its pins and gently scraping their outer surfaces. This produced an immediate response, signal strength being very nearly as good as it ought to be. Eventually I traced the real trouble to a bad contact between the lead-in and the terminal outside the window frame. Corrosion had set in here, but a few touches with emery-cloth very soon set matters right and things went as well as ever.

The H.T.B. Problem

I am rather perplexed just now over the question of high-tension batteries. I want a new one and it must be a big one, because I generally take about 10 milli-

On Your Wavelength! (continued)

amperes from it when the set is working. But I hear from my friends bad reports about the performances of high-tension batteries of various makes which they have purchased during the last few months. Batteries which should have lasted for a year have lost their voltage in a couple of months though the load upon them has never been excessive. One battery that I saw the other day shows no more than a quarter of its original voltage across any pair of sockets after a short period of quite light usage.

To my mind the high-tension battery is at the present time quite the most unsatisfactory component of the set. Most of the other parts that we use we can rely upon entirely, but the H.T.B. is an unknown quantity which may give good service for a long period or may let us down badly in the most unexpected way. I am sorry to see that pitch is being used as a covering instead of wax by several makers. It is far less efficient as an insulator than wax and it has the bad quality of attracting moisture from the atmosphere. Pitch is all very well where the maximum voltage across the terminals is a small one, but I am sure that it will not answer satisfactorily for the 120-volt battery, whose insulation must be of the best.

A Problem

The problem is what to do. Accumulators are excellent, but there is always a certain amount of difficulty about getting them recharged at the ordinary station. Further, the accumulator battery requires a good deal of attention, since evaporation from its small cells takes place pretty rapidly in a warm room. I am not sure that the best tip is not to make up a high-tension battery from flashlamp refills of the largest size. If these are placed upon a sheet of glass in a partitioned box one can obtain excellent insulation between them, and any unit which gives out can be replaced readily. It is slightly more expensive than buying a ready-made battery, but I rather fancy that it will pay in the long run.

A Big 'Un

I am in the throes just now of designing my 1925 receiving set. I should say that I am one of those unhappy mortals who are never content for more than a few months on end with any set no matter how good it may be. And the worst of it is that when I make up a new set I never have the heart to scrap the old one. At the present moment there repose on shelves of cupboards, on top of bookcases and on the floor beneath my writing-table no less than six old friends which have given good service in past years. I never use them; they contain pounds' worth of condensers, transformers, rheostats and so on, but somehow I simply cannot pull

them to pieces and use their parts for making new editions. The 1925 set will, I think, put all the rest badly in the shade. The new set is to be a super-heterodyne boasting nine valves. If it works as well as I hope and believe that it will I shall be able to get almost everything that is going. The great thing about the "super set" is the few controls that are required. I am proposing to have two only, the condenser which controls the frequency of the oscillator and that which tunes the grid circuit of the first valve. The super-heterodyne, which requires a large number of valves, brings home forcibly the usefulness of the dull-emitter. If I were going to use nine ordinary valves I should have to call in a furniture van to take my accumulator to the charging station, for the filament current required would be rather better (or worse) than six amperes, and the accumulator capable of coping with this for a reasonable time would weigh something! As it is, I am going to use eight ordinary dull-emitters requiring .2 ampere apiece and one-power valve of the same class which takes .25 ampere. The total load will therefore be well under 2 amperes, and my present low-tension battery will have no difficulty in supplying this for about a fortnight at one charge.

Chelmsford and U.S.A.

An interesting experiment was carried out recently by the Chelmsford high-power station. A special transmission was sent out, beginning at midnight, and it was hoped that the Savoy bands, which provided part of the programme, would be picked up in America and relayed locally by U.S.A. stations.

The usual conditions combined to render the test a difficult one. As is invariably the case when these tests are made public beforehand, both the short-wave band and the higher wave band were mushed out. A horde of morse transmitters were working on sixty-five odd metres; one so accurately tuned to KDKA that he actually modulated the music from America during their dinner-hour concert; and Northolt combined with other stations to render telephony reception between three hundred and five hundred metres also an impossibility.

To add to the jumble, the new 2 L O transmitter was testing at the same time. It is interesting to note that personally I did not find this transmitter any louder than the old one.

Reports have come in from British listeners who claim to have heard KDKA on her short wave relaying Chelmsford. I am quite unable to corroborate this. From eleven-fifteen to midnight KDKA regaled me with her dinner-hour concert, and from approximately one-thirty to two-thirty she provided me with a charming

programme of studio music. In the interval between midnight and one-thirty, when she was supposed to have been heard relaying Chelmsford, I was entirely unable to pick up even her carrier wave. Whether, in fact, the relay did appear on this short wave will be established later by cable.

Though I was unable to hear Chelmsford's programme through KDKA's short-wave transmitter, I am inclined to think I did hear it from WBZ at Springfield. There was also a possibility that it was coming through KDKA's 326-metre transmitter, but I was unable definitely to log either of these two stations on account of the preponderance of mush and morse, which made the task of hearing a call-sign almost an impossibility.

Every day I become more convinced that tests are deliberately blocked when it is known they are to be attempted. I have never heard so much morse on the short waves as on this occasion.

(Since the above was written a cable has been received from KDKA stating that it did not relay Chelmsford.)

To-night's Novelty

The morality play has always found a certain section of the public, and to-night's modern example, I suppose, will be only carrying out the B.B.C.'s determined propaganda policy. This new *Pilgrim's Progress* was given at Cincinnati in 1918, for the composer is an American, Mr. Stillman-Kelley. He came into prominence in writing the incidental music for the stage production of Lew Wallace's *Ben Hur* in 1899, and he has written music to *Macbeth* and *Prometheus Unbound*. I should think, too, that his two symphonies would bear broadcasting. One is a humorous composition on "Gulliver's Travels" and the other "New England"; both have been performed in America. For to-night I am glad to see that Miss Ursula Greville has been found available. She is one of our foremost British singers, and a pioneer of the new and modern school of art. She has only just returned from America, where she has had a successful tour. I am also curious as to how the 1,000 choristers will broadcast.

Youth and Promise

I see that to-morrow night Nottingham is going to copy Plymouth's recent effort and let the youthful talent of the town loose on us. Well, it isn't a bad idea, and at any rate we shall know where the new generation of artistes are coming from. The ages of these embryo artistes range from eleven to eighteen, and now perhaps we shall recognise the real truth of Barrie's cryptic epigram, "Young enough to know everything."

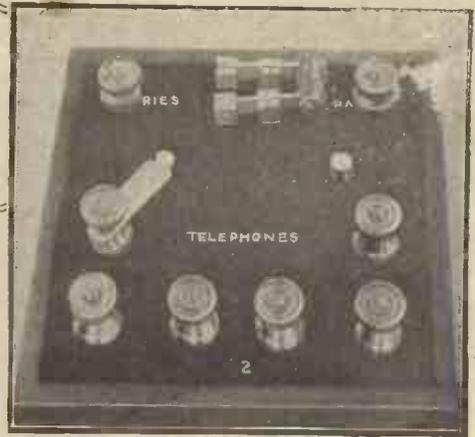
THERMION.

CRYSTAL TALKS.—IX

CONCERNING PHONES

IN choosing a pair of headphones for use with a crystal receiver, certain details should be observed. Comfort is certainly an all-important factor, as there are several cheap types of phones, mostly of foreign manufacture, which seem to be specially designed to cause discomfort to the wearer. Light headbands, having a sliding stem and pivot adjustment, are usually the best for ease. Some headphones are provided with adjustable diaphragms—that is to say, the diaphragm is adjusted to, or away from, the magnets by means of an adjusting screw provided

phones are better connected in series or in parallel. These positions are shown in Fig. 1. A shows the phones in series, and B and C show them in parallel, the last two examples being alternative ways of doing the same thing. In the case of high-resistance phones, series connections are considered the better, although it is extremely useful to be able to switch the phones into either series or parallel positions at will. The writer has, in fact, found that using two of the phones (each pair having a total resistance of 4,000 ohms) parallel connections give the better results.



Phone Extension Panel.

one with a piece of wire placed across the two terminals at the back of the earpiece. Next short the other earpiece and test again. If a click is not heard in the

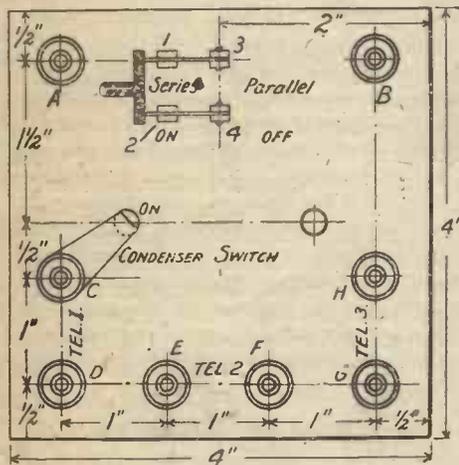


Fig. 2.—Plan of Extension Panel.

on each earpiece until the best signals are heard. This type of phone certainly has distinct advantages, although the fixed diaphragms may prove less troublesome to the absolute beginner. It is as well to use rubber earpads, which may be obtained from any dealer, as these result not only in added comfort but effectively shut out all external sounds.

Resistance

A debatable point is whether high-resistance or low-resistance phones are best with crystal receivers. High-resistance phones are more sensitive, but, of course, less robust owing to the finer nature of the windings. It is therefore obvious that the low-resistance phones, which are used in conjunction with a step-down telephone transformer, are best for valve receivers, as they are more capable of taking heavy high-tension voltages, etc. On the other hand, high-resistance phones are best for crystal receivers, as in this case utmost sensitivity is required. Those having a resistance of 2,000 ohms each earpiece are probably the best.

Connections

The next point to consider is whether

Extension Unit

A telephone extension unit is a useful component which every experimenter should possess, as it enables him to carry his phones to any part of the house. Figs. 2 and 3 and the photograph show a unit designed for this purpose, or it may be used in conjunction with the units already described. It provides for series or parallel positions for three sets of phones by means of a double-pole single-throw (D.P.S.T.) switch. Fig. 2 shows the front of the panel, together with dimensions. The condenser switch is made from springy brass. The fixed condenser on the under side of the panel is brought into circuit when the switch is on the contact stud as shown. The stud also secures the condenser in position. Terminals A and B connect to the telephone terminals of the existing crystal receiver. Terminals C, D, E, F, G and H may either be of the pillar or telephone type as desired. The wiring of the unit is clearly shown in Fig. 3. When the D.P.S.T. switch is "on," the phones in use are in series, and when the switch is "off" they are automatically thrown into parallel positions.

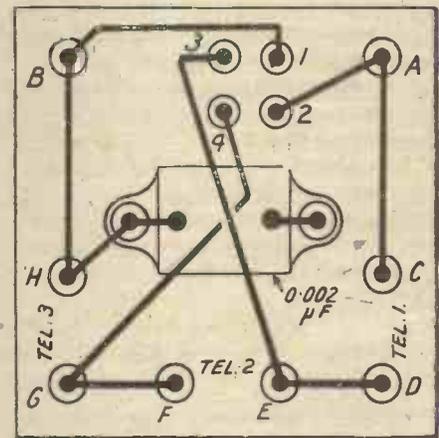


Fig. 3.—Wiring of Panel.

earpiece which has not been shorted, something is out of order and further investigation should be made.

Possible Causes of Trouble

It is often found that the phones will not function owing to the diaphragm having become accidentally bent, this causing it to touch the magnets. This is easily remedied by unscrewing the cap, taking out the diaphragm and then replacing it the other way round. Failing this, a new diaphragm should be purchased. In another instance the phone tags often become torn from the leads, causing disconnection. If the damage is beyond repair new leads should be bought. RADIO.

One official of the B.B.C. puts the number of unlicensed listeners at 2,500,000. A less humble man might have put it at 222,500,000!

The Marconi Co. has recently dispatched wireless installations to Belfast, Brussels, Cape Town, Durban, Lima, Rome and Rio de Janeiro.

Serious interference with the wireless programmes is being caused in Clifton by a medical-electrical treatment set using H.F. currents.

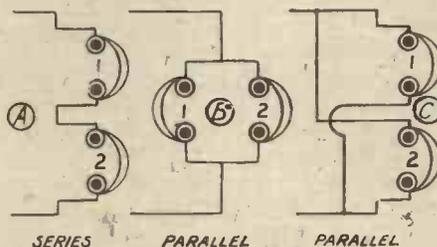


Fig. 1.—Diagram of Phone Connections.

Testing

A simple method of testing headphones is as follows: Place the telephone tag across the negative and positive connections of a single dry cell. If the earpieces are all in order a distinct click will be heard when contact is made. If uncertain, test each earpiece separately by shorting

A SIMPLE INDOOR AERIAL



Fig. 2.—Lamp Connector.

THE idea of utilising the electric-light mains as an aerial is by no means new, but it is not always the newest ideas which prove to be most interesting, and if the reader has not yet tried this type of aerial, then I am sure he will find the experiment worth while. It is well

known that high-frequency currents will easily leap across a small condenser and that the same condenser will effectively block low-frequency currents, such as those flowing over the electric-light mains. It follows, therefore, that if we connect two small fixed condensers to an ordinary lamp socket, as shown in Fig. 1, and close the switch to that lamp socket, we collect, on the lead indicated by the arrow, only the high-frequency currents flowing over the mains and in no way interfere with the ordinary low-frequency currents used for lighting. The electric house mains collect high-frequency currents in the same way as an ordinary aerial or other metal conductor insulated from the earth, so by means of this simple condenser arrangement it is not a difficult matter to make the house mains function as an aerial.

To construct the necessary attachment, obtain a burnt-out lamp and break away the glass bulb and all fine filament wires so that the metal top, glass stem, and the two main filament



Fig. 3.—The Complete Arrangement.

wires remain as indicated in Fig. 2. Make a small loop at the end of each wire and attach one end of a .001-microfarad fixed condenser to each. Take a 3-in. length of fairly stiff bare copper wire, make a loop in the exact centre and firmly clamp the shank of a small telephone terminal into it. Now connect the ends of this wire to the lower ends of the condensers, connect the aerial terminal of the receiver to the small terminals by means of the usual insulated lead-in, close the switch to the lamp socket and all is ready for use.

Fig. 3 is a photograph of the device being used on a small valve receiver. The condensers used were each of .001 microfarad capacity, as specified above, direct current being supplied to the mains. Results were in every way satisfactory. The main filament wires on the lamp core were particularly robust, and thus no further support was required for the condensers. However, if necessary a simple support can easily be attached to the lamp socket and the two upper lugs of the condensers.

The idea is fully covered in an existing patent of the "Ducon plug," a more convenient article made by the Dubilier Condenser Co., Ltd. This, of course, does not mean that the reader must not carry out experiments with a similar device. O. J. R.

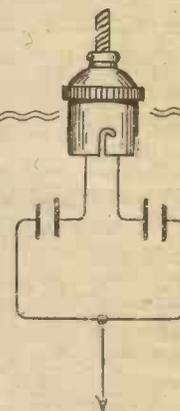


Fig. 1.—Connections of Aerial.

PADEREWSKI TO BROADCAST

M. PADEREWSKI, the famous pianist, is to broadcast from 2 L O on Sunday, March 15, from 9 to 10.30 p.m. The transmission will be S.B. from all stations.

It would be hard to find in the realms of history or fiction a more romantic figure than that of Paderewski, pianist, president and patriot.

Ignace Jan Paderewski was born in Podolia, a province of Russian Poland, on November 6, 1860, and when only three years of age commenced to play the piano by ear. A few years later his father placed him under the village teacher, Pierre Sowinski, with whom he remained until he was eleven. From that time onward such talent had he shown that a musical career was chosen for him and a course of serious study mapped out. He was sent to Warsaw, where for the next four years he studied harmony, thence to Berlin, where by this time he began to prove his powers as a composer.

On his first professional tour through Russia at about the age of sixteen he played only his own compositions, and the following year, when barely eighteen, he

was appointed professor at the Warsaw Conservatoire. He was not content, however, to spend his life in teaching, and so after six years he resigned and, going to Vienna, placed himself under the famous teacher Leschetitzky and his equally famous wife, Annette Essipoff. Under their guidance Paderewski found his true métier, that of virtuoso pianist, and after making his debut before the critical audience of Vienna, in 1887 he was hailed by the critics as one of the greatest pianists of the day. He speedily sought the opinion of Germany and became one of the "lions" of that country. The following year he challenged Paris, making his appearance there at the Salle Erard, and his success retained him there for two years, during which, however, he paid visits to Holland, Belgium and Switzerland. It was not until 1890 that his first appearance was made in England at the old St. James' Hall.

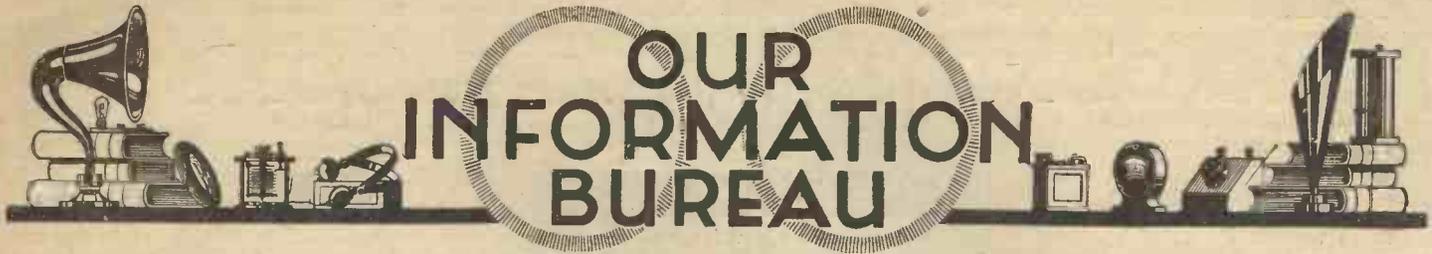
He has practically captured the imagination of the world by his dramatic vivid renderings of the classical works. His own compositions, in addition to piano-

forte works include an opera *Manru*, a suite for orchestra, concertos, sonatas and a symphony. A favourite figure with royalty, he has been the recipient of countless foreign orders and distinctions. In the upheaval of Continental history he became for a time President of Poland, but gladly relinquished this office to return to his beloved piano, and, judging by his performance at the Albert Hall recently, has lost nothing of his powers of interpretation. L. B.

MATTING EBONITE

EXPERIMENTERS are constantly reminded that they should use guaranteed ebonite for panels in order to prevent surface leakage, and if by any chance unguaranteed ebonite has to be used the surface should be matted with emery-cloth.

This matting produces a dusty brown surface, and oil is often recommended as a polishing medium. If the duster or rubber is smeared with either beeswax or candle-wax a uniform semi-polish will be obtained K.



RULES.—Please write distinctly and keep to the point. We reply promptly by post. Please give all necessary details. Ask one question at a time to ensure a prompt reply, and please put sketches, lay-outs, diagrams, etc., on separate sheets containing your name and address. Always send stamped, addressed envelope and attach Coupon (p. 464).

Crystal Detectors

Q.—What is the advantage of using a carborundum and steel detector?—I. S. (Newcastle).

A.—For constancy in action this combination remains supreme. An added potential by means of a battery and potentiometer is, however, necessary.—U.

Low-loss Crystal Sets

Q.—I am of the opinion that the possibilities of low-loss crystal sets have not yet been fully explored, and I have decided to experiment with these receivers. Could you give me any advice on the construction of low-loss sets, or could you give me any data on low-loss tuners.—A. B. (Leeds).

A.—New principles of construction have been recently tried out in the search for efficiency, and various types of low-loss components have been constructed. Crystal sets employing low-loss tuners are described on p. 253, No. 141, and on p. 309, No. 142. The theory of low-loss coils is discussed in No. 143.—U.

H.F. Transformers

Q.—I have two slotted ebonite formers, on which I wish to wind the turns of two H.F. transformers. Each former has eight slots 2 in. in diameter, 1/2 in. deep and 1/2 in. wide. Could you tell me how many turns I should employ, what gauge of wire is suitable, and what the wavelength range of the finished pair of transformers will be?—D. R. (Bath).

A.—Each slot in the formers should be wound in the same direction with No. 40 s.s.c. copper wire. Each alternate slot is connected in the primary circuit, tappings being taken so that either one, two, three or four coils can be used. A similar arrangement is made for the four secondary coils. The range of the finished transformer will be approximately 300 to 1,200 metres, though the efficiency will not be so great on the low wavelengths. The primary should be tuned with a .0003 microfarad condenser.—U.

Dead-end Switches

Q.—Shall I obtain stronger signals if I fit "dead-end" switches to the tuner to cut out the turns of the inductance that are not being used?—B. C. (Lavender Hill, S.W.11).

A.—You do not state the wavelength range of the tuner, so it is rather difficult to advise. A tuner having a range of 1,000 metres upwards may be fitted with dead-end switches if the maximum efficiency is desired. For the short wavelengths the use of plug-in coils is recommended, as it is extremely difficult to design an effective dead-end switch.—U.

Low-power Transmitter

Q.—I have been interested in the articles on transmission in AMATEUR WIRELESS, and intend to build a simple transmitter employing the Colpitt circuit. I should like to know whether the use of a loose-coupled circuit is desirable. It would seem that a second tuned coil would introduce many extra complications.—P. T. (Farnborough).

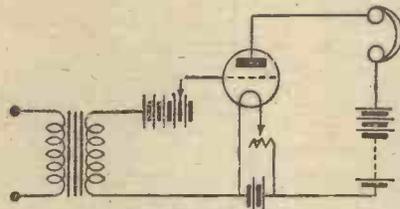
A.—The whole point of using loose-coupled circuits is to reduce and minimise the complications in a transmitter. Although extra tuning adjustments are needed, separate adjustment

of grid, anode and aerial circuits is possible, and stability of wavelength is obtained. For general work a loose-coupler is recommended. For short-wave work it is a necessity.—U.

Grid Bias

Q.—Would you please give a diagram showing how grid-bias can be applied to the L.F. stage of my receiver, as I have been told that the addition of grid bias will increase signal strength and reduce distortion. I should also like to know if these statements are correct, and if the addition of grid bias is worth the extra complication.—T. Q. (Hove).

A.—A diagram illustrating the application of grid bias to the grid of an L.F. amplifying valve is shown. It will be seen that the only addition necessary is a battery connected in the grid circuit of the amplifier. A dry battery will be quite sufficient, since no appreciable current is used, and it is unnecessary



Addition of Grid Bias.

to have a voltage of more than about 15 volts. The use of tappings is practically essential since the value of the grid bias voltage is critical for best results.

Provided that a hard valve and a high value of H.T. voltage is used the addition of grid bias will improve reception and signal strength. If only one stage of L.F. is employed, a grid-bias voltage of about 1 1/2 volts will probably be suitable.—U.

Valve Voltages

Q.—Please give filament voltages and current and H.T. voltages for Cossor "Wuncell," Dextraudion, Myers D.E., Loudon, Penton HE4, Wecovalve and G.W.I. valves.—C. D. (Oundle).

A.—

Type of Valve.	Filament Volts.	Amps.	H.T. Volts.
"Wuncell" W1	1.6-1.8	0.3	30-70
" " W2	1.6-1.8	0.3	30-70
Dextraudion ..	1.0	0.1	20-150
Myers D.E. ..	2.5	0.25	20-300
Loudon—			
(Plain) ..	4.8-5.0	0.4	40-80
(Blue) ..	4.8-5.0	0.4	40-80
Penton HE4 ..	5.0	0.15	60
Wecovalve ..	0.8-1.1	0.25	17-47
G.W.I. A1 ..	4.6	0.45	50-200
" " G1 ..	4.0-6.0	0.45	50-120

—U.

Wavemeters

Q.—I intend to construct a wavemeter for the purpose of testing the wavelength of my receiver. I am undecided, however, what type of meter to employ, and whether a circuit using a valve or a buzzer is suitable.—F. S. (Pinchley, N.3).

A.—For general use in testing the wavelength of receivers there is no need to go to the trouble and expense of constructing a heterodyne wavemeter. A buzzer wavemeter should be quite suitable for your purpose. The construction of a simple home-made wavemeter is described on p. 293, No. 142.—U.

Mansbridge Condensers

Q.—I intend to use a 2-microfarad Mansbridge condenser across the H.T. terminals of my receiver, but do not know if the dielectric will stand the strain.—C. S. (Limpsfield, Surrey).

A.—The waxed-paper dielectric of the condenser will safely stand up to a potential of 100 volts direct current. It is not safe, however, to place such condensers in A.C. circuits if a voltage greatly in excess of 100 volts is present. For this reason great care should be taken to see that the filaments are switched on before the H.T. is connected, or else the sudden flow of current may damage the dielectric.—U.

Three-coil Tuning

Q.—A three-coil holder is used on my two-valve set, but only two of the coils are connected. The circuit is at present arranged so that the reaction coil couples to the aerial coil. Should I expect to get better results if all three sockets are used?—P. P. (Bromley, Kent).

A.—You do not state in what manner you intend to use the third socket, but if you intend to form a loose-coupled tuner, then a distinct advantage in selectivity will be gained. The first coil could be connected in series with the present A.T.I., thus forming a variometer tuner, or by connecting the coil between the negative H.T. and positive L.T. terminals, the double reaction circuit may be tried. A simple wavetrap may be made by coupling the third coil to the aerial inductance and connecting across its terminals a .0005-microfarad variable condenser.—U.

Anode Voltages

Q.—I have been told that in a receiver such as I possess (H.F., detector, L.F.), better results are obtainable if separate anode voltages are applied to each of the three valves. I do not wish to go to the expense of using three separate high-tension batteries, and should be pleased if you could inform me whether the better results obtained would be worth all the extra trouble taken.—V. K. (Bedford Place, W.4).

A.—There is no necessity to employ three high-tension batteries for this purpose as the tappings from the receiver may be taken to one common battery. The connection is quite easily made. The lead supplying the anode current to all the valves is disconnected and separate wires are taken from the anodes of each of the valve. Three plugs are used for tapping the battery.—U.

Induction

Q.—What is induction?—J. T. (Ripon).

A.—The effect produced upon a coil of wire in juxtaposition to another coil in which a current of electricity is made to flow at the moment this current is started, stopped or varied.—U.

AROUND THE SHOWROOMS

Valve Unit

ANYBODY who uses the new Woodhall valve unit in constructing a set will be saving himself a good deal of time and trouble.

The unit consists of a strip of insulating material, on which are fixed a valve holder (for vertical mounting), a Woodhall vernier filament resistance and a valve window.

By drilling only two holes, one for the window and the other for the rheostat control spindle, the unit can be easily fixed into position behind a panel. The use of these units would apparently save the cost of an ebonite panel, for they can quite well be mounted on a wooden panel.

The makers of Woodhall components are Pressland Electric Supplies, Ltd., of Hampton-on-Thames.

Grid Leak

EXPERIMENTERS and constructors alike feel the need for reliable grid leaks. One of the latest of these I have just tried is the Chaseway variable grid leak, made by the Chase Electrical Manufacturing Co., Ltd., of 184, Fleet Street, E.C.4.

The appearance of this leak is different from all I have yet seen, the resistance being varied by a plunger which has a $1\frac{1}{2}$ -in. throw. One-hole fixing is employed. The range claimed is 10,000 ohms to 20 megohms.

On test I found one of the leaks to be extremely silent, and reaction could be very finely controlled by movement of the plunger. The price is 4s.

Sparta Grid-bias Battery

IN most cases it is desirable to adjust grid bias in steps of $1\frac{1}{2}$ volts, and also to have provision for comparatively high voltages when needed. A number of grid-bias bat-



Sparta Battery.

teries with a total voltage of 12 are adjustable in steps of only 3 volts.

Fuller's have overcome this disadvantage in their Sparta 12-volt W.A. 8 battery, which is tapped at 3, 6, $10\frac{1}{2}$ and 12 volts. Any of the following voltages can be obtained: $1\frac{1}{2}$, 3, $4\frac{1}{2}$, 6, $7\frac{1}{2}$, $10\frac{1}{2}$ and 12.

This battery is certainly a very useful accessory. Measuring only $3\frac{1}{2}$ in. by $1\frac{3}{4}$ in. by $2\frac{3}{4}$ in. high, it can be easily accommodated in any set. The makers are Fuller's United Electric Works, Ltd., of Chadwell Heath, Essex.

Anti-vibro Valve Holder

I have just come across a valve holder that is of particular interest to those who are short-wave enthusiasts and to those who use .06-ampere valves.

The holder to which I refer is the Anti-vibro, made by Phipps and Read, of 10, Baron Street, Pentonville Road, N.1, the price of which is 2s.

In this holder the sockets, which have comparatively thin walls, are mounted in a circular piece of fairly soft rubber, and no metallic nuts or washers are used. This results in a very low capacity between the sockets themselves.

Rubber washers are provided, and instead of metal nuts small pieces of threaded ebonite tube are used for fixing.

By virtue of the rubber mount a great deal of unwanted vibration is absorbed, and for this reason the holders should be especially suitable for mounting .06-ampere valves.

Tapped Plug-in Coils

THERE are many circuits in which advantage can be taken of a tapped coil, especially of the usual plug-in variety.

I notice that Lissen, Ltd., of Woodger Road, Goldhawk Road, W.12, are introducing a range of tapped plug-in coils, called Lissenagon X.

These are built on the lines of the ordinary type of Lissenagon coil, with the difference that on each side of the mount is fixed a tapping terminal. The first X coil to be put on the market is a No. 60.

VANGUARD.

PROGRESS AND INVENTION

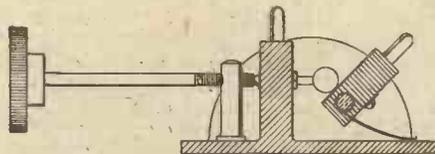
Eliminating Atmospheric

A NOVEL solution to the problem of elimination of atmospheric is described in Patent No. 225,867/24 (Y. Marrec, 146, Bishopsgate, London). The rectified output from an ordinary receiver is first fed to a group of highly-damped amplifying circuits, in which both signals and atmospheric are amplified simultaneously without, however, their pitch being modified. The amplified currents are then fed to a series of resonant circuits, tuned to the note of the desired signals or to a multiple thereof. The filament temperature of the valve in these circuits is decreased to a point where a limiting action is imposed upon the atmospheric, and sustained oscillations at signal frequency set in and persist during the period of the desired signal. This ensures an intense reception of the selected signals, whilst the amplitude of

atmospheric disturbances is relatively weakened.

Coil Holder

PATENT No. 228,357/24 (John Rodger, Pendleton, Manchester, describes a type of Vernier coil holder in which a



Coil Holder No. 228,357/24.

novel method is used for obtaining the fine adjustment.

The moving coil holder or holders are under tension by a spring, so that the tendency of the spring is to close up the mov-

ing holder in the direction of the fixed coil holder.

A rod, which may be threaded and which is held in position by a support through which it passes, acts against the direction of the spring on the movable coil holder, and by this method regulates the position of the plugged-in coils.

This method can also be adapted to holders of the two or multiple coil type.

The details of the holder, which is a typical two-coil socket, are seen in the diagram. The threaded adjusting arm has a knob at one end which bears against the moving holder. A flat spring maintains a steady pressure between the holder and this knob. The spring should be capable of maintaining enough pressure to prevent the holder moving when a large coil is inserted. The amount of control possible is varied by the pitch of the thread on the controlling arm.

TRANSMISSION STEP BY STEP.—II

This, the second article of the series, describes the simple spark transmitter.

THE following article describes the simplest type of spark transmitter. It should be understood that spark transmission is not allowed by the P.M.G. under the usual transmitting licence, and that a special permit is necessary. The intention of this article is more particularly to explain the principles of transmission.

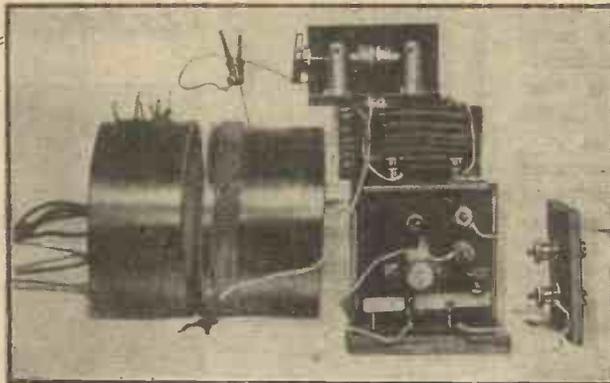
We have seen from a consideration of the elementary apparatus described in the first of these articles that it is possible to energise an aerial with high-frequency current generated by very simple means—an ordinary buzzer and dry battery. If it were possible to build up a very high voltage potential inside the secondary-tuning condenser and allow it suddenly to discharge across an air space, a greater amount of oscillatory current will flow in the aerial circuit.

Spark Transmitter Circuit

This effect is obtained by using a very high ratio transformer in conjunction with a buzzer or circuit-breaker as illustrated in Fig. 1. The condenser C is in this case a fixed condenser with a value of .002 microfarad and the dielectric is such as to withstand a very high voltage. The transformer which is used for stepping-up the voltage applied to the primary terminals AB via the key K consists of an old Ford spark coil.

This transformer is exceedingly efficient and is self-contained inasmuch as the buzzer or contact breaker (vibrating armature) is incorporated in the coil. This can be plainly seen on the front of the instrument. Apart from the foregoing there is little difference between this apparatus and the elementary apparatus previously explained, except that a spark gap is used.

The spark gap may consist of two metal balls suitably insulated one from another and suspended on two metal rods held in pillars and adjustable as regards distance one from the other. The amount of current which will flow in the circuit L₃ and L₄ is proportional to the voltage applied to the terminals A and B, and when a 6-volt accumulator is used the aerial current is in the neighbourhood of .5 ampere and is registered on an ordinary hot-wire meter.



Simple Spark Transmitter.

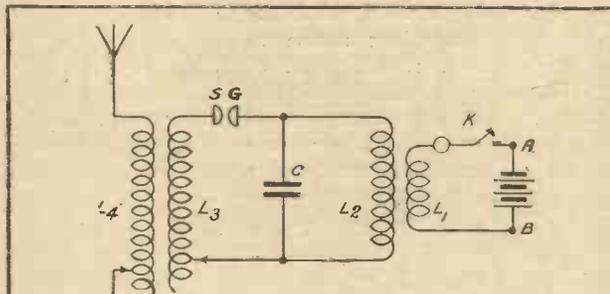


Fig. 1.—Circuit Diagram.

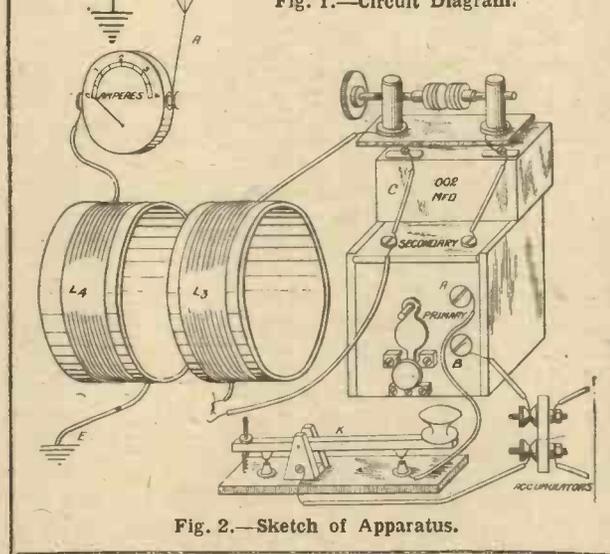
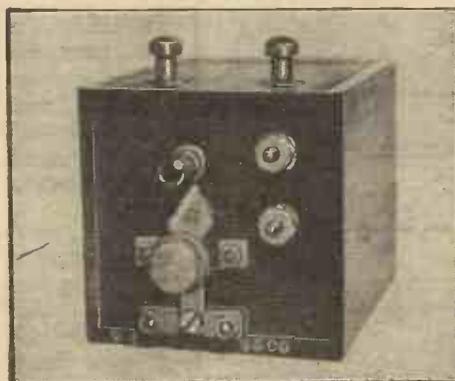


Fig. 2.—Sketch of Apparatus.



Spark Coil

The Ford coil previously referred to works quite well on a 4-volt accumulator. A large amount of high-frequency current flows in the coils L₃ and L₄, so that the wire used is of heavy gauge. No. 18 d.c.c. wire is used for the secondary coil L₃. The cylindrical cardboard former is 5 1/4 in. in diameter and 2 in. long. Twenty turns of No. 18 wire are used on the former, the last nine being tapped at every turn. Lico clips are used for tuning purposes.

The primary coil L₄ is wound with fifty turns of No. 20 d.c.c. wire on a former 5 1/4 in. in diameter by 4 1/2 in. long. The last twenty turns are tapped every two turns in the same manner as the secondary coil.

Operation

As regards operation, the aerial is disconnected and the key pressed. The vibrating armature is adjusted until it gives a high-pitched note without sparking at the contacts, and the spark gap is so adjusted that it produces a sharp crisp and regular spark on the dots of the morse code. The tuning of the secondary is accomplished in the following manner: The operator listens-in on a receiver or wavemeter at a distance and adjusts the inductance of the coil L₃ until the transmission is taking place on the required wavelength of, say, 440 metres. The aerial is connected to the coil L₄, and this inductance is adjusted until a maximum aerial current is indicated in the hot-wire ammeter.

This is the cheapest transmitting set it is possible to produce, and ranges of from 5 to 10 miles may be obtained by it. The diagrams and photographs clearly indicate the connections of the various component parts.

A. J. C.

The first hour of the programme from 5.XX on March 19 will be given by Robert Carr and his "Georgeans" concert party. Part of the Hallé concert from the Free Trade Hall, Manchester, will be relayed at 8.30 p.m.

An appeal for funds for the Sheffield War Memorial was broadcast recently from the Sheffield relay station by the Bishop of Sheffield.

THE receiver described in this article is the result of an attempt to build a loud-speaker set using components almost entirely manufactured by one firm, as it was thought that by so doing the various parts would harmonise. The components in this particular set were mostly made by Lissen, Ltd., but it should be understood that there is no reason whatever why a similar set should not be built with the products of any other manufacturer.

The cost of the components illustrated is not much more than £13, inclusive of the cabinet (ready-made), panels, engraving and the loud-speaker parts.

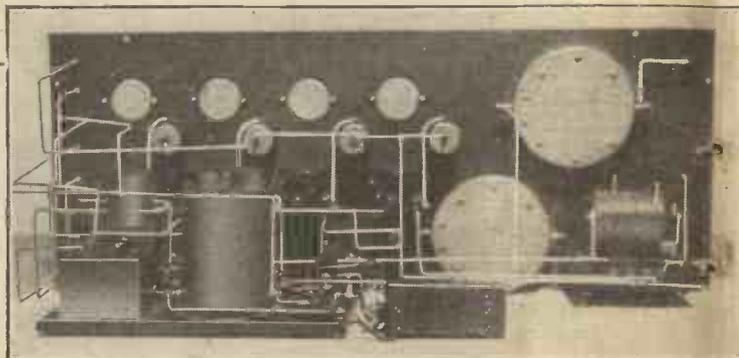
Components

The following is a list of the components used:

Two Mark III, mica-dielectric variable condensers; two grid leaks; four coils (broadcasting range for tuned anode, reaction and aerial tuning); one T.I. transformer; four Lissenstats; two chokes; one .0003-microfarad fixed condenser (grid condenser); one .001-microfarad Lissen fixed condenser (transformer by-pass condenser); one .25 microfarad Mansbridge fixed condenser (valve-choke coupling); four .05-microfarad Mansbridge smoothing condensers; one .25-microfarad Mansbridge smoothing condenser; one grid-biasing cell (1½ volts); one cabinet; one ebonite stage, 7 in. by 7¾ in. by ¼ in.; one ebonite stage, 4 in. by 3¾ in. by ¼ in.; one ebonite panel, 20 in. by 7½ in. (Unique Wireless, 50a, Strand); four Aeromonic valve holders; four Aeromonic

A FOUR-VALVE LO

Constructional Details of Receiver Built f



Back View of Panel showing Wiring.

valve windows; one pair 3-in. iron brackets; one Brown reed phone and parts for the paper loud-speaker; ten terminals.

The Panel

Having obtained or made a cabinet to the dimensions shown in Fig. 1, the panel of ¼-in. ebonite should first be trued up to fit in the front of the cabinet and all the holes shown in Fig. 2 drilled or cut. The sizes of the various holes have not been specified, but they are made to suit the various components.

Next a full-size paper plan of the sketch is prepared, with the lettering inserted but without the dimensions, the relative positions of the holes and the desired lettering alone being shown. The panel and paper may now be engraved.

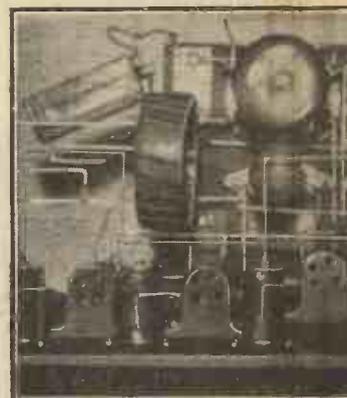
The Coil Holder and Component Stage

On the score of economy in space and outlay on ebonite it was decided to put the components into as small a space as possible. In view of this it was found necessary to elongate the reaction handle of the coil holder by ⅜ in. so that the A.T.I. would be clear of the metal case of the aerial tuning condenser. This is effected by cutting the metal rod into two pieces as near to the carrying bracket as possible and threading the ends. Next a piece of brass tube of suitable size is tapped out and fitted to the two ends of the rod as a sleeve, two lock-nuts being provided on each side to prevent them coming loose.

A small stage for the coil holder is now prepared according to the sketch (Fig. 3) and the holder mounted in position on it. The ebonite stage for the chokes, transformer, condensers, etc., may also be prepared (Fig. 4). These components, together with the brackets for fixing purposes, are laid out in the relative position indicated in the sketch. These stages are screwed to the panel.

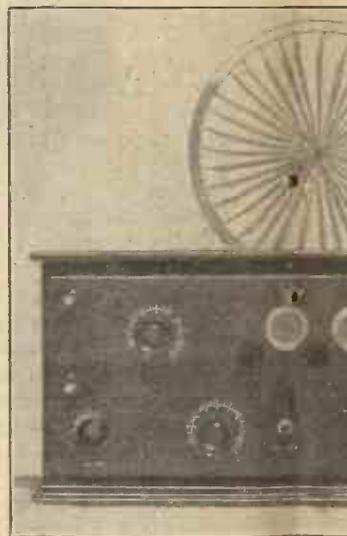
The Loud-speaker

The type of loud-speaker is, of course, optional. It is not proposed to give detailed instructions here for the construction of the loud-speaker, as these have already been given in



Another Plan View showing

No. 125. This instrument (graph), however, differs slightly described, as it was made up from Messrs. Unique Wireles



The Complete Four-val

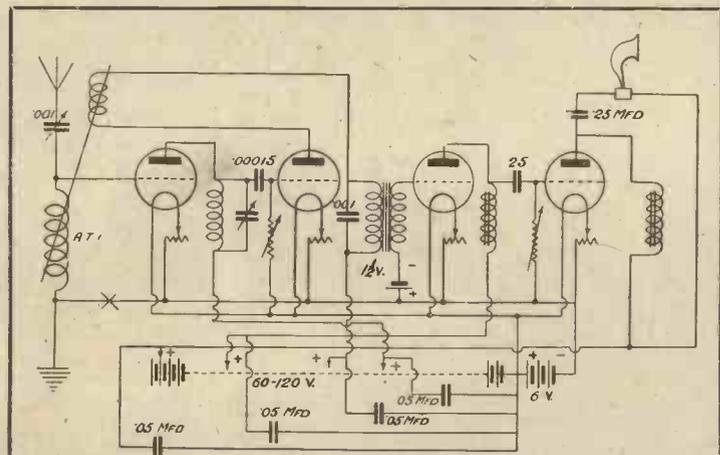


Fig. 5.—Circuit Diagram.

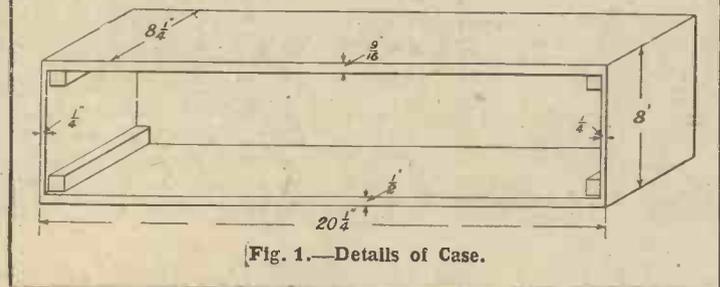
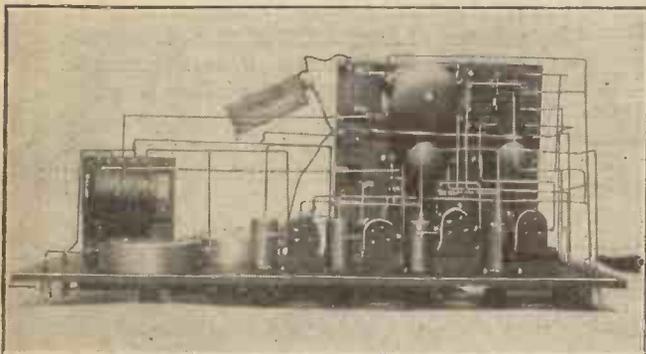


Fig. 1.—Details of Case.

LOUD-SPEAKER SET

from Components of Proved Efficiency



Plan View showing the Stage.

of two aluminium rings, a quantity of paper creased ready for folding and a Brown reed earphone. The loud-speaker shown was mounted on a bent brass bracket, which was offset so as to allow the lid of the cabinet to be opened without damaging the dia-

phragm (Fig. 6). It is suggested that the speaker could equally well be mounted by means of a wooden bracket.

Assembly

When the panel has been engraved the variable condensers, grid leaks, valve holders, valve windows, Lissenstats and terminals may be mounted in position as shown in the photographs and drawings. The only unit which is not mounted on either of the stages is the grid-biasing cell, and this is attached to the floor of the cabinet by means of a fibre or metal strip. With regard to the Aermonic valve holders, the last two intended for the low-frequency amplifying valves are built out from the panel to allow of the insertion of larger valves. This is done by inserting pieces of 1/4-in. ebonite sheet between them and the panel before bolting up.

Wiring-up

The wiring must, of course, be carried out with due regard to the usual rules. A point should be made of following a system of wiring-up the filament circuits and grid leads first, after which the H.F. circuits and the transformer and chokes may be connected. It is not possible to give a practical wiring diagram in a set of this description, but if the above rule is followed and careful attention paid to the theoretical diagram (Fig. 5) no difficulty will be experienced in making connections.

It will perhaps be noticed that no switches have been added to the set. These have been purposely omitted so as to avoid unnecessary complications and crowding.

Separate values of H.T. potential are available for each valve, together with a bank of smoothing condensers, and the loud-speaker is isolated from the H.T. steady current by means of a suitable blocking condenser and a Lissen choke. The last L.F. amplifier

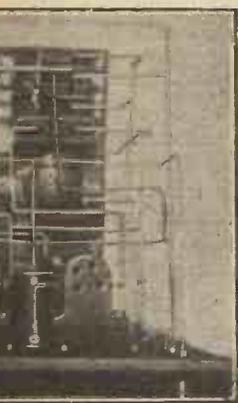
is choke-coupled, so that it may be used as a power amplifier if desired. The use of choke-coupling retains purity of reproduction, often impossible when using transformer coupling for this second stage.

H.F. Amplifier

The H.F. amplifier is of the tuned-anode type. With suitable valves and a suitable value of H.T. and filament potential this method of coupling will be found to be perfectly stable. A Cossor "pink-top" valve or a V24 functions exceedingly well in this position, as also will a Mullard "Red Band" valve.

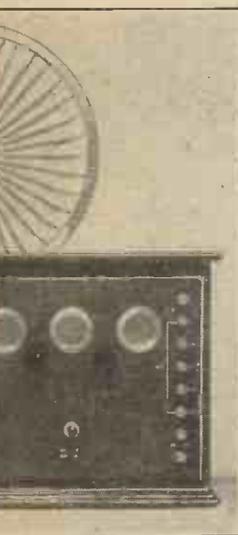
The size of the inductance inserted in the coil plug will naturally vary with the wavelength on which it is desired to receive, and generally a Lissen 50 or 60 will be found to be the best value for British broadcasting.

In some instances it may be found that the H.F. circuit will persist in oscillating under all conditions of H.T. and filament voltage. If this should happen and the music is distorted (this is generally a sure indication of self-oscillation) it will be necessary to add a little positive potential to the grid of the H.F. amplifying valve. This may be done by placing a 1 1/2-volt grid cell with the negative pole to the negative L.T. lead at the foot of the aerial tuning inductance, the positive pole going to the A.T.I. The position of the cell is shown at X in the circuit diagram. This method, although effective in preventing self-oscillation, is not the most efficient method. It is better to use a



Viewing the Stage.

shown in the photograph from that formerly from parts purchased.



View Receiver.

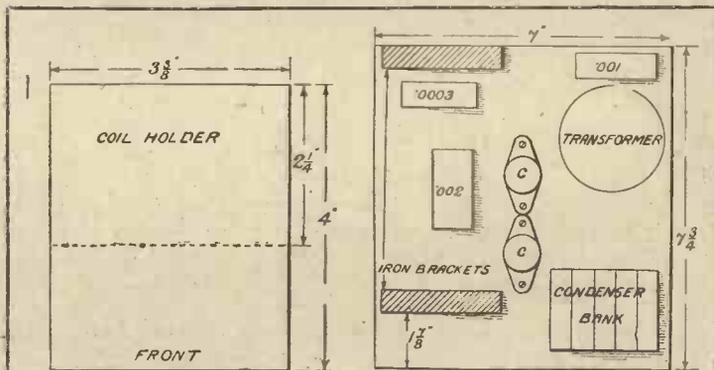


Fig. 3.—Details of Coil-holder Stage!

Fig. 4.—Layout of Components Stage.

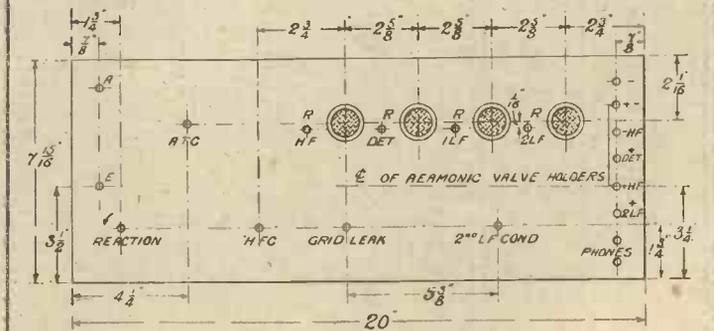


Fig. 2.—Layout of Panel.

Lissen potentiometer wired up as shown in the small sketch Fig. 7. Another method of preventing self-oscillation is to damp the circuit by using a tuned-anode coil wound with very fine wire. This may be a basket coil of a suitable value.

remembered that Lissen Mark III. condensers rotate over two revolutions of the scale to get the maximum reading of .001 microfarad, but that the mica does not come into use until the second revolution is commenced.

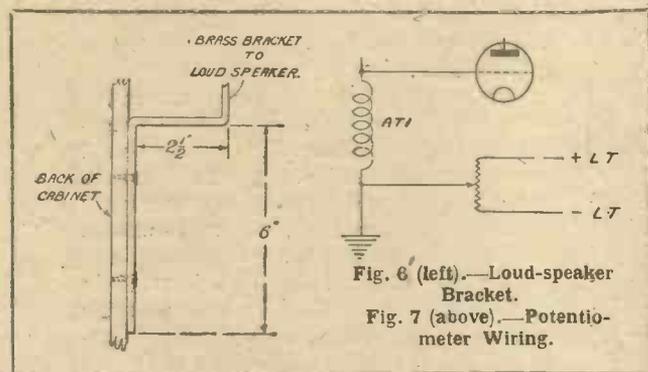


Fig. 6 (left).—Loud-speaker Bracket.

Fig. 7 (above).—Potentiometer Wiring.

As regards tuning, it will be found that the Lissen Mark III. condenser provides a very fine vernier adjustment when rotating the knob over the first range of dial readings. Air dielectric only is used over the range, and there is no need to use the second range (mica dielectric) when tuning the H.F. circuit. It must be re-

first valve at first, but by suitably adjusting the value of the H.T. and L.T. this difficulty was overcome. These values differ according to the valves in use and can only be found by experiment. The set has also been used for receiving amateurs on wavelengths of 100 metres and upwards with excellent results.

A. J. C.

Results

With the set built as described, exceedingly good results have been obtained. London, Birmingham, Cardiff and Bournemouth have all been received on the loud-speaker at full strength, and all B.B.C. and most of the Continental stations come in at excellent strength on the telephones. A little difficulty was encountered with self-oscillation of the

will be made if the work is carried out along these lines.

When unusual or even freakish results are obtained a careful search should be made for the cause; if an examination proves that something new has been discovered, a full report, sent immediately to AMATEUR WIRELESS, will give fellow experimenters the benefit of your experience. In the same way your own knowledge of wireless will be vastly improved if the columns of AMATEUR WIRELESS are scanned every week for some new development in the particular branch of wireless in which you are interested.

Dual amplification has been very much to the fore during the last few months; the experimenter should test all the newest reflex circuits and compare them with the old ones in order to estimate their true value; he should also attempt to decide whether "straight" circuits are definitely obsolete, or whether the drawbacks of dual receivers really outweigh their advantages.

Innumerable Opportunities

Even such familiar objects as the aerial and earth offer innumerable opportunities for experiment; the value of height and length, screening and locality, good and bad insulation, should all be examined. The different forms of earth connections—counterpoise and water-pipe, biscuit-tin, etc.—must also be carefully tried. The ultimate aim of such experiments would be the production of an ideal aerial-earth system. The effect of weather conditions is another interesting subject.

A Fascinating Hobby

Wireless experimenting is one of the most fascinating of hobbies. It can be indulged in during any spare moment and under practically any conditions. It need not confine the enthusiast to a stuffy indoor atmosphere, since he can easily take a portable set out into the country and perform his experiments there. Hours can be passed away like this in interesting and profitable study.

G. J. M.

HOW TO EXPERIMENT

THE first thing to be grasped by the graduate from the ranks of the broadcast listener pure and simple is the fact that his new apparatus must be quite different to his old set. The average set is unsuitable for experimenting and will henceforth be used solely for entertainment purposes.

The Best Receiver

As the experimenter is constantly trying to keep ahead of existing ideas and practice his set is never finished, but is always in a state of flux. Since it is to be used chiefly for testing new gadgets, circuits, etc., it stands to reason that the receiver must be designed in such a way that the components are easily "get-at-able" and the connections can be swiftly changed. Consequently a large part of the wiring will have to be on the top instead of the under side of the panel.

The following materials would form the nucleus of a very good experimental outfit: A large wooden baseboard, not less than 24 in. long and 12 in. broad. A pastryboard of these dimensions will answer the purpose quite well.

The components here mentioned are mounted on the baseboard: Two or three valve panels with terminals for grid, plate and filament connections; three good .0005-microfarad variable condensers and two rheostats—preferably of the carbon-compression type; one or two resistances, 2 megohms and 100,000 ohms (these can

be either fixed or variable); a selection of fixed condensers (.002, .0002, .0005 and .001) will also be required. A ¼ lb. of each of the following wires will be needed for the construction of tuning coils: No. 16, 20, 24 and 30 double-cotton-covered copper wire. In addition to these a quantity of flex and busbar should be obtained for the necessary connections. The high- and low-tension batteries will in most cases be already in the owner's possession; it is a good idea to buy a dozen or so extra flashlamp batteries (costing about sixpence each) in order to increase the plate voltage in certain cases. These few components, which (excluding the valves and batteries) should not come to much more than thirty shillings, will form a very good beginning for experimental work.

A Line of Experiment

The next step is to decide what branch of wireless your experiments will follow. Selectivity, the elimination of atmospherics and pure amplification are examples of some wireless problems which still have to be solved. Short-wave working is the fashion at present and certainly offers great opportunities for experiment.

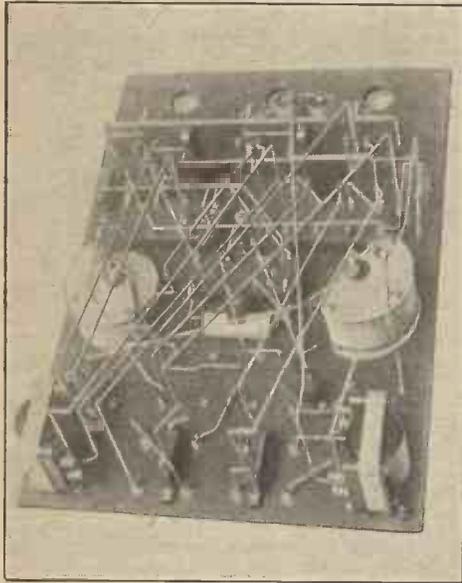
In all cases experiments must be carried out carefully and systematically if the experience is to be of any permanent benefit. Results should be tabulated in a notebook, kept specially for the purpose; very real progress in wireless knowledge

BROADCASTING IN BULGARIA

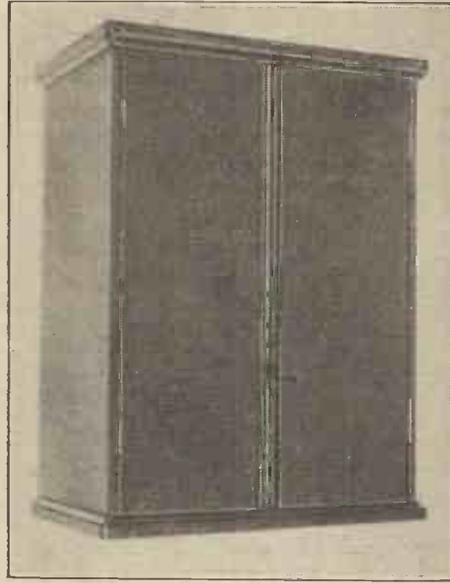
IT is stated that the Bulgarian Government, which up to the present has prohibited the private use of all wireless receivers under dire penalties, is now considering the establishment of a limited broadcasting service. Concessions will be granted only to Bulgarian companies, and the transmissions will be strictly limited to the broadcasting of censored news bulletins, stock-exchange quotations, and lectures dealing with agricultural subjects.

Bulgaria is one of the few European countries which does not suffer from "oscillators," and for the very good reason that to date there are only four licensed wireless sets in the country, each one imported under special authority. J. G. A.

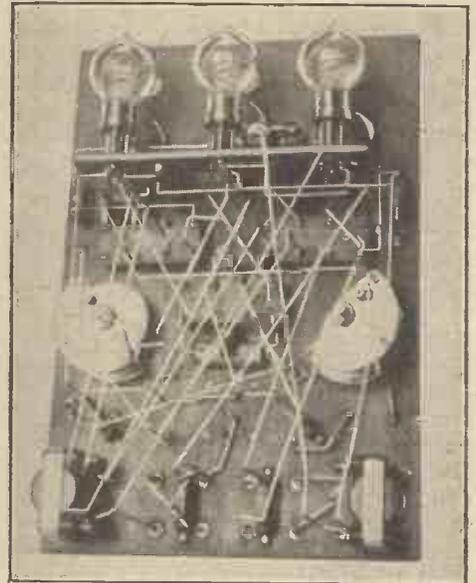
A THREE-VALVE EXPERIMENTAL RECEIVER.—II (Conclusion)



View of Back of Panel.



Exterior of Case.



Another View of Back of Panel.

Panel Fittings

THE finished components are fitted on the panel in their respective places as shown in Figs. 2 and 7, care being taken to keep all the screws flush with the surface. The fixed condensers C₃, C₄, C₅, C₆ and C₇ (Fig. 7) should be fixed in the positions shown by drilling small holes in the panel and tapping them to take 6 B.A. screws. Lastly, the grid batteries require fixing in two places. A single cell B₁ (Fig. 7) is enough for the first valve,

while two cells B₂ are necessary for the last stage of low-frequency amplification. These two cells are fixed by the side of the valve holder on the ebonite shelf carrying the valves. The grid cells can be clamped in position by small ebonite pieces and long brass screws.

Wiring

The panel fitted with all the above components is now ready for wiring. The wiring is shown in Figs. 7 and 8. Two different wiring diagrams have been given to avoid confusion. The wires in Fig. 7 will be close to the panel, while Fig. 8

shows only long connecting wires, which are kept as high as possible.

The wire used for connections is No. 16 S.W.G. square tinned-copper wire.

The Cabinet

The exact dimensions and the working details are given in Figs. 9 and 10.

Tuning

In use the three inductance coils are plugged in first, No. 50 in the left plug, and No. 75 coils in the other two plugs.

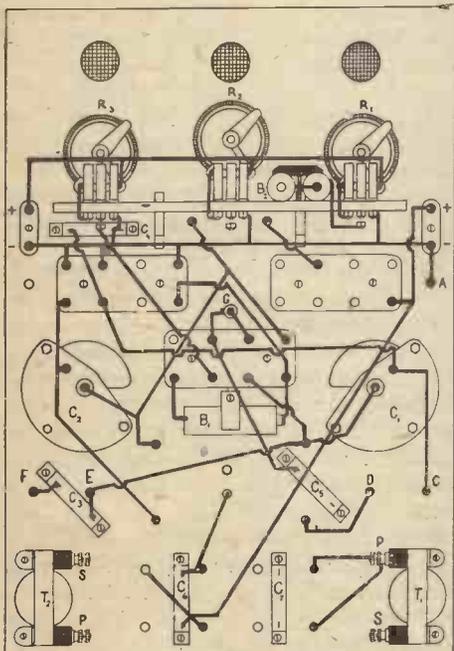
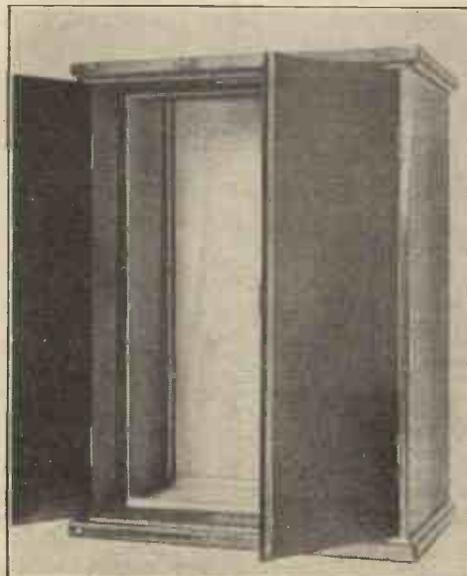


Fig. 7.—Diagram showing Wires Close to Panel.



Case with Doors Open.

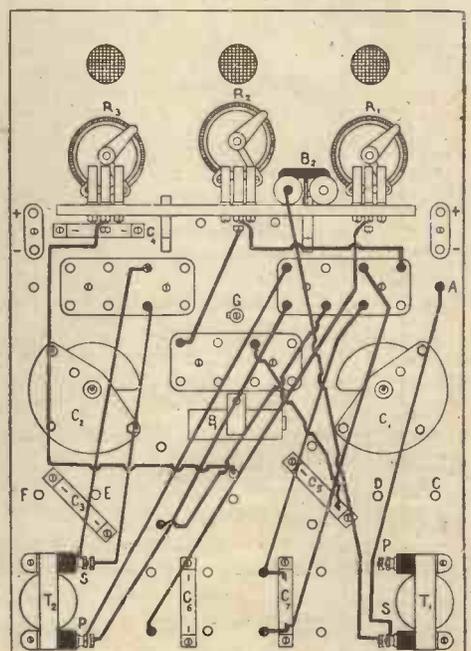


Fig. 8.—Diagram showing Long Wires.

The receiver is then connected to the aerial, earth and the batteries, and the tuning accomplished by turning the aerial condenser dial until the desired signals are heard, keeping the second condenser

connections to be made for the corresponding circuits (see Fig. 11).

Note.—The numbers in brackets are to be short-circuited by means of plugs, as in Fig. 11.

bearable. The above results have been obtained on an indoor aerial, consisting of ordinary cotton-covered copper wire stretched across the room, using no insulators whatsoever.

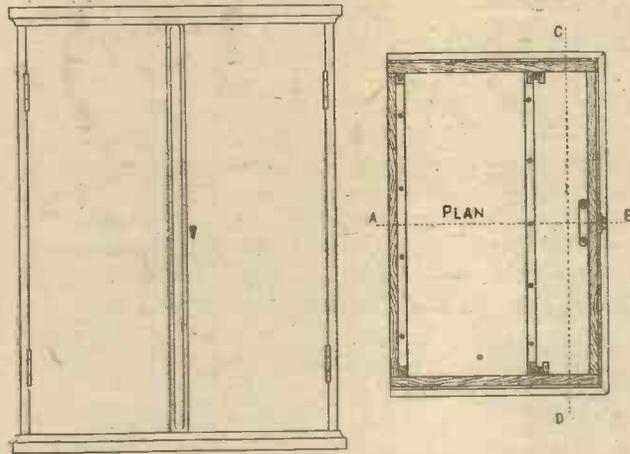


Fig. 9.—Front Elevation and Cross Section of Case.

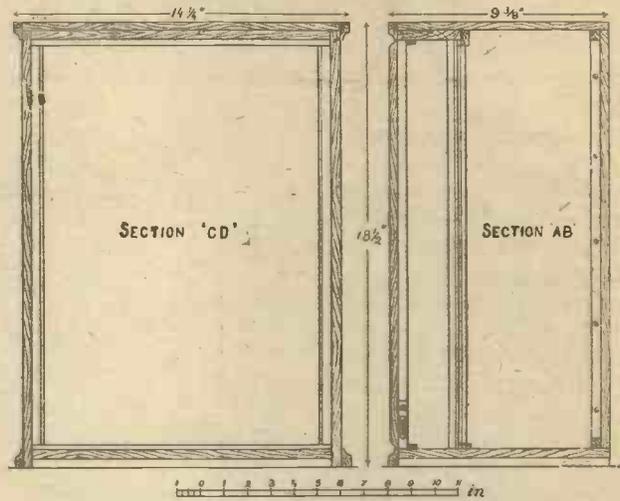


Fig. 10.—Back Elevation and Vertical Section of Case.

at about 10 degrees. The next stage consists of tuning the third coil, which will result in louder signals, but still requiring a finer adjustment of the first condenser. It will be found easier in the initial trials to have tight coupling between L2 and L3 and the coils L1 and L2 kept loosely coupled, although best results will be obtained by keeping L2 and L3 slightly apart.

The following is the table of necessary

Results

Using only one valve in a reflex circuit Cardiff (150 miles) and Birmingham (100 miles) can be very easily tuned-in even when London is working. London at a distance of four miles comes in on the loud-speaker to be comfortably heard all over a room, and if another stage of low-frequency amplification be used the loud-speaker becomes deafening and the receiver has to be detuned to make it

The loud-speaker can also be operated without any aerial—with two valves, of course—but it is not loud. A piece of cotton-covered wire about 10 ft. long lying in the room when used as an aerial works the loud-speaker satisfactorily.

M. J. C.

CARRIER-FREE BROADCAST

Successful experiments have recently been carried out by the University of Illinois in broadcasting telephony without the use of a carrier wave. Actually both the carrier and one of the side-band frequencies produced by the combination of the high- and low-frequency aerial currents are eliminated, so that the radiated energy is confined to the remaining side-band, which is, of course, fully modulated. A saving of more than one-third in power output is thereby effected at the transmitting end, whilst sharper tuning and an absence of any heterodyne howl is secured in reception. Incidentally, radiation only takes place when and so long as the microphone is actually being spoken into. During the intervals between successive words and sentences the ether is quiescent.

The main drawback to the new system lies in the necessity for the use of a valve oscillator at the receiving end in order to restore the missing carrier wave before detection. A crystal, for instance, would be useless for receiving the new type of transmission, which can only be rendered audible by means of a local oscillator tuned to the frequency of the suppressed carrier wave.

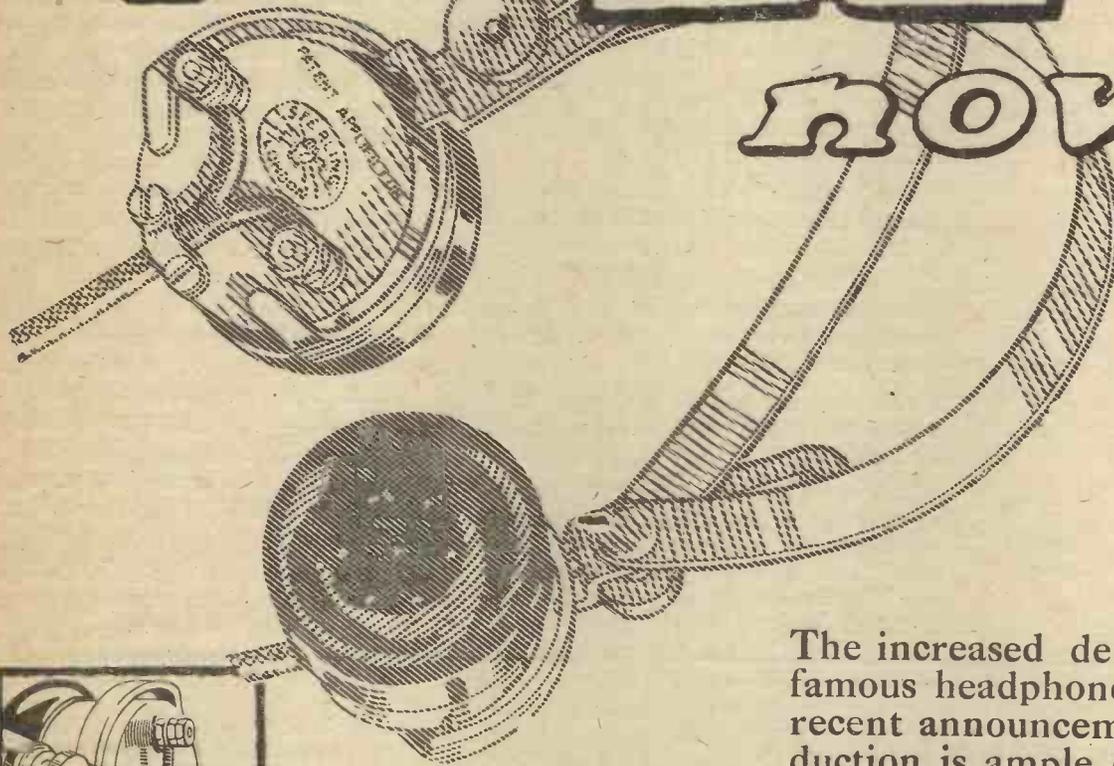
M. A. L.

When you buy your set, let the dealer demonstrate it. If it is what he claims it is, he will gladly do so.

Acid from your accumulator will eat holes in almost anything, so be careful.

No.	Circuit	Connections to be made	Phones	Valves Used	Remarks
1	Crystal (a)	(10-11), (2-3)	(26-30)	—	L2 removed, and earth connected to c.
	(b)	(10-11), (2-3), (17-22), (15-16)	(26-30)	—	L2 and L3 removed and earth connected to c.
<i>One Valve</i>					
2	One-valve reflex	(11-12), (3-4), (14-15), (6-7), (21-22), (23-24)	(27-31)	Third	L2 and L3 closely coupled.
3	Detector	(18-22), (19-23), (7-15)	(27-31)	Third	L3 removed.
4	H.F. and Crystal	(22-23), (7-15), (10-11), (2-3), (27-31)	(26-30)	Third	L2 and L3 closely coupled.
5	Crystal and L.F.	(11-12), (3-4), (13-14), (5-6), (7-15), (9-10), (1-2), (20-24)	(26-30)	Second	L2 removed.
<i>Two Valves</i>					
6	Two-valve reflex	(17-18), (19-20), (1-4), (9-12), (14-15), (6-7), (8-16)	(27-31)	Second and third	L2 and L3 closely coupled.
7	H.F.; Crystal and L.F.	(22-23), (7-15), (11-12), (3-4), (13-14), (5-6), (20-24), (9-10), (1-2), (27-31)	(26-30)	Second and third	L2 and L3 closely coupled.
8	H.F. and Detector	(17-18), (19-20), (7-15), (8-16), (9-10), (1-2), (27-31)	(26-30)	Second and third	L2 and L3 closely coupled.
9	Crystal and two L.F.	(11-12), (3-4), (13-14), (5-6), (7-5), (9-10), (1-2), (20-24), (25-26), (29-30)	(28-32)	First and second	L2 removed.
10	Detector and L.F.	(18-22), (19-23), (7-15), (27-25), (29-31)	(28-32)	First and third	L3 removed.
<i>Three Valves</i>					
11	Three-valve reflex	(17-18), (19-20), (1-4), (9-12), (14-15), (6-7), (8-16), (25-27), (29-31)	(28-32)	All	L2 L3 closely coupled.
12	H.F.; Crystal and two L.F.	(22-23), (7-15), (11-12), (3-4), (13-14), (5-6), (20-24), (9-10), (1-2), (27-31), (25-26), (29-30)	(28-32)	All	L2 and L3 closely coupled.
13	H.F. Detector and L.F.	(17-18), (19-20), (7-15), (8-16), (9-10), (1-2), (27-31), (25-26), (29-30)	(28-32)	All	L2 and L3 closely coupled.

For 22'6 now!



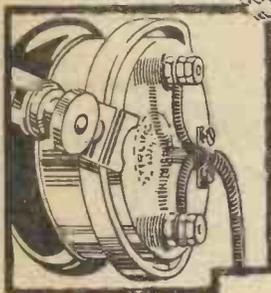
The increased demand for these famous headphones following the recent announcement of price reduction is ample evidence of the keen sense of value possessed by the public.

Sterling Lightweight Headphones at the old price were universally acknowledged as the best value procurable—at the reduced price the value offered remains incomparable.

Comparison with headphones at any price has shown the superiority of Sterling Headphones in efficiency, design, finish and value. In the words of the radio slogan : "Those who buy Sterling buy best!"

STERLING LIGHTWEIGHT HEADPHONES

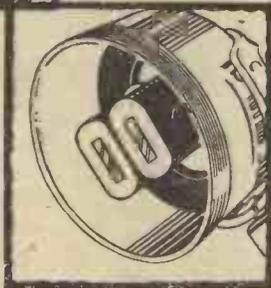
At all Radio Dealers



I The swivel and trunion movement which provides easy adjustment



II The back view of one ear-piece — note the difference in construction



III The highly efficient electro-magnetic system

Advt. of **STERLING TELEPHONE AND ELECTRIC CO., LTD.**
Manufacturers of Telephones and Radio Apparatus, etc. Telephone House, 210-212, Tottenham Court Road, London, W.1 Works: Dagenham, Essex

RADIOGRAMS

KDKA dance music, picked up 11,000 miles away by the *Melbourne-Herald*, permitted dancing in the public square at Melbourne.

There are now five hundred and sixty-three broadcasting stations in the United States. Four hundred and fifty-five of them are working with a power of 500 watts or less.

The world's southernmost wireless station will be at South Orkney Island, one of the outposts of the Argentine Republic. The station, to which the call letters L H T have been assigned, will be used principally for Government purposes.

A new principle, which is the basis of a modulation system which renders transmission practically exempt from distortion, is being used in experiments by the Telefunken Laboratory, Berlin. The wavelength is 290 metres and the power 100 watts.

Arrangements are being made for Sig-

nora Tetrassini to sing from the London broadcasting station. This will be the first time she has sung for wireless outside of Italy. It is already decided that her songs will be relayed from London to all British stations, including Chelmsford.

The number of wireless receiving licences in the Southampton area is about five thousand.

It has been suggested that an attempt should be made to broadcast the speeches made by the Prince of Wales during the forthcoming tour.

The Ashton-under-Lyne Concertina Band will give their first broadcast from London on March 21.

Marconi's Wireless Telegraph Co. announces that as an addition to the existing week-end letter service to Bermuda, Turks Island and Jamaica, a similar service has now been arranged to the principal islands of British West Indies.

Latest details of the new measure adopted by certain Glasgow landlords show that tenants are now being offered the alternative of taking down their outdoor aerials or else taking out insurance policies against possible damage to the amount of £1,000.

A musical comedy programme to be broadcast on March 14 will include songs by Miss Grace Gordon and Mr. Frank Cochrane (the original singer of "The Cobbler's Song" in *Chu Chin Chow*), and syncopated songs by Cyril Ramon Newton and Billy Mayerl.

Before the Pacific liner *Orcoma* sailed from Liverpool, the passengers listened-in to a wireless concert provided by a five-valve set which operated loud-speakers in the first-class and second-class saloons.

There are at present fourteen German broadcasting stations which are owned by the Reich Post. A further six stations will be erected this year.

The wireless listener in Germany has to pay 2s. a month, which is collected by the Postal Ministry. The total receipts last year amounted to £271,250.

The Bournemouth station of the B.B.C. has presented a wireless set to the House Beautiful, the N.S.S.U. home for children at Bournemouth.

A loud-speaker is to be placed over the big clock at St. Pancras Station, and an
(Continued on page 452)

C.A.V. Although we are not the pioneer firm for Loud Speakers, we do know that the C.A.V. models appeal to those who appreciate perfect reproduction and are willing to discard their present instrument in favour of the C.A.V.

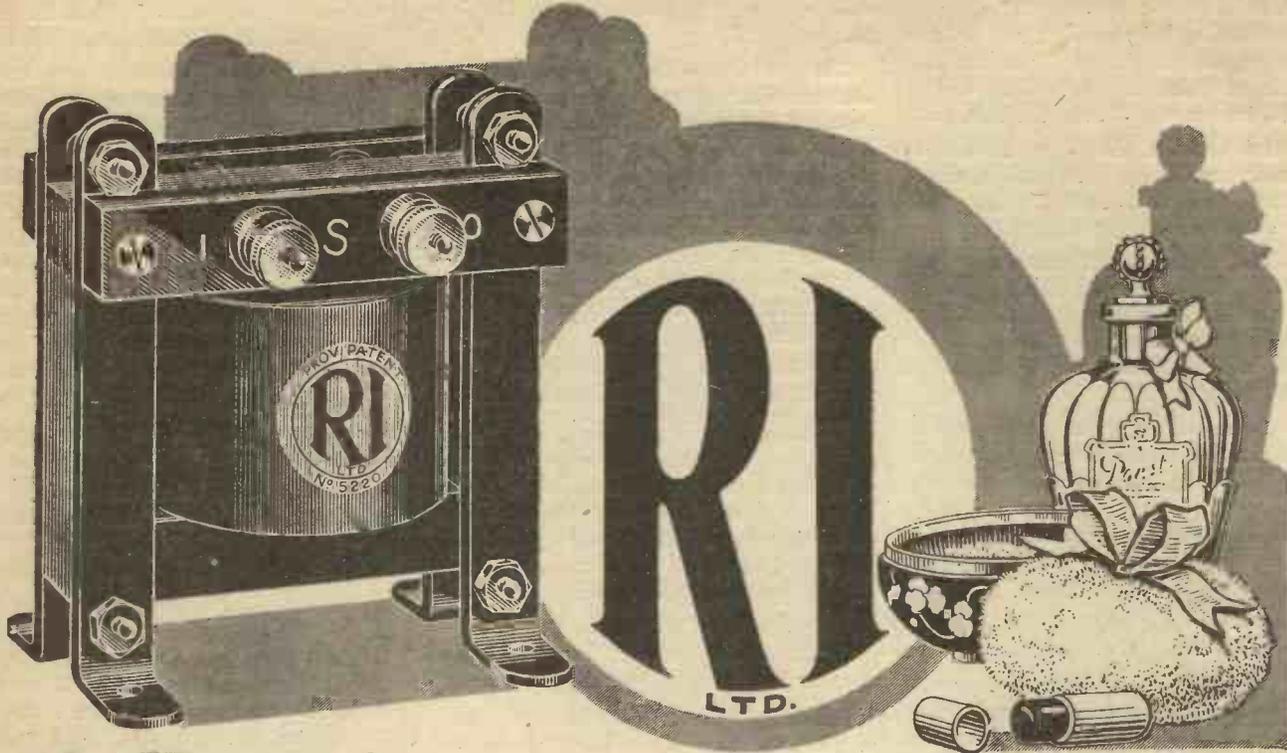


LOUD SPEAKERS
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 2000 ohms £5 0 0
 4000 " £5 10 0
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 Black Crystalline or Black Satin Enamel.
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 2000 ohms **30/-**
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C.A.V. ACCUMULATORS
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No external aids are required to emphasise the wonder of the R.I. Transformer. It is a real trustworthy British component, with a supreme design of its own that places it before all others on the market. The basis of the R.I. construction is emphatically for the

REPRODUCTION OF BEAUTIFUL MUSIC.

In more technical language the extremely low self-capacity of only 18 micro-microfarads resulting from the sectional method of winding gives—

MINIMUM DISTORTION, MAXIMUM AMPLIFICATION.

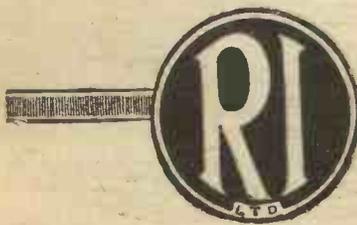
Beautiful music must be perfectly reproduced
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all Government
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Radio Instruments Ltd
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Telephone: REGENT 6214 (3 lines) W.C.I. Telegrams: Instradio London

RADIOGRAMS (continued from page 450) official, speaking quietly into a microphone in his office, will announce the arrival and departure of trains in tones which will, it is hoped, be heard all over the station.

The Reich Postal Ministry intends to build new broadcasting stations at Kiel, Dortmund, Dorstfeld and Stettin. The cost is estimated at £50,000.

An official of the B.B.C. states that "our twenty-five permanent orchestras, with the artistes, alone cost about £160,000 a year. In addition we have the upkeep of the stations, staff salaries, rents, copyright fees and other expenses."

From June 1 last year to the end of January 265 applicants were granted wireless transmitting licences and 126 were refused.

The building and equipment of a main station costs about £10,000; Daventry, the new high-power station, will cost £50,000.

An international congress of wireless students and amateurs will be held in Paris from April 14 to April 19.

The fourth of the International Symphony concerts will be relayed from the Royal Opera House, Covent Garden, on March 12. The first performance in England of Edgar Stillman Kelley's musical miracle play *The Pilgrim's Progress* will be given. At approximately 10.15 p.m. the Savoy bands will be heard until 11 p.m.

De Groot and the Piccadilly Orchestra

will be heard on the evening of March 15, the vocalist being Charles True.

The Basrah port authorities have arranged for Marconi wireless telephone installations to be fitted on their dredgers *Liger* and *Tiger* and also for a shore station with similar equipment. A wireless bell will be included in the installation, thus obviating the necessity for maintaining a continuous watch. This equipment will enable any of the stations to call the others with the facility of an ordinary telephone.

The Royal Air Force band will give its second "request" programme on March 13.

On March 19 the regular chamber music evening of the week will include art songs sung by Miss Anne Thursfield, pianoforte solos by Miss Ethel Bartlett, and string quartets played by the Wynn Reeves String Quartet. The customary fortnightly poetry readings will be included at 8 p.m.

Bournemouth has been heard on a loudspeaker with two valves at Kilmarnock.

Edinburgh Town Council proposes to take drastic measures against those who do not obey the mandate to remove all aeriels which cross the streets of the city. Recently it was brought to the notice of the authorities that there were still over two hundred contravening in this way. Anyone failing to comply with the regulations is now threatened with a penalty not

exceeding forty shillings for each day during which the offence is continued.

"Our object is, and always has been, to provide the best programmes for the greatest number of people. We believe—and the vast bulk of the letters we receive from listeners support our belief—that we attain that object," states an official of the B.B.C.

The Postmaster-General states that about 1,200,000 wireless receiving licences are at present in force. The Post Office has no material with which to form an estimate of the unlicensed sets in use.

An appropriate programme for St. Patrick's Night will be given at 7.30 p.m. on March 17.

M. Paderewski has consented to play for British broadcast listeners from 9 to 10.30 p.m. on Sunday, March 15.

On Friday, March 6, the Glasgow station of the B.B.C. celebrated its second birthday. The occasion was marked by a special programme, which included a novel burlesque by the 5 SC staff of a wireless programme in 2000 A.D.

Transmitting and receiving apparatus must be installed on French merchant and fishing vessels of 2,000 tons or more gross, or those which carry a crew of fifty, or those having more than twelve passengers, according to a recent Act of the French Chamber which comes into operation on March 15.



IGRANIC Unitune Aperiodic Fixed Coupler

for
Transatlantic Reception

you should use this coupler

The many difficulties which arise in short-wave reception owing to very high frequencies are greatly reduced by the use of the Igranitic Unitune Aperiodic Fixed Coupler.

Yet there is no difficulty in fitting it to any receiver having standard coilholders. You plug the coupler into the first grid socket, remove the aerial lead from the set and connect it to the top terminal on the plug extension arms. The lower terminal you connect to the "earth" terminal of the set and to earth.

Unitune Minor, 80-180 metres, 7/6 Unitune Major, 300-600 metres, 9/-
Ask your dealer about it.

IGRANIC RADIO DEVICES
include: Honeycomb Duolateral Coils, Fixed Condensers, Filament Rheostats, Intervolve Transformers, Variometers, Vario-couplers, Bi-plug Coil Holders, Tri-plug Coil Holders, Battery Potentiometers, Vernier Friction Pencils, etc.
All carry IGRANIC guarantee.

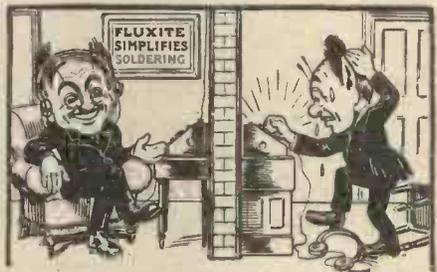
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Brown lived next door to Jones. They both made their sets. Same sort of Components—same valves—same condensers, in fact same everything, except for one small thing—and that was all the difference. Jones fretted, whilst Brown sat continually "listening in." In no way was Jones' reception to be compared with Brown's. And that provoked Jones sadly. You see, Brown methodically soldered the wiring of his circuit. Jones despised that as unnecessary—and called soldering a finicky and difficult job. Soldering is made simple by using the wonderful **FLUXITE**; so follow Brown's example and solder your connections right away and so avoid imperfect reception.

Ask your Ironmonger or Hardware Dealer to show you the neat little

FLUXITE SOLDERING SET

It is perfectly simple to use, and will last for years in constant use. It contains a special "small-space" Soldering Iron with non-heating metal handle, a Pocket Blow-lamp, **FLUXITE**, Solder, etc., and full instructions. Price 7/6. Write to us should you be unable to obtain it.

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SIMPLIFIES SOLDERING

All Hardware and Ironmongery Stores sell **FLUXITE** in tins, price 8d., 1/4, and 2/8.

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The Best Dull Emitter

SCIENTIFICALLY SUPREME

The only valve with a Molybdenum Thorium Covered Filament.

The only valve which gives approximately 50% greater volume than a bright emitter.



And it conserves accumulator current over ten times.

BRITISH
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B.B.C.
STAMPED.

FROM the coherer to the crystal, from the crystal to the valve—and now, to the “Six Sixty,” the only valve with a Molybdenum Thorium Covered Filament.

The processes of manufacture of this wonderful new filament are the outcome of recent important scientific discoveries. The emission of electrons from a “Six Sixty” filament is very much greater than that obtainable from a tungsten filament, with the result that the “Six Sixty” gives much greater all-round efficiency and approximately 50% greater volume than standard bright emitters, whilst it consumes only one-tenth of the amount of current they require.

Greatly increased efficiency and largely decreased upkeep costs are certain with the “Six Sixty.” Let it be your next valve purchase.

Filament Volts
1.5 to 2
Filament Current
.3 amps.

18/-

If your local dealer cannot supply you with the “SIX SIXTY,” communicate with us.

DISTRIBUTORS WANTED

Every discerning dealer will want to stock this important valve innovation. Quantities are ready for delivery and dealers are invited to write in AT ONCE. Show cards, posters & leaflets supplied.

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Any reduction in price is welcome, but the reduction in price of Fellows Headphones is more welcome than usual.

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Only **16/6**

WIRELESS IN PARLIAMENT



From Our Own Correspondent.

In the House of Commons Mr. A. Alexander asked the Postmaster-General what steps he proposed to take in connection with the contemplated amendment of the Wireless Telegraphy Acts to make adequate and specific provision for preserving the right of amateur experiments in wireless communication?

Sir W. Mitchell-Thomson said he hoped to make a full statement on this and other points connected with the Wireless Telegraphy and Signalling Bill on the motion for second reading. Clause 2 (1) of the Wireless Telegraphy Act, 1904, which conferred the right referred to, was reproduced textually in the present Bill. He did not consider that the position of the

experimenter was in any way prejudiced under the Bill.

Sir W. Mitchell-Thomson informed Lieutenant-Commander Kenworthy that in two cases in the last two years the Post Office had taken proceedings against possessors of wireless sets for failure or refusal to take out licences.

Asked by Mr. Morris if an applicant for a wireless experimental licence had first to declare the nature of his experiments, Sir W. Mitchell-Thomson said that it was the statutory duty of the Postmaster-General before granting an experimental licence to satisfy himself that the sole object of the applicant was to enable him to conduct experiments in wireless telegraphy. In order to fulfil this duty, an applicant was asked to state what scientific qualifications he possessed and the general nature of the experiments he desired to conduct. If his scientific qualifications were in themselves sufficient to justify the issue of a licence, no detailed information would be insisted on.

Mr. A. M. Samuel, secretary to the Overseas Trade Department, informed Mr. Everard that the value of the wireless apparatus and accessories imported from foreign countries in January, 1925, and in the corresponding month in 1924 were:

<i>Imports Registered in January, 1924.</i>	
Wireless instruments	£23,666
Wireless valves	1,214
<i>Imports Registered in January, 1925.</i>	
Wireless instruments and apparatus	£100,038
Wireless valves	13,117

Note.—In the year 1924 imports of wireless apparatus were included under the same heading with other telegraph and telephone apparatus. The particulars given above regarding imports of wireless instruments in 1924 were consequently not comparable with those regarding imports of wireless instruments and apparatus in 1925.

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

The BRETWOOD GRID LEAK
with the N.P.L. Report
Patent No. 224295

PRICE 3/-

Post 3d

Another Guaranteed BRETWOOD
Speciality is our Improved
ANODE RESISTANCE

which gives accurate readings consistently from 10,000 ohms to over 100,000 ohms. It is constructed on the same principles that have made BRETWOOD Components famous, and, of course, it carries the BRETWOOD Guarantee. Patent No. 20292/23. Obtainable from all wireless dealers.

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The Latest *Watmel* Improvement

The new contact! (shown in the enlarged illustration) any slackness between the bush and adjusting screw is automatically rectified and perfect electrical contact maintained at all times. Other features worthy of special mention are:—Continuously variable, silent in operation, dust and damp-proof and constant in any temperature.

VARIABLE GRID LEAK, Black Knob 5 to 5 megohms 2/6
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By means of an ingenious (shown in the enlarged illustration) any slackness between the bush and adjusting screw is automatically rectified and perfect electrical contact maintained at all times. Other features worthy of special mention are:—Continuously variable, silent in operation, dust and damp-proof and constant in any temperature.

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is recognised by the highest experts and experimenters as the only Valve Holder which

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·0006 "	6/-	10/9	11/6
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Vernier	3/9	—	6/6

Postage extra.

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LARGE UPRIGHT HORN, height 24 ins., flare 15 ins. PRICE 11/9. Post, packing and crate, 2/-

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High Tension Batteries (best quality), 60 volt, tapped every 3 volts	6/9 each
Headphones, best adjustable diaphragm, double leather headbands	10/6 pair
Headphones, best non-adjustable diaphragm, double leather headbands	9/6 pair

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ONE amateur enthusiast writes: "Your transformers are definitely superior in quality of production of speech and music." Another says: "The greatly improved reception since fitting these transformers is indeed amazing."

These opinions, arriving daily, confirm our own tests. With the M-L transformer you get both speech and music clearer. There is a complete absence of distortion, greater amplification and a longer range.

Stoutly built and well finished, it is dust and damp-proof. The coils are completely enclosed. Insulation has received special attention, and there is no danger of burning out. Primary to secondary ratio, 1-4.

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The  **ANODE
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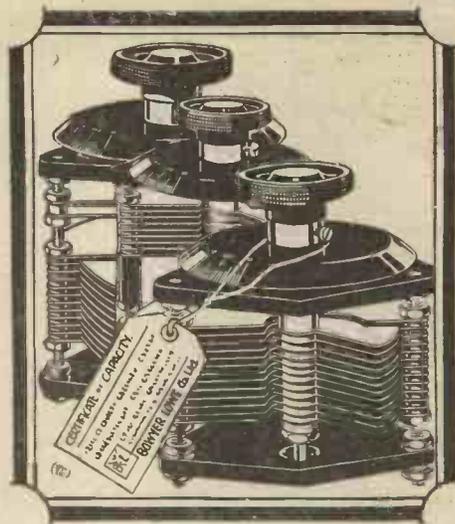
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- Type B 6-120 volts } For two stage power amplification
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We invite applications from traders for terms. Write for details.

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When you see the Conjurer wave his little wand

You are not less appreciative of the unexpected result because you know it has a simple explanation.

So with Condensers. Every week hundreds of amateurs fit Bowyer-Lowe Square-Law Condensers in their sets and by doing so obtain results more startling than they had imagined possible. Signals gain purity and strength, stations which previously jammed can easily be separated, wavelength range increases so that more stations can be heard.

And these results are not less gratifying because the simple explanation lies in the exclusive design of Bowyer-Lowe Condensers which gives them the lowest losses and highest capacity ratios in wireless.

These Condensers are similar in size and shape to condensers of the non-square-law type. Instal them in your present sets and notice what a surprising difference they make.

Your dealer can supply them from stock, or we can execute your order by return of post. Test these low loss Condensers to-day.

A FEW CURRENT PRICES.

	Single	Double (each half)
.00025	15/-	.00025 28/-
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.0005	17/-	.0005 31/-

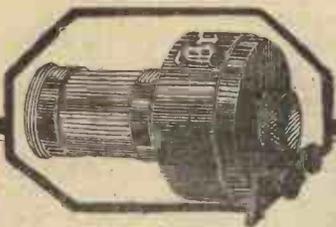
Including Dial, Drilling Template and 3 Calibration Charts.

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COMPLETE LIST FREE

Send name and address with 1½d. stamp to cover postage for informative new Price List of all our TESTED LOW LOSS PARTS. They make responsive sets.

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Have you a Gramophone

—then why not use it as a Loud Speaker?

MANY wireless enthusiasts have overlooked the fact that any good Gramophone can be readily converted into a first-class Loud Speaker by the attachment of a BROWN Gramophone Wireless Adaptor (in either of its two types).

No alterations are necessary, merely remove the Sound box and fit the Adaptor. A rubber connection ensures that it will fit practically every type of Gramophone.

You will be surprised at the volume of mellow tone that either of these Adaptors can produce—with a good Gramophone the results should be practically indistinguishable from a standard BROWN Loud Speaker.

Prices

SOLD IN TWO TYPES:

Type H1.

120 ohms £4 : 7 : 6
2000 ohms £4 : 10 : 0
4000 ohms £4 : 12 : 0

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120 ohms £2 : 0 : 0
2000 ohms £2 : 2 : 0
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Wireless Apparatus

Gilbert Ad. 245c



D. X. Work

SIR,—We think some of the following recent D.X. reception may be of great interest to most of your readers. During the last few months we have logged Australia, 3 B Q, 3 B D and 5 B G; Chili, 9 T C; Porto Rica, 4 S A; New Zealand, 4 A G; Mosul, G H H, G H B and M I. All these were on one valve only. On two valves we logged: Australia, 2 D S and 2 Y I; French China, H V A; Mexico, 1 A F, 1 N and 1 K; New Zealand, 4 A R.

The set is home-made with straight circuit. Z 4 A R was heard on Sunday, March 1, calling C Q G Z 4 A R, and Z 4 A G was heard on the same morning calling Mexico, 1 N. H V A is at Hanoi and transmits on a wavelength of 90 metres C.W., using 90 watts.—F. C. and T. A. STUDLEY (Harrow).

"KDKA on a Crystal"

SIR,—There are two things that Mr. Stafford might have made clear: (1) How did he know it was KDKA? He says "apparently a speech was in progress," so that there was no opportunity to hear the call-sign given.

(2) What did he hear? As it was (by inference) clear enough to be understood, he might have given some particulars (which could easily have been verified).—W. P. (West Ealing).

2 L O and 2 Z Y

SIR,—I notice that THERMION in his notes states that he has difficulty in separating 2 L O and 2 Z Y. I had the same trouble until recently, when I fitted a .0003 variable condenser, a broadcast variometer and a No. 35 honeycomb coil all in series and used reaction on the No. 35. The reaction coil was a No. 75. When tuning in to 2 L O I loosen the coupling of the reaction, put the condenser at 90 degrees, and tune on the variometer, then advance the reaction.

To receive 2 Z Y or other stations I couple the reaction tight against the A.T.I. and decrease the capacity of the condenser.—A. B. K. (Poplar).

The Super-set and Interference

SIR,—On several occasions recently THERMION has made scathing references to users of super-heterodyne receivers in relation to interference.

I hope you will not mind me telling you that a correctly-designed and constructed "straight" super-heterodyne does

not re-radiate, and I have often used two separate receivers at the same time in the same room within six feet of each other with no mutual interference.

A good super should not be used with an outdoor aerial, for the simple reason that signal strength is not increased to the same extent as interference.—5 C B (London, S.E.).

Other Correspondence Summarised

T. W. R. (Staffs) thinks that wireless would lose a lot of its charm for amateurs if only one-knob sets were made.

G. E. G. (Chester) found that certain noises which were troubling him in his set were traceable to panel leakage, as he had omitted to matt the latter.

E. R. B. (Staffs) frequently receives KDKA on his one-valve set.

A CHALLENGE TO THE POST OFFICE

MR. R. M. FORD, the wireless amateur who recently challenged the right of the Postmaster-General to enforce the licensing regulations, has now made an application in the High Court for an interim injunction to prevent the Postmaster-General from paying over to the B.B.C. a proportion of the licence fees collected.

The total amount paid over to the British Broadcasting Co., Ltd., is about £500,000, and it is claimed that the Post Office has no right to collect the licence dues from persons having receiving sets.

Mr. Justice Astbury, before whom the application was made, stated that he would not grant an injunction in the absence of the B.B.C. and the Postmaster-General, who were entitled to be heard. The motion was ordered to stand over until Friday, March 6.

TRADE NOTES

A CATALOGUE of Navy-pattern sectional steel wireless masts has been sent us by Hamilton May, Weybridge, Surrey.

An illustrated folder describing the Perfex aerial has been sent us by the Wireless Apparatus, Ltd., 35, Pantons Street, Haymarket, S.W.1.

From Malone and Co., Leigh-on-Sea, Essex, we have received a catalogue of wireless sets and components.

CHIEF EVENTS OF THE WEEK

SUNDAY, March 15

London	3.0	Orchestral Programme.
London	9.0	Paderewski. S.B. to all Stations.
Bournemouth	3.0	Band of the 1st Middlesex Regiment.
Aberdeen	9.0	Parsifal Choral Selection.

MONDAY

Birmingham	7.30	Music and Drama.
Bournemouth	7.30	Twenty-first Symphony Concert.
Aberdeen	7.30	"Saint Patrick's Eve."
Glasgow	7.30	Chamber Music Programme.
5 X X	7.30	The Catterall Quartet.

TUESDAY

London	7.30	"St. Patrick's Day."
Belfast	10.30	"New Prince's" Frivolities Cabaret.

WEDNESDAY

Birmingham	7.30	Mystery Programme.
Bournemouth	8.0	Winter Gardens Night.

THURSDAY

London	7.35	Chamber Music.
Manchester	8.30	The Hallé Orchestra.
Aberdeen	7.35	Popular Evening.

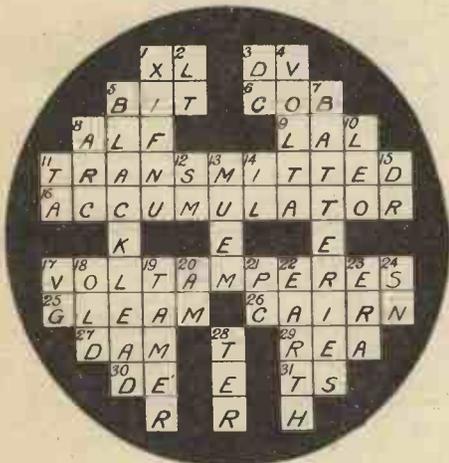
FRIDAY

London	7.30	Popular Concert.
Cardiff	7.30	Women's Night.
Manchester	7.30	An Evening of Variety.
Glasgow	7.30	Clan Campbell Night.

SATURDAY

Cardiff	7.30	Pre-War Reminiscences. (Relayed to 5 X X.)
Newcastle	7.30	Popular Concert.

The Solution of the "Valve" Cross-word Puzzle



This puzzle appeared in the preceding issue.

"A New Treatment for Damp Walls" is described in the current issue of "The Amateur Mechanic and Work" (3d.), and will doubtless prove of interest to many readers. Other articles and features in this number are: "Modelling in Card-board," "A Novel Form of Hall Table," "In the Metalworker's Shop: Deflection of Tools," "Motor-cycle Practicalities," "A Simple Mounting for a Crystal Set," "Helpful Notes on Keeping the Wireless Set in Good Condition," "The Crystal and Indoor Aerial," "Notes by the Way," "Pip-lamps for Country Dwellers," "How to Set Out a Horizontal Sundial," "Devices for Ornamenting Pastry," "Our Small Car Page," "Fixing a Shelf on Plugs," "Making Money by Inventing."



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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 (2LQ), 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), 326 m. Plymouth (5PY), 335 m. Sheffield (6FL), 301 m. Stoke-on-Trent (6ST), 306 m. Swansea (5SX), 481 m. Chelmsford (high-power station), 1,600 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 (Radio Wien), 530 m. (1 kw.). Daily: 08.00, markets (exc. Sun.); 10.00, con.; 12.05, time sig.; 12.20, weather; 14.30, Stock Ex. (exc. Sun.); 15.00, news, con.; 15.10, children (Wed.); 17.00, lec. (Tues., Wed., Thurs., Sat.), children (Mon., Fri.); 17.20, women (Tues.); 18.00, news, weather; 19.00, time sig., con., news; 21.00, dance (Wed., Sat.).
Graz (relay), 404 m. Testing.

BELGIUM.

Brussels, 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) (250 w.), 1,100 m. (250 w.). 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), 1,180 m. (1 kw.). Weekdays: 13.00, Stock Ex., weather, news; 17.30, con. (Thurs.); 09.00, con. (Sun.).
Strasnice 430 m. (1 kw.). Testing.

DENMARK.

Copenhagen (Kjobenhavns Radiofoni station), 475 m. (1 kw.). 18.35, notices, lec., con.* (Tues., Thurs., Sat.). * This con. is also relayed by the Aalborgshus ship station on 510 m.
Lyngby (OXE), 2,400 m. and 2,700 m. Weekdays: 18.20, news, Stock Ex. (2,700 m.); 20.00 and 21.00, news, weather, time sig. (2,400 m.). Sundays: 15.00 and 20.00, news (2,400 m.).
Ryvang, 1,190 m. Concert, 14.00 (Wed.), 15.00 (Sun.), 19.00 (Fri.), 19.30 (Tues.).

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); 18.45, Paris fashions (in English)—temp—(Wed. and Sat.); 19.00, weather; 20.30, con. relayed from PTT (Fri.); 22.10, weather (exc. Sun.). Frequent tests on 1,500 m.

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

Radio-Paris (SFR), 1,780 m. (3-4 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; 20.50, con.; 21.00, time sig.; dance (Thurs.). Tests probable on 1,125 m.

L'Ecole Sup. des Postes et Télégraphes (PTT), Paris, 450 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.).

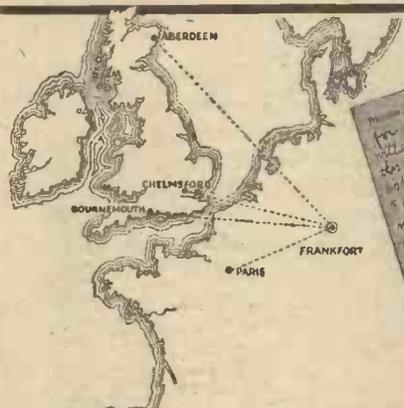
"Le Petit Parisien," 345 m. (500 w.). 21.30, con. (Sun., Tues., Thurs.), dance (Sat.).

Lyon (Radio Sud-Est), 87 and 440 m. Testing.

GERMANY.

Berlin (2), 505 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.

Königswusterhausen (LP), 2,450 m. (5 kw.). (Continued on page 460)



The Postcard, reproduced here, reads as follows:—
"I bought one of your Crystals here on Saturday last, and would like to tell you of my results. Frankfurt o/M., one-and-a-half miles off, on the L. Speaker, Radio-Paris and 5XX loud on one pair of 'phones, and still easily readable on five pairs. Sunday morning I got the concert from Koenigs-wusterhausen on 2,800m., and after dinner 2.3 W.E. time, Radio-Paris. Monday evening I tuned in Bournemouth, 5XX, R-Paris, some other stations, which I did not wait to identify, and finally I got Aberdeen perfectly clear. I think for pure Crystal reception, without any amplification, this is nearly a record, the distance being over 1,200 Km. 5XX and R-Paris I can tune in while Frankfurt is transmitting (with a wave-catcher). My aerial is non plus ultra. With hearty congratulations on the excellence of your fabric, I am,
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Wilhelmstrasse, 20, Frankfurt o/M."

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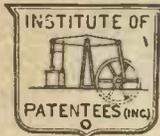
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A. DE ST. DALMAS & CO., Ltd., LEICESTER



"BROADCAST TELEPHONY" (cont. from page 458)

Wolff's Büro. Press Service: 06.00, 20.00, 2.900 m. (5 kw.): 10.30, con. (Sun.), Esperanto lec. 3.150 m.: Telegraphen Union, 06.45-18.45, news. 4.000 m. (10 kw.): News, 06.00-20.00 (daily).

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

Breslau, 418 m. (1½ kw.). 10.15, Stock Ex., weather; 11.00, factory con. (weekdays), sacred con. (Sun.); 11.55 (Sun.), time sig., weather, Stock Ex.; 14.00, news (weekdays); 15.00, children (Sun.); 16.00, orch., children (Fri.); 16.45, con. (Sat.); 17.00, shorthand (Sat.); 18.00, Esperanto (Mon.), Engl. (Thurs.), lec. (other days); 19.00, con., weather, time sig.; news; 20.30, dance (Sun.); 21.15 (Mon.).

Cassel, 288 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.); 18.00, lec. (daily), shorthand (Wed.), Esperanto (Fri.); 18.30, educat. hour; 19.00, lec., Engl. (Mon.); 19.30, con. (daily), jazz band (Fri.); 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., chess; 12.00, con., lec.; 16.00, children; 17.00, 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.; 12.20, Engl. (Wed.); 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.), Spanish (Mon. and Thur.); 19.00, weather, con. or opera; 21.00, weather, markets, news; 21.50, news (in English), dance (not daily). Will shortly be increased to 5 kw.

Hanover, 296 m. (1½ kw.). Relay from Hamburg. Also own con., 16.00.

Königsberg, 463 m. (1 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. (700 w.). 07.30, 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). Will shortly be increased to 5 kw.

München, 485 m. (1 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.).

Munster, 410 m. (1½ kw.). 11.00, sacred con., news (Sun.); 11.30, news (other days); 11.55, time sig.; 14.30, markets; 15.30, 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.).

Nuremberg, 340 m. (800 w.). Relay from Munich.

Stuttgart, 443 m. (1 kw.). 06.30, time sig., weather (weekdays); 10.30, con. (Sun.); 15.00, time sig., con., news (Sun.), children (Sat.); 16.45, children (Wed.); 18.30, lec. (weekdays); 19.00, con. (daily); 20.15, time sig.; 22.00, weather, news, dance (Sun.).

FINLAND.

Haelsiukki, 400 m. (temporary w.l.). Testing daily.

HOLLAND.

Amsterdam (PCFF), 2,125 m. (1 kw.). Daily: 07.55-16.10 (exc. Mon. and Sat., when 10.10-11.10), news, Stock Ex. (PX9), 1,070 m. (400 w.): con., 20.40 (Mon.). (PA5), 1,050 m. 19.40, con. (Wed.).

Hilversum (HDO), 1,090 m. (2½ kw.). 17.40, children (Mon.); 19.40, lec. (Fri.); 19.40, con. (Sun.), relay of Mendelberg orch. (Thurs.); con. (Sun.); 19.55, Radio talk (Wed.); 21.40, lec. (Sun.).

Bloemendaal, about 345 m. 09.40 and 16.40, sacred service (Sun.).

ITALY.

Rome (IRO), 425 m. (3 kw.). Weekdays: 16.00, orch., Stock Ex.; 19.30, time sig., news, con.; 20.15, news, Stock Ex., con.; 21.10, dance, weather. Sundays: 09.30, sacred con.; 15.45, children, Stock Ex.; 16.15, orch.; 16.45, jazz band, con., dance.

Milan, 650 m. (temp. W.L.). Testing shortly.

JUGO-SLAVIA.

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

NORWAY.

Oslo, 320 m. (500 w.). Testing, daily, about 19.30.

POLAND.

Warsaw (Radiopol), 390 m. 17.00, tests.

RUSSIA.

Moscow (Central Wireless Station), 1,450 m. Sundays: 12.45, lec.; 15.30, news and con. Weekdays: 13.00, markets; 15.30, news or con. (Sokolniki Station), 1,010 m. Sundays: 14.30, con.; 17.00, lec. and con. (Tues., Thurs., Fri.). (Trades Union Council Station), 450 m. 17.00, con. (Mon., Wed.).

SPAIN.

Madrid (Radio-Iberica) (3 kw.), 392 m. 22.00, weather, Stock Ex., time sig., con., news.

Barcelona (EAJ1), 325 m. 18.00, lec., Stock Ex. markets, con. or relay of opera; 20.30, news and con.

Seville (EAJ5), 350 m. 18.30, lec., con., news.

SWEDEN.

Stockholm (SASA), 430 m. (500 w.). Sundays: 09.55, sacred service; 16.00, children; sacred service; 19.00, con., news, weather. Weekdays: 11.30, weather, Stock Ex., time sig.; 18.00, lec. (irr.); 19.00, con., lec., news, weather.

Gothenburg (SASB), 290 m. (500 w.), also 700 m. 10.00, fishery reports (700 m.); 11.55, time sig.; 19.00,* programme s.b. from Stockholm.

Malmö (SASC), 270 m. 11.00, weather; 19.00,* programme s.b. from Stockholm.

Boden (SASE), 2,500 m. 18.00, con. (Tues., Fri., Sun.)—temp.

* Local programmes are also broadcast at times.

Sundsvall (SASD), 680 m. (500 w.). Testing shortly.

SWITZERLAND.

Geneva (HB1), 1,100 m. (500 w.). 13.15, lec. No Sun. transmissions.

Lausanne (HB2), 850 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), 515 m. (500 w.). 11.00, weather; 11.55, time sig., weather, news, Stock Ex.; 15.00, con. (exc. Sun.); 17.15, children (Mon., Wed., Thurs., Sat.); 18.00, weather, news (exc. Sun.); 19.15, lec., con., dance (Fri.); 20.45, news.

The Weekly Telegraph

“UNIVERSAL” WAVE TRAP and How to Make It (By Nautacore)

THE BEST YET (As supplied to the War Office) See The Weekly Telegraph NOW ON SALE

'07 VALVES for 13/3

Equal in performance to any '06 or '07 obtainable. Send for the concert-tested PIOTRON S. S. post free with makers' instructions for use.

24 Hours' Approval upon receipt of cash order.

Max. con. '07, fil. volts 2'3, anode 40-80.

English "R" Valves, fil. volts 4'5, anode 45-100, 3/6.

Concert tested, post free, 24 hours' approval.

Responsibility for all postal damage accepted if damaged valve is returned within 24 hours of receipt.

ANELOY PRODUCTS (Dept. A. 25), Eton Works, Upland Road, London, S.E.22

PARIS AND OTHER STATIONS

Clearly heard on Loud Speaker Nr. London, using the "MIRACLE" MASTER 2 Valve set £3 12 6 plus Royalties. 1, 2, 3, & 4 Valves.

Trade supplied. Send stamp for particulars. WORLD'S WIRELESS STORES, WALLINGTON

TELEPHONES RE-WOUND

to 4,000 ohms. Guaranteed. All makes 5/-, except Brown "A" 6/- and Sullivan. Wax filled, 10/- or pair. Ex-army converted to high resistance 2/6 each earpiece. Re-magnifying 3/- per earpiece. Postage extra 6d. per pair. Write for prospectus.

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If you want to buy a guaranteed receiver by easy payments it will pay you to send for our illus. cat. and terms. Our range covers Crystal Sets to multi-valve cabinet sets. Cash prices:—Crystal £5/6, 1 valve £3, 2 valve £4 18s., 3 valve £5, 4 valve £14, 5 valve cabinet complete £22. 4 valve ditto, £27. Satisfaction assured. R. G. JONES, 75, HARGREYNE STREET, STOCKWELL, S.W.9

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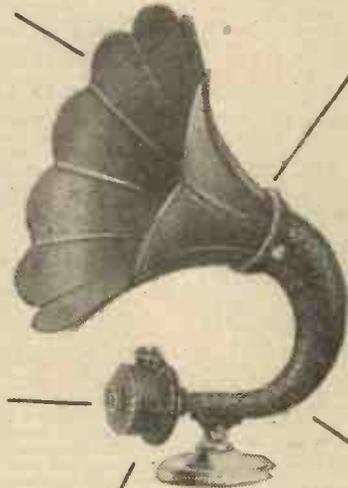
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Every part an Exclusive Feature

Bell-mouth Trumpet of polished oak or mahogany. Artistic in appearance and the best possible radiator of Sound, the "insulated" wood horn possesses especial merit.



Sound Conduit provided with rubber bush to receive unit as well as connector at junction of conduit and horn, to ensure freedom from objectionable resonance.

Name-plate with Type and serial numbers thereon, by which the "HOUSE OF GRAHAM," unconditionally guarantees complete satisfaction to any possessor of an AMPLION.

The contour of the Sound Conduit affords a duct of considerable length, compared with the overall dimensions of the instrument, and the sweeping curve allows an unobstructed path for the sound waves.

Super Loud Speaker Unit incorporating the "floating" diaphragm. The unit is "insulated" and detachable from the sound conduit.

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AMPLION

The Loud Speaker Supreme

Obtainable from AMPLION STOCKISTS and Wireless Dealers everywhere.

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Bretwood Variable Grid Leak	3/-	By post 3/-
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.001, 2, 3, 4, 5, 6	each 3/-	By post 3/-
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.0003 and Grid Leak	5/-	By post 5/-
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25	1/6
35	1/9
50	2/0
75	2/3
100	2/9
150	3/0
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Valve Legs, Set 4 1/3

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5-pin Valve

For Unidyne Circuit

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All bright emitters.

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Power Valves 22/6 to 30/-

AS PER MAKERS' LISTS.

Valves posted buyer's risk.

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New Improved

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Reduced prices.

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All 4,000 ohms.

Highest quality finish.

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£50 REWARD

given if the **DR. NESPER** PHONES SOLD HERE ARE NOT GENUINE. BEWARE OF FRAUDULENT IMITATIONS

(Injunctions obtained) Adjustable diaphragm, detachable receivers, double leather-covered head-spring long flexible cords, nickel plated parts. Very comfortable fitting to the head. Per 12/11 Post 3d. pair.

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Adjustable. 4,000 ohms. Only genuine when bearing No. EH 333 on each earpiece. These 'phones are lighter than a feather, and simply wonderful for reception. Post price U.K. 17/11 pair.

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Variable Condensers

.001 10/6

.003, .0005, .00025 18/6

Micrometer 5/6

2-way cam vernier 6/-

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Square Law, with Vernier.

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25	5/-	35	5/-	50	5/2	75	5/6
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30 ohms 7/-

Potentiometer standard 7/-

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Minor 80/180 metres. 7/6

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Aerial Wire, 49 strands Special alloy Phosphor Bronze, for frame, indoor, or outdoor. Non-corroding. 110 feet 3/3 By post 3/8.

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Crystal Set. Sloping cabinet. Fitting for Chelmsford. Splendid results. 17/-, including aerial wire, lead-in, and insulators. Post free U.K.

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See Transformers.

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25, 35	4/10
50	5/-
60	5/4
75	5/4
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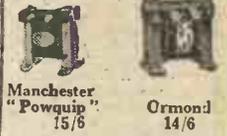


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Rheostat, with Dial, extra value, 2/6

Bretwood Valve-holder 1/9



Manchester "Powquip" 15/6

Ormond 14/6



Shrouded "Powquip," 18/-

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"R.I." NEW MODEL IN SEALED BOX

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6 x 6	1/8	10 x 8	3/6
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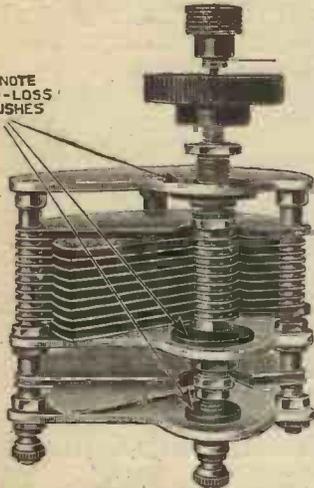
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The only Condenser with the Low-Loss Bushes.

Electrical losses reduced to a minimum.

Full capacity as rated.

Exceptional Low Capacity.

The Condenser for short wave-lengths.

Why buy a Condenser without Vernier when one WITH costs no more.

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Including Knob and Dial (Ebonite Ends 1/- extra). TRADE SUPPLIED.

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One-hole fixing. Aluminium ends. **EBONITE Bushes.** Highly recommended. **WITH VERNIER WITHOUT VERNIER**

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Equal parts of •0005, •0003, and •00025. With Knob and Dial. Ebonite Ends.

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LONDON'S LARGEST Stockist of JACKSON BROS.

J.B. Variable Condensers. Complete with Knob and Dial. SQUARE LAW STANDARD

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ERICSSON E. V. CONTINENTAL

Your favourite 'phones. Entirely NEW MODEL.

Most beautifully finished, exquisite tone. Ridiculous Price per pair (4000 ohms).

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All orders in rotation 6/-

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Set of 5 3/-
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42/-

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so near to originals only an expert can tell the difference (except not adjustable) 10/9 pair

FORMO PORTABLE AERIAL COMPLETE with insulators hooks, etc.

7/6 Eliminates static.

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GENUINE LATEST MODEL, 4000 ohms.

15/11

FEW OLD MODELS

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POST 6d. PAIR U.K.

GENUINE 'BRUNET'

L.F. Transformers. 3-1, Primary 5000, Secondary 15,000

5-1, Primary 5000, Secondary 25,000

13/6

each.

Warning! Note name RAYMOND on windows. You will not be able to buy these goods otherwise. Nearest Tube, Leicester Square. This address is at the back of Daly's Theatre. Open weekdays 9 to 8. Saturdays 9 to 8.45. Sundays 10 to 1.

3 COLUMNS for CALLERS ONLY ALL POST ORDERS FROM OTHER COLUMNS

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W.O., Pillar, 'Phone, brass, 1d. each; nickel, 2d. each; stop and valve Pins, 1d.; nuts, various, 6 a 1d. Valve Sockets 1d., 1 1/2d. Flush panel do. 1d. Spade Tags 6 a 1d. Do. Terminals... 2 for 1 1/2d. Do. Pins... 2 for 1 1/2d. Screws and nuts 2 a 1d. Switch arms 7d. Nickel arms 10 1/2d. Studs, complete... 2 a 1d. 'Phone connectors 1d. 2 B.A. Rod ft. 2 1/2d. 4 B.A. Cod ft. 2d. Valve windows 4d. Washers 12 a 1d. Shorting plug and socket 3 1/2d. Shellac 5d. Ormond (Neutrodyne) 2/- Colvern 3/6 Success 3/6 Vernier (Colvern) 2/6

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60 v.H.T. Batteries, 4/11, 5/11, 6/11

CRYSTAL SETS

5/11, 6/11, 7/11, 8/11 up to 30/-

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B.B.C. 60 v. 8/11
B.B.C. 36 v. 5/6
Eveready 66 v. 13/6
Eveready 108 v. 22/6
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Do. 4.5. 6/6 dozen

SHAW'S HERTZITE with J. I. Shaw facsimile signature. None genuine without. In sealed box. Callers 8d.

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per 1 lb. Reel.
18 or 20 g. 9d.
22 g. 10d.
24 g. 11d.
26 g. 1/-
28 g. 1/2
16 D.C.C. 2/6 lb

SET OF 5 COILS

Extra air spaced 1/2 in. thick 1/8
Duplex Waxless, wavelengths marked No. 25, 35, 50, 75, 100

CHELMSFORD with above specification

10 1/2d., 11/-

CRITERION COILS

Set of 5 8/11
25, 35, 50, 75, 100.
Every turn and layer air spaced, perfect for reaction, low self-capacity, mounted on plug.
Also sold separately.

WARNING!

Buy Shaw's Hertzite, only in sealed box, bearing facsimile signature of J. I. Shaw. Not genuine otherwise.

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2 v. 40 amps. 9/6
4 v. 40 amps. 16/6
4 v. 60 amps. 18/6
4 v. 80 amps. 23/6
6 v. 60 amps. 27/6
6 v. 80 amps. 33/-
6 v. 105 amps. 38/6
Hart's Stocked. All High Quality

EBONITE, 3/16 in. Stock Sizes

Cut to size, 1d. sq. in.
6 x 6 1/4 12 x 6 3/-
7 x 5 1/4 12 x 9 4/3
8 x 6 1/10 14 x 12 5/6
9 x 6 2/- 14 x 10 5/6
10 x 8 3/-
1-in. also Stocked.

SWITCH ARM, one-hole fixing. 12 Studs, 12 Nuts, 12 Washers. Lot 10 1/2d.

COIL PLUGS, EBONITE

Fitted Fibre 7d.
Wedge Shape 7d.
Edison Bell 11d.
Plaincoil Plugs 4 1/2d.
Also 5d., 6d., 7d. each
Fibre Strip 2d.
(36 in. by 1 in.)
Empire, Tape, doz. yds. 6d.

RAYMOND FIXED CONDENSERS

•001, •0001 to •0005 10d.
•002, •003, •004 1/-
•006, 1/3; •01, 1/9; •02, 1/9
Ebonite Base Terminals

ENCLOSED DETECTORS

Micrometer 1/6
Half Opal 1/-
Small Brass 8d.
Large Brass 1/-, 1/3
Nickel 10d. to 1/6
Burndept 4/-
Shaw's Genuine Hertzite 10d.
Uralium 1/-
All known makes.
4 Whiskers (1 gold) 2d.
Gold and Silver do. 2d.
7 Waxed Coils 1/8
5 Waxed Coils 1/3
(For B.B.C.)

SPECIAL!

Vernier 2-way Coil 3/3
Stands 5/3
Geared do. 5/3

HEADPHONES

Ericsson's Ev. Continental, 4000 ohms 11/9

SPECIAL!

Square Law Variable Condensers
•0005 5/-
•0003 4/6
Complete with Knob and Dial
Ebonite ends, 1/- extra

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all cleared out daily at cheap prices. Not obtainable elsewhere. Shaw bears the name RAYMOND on windows, etc.

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

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ABOUT L.F. TRANSFORMERS

Our wide experience in transformer repair has shown us all the common faults that are likely to occur in L.F. Transformers.

The distortionless all British "Renown" L.F. Transformer which we have designed and manufactured is unequalled for distortionless powerful amplification and its immunity from breakdown is a special feature. **Price 8/4 Post free**

GUARANTEE: Try this transformer against any in existence and if it is not equally as efficient in every respect, return it to us within 14 days and we will refund cash without quibble. Should this transformer ever breakdown we will rewind it making it equal to new for 2/9

100 HENRY Amplifier chokes. 7/6 We are still repairing any make of L.F. Transformer with our efficiency equal to new; guarantee for 5/- Post free. delivery 3 days.

TRANSFORMER REPAIR CO., HAY STREET, PORTSMOUTH.



CLUB DOINGS

York and District Radio Society
Hon. Sec.—Mr. E. S. CANHAM, 3, Fourth Avenue, Heworth, York.

On February 24 the first meeting of the above society was held, when the usual officers were elected.

Ipswich and District Radio Society

On February 23 a debate and practical demonstration took place, the subject being "Can a two-valve receiver operate a loud-speaker on the Chelmsford station without energising neighbouring aeriols?"

Croydon Wireless and Physical Society

Hon. Sec.—Mr. H. T. P. GEE, Staple House, 51, Chancery Lane, W.C.2.

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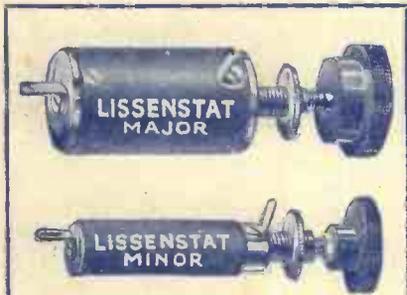
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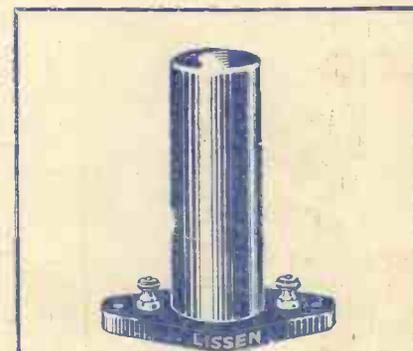
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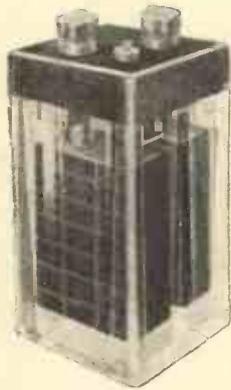
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Amateur Wireless

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Vol. VI. No. 146

March 21, 1925

HOW TO TUNE

THERE are two general methods of doing everything, the slipshod and the methodical, with, of course, infinite variations of each. Tuning-in the local station may be a very different matter to merely getting a good result on the local station. In fact it is far more difficult to tune-in a near-by station than a distant one owing to the effect of the local station on the receiver.

When to Practise

Let me start off by telling my readers that their receiving set may become a powerful transmitting set, causing the most awful catcalls in all receivers within a range of ten or twenty miles. Therefore do not practise tuning on broadcasting wavelengths during broadcasting hours until such time as you know thoroughly the signs of oscillation or, rather, incipient oscillation. The real art of tuning consists in the first place of knowing and understanding the various classes of sounds heard in the receiver even when no signals are being received, and for real understanding it is better to use a pair of the very best phones obtainable, and especially to use very light diaphragms.

For those who can afford them, a pair of Brown's A-type phones enable the sounds to be recognised and oscillation prevented more easily than less sensitive phones.

The Different Sounds

Until we count them up it is difficult to realise how many sounds there are. There is first the absence of sound when the receiver sounds absolutely dead, except that on touching the condenser spindle or grid connection of the detector valve we hear one click—one click only, and *no* click on taking the finger away.

Now we assume that our receiver contains more than one tuned circuit, and the above deadness means that the circuits are not tuned to each other, nor to any wavelength on which there are easily receivable signals. I say receivable signals, as the receiver is not under the condition of sensitivity yet, but a local station may and will probably be heard all over the scale.

Remember that a near-by station has always to be *tuned out* rather than be tuned in, and tuning out consists, in the first place, of having all the circuits tuned to the same wavelength as each



other, but not to the wavelength of the local station.

Now sound number two is also a dead sound, but there is a fullness of sound in the phones; it is as if nothing can be heard because of the immense number of sounds.

Signs of Oscillation

It is not always easy to distinguish between this sound and the first, but there is one certain test, which is to touch a certain point in the receiver; it may be the aerial, it may be the grid socket of the detector, but wherever it is we get one click on touching it *and another click on removing the finger*. It is this second click which is the important sign of oscillation.

Please do not oscillate, *especially* during broadcasting hours, whatever anyone says about the aerial not being affected by oscillations:

There are many stages of oscillation; in fact for ideal tuning efficiency and for tuning in distant stations it is absolutely essential that the receiver be capable of passing smoothly and gradually from oscillation to non-oscillation.

We shall return to this later, but here let us say that if the receiver is oscillating strongly, nothing whatever will be heard of incoming signals except perhaps a fearful scream from a near-by and powerful station.

I will repeat this in another form: that if the reaction is set very closely, not even the local carrier wave will be heard by the offender. But everyone else within a wide area will have their concert entirely spoiled by cat-calls. Offenders are usually quite unaware that if they use excessive reaction they will not even hear their own cat-calls. Therefore handle the receiver carefully, preferably without reaction to start, and work up the signal strength later. Beware of the *double click* when you touch the detector, grid or aerial terminal.

So long as you are receiving clear and undistorted telephony you are not causing interference. I am faking it for granted that you know that oscillation is caused in practically all cases by moving the reaction coil nearer to its partner coil.

But there are several circuits which will oscillate even without reaction, notably those in which a series condenser is used in the aerial and those in which primary and secondary circuits or a coupler are used before the first valve. In these cases increasing the aerial condenser or increasing the coupling between aerial and secondary, that is, moving the coils nearer to each other, tends to stop oscillations. With practically all sets when you hear oscillations, move the reaction coil away from its mated coil.

Carrier Waves

We have so far dealt with two sounds, or, rather, absences of sound: (1) The dead mistuned sound, (2) the dead but full oscillation sound.

If the set is gently oscillating and there is telephony about, the carrier waves of the different stations will be heard as musical notes as we ascend the wavelengths; the pitch of these notes will rise and fall as we move our condensers or variometers. I have already said that these notes will *not* be heard by us if our receiver is oscillating violently. As we diminish our oscillation the carrier waves become louder and louder and also alter in pitch. The telephony is always in the bottom note of the carrier wave.

(Concluded at bottom of next page)

"STRAIGHT" TO "SUPER"

A simple method of transforming your present set.

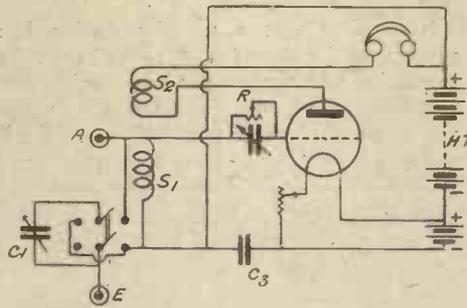
MANY amateurs possessing a small valve set, such as a single detector valve or detector and low-frequency valve set, have wished at one time or another to increase the range of their set either by adding a high-frequency valve or increasing the size of their aerial; others have wanted to make their set more portable by making it independent of aerial or earth. The circuit about to be described will appeal to those possessing only a single-valve straight-circuit regenerative set and especially to those who have to be content with a small and inefficient indoor aerial. The transformation can be made at a cost of a few shillings, the only additions being a fixed condenser (C_3) and a variable grid leak (R); a variable grid condenser might prove a valuable addition.

A Super-regenerative Set

As can be seen from the diagram, the circuit is a modified Flewelling super-regenerative, the tuning being reduced to the minimum; the main feature of it is that the grid, instead of being connected, as is usually the case in ordinary straight circuits, to the negative of the L.T. through the grid leak and tuning coil, is in this case in connection with the posi-

tive of the high-tension battery, a fixed condenser of fairly high capacity (.006 microfarad) being placed between the tuning coils and the filament.

The set can be worked on a small indoor aerial or a frame aerial (3 ft. square).



Method of Modifying a "Straight" Circuit.

The tuning is very simple: the condenser C_1 is in parallel with the coil S_1 , the reaction coil S_2 being coupled with S_1 to get oscillation. The carrier wave is found by means of the condenser C_1 and the variable resistance R is adjusted until the hissing peculiar to super-circuits is heard; loosen the coupling of S_2 and adjust the tuning by means of the con-

denser C_1 . The tuning is very critical, and speech should come out clear and free from the distortion usually associated with super circuits. The best results are got without aerial or frame simply by connecting the aerial terminal A to a water-tap

Results

With one detector followed by a low-frequency valve speech is received quite clearly from Bournemouth (120 miles), London and Chelmsford (140 miles).

The set can be used also on an outdoor aerial providing the reaction is used with great care and the variable resistance is off the oscillating point, as the set would react strongly in the aerial. It is then acting as an ordinary circuit, and results are equal to those obtained with a high-frequency valve and detector. On a 30-ft. twin-wire aerial 18 ft. high, speech and music are quite clear from Rome (I R O) and Madrid (R I). Music from Radio-Paris and Chelmsford can be heard 10-ft. away from the phones.

Experimenters should test this circuit and find out whether any improvements can be made, such as trying different values for the condensers C_2 , C_3 , or adding a high-frequency valve. F. E. A.

"HOW TO TUNE" (continued from preceding page)

Therefore as we decrease reaction, which alters the tuning, we must retune on a condenser to keep on the lowest note of the carrier wave.

As we decrease the reaction the receiver begins to be controlled by the incoming signals, and telephony—probably distorted—or morse—probably mushy—begins to be heard, and finally we get clear and undistorted reception. But all the time we have been causing interference with someone else, and although this method of tuning is correct theoretically and practically, it is most unkind to everyone else. We must always work up towards oscillation and not down from oscillation.

The Valve Click

The bugbear—the *bête noire* of all experimenters—is the valve click. This has nothing to do with the finger-click test mentioned earlier. Everyone who has handled a set knows what I mean by the valve click. Its immediate cause is that a valve when oscillating takes less current than when not oscillating; the valve click is the noise due to an instantaneous change from oscillation to non-oscillation or vice versa. We hear the increase or decrease in current, but we do not know

by the phones how much steady current is passing.

Backlash

Even worse than the valve click is the valve backlash. Try it for yourself as you move your reaction coil (not during broadcasting hours, please). As you move the reaction coil up you will hear the valve click as oscillation starts.

As you move the reaction coil away you will hear the valve click as oscillations stop. If the click on and the click off do not take place at exactly the same spot you cannot possibly get the very best out of your receiver. The distance between the positions for click-on and click-off is the backlash, the most annoying of wireless troubles.

If you do get backlash try dimming the valve, reducing the H.T. or improving the earth; do not rest content until the passing from rest to oscillation is perfectly steady, without any trace of a click.

Searching

Once you have such control of your circuits that the valve click is replaced by a gradually increasing hissing noise in the phones leading to the fullness of oscillation, then and then only can you get really maximum efficiency. The hiss becomes

less marked as the receiver begins to oscillate. When the hiss is at its loudest it is a certain sign that the receiver is tuned throughout to one definite wavelength.

Having reached this point, do not work haphazard to find your telephony. Work gradually up and down the wavelengths, keeping the receiver gently hissing all the time, working on the non-oscillating side of the hiss. In this case you will hear the carrier waves as peculiar indescribable noises and you will not miss any stations, and, what is most important, you will cause no interference, while having your set at highest efficiency all the time.

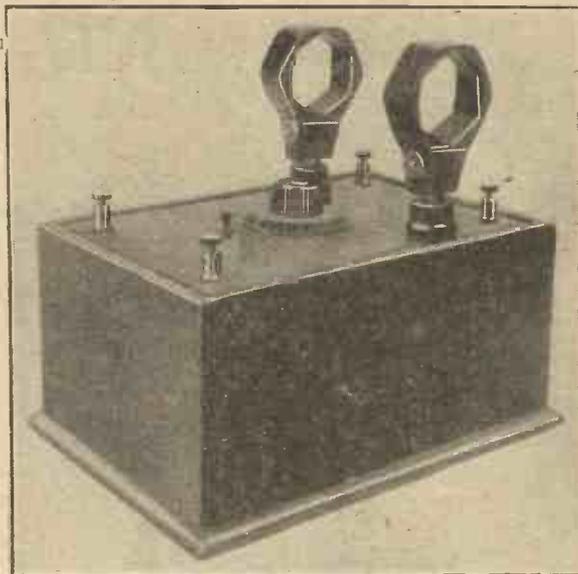
E. J. B.

A SOLDERING TIP

It usually happens when soldering that one drops solder and flux on to the panel on which one is soldering, with the result that the insulation of the ebonite is much impaired. This trouble can be almost entirely eliminated by cutting out discs of thin cardboard and placing these on the screwed part of the terminal shank like a nut before the soldering is commenced. In use all the solder and flux droppings fall on to the cardboard, which is afterwards removed. E. N. F.

A DOUBLE-COIL CRYSTAL SET

THE parallel-coil tuner is not very popular yet owing to its usually requiring two controls for tuning. The set about to be described, however, employs only one control, which simplifies matters considerably. The idea of putting two coils in parallel in a tuning circuit is not new; its object is to halve the resistance in the coil, and the arrangement results in a greater potential at the ends of the inductances. In a crystal set this greater potential is much more noticeable and desirable than in a valve set. The effect is also to halve the natural wavelength of one of the coils, necessitating the use of



and all holes marked (see Fig. 2). Drilling should be done carefully, taking care that the drill is upright. If the components used vary from those in the original, the drilling may have to be different. The wiring is carried out with square tinned-copper wire of No. 18 gauge. The wiring is very simple, and there should be no difficulty (Fig. 3).

Operation

Connect the aerial, earth and phones to their respective terminals, adjust the crystal and tune with the condenser. Plug in one coil only, say a No. 40, and tune in the local station, then take it out and put

The Complete Set.

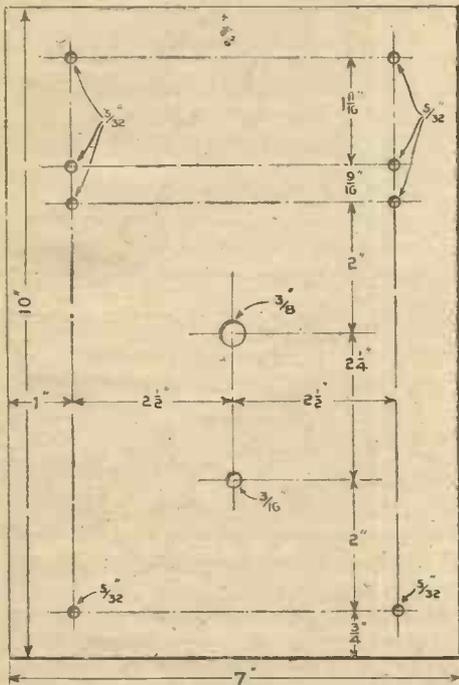


Fig. 2.—Drilling Diagram.

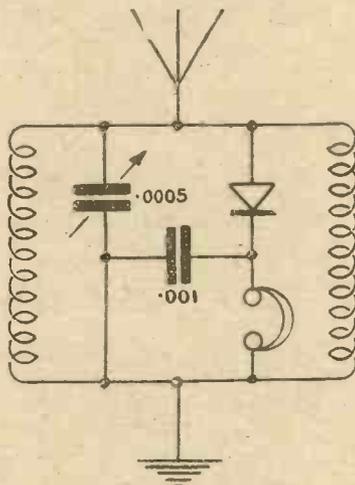


Fig. 1.—Circuit Diagram.

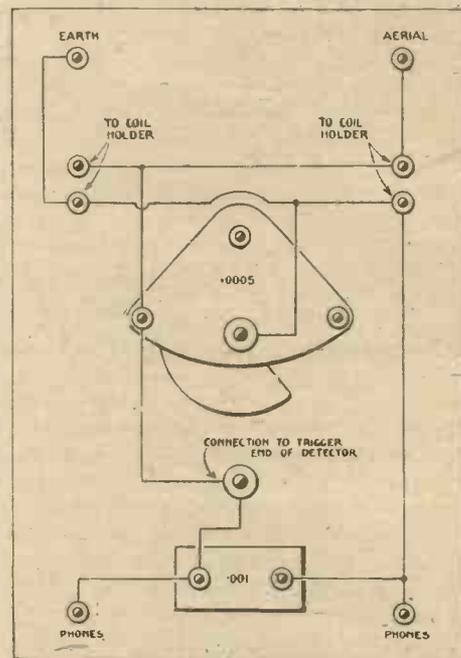


Fig. 3.—Wiring Diagram.

larger coils than are ordinarily used.

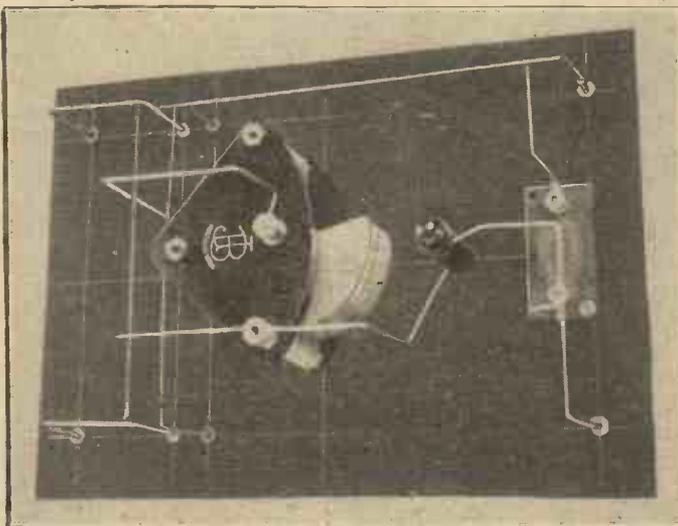
The circuit diagram is given in Fig. 1, where it will be seen that a condenser of .0005 microfarad capacity is used to tune the coils.

Components

One mahogany (or ebonite) panel, 10 in. by 7 in. by 1/8 in.; two coil holders (panel mounting); four terminals; one variable condenser (.0005 microfarad); one crystal detector (R.I., Ltd.); one .001-microfarad fixed condenser; tinned copper wire.

Drilling and Wiring

The panel should be cut to size



View of Under Side of Panel.

in two No. 50 coils (these *must* be matched), and listen again. After retuning the increase in strength will be very noticeable.

By taking out one coil the receiver may be used as an ordinary crystal set—a decided advantage when wishing to make experiments with this method of tuning.

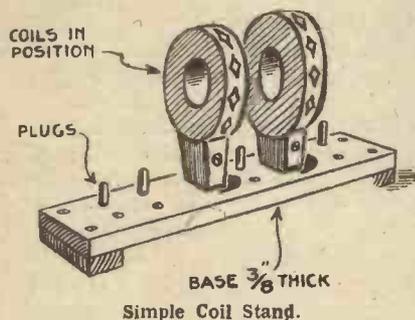
The general construction and layout can be seen from the photographs. The range of this set will be found to be greater than that of the ordinary crystal receiver. Loud-speaker results were easily obtained on an indoor aerial at a distance of one mile from 2 L O. J. S.

PRACTICAL ODDS AND ENDS

Coil Stand

A COIL stand which should be of interest to users of plug-in coils is shown in the sketch below.

It is a convenient method of standing coils which are not in use, much better than having them spread all over the

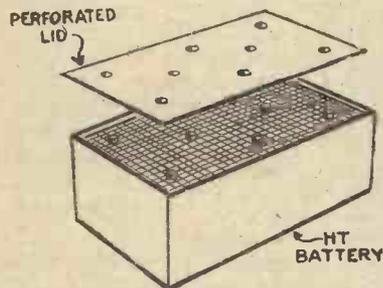


place where they are likely to be damaged. The hard-wood plugs should be glued into the holes to make them firm. L. C.

Tapping the H.T.

A MATEURS who have had the misfortune to burn out a valve by reason of the L. T. lead terminal tags accidentally brushing the top of the H. T. battery may find the following tip useful in preventing a repetition of such an accident and also in keeping the wax surface of the battery free from dust.

A piece of cardboard is carefully cut to make a good push fit into the top of the battery box, and holes are drilled to correspond with the voltage stages. The

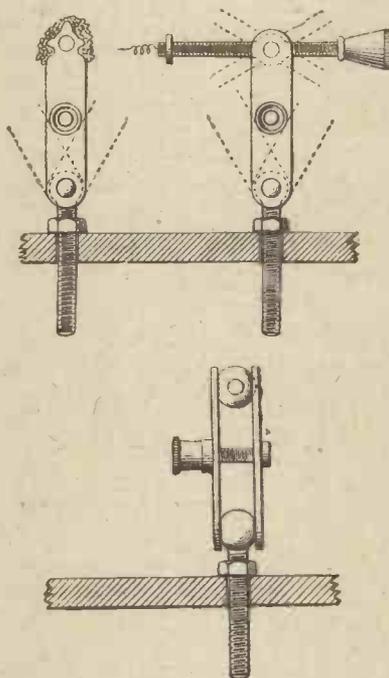


Protecting the H.T. Battery.

cardboard shield should then be varnished with shellac and pressed into the base about 1/8 in. above the metal plugs. This will also prevent the battery being accidentally short-circuited should any metal object be laid upon it, a not uncommon occurrence. W. B.

A Handy Detector

CLOSED-IN crystal detectors usually allow only a limited movement of the catwhisker arm, and when it is desired to explore fresh faces of the crystal it is often necessary to dismantle the detector. The diagrams show a simply constructed type of detector, in which universal movement of the catwhisker and crystal is possible. The crystal may be turned in any direction, and it is possible to make contact to almost any point. Ball-and-socket mountings are employed for the catwhisker arm and the base of the crystal holder. Each of the two holders has a terminal through its centre, by means of which the tension of the supports may be



Details of Detector.

adjusted and to which connection may be taken by means of short lengths of flex. A wide range of movement is possible, as can be seen by the dotted lines. R. P.

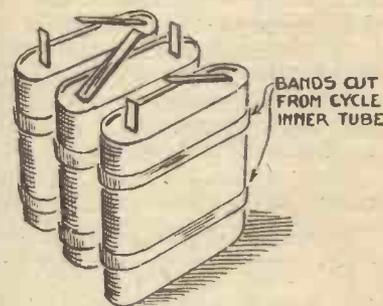
Burnt-out Valves

WHEN you burn out your valves, do not throw them away, for they can be put to several uses. In the first instance, the legs can be utilised in the place of "wander plugs."

When the bottom of the valve is taken out the insulating material can be used as an excellent valve template for drilling purposes. J. W.

Assembling the H.T. Battery

MANY amateurs make up their high-tension battery from flashlamp cells, but do not guard sufficiently against leakage, due to the cells touching each other, and the best results are therefore not always obtained. A piece of waxed



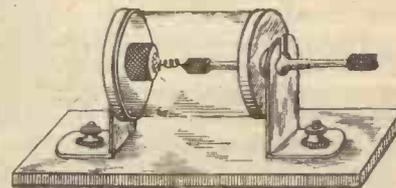
Insulating the H.T. Battery.

paper inserted between each battery overcomes the difficulty.

Another and more efficient method is to cut off a number of wide elastic bands from an old cycle inner tube and place two around each battery as shown in the accompanying sketch. This spacing of the cells will prevent any current leaking away, so that the life of the battery will be materially increased. C. L. R.

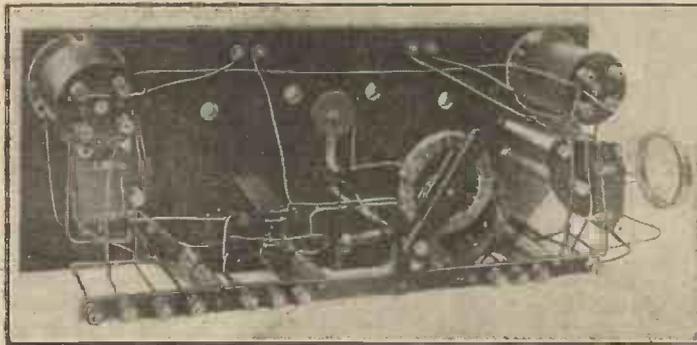
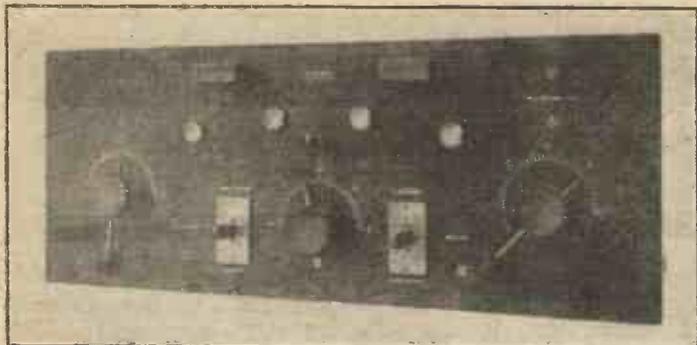
Improving the Detector

CRYSTAL detectors that are enclosed in glass covers are usually rather awkward to dismount when it is desired to change the crystal. If it is not desired to construct a detector having a larger range of movement the standard closed-in detector can be improved by cutting a slot in one of the end pieces as shown



Improving the Detector.

in the diagram. This will allow the shank of the ball socket to pass freely up and down, and it will be found quite a simple matter to dismantle the detector when required. The slot, of course, should not be made so large that it will allow of any undue movement of the catwhisker arm. E. W. P.



Two Photographs showing the Front and Rear of Panel Respectively.

THE KING'S GIFT SET

A Description of the Receiver Presented by H.M. the King to His Stable Lads.

MESSRS. HART COLLINS, LTD., of Bessborough Street, London, S.W., have had the honour of supplying a four-valve receiver to the order of H.M. the King for the use of His Majesty's stable lads. By the courtesy of the makers, we are enabled to give some details of its construction. The set is extremely efficient, and the firm are to be congratulated on its production. During a short test we made with a duplicate of the set we found that the manufacturers' claims are entirely fulfilled.

The circuit diagram is given below, and it will be seen that, apart from the com-

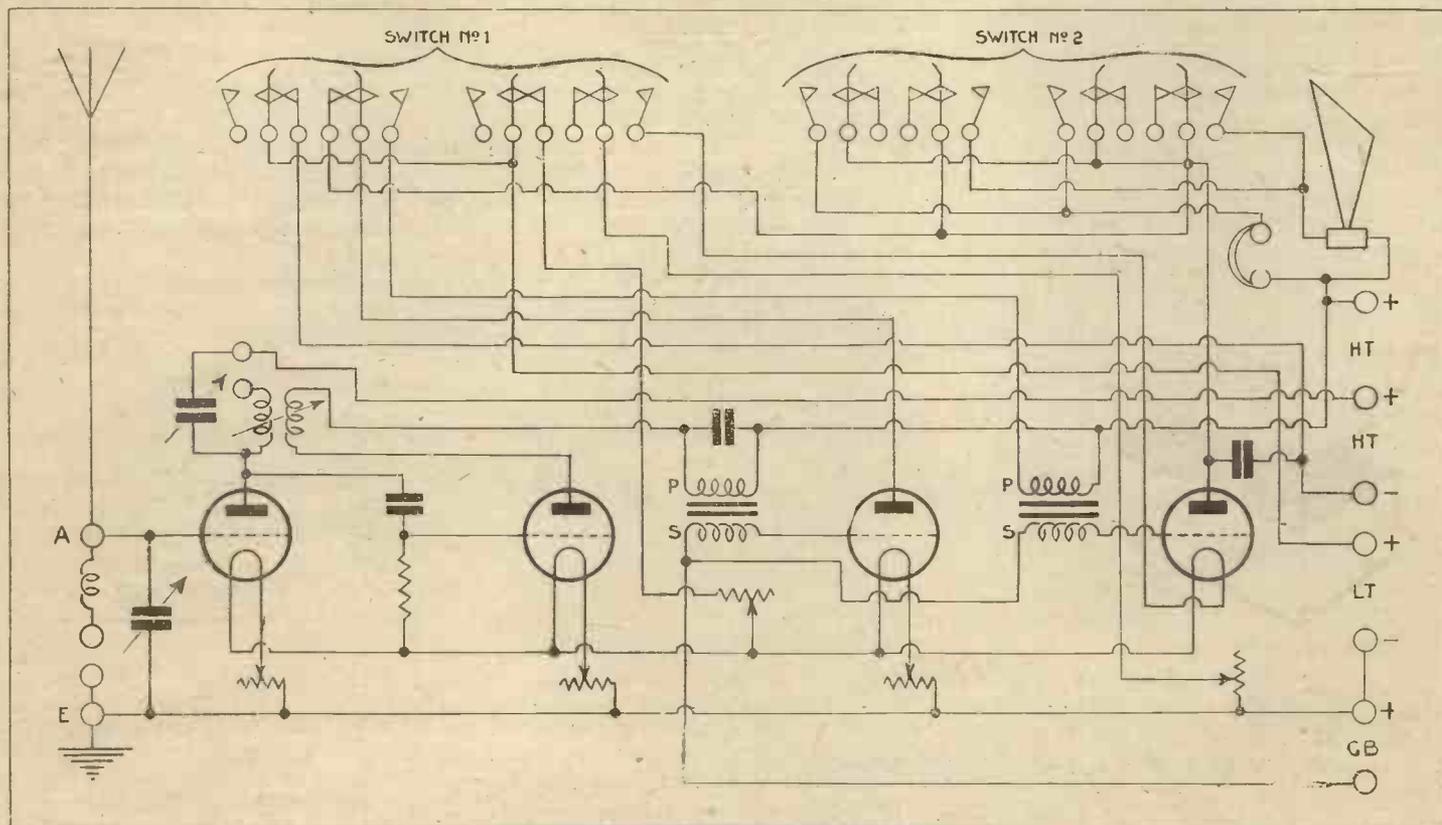
plications due to the two Dewar switches, the wiring of the receiver is quite straightforward. The circuit comprises a high-frequency stage of amplification, a detector and two low-frequency stages, one of which may be cut in or out of action by means of the left-hand switch on the panel front. This switch has three functions. In the middle position three valves are in use; in the bottom position four valves are brought into action, while in the top position the valves are switched off.

The right-hand switch (looking at the front of the panel) is used for switching the loud-speaker or phones into circuit.

The Design

The design of the set is on original lines. All the terminals are fixed on a long ebonite strip at the back of the panel. This strip is fastened to the panel by means of four ebonite rods about 1/2 in. in thickness, round each of which is wound the resistance wire necessary for the control of the valve filament current supply. Adjustment of the filament resistances is made by sliding a metal slip along the resistance until the best results are obtained. Once this position is found the resistance need not be touched until such

(Concluded at bottom of next page)



The Circuit Diagram of the King's Gift Set.



Mr. Studley with his Receiver.

TWELVE HUNDRED STATIONS IN FIVE MONTHS!

No special precautions have been taken to ensure that there is a minimum of loss in the receiver and yet signals from all the five continents have been received.

World-wide Reception

Signals have been heard from stations in the following countries: Chili, Canada, Mexico, Australia, New Zealand, Porto Rica, Morocco, French Indo China, Algiers, Mesopotamia, U.S.A., Norway, Italy, Spain, Belgium, France, Luxemburg, Switzerland, Holland, Germany,

A TWO-VALVE straight circuit without any high-frequency amplification, using the simplest components, and working on an aerial but 27 ft. high—such is the receiver used by Mr. F. C. Studley, of Harrow, to obtain the excellent results which he mentions in the correspondence columns of AMATEUR WIRELESS No. 145.

A short description of the receiver may be of interest to readers who aspire to obtain good signals on the short waves.

Aerial System

The aerial is a twin wire, 50 ft. long and 27 ft. high, and yet wavelengths as low as 40 metres can be tuned in. The earth connection consists simply of a 4-ft. length of gas-piping driven into the ground. It may be mentioned that although the station is situated at the foot of Harrow Hill, no appreciable shielding effects are noticed.

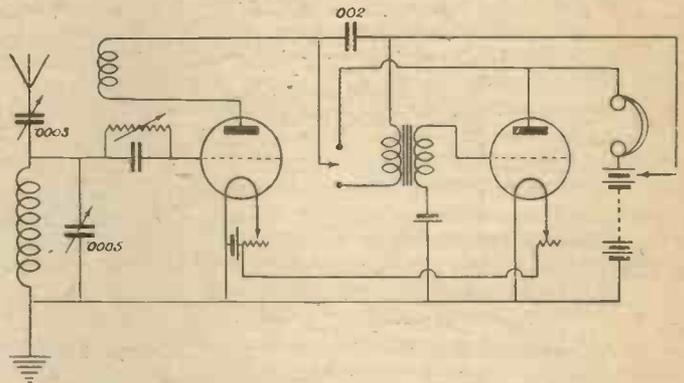
The coils are wound with No. 14 d.c.c. wire and are not spaced as low-loss coils.

The Circuit

The circuit diagram of the set is shown in the diagram, and it will be seen that the controls are few in number. Two variable condensers, one .0003 microfarad and one of .0005 microfarad capacity, are used for tuning the aerial, and a variable grid leak is used to ensure that the valve is working on the correct part of its curve.

A separate H.T. tapping is taken to the plate of the detector valve, but this can only be used when the L.F. valve is switched on.

The valves are dull-emitters, a Mullard LFC Ora is the detector, and a M.O. DER is used in the L.F. stage. A grid bias cell of 1.5 volts is used with the DER valve.



The Circuit Diagram of Mr. Studley's Receiver.

Finland, Sweden, Denmark, Austria, Portugal and Czecho-Slovakia.

In all 1,200 stations have been logged since last October, 400 of these being in the U.S.A.

"THE KING'S GIFT SET" (continued from preceding page)

time as a new valve is fitted. A main control vernier rheostat is mounted on the panel.

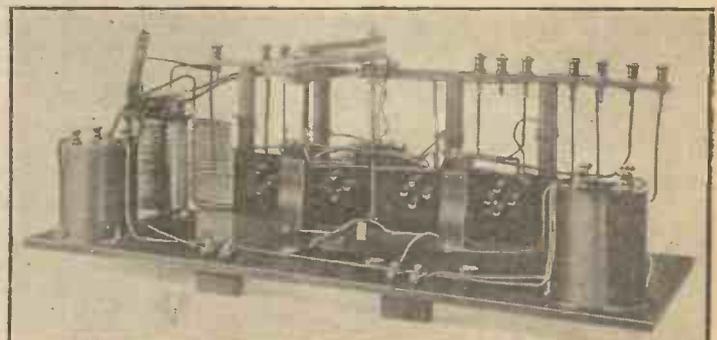
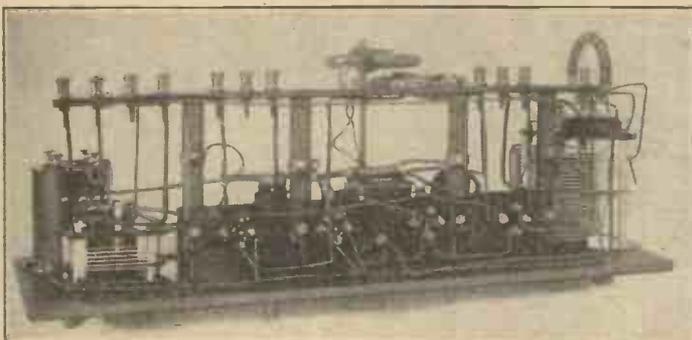
Looking at the photographs of the back of the panel, the aerial tuning coil is to

strip is the H.F. tuned-anode coil, tuned by the variable condenser seen on the left-hand side of the back of panel photographs. The two L.F. transformers are seen at the top corners.

Provision is made for loading coils to increase the wavelength range of the

loud-speaker +, loud-speaker -, H.T. -, H.T. + (40 to 72 volts), H.T. + (100 volts), earth.

The whole instrument is mounted in a beautiful cabinet, having hinged doors that close over the panel, thus preventing the invasion of dust. Compartments are made



Two Views of the Back of the Panel of the King's Gift Set.

be seen on the right. This is fixed in position inside the special cabinet supplied with the receiver. Reaction is obtained by altering the relative positions of the coils seen in the centre of the photograph. The coil fixed to the ebonite terminal

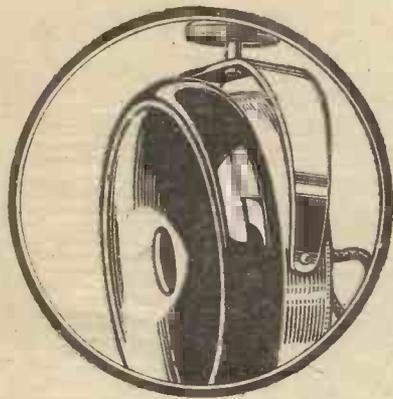
receiver. The sockets for this purpose are on the top of the panel at the front. Reading from right to left, the terminals mounted on the ebonite strip are as follows: Aerial, L.T. - and G.B. +, G.B. -, L.T. +, phones -, phones and

in the cabinet for the enclosure of H.T., L.T. and G.B. batteries and the telephones. A very pleasing appearance is presented by the complete receiver, which is compact and well finished in every way.

W. C. R.



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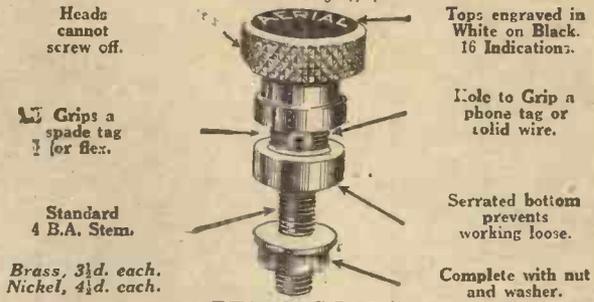
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"BELLING-LEE" Plug & Socket Terminals

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2. 2 1/2 in.	"	350 to	550 "	7d.	"	3.	6d. "
3. 3 in.	"	450 to	650 "	8d.	"	4.	7d. "
4. 3 1/2 in.	"	600 to	750 "	10d.	"	5.	8d. "
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6. 4 1/2 in.	"	950 to	1,350 "	1/4 "	"	7.	10d. "
7. 5 in.	"	1,300 to	1,750 "	1/8 "	"	8.	1/1 "
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						10.	1/4 "
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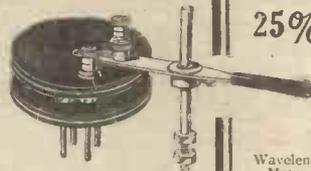
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On Your Wavelength!

Researches and Experiments

SOME time ago, if you remember, 2 L O's programmes sounded for a night or two as if a steam whistle had been installed in the studio. This was due to a heterodyne from one of the French stations, which had to be tracked down. As soon as this had been done a mutual agreement was arrived at and the nuisance ceased. You may notice sometimes that if you have left your set tuned overnight to the wavelength of the station which you habitually use, it may require a slight readjustment when next you switch on. Possibly you tear your hair and ask yourself why on earth the stations cannot stick to their proper wavelengths. The fact is that it has been found necessary to move very slightly up or down the scale in order to avoid either heterodyning or some other form of interference. If the research and experimental staff were not there to see to this your wrath would be far greater than it is when a slight readjustment of the wavelength is found necessary.

Varying Wavelengths

The trouble is that the fellows on the Continent do not always stick to their wavelengths. If they did the heterodyne question could be solved once and for all; but as it is they have a little way of being as much as five metres off their proper wave at times, which means that our own must make small alterations in order to avoid clashing with them. And the engineering staff has done very fine work on the problems of relaying and of simultaneous broadcasting.

Good though the transmissions are at present, they have by no means reached perfection. If you think of what wireless was like even a couple of years ago you will realise how enormous are the improvements that have been made in broadcasting in this short time. Improvements are still going on, thanks to the technical men. We who build receiving sets are always striving to turn out instruments capable of reproducing faithfully the speech and music that are sent out. Those who are responsible for broadcast transmissions must always see that their transmitting instruments are at least as good as our receivers. Actually they are always rather better, for it is now possible to send without distortion, though no receiving-set so far can reproduce perfectly the wave forms brought in by the aerial.

Radio-Iberica

I have had a delightful letter from the Technical Directors of the Spanish station Radio-Iberica, which is now so well known to listeners-in in this country. They have

read some of my congratulatory notes on their transmissions, and they write to thank me for them. This is one of the most successful of all the Continental stations, for it is unsurpassed in the excellence of its programmes and in the quality of its transmissions. The official rating of the station is only 1,500 kilowatts, though it is often credited in the lists of Continental stations with double that power. Its signals come in—in the South of England, at any rate—with quite amazing strength. Twenty-five miles north-west of London one can receive them at good loud-speaker strength on four valves without making use of magnetic reaction. They are quite as loud as those of Birmingham, Cardiff or Newcastle, though the distance between Madrid and my aerial is a matter of 700 miles. The surprising part of it all is that they have to travel for a long distance over land on their way to this country, and Spain is renowned as being a country of dry soil with very few rivers and no lakes. This sort of land is generally supposed to be the worst of all for wireless waves to cross. And in addition to this there are several mountain barriers between Madrid and the waters of the Bay of Biscay. How Radio-Iberica's transmissions overcome these difficulties and arrive with such strength in this country is a mystery; but arrive they do, as you can discover for yourself, if you have not already done so, on any evening of the week. A single valve brings in Radio-Iberica quite well, and it has been heard more than once on a crystal.

Spring Conditions

The coming of spring brings no joy to the soul of the real wireless enthusiast, for he knows that it spells the beginning of the end of good reception until winter comes once more. Already the fell work of the longer hours of daylight is manifesting itself. The distant stations are not coming in so well as they were a week or two ago, and even the near-by ones no longer require to be throttled down a little to make them comfortable. In quite a few weeks America will be beyond the range of any but the big sets on most nights, and even if you do pick up a U.S.A. station you will usually hear more of atmospherics than of music.

If Shakespeare had been alive to-day he would probably have revised one of his lines and written, "Now is the summer of our discontent!" I feel sure that Shakespeare would have been a keen wireless enthusiast; in fact he more or less anticipated broadcasting, as you may see if you read about the doings of Prospero in *The Tempest*. It is curious that

Prospero should have sent out songs and the "voices" which appeared to come mysteriously from nowhere by means of his Ariel!

A Wonderful Evening

One was rather afraid when the *Evening Standard's* splendid programme was first announced for March 10 that something would go wrong. It seemed too much like tempting fate to bring together such a galaxy of talent upon one evening. Had things gone agley the whole thing might have been spoilt by vagaries of the atmosphere and the ether that are beyond human control. But as it turned out conditions for reception were about as good as they could be. It was one of those evenings when stations are picked up without any difficulty. Signal strength was excellent, and there was no interference at all, atmospheric or otherwise. The elements in fact appeared to be doing their very best to enable Tetrizzini to be heard by each one of the mighty host—the number has been put at ten millions—that was listening-in in order to hear that wonderful voice.

The great singer was in splendid form, her voice as clear and as sweet as it has ever been. What a joy it is to hear such a singer, who hits her notes clearly and stays upon them without the slightest trace of wobbliness. To me there are few more hateful things to listen to than the soprano or contralto who goes in for *vibrato* singing. We have far too many of these in the ordinary way, and wireless rather accentuates this horrible trick, a point that the Musical Director might note.

Tetrizzini

Madame Tetrizzini sang both in her native Italian and in English, choosing her songs in such a way that they would appeal to all. She gave us a real treat, and I am sure that she has earned the gratitude of scores of thousands of people who, but for the agency of the wireless receiving set, would never have been able to hear her sing. Hers is a glorious voice, fresh, true and perfectly controlled. Her singing of that old favourite, "The Last Rose of Summer," as her concluding item was a masterpiece, and her rendering of it must have brought tears to many eyes. And what a charming little speech she made when she had finished! One felt that she had thoroughly enjoyed herself in giving pleasure to the huge audience that listened to her, though she could see them only in imagination. One's only regret was that one could not join in the applause or say "Thank you" in some way.

On Your Wavelength! (continued)

A Splendid Programme

Yes, it was a programme to remember. It was certainly the finest that has yet been given in the history of wireless. We have had great singers and world-famous instrumentalists before, but never has there been a programme in which every performer was a star of the first magnitude. Miss Phyllis Lett, the finest British contralto, is, like Tetrizzini, a perfect broadcaster; her voice comes through so clearly on the receiving set that she might almost be singing in the same room. Dinh Gilly is a prince amongst baritones, and what could have been jollier or more tuneful than John Goss's "Sea Shanties" The "Rio Grande" was my favourite amongst them. Isolde Menges let us hear what a wonderful violin played by a finished violinist can sound like. The Kerdoff Quartet consists of four Russian professors of music from the Conservatoire at Petrograd. Their rendering of the "Volga Boat Song" must have appealed to every listener.

This is the kind of programme that is really worthy of being simultaneously broadcast. Let us hope that we shall have many more up to the same splendid standard. Why should not the B.B.C. arrange, say, one each month? This fine programme gave a tremendous impetus to the wireless trade, and if the same kind of thing were done every few weeks the number of aeriols installed would increase by leaps and bounds.

Sediment

I came across the other day a clear example of the iniquities of which some charging stations are capable. A friend purchased a brand new accumulator of first-rate make and sent it to the local garage to be charged. When it was returned it was seen that there was a very large deposit of sediment in the bottom of the case, so much in fact that there was a grave risk of its ruining the accumulator by causing an internal short-circuit. The only explanation that the charging station vouchsafed was that during the night the generator had raced, raising the charging current to something much higher than it ought to be. I do not know how many accumulators were being dealt with when this occurred, but I am certain that all of them have had their lives very much shortened.

Those Electrons

Probably all my readers are familiar with the fact that very often a small chip of glass left in the pinch of a valve makes a rattling sound when the valve is moved. I was in a shop recently and noticed a man, evidently "up from the country," very busy at the valve counter. The salesman, with an anxious expression on his face, was diligently laying out

valves of all sizes and descriptions; he finally signified that he had no other makes in stock. The countryman seized upon the last sample and held it to the light and examined it. With a puzzled face he placed it to his ear and shook it.

"A very good valve that, sir," volunteered the salesman.

The countryman gave it one more shake and, sighing heavily, put it down. "Naw ye doan't, young feller," he said, turning to leave. "Oi naw that ye think oi be soft 'cause oim oop from t' country, boot moi valve 'ad one o' them 'lectrons in't, and none o' your'n ain't." And shaking his head sorrowfully, he departed!

Strange Business Methods

For some long time past there has been a tendency on the part of the manufacturers to adopt a new component for manufacture, produce a few samples and advertise extensively in advance of bulk manufacture. The result is that the public approaches the dealer with a view to purchase, and is surprised to find that not only has the dealer no stock of the particular article, but, furthermore, he never has had any! The dealer, all in good faith, promises to obtain the requisite component, and forthwith places an order. Patiently he awaits delivery of his order, and in the meantime is inundated with inquiries from his clients. The weeks pass by and the inquiries begin to drop off until another new arrangement of a better design is advertised. About this time (generally two months after the order has been placed) the goods are delivered, but the public is now clamouring for the later design, and the dealer has his shelves laden with obsolete stock which nobody wants.

Atmospheric Conditions and Wireless

I am somewhat interested in the remarks of "B. H. R.," of Sale, in reply to mine concerning atmospheric conditions. Without a doubt his theory is perfectly sound. It is a pity really that so little work is carried out in the matter of atmospheric conditions as they affect wireless, since it is more than possible that a little research might be a means whereby many static phenomena might be avoided. Undoubtedly I have noticed that atmospheric effects on occasions do appear to be directional, and it is valuable to have corroboration of this. If more amateurs were to undertake an examination of this question very valuable data would no doubt be obtained. One or two experimenters working in conjunction, situated at a distance from each other, could compare results achieved by using different types of aerial, and if they worked systematically, in accordance with the published meteorological reports, might set down their experiences in the form of a table. I

have always been of the opinion that a considerable amount of so-called fading might be traced to a human source, such as the absorption which may be occasioned by the fringe of an interfering station. Research on this point would also be valuable.

To Pad or Not to Pad

There has been quite a lot of discussion lately on the subject of whether broadcasting studios should be draped and padded or not. Personally I would plump for the undraped studio every time, for the quality of music that is transmitted from a church or a big hall is always infinitely better than that which comes from the specially prepared studio.

Experts say that you must drape floor, walls and ceiling if you are to avoid distortion of speech. Personally I cannot say that I have noticed any distortion worth talking about in the speech that comes from theatres, concert halls or churches. Anyhow, I think that most of us would gladly put up with slightly inferior reproduction of speech if it would mean the transmission of music that sounds so much better than it does from the ordinary studio. "Unpadded music" has a ring, a depth and tone that you do not get when it comes from the studio.

Musical Guesswork

This query programme, you know, threatens to become as much a disease as those cross-word puzzles. What with the office boy trying to find if a word in four letters beginning with s and ending in k stands for "situations vacant," and my typist trying to remember if "Because" is by Ronald Gourley or Meyerbeer, life becomes too complicated; but, anyhow, last night's mystery programme at Birmingham was certainly worth trying for the two guineas prize, for it gave us henpecked husbands a chance to get a word in edgeways.

"A Tale of Alsatia"

Between ourselves, I don't know what a "Picaresque" is. (Now there's a chance for our cross-word editors.) Anyhow, I do want to get Aberdeen to-morrow, for a London Picaresque of the time of James I will be broadcast. *A Tale of Alsatia* does not centre on that foreign country in your Cook's tour guide, so don't ear-mark it for your summer holidays; it was the name given to that part of Fleet Street district known as Whitefriars, where from the 13th to the 17th centuries stood a monastery. Here the whitehooded monks gave shelter from debt and penalties to half the foreign rascals in the city. Possibly the modern prototype is another part beginning with white. But there, you just see how catching that cross-word business is.

THERMON.

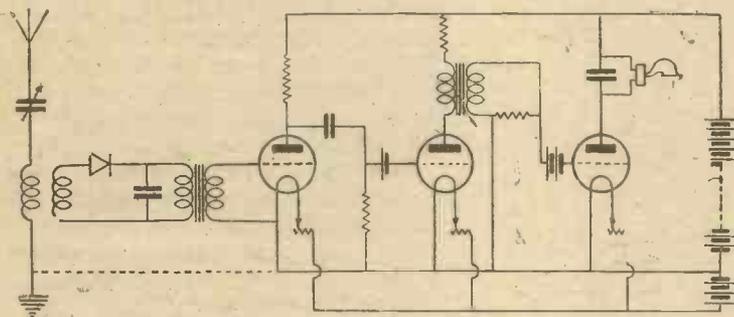


RULES.—Please write distinctly and keep to the point. We reply promptly by post. Please give all necessary details. Ask one question at a time to ensure a prompt reply, and please put sketches, lay-outs, diagrams, etc., on separate sheets containing your name and address. Always send stamped, addressed envelope and attach Coupon (p. 503).

Loud-speaker Set

Q.—Please give a circuit showing suitable connections for wiring up a powerful loud-speaker set. The receiver is to be used at a distance of about five miles from 2 L.O., and long-distance reception is therefore not necessary. Absolute purity of reception is essential, and a great volume of sound is needed for demonstration purposes in a large hall.—V. M. (E.10).

A.—A description of a high-power loud-speaker set was given in AMATEUR WIRELESS No. 136, page 48, but as this receiver employs



A Loud-speaker Circuit.

two stages of high-frequency magnification as well as two stages of low-frequency, the set described may not be entirely suitable. Some valuable hints with regard to the operation of loud-speaker sets are given and may prove very useful in connection with your receiver. A circuit more suitable for your requirements is shown above; it will be seen that a loose-coupled crystal detector is used together with three stages of low-frequency amplification. If purity of reception is desired, the following points should be noted: the first transformer should have a ratio of only 2 to 1; the values of the resistances of the second valve are critical for the best results; grid bias is used for the second and third valves; several loud-speakers should be used in parallel to prevent overloading and consequent distortion. An aperiodic secondary coil is used.—U.

Super-regenerative Circuits

Q.—Please advise in the use of super-regenerative circuits such as the Flewelling or Armstrong single-valve sets. I propose to build a receiver of this type, but am uncertain as to what the exact capabilities of super-circuits are. Is it desirable to use an out-door aerial? Could you also tell me what gauge of wire is suitable for winding a powerful loud-speaker of the standard moving-iron diaphragm type.—W. P. (Blackheath).

A.—Super-regenerative circuits were designed for long-distance work on short wavelengths. The strength of signals obtained varies inversely as the square of the wavelength, and therefore although astounding results may be expected on 100 metres, on 600 metres the strength will only equal that of a simple crystal set. All the time that signals are being received, a high-pitched whistle will be heard in the phones or loud-speaker. This may be eliminated, but super-

circuits are hardly suitable for broadcast reception as a certain amount of distortion is always present. A frame aerial should be used or serious re-radiation troubles will be caused.

If care is taken in choosing the components, remarkable results may be obtained, but super-circuits cannot be regarded as stable receivers for broadcast purposes. No. 46 s.s.c. wire is recommended for winding the magnets of the loud-speaker.—U.

Tuning Coils

Q.—I am constructing a tuner for my new two-valve set (detector and note mag.), and am undecided what type of coil to use. My old set employed tapped inductance, but I am told that these coils are now out of date. What kind of tuner do you recommend, and what size coils are suitable?—M. T. (Newbury, Berks).

A.—It is scarcely true to say that tapped coils are out of date, but it has been found advisable to use coils having a lower degree of loss on the short wavelengths. For wavelengths between 200 and 1,000 metres, therefore, the plug-in type of coil is to be recommended. Coils of this description should be wound honeycomb fashion on a 2½-in. former, 1 in. wide, and we suggest you wind coils having the following number of turns: 25, 35, 50, 75, 100, and 150.

For the lower wavelengths air-spaced coils (as described in No. 141) are recommended, since even the low self-capacity of ordinary plug-in coils will be detrimental to signal strength on wavelengths below 100 metres.

Tapped coils will probably be more useful than bulky plug-in coils on the long wavelengths.—U.

Inductance of Basket Coils

Q.—How can the inductance of a basket coil be calculated?—M. T. (Edgbaston).

A.—The following formula will be found fairly accurate: $L = \pi^2 n^2 d^2 l$. When L = inductance in cm. d = mean diameter of the coil in cm. n = number of turns. l = difference between radii of outermost and innermost turns.—U.

Filament Rheostats

Q.—What value of resistance is suitable for a rheostat for use with the Marcouli D.E.5?—C. M. (Croydon).

A.—30 ohms is a suitable value of resistance.—U.

Crystal Detectors

Q.—What is the best type of crystal detector for use in a simple crystal set? I wish to have a detector that is sensitive and yet which will not be affected by vibration.—J. P. (W.C.I.).

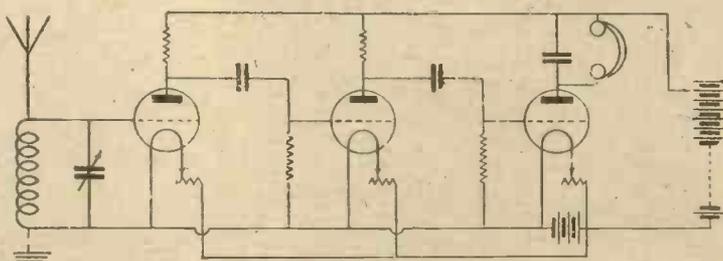
A.—It is very difficult to combine sensitivity and stability in a crystal detector. Carborundum and steel make a very stable detector, but an added potential is necessary. A silver, copper or brass contact with galena forms a sensitive combination.—U.

H.F. Amplifier

Q.—I am enclosing the diagram of my receiver (reproduced below), which is intended for the reception of long-distance broadcasting. I have not been able to get any satisfactory results as the addition of the high-frequency valves seems to make no appreciable difference. It is difficult to obtain reception from more than two of the B.B.C. stations, and even London is not strong in the phones.—C. T. (Lower Edmonton).

A.—It should be remembered that the use of two high-frequency valves will not greatly increase the strength of signals from local stations. Low-frequency amplification is needed to increase signal strength, whereas the two H.F. valves will only increase the range of the set. The chief fault in your receiver seems to be that you are using resistance-capacity coupling for H.F. valves on comparatively short wavelengths.

Unless the receiver is specially designed and constructed it is almost an impossibility to obtain any H.F. amplification from resist-



Resistance-coupled H.F. Amplifier.

ance-coupled valves on wavelengths below 1,000 metres. It is therefore not surprising that all the B.B.C. stations are not received at good strength. If the resistances be taken out of circuit and tuned inductances connected in their place, thus forming the tuned-anode method of coupling, this difficulty should be overcome. If the resistance-capacity coupling is still retained it would be advisable to take separate tapplings from the H.F. valves to the high-tension battery, since the detector valve requires less anode voltage than the two valves having resistances in their anode circuits. For short-wave work it would be advisable to place the aerial condenser in series instead of in parallel.—U.

TRY THE SHORT WAVES!

(CONCLUSION)

The instructions in this and the preceding article will enable you

to receive on the short wavelengths now coming into great favour.

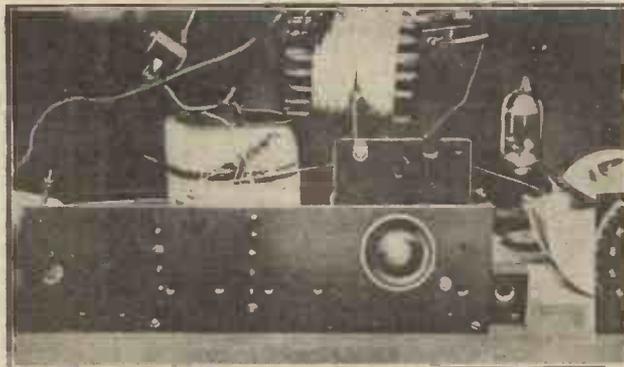
Other Capacity Losses

TURNING to the set itself, let us examine losses here; for example, the grid leak and condenser. Figs. 4 and 5 show the correct and incorrect way of mounting these articles in position. For short-wave reception always put the leak across the condenser, never from the leg of the valve filament to the grid.

Now the valve holder. Referring to the photograph (p. 429), there will be seen two valves from which the caps have been removed. This is the best way of employing a valve on the short wavelengths, as capacity losses arise at the "pinch" where the leads are fixed in the glass, and in the holder of course. Marconi V24 valves are better for short-wave work, as their capacity is much lower. However, not everyone wishes to remove the base from this valve, and therefore care must be taken to reduce the losses which are bound to occur in the valve holder.

Valve-holder Losses

Fig. 6 shows the losses which occur when an ordinary moulded composition holder is used. The circuit shown (Fig. 7), shows the application of such losses or how they would appear in an ordinary one-valve set.



The Type of Set.

Fig. 8 shows a method of reducing capacity and leakage losses where ordinary pins are employed by cutting away small strips of the ebonite panel between the legs. It is always advisable to employ these pins or legs, and to adopt the above suggestion.

Valves

Fig. 9 shows two types of valves—an ordinary 4-pin type and the V24 mentioned above. It is easy to see which is the better valve from the lower self-capacity point of view.

The Secret of Success

The photograph shows a view of a receiver, using the low-loss coil mentioned above and the method of mounting. (This coil is used in a Reinartz receiver; hence it is centre tapped and is supported by the centre tap—a stiff piece of heavy gauge aerial wire.) If any high-frequency chokes

The Type of Set

Now we have reviewed the situation as far as it is necessary, and a few words on the type of set will conclude this article.

High-frequency amplification is useless. Any ordinary or extraordinary type of rectifier will do (excluding the obviously doubtful reflex circuit and the like), and note magnification may be added. The writer advises the use of only one stage, however, which may be cut in or out at will. He himself uses a modified Reinartz circuit with an optional note magnifier.

As regards transmitting, the above remarks hold true for this also. Watch stray capacity and the rest will look after itself. Of course care should be taken to increase the gauge of wiring to withstand the heavier currents which they will be required to take, and insulation should be looked to even more carefully than ever.

A. G. W.

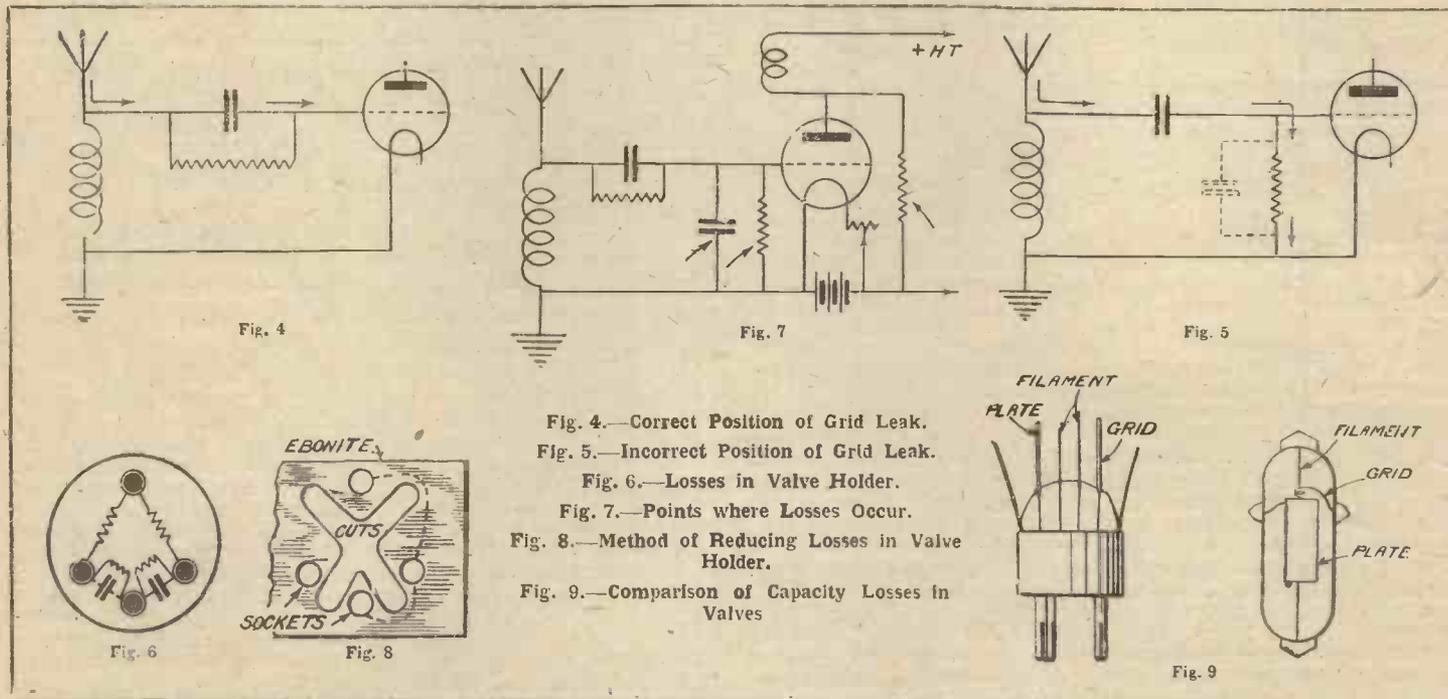


Fig. 4

Fig. 7

Fig. 5

Fig. 4.—Correct Position of Grid Leak.

Fig. 5.—Incorrect Position of Grid Leak.

Fig. 6.—Losses in Valve Holder.

Fig. 7.—Points where Losses Occur.

Fig. 8.—Method of Reducing Losses in Valve Holder.

Fig. 9.—Comparison of Capacity Losses in Valves

Fig. 6

Fig. 8

Fig. 9

AROUND THE SHOWROOMS

Electron Wire

TO test a sample of Electron aerial wire I adopted a rather unique method.

I erected a number of indoor aerials (of different wires) of exactly the same length, including a length of Electron wire.

Then I tuned-in a crystal set to London on what I thought would be one of the best aerials, and then detuned until signals were only just audible.

Next I "borrowed" an independent observer, who sat with his back to the set. I then changed the aerials about, while the observer noted the difference in signal strength. Every time he voted for the Electron aerial. This was quite a conclusive test, and I can recommend this wire to anyone who wants to fix up an aerial with the minimum of trouble.

This wire is supplied by the New London Electron Works, Ltd., of Boleyn Road, East Ham, London, E.

Grid-leak Attachment

A LONG-FELT need in the form of an attachment for use in conjunction with the Dubilier-type 600 grid condenser when a series grid-leak connection is required, has just been placed on the market by the Dubilier Condenser Co., Ltd., of Victoria Road, North Acton, W.3.

This attachment is easily added to the existing condenser and dispenses with the necessity for separate grid-leak clips when H.F. amplification by the tuned-anode method is embodied in a receiving set.

I understand that large supplies are available for immediate distribution, the clip and moulded insulating-base complete retailing at 6d.

The same firm has produced a new form of variable condenser, called the Duwatcon, which, by reason of its special construction, enables the value given when the condenser is in its maximum series position to overlap that given when in its minimum parallel position.

In this way there is no risk that any wavelengths will be passed over when the condenser is changed from the series to parallel position.

The condenser is provided with three terminals, which are joined up to the tuning coil and to a "series-parallel" switch. A diagram of connections is included with each condenser to facilitate wiring up.

"Plotron" Dull-emitter Valves

I HAVE tested a new dull-emitter valve of the .06-ampere type (Model SS4) made by Aneloy Products, of Eton Works, Upland Road, S.E.22.

The results obtained were excellent, and for a valve of extremely low filament-current consumption is noticeably devoid of any microphonic tendency.

On actual test I found that the valve is most suitable as a detector, although fair results were obtained using it as a low-frequency amplifier.

When used as a detector, 40 volts H.T. on the plate is found to give the best results, and when used as an amplifier 80 to 100 volts are necessary, with a negative grid potential of 1½ volts.

Televox Loud-speaker

FINISHED in dull gold and black, the Televox loud-speaker, made by the Edison Swan Electric Co., Ltd., is pleasing in appearance and no less pleasing in performance.

In order to make a fair test, I connected the loud-speaker to a three-valve receiver known to give excellent results. London, at a distance of ten miles, came through with remarkable purity and volume, while other stations were received with the same purity and with enough volume to fill a large-sized room.

The proximity of the diaphragm to the magnets is adjusted by loosening a locking ring round the base of the instrument and unscrewing the top of the receiver (to which the diaphragm is attached) until the diaphragm is in the best position, which may be judged by the quality of the sound.

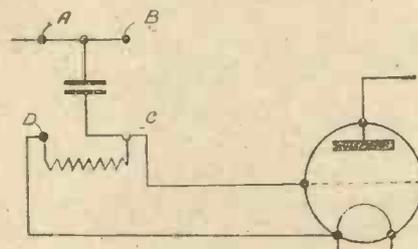
VANGUARD.

PROGRESS AND INVENTION

Grid-condenser Unit

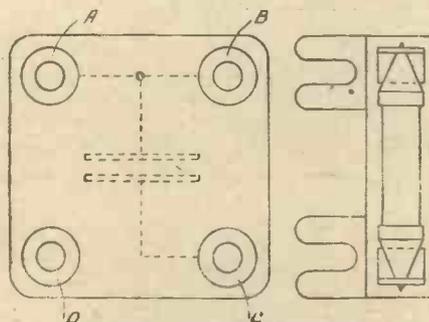
A CONDENSER unit for use in the grid circuit of a valve is described in Patent No. 228,693/24 (Wadia Halim Murad, Manchester).

It will be seen from the diagram that



The Grid Leak in Series.

the unit consists of a base having four terminals A, B, C and D, and a grid condenser connected as shown to the three terminals A, B and C. A grid leak is



Condenser Unit (No. 228,693/24).

mounted on separate clips so that it can be connected across any pair of terminals.

According to the specification, the plates of the condenser, interleaved with thin sheets of mica, are fitted into a moulded case of ebonite or other insulat-

ing material, having the four terminals for connection at each corner.

In order to make the change from the parallel to the series arrangement of connections or vice versa it is only necessary to remove the grid leak from the terminals on one side of the condenser case and to connect it to those on the other side, and to add or remove the low-tension wire.

The circuit diagram shows how the connections are made in order to place the leak in the series position.

Frame Aerials

PORTABLE sets are now a practical proposition, and frame aerials are generally sufficient to provide the energy for a modern sensitive set.

Portable frame aerials, however, are not easily constructed, as considerable difficulty is usually experienced in arranging the wires in the correct position. It is, of course, essential that the wires should be symmetrically placed, as serious high-frequency losses will be introduced into the coil if the turns are wound unevenly. It is essential, too, that once the wires have been arranged this arrangement should always be adhered to or tuning adjustments will need to be constantly varied. Patent No. 225,148/23 (F. Sloop, Gray's Inn Road, W.C.) describes a simple method of overcoming this difficulty of the arrangement of the conductor.

The aerial is formed by interposing the wire between two sheets of textile fabric which are stitched together between the convolutions of wire so as to enclose the wire at all points between the extremities.

The frame of the aerial has hooks placed at the four extremities of the arms, and the two stitched fabric sheets are supported on these.

A TALK WITH CAPTAIN ECKERSLEY

(FROM OUR OWN CORRESPONDENT)

"THERE is," I said sternly, "not the slightest possibility of escape down that corridor."

Captain Eckersley withdrew his pipe from his mouth, gazed at me intently for a few seconds, then in a resigned tone:

"Very well. Come down to my office now. I have a few things to look over. Might as well kill two birds with one stone."

"My hope," I observed, "in the one case, is that your aim may not be accurate." I followed him.

By means of a desk and three chairs I fortified my position, and also made sure that the wall at his back contained no secret door, by which he could beat a hasty retreat and avoid the interview.

"Now," said the chief engineer, "what is it you wish to know?"

The Day's Work

"Listeners," I began in my most persuasive manner, "judge of your work by the results they hear, but have no idea of what you actually do throughout the day. To quote the wording of a detective agency's advertisement, 'Does shopping account for all the time?'"

"It is difficult to say how I subdivide my day's work, but I will give you some idea of the organisation under my control. The engineering side of the B.B.C. is composed of three departments dealing with, respectively, maintenance, development and correspondence. Subdivisions include stores and training. Personally, I supervise both the administrative and executive sections of the work, and I possess very able lieutenants, who take most of the routine and straightforward duties off my hands.

My principal time is naturally mainly occupied with questions of policy. The maintenance department is, of course, responsible for the running and upkeep of the existing stations; the development section for the examination and study of all new inventions, improvements, experiments and for the construction of new plant and stations. This is quite an important part of the day's work. The correspondence department deals with, amongst other matters, the large mail received from listeners in all parts of the United Kingdom; at least that portion of the mail which deals with transmissions—'blind spots,' technical matters, peculiar effects experienced, howling, and the sundry complaints or criticisms made by the public and which refer to the engineering side of the work. For my share, I receive about two hundred letters a day, most of which can be dealt with by my correspondence staff. Any cases which present peculiari-

ties or involve special investigation are brought direct to me, and such complaints are very carefully examined and dealt with in detail. As an example, I can give you the statement made by some owners of crystal sets that their neighbours possessing valve receivers were able completely to cut off their reception of the local station. We need not discuss this particular matter, as I have dealt with it in one or two of my 'Fortnightly Talks.' Such a complaint, however, demanded a thorough investigation, and very many tests were made to confirm or refute the accusation. In the public interest it was my duty to go very carefully into this matter, and I have since broadcast the results of my personal experiments and observations. So far as possible, I see that every letter received is duly answered, but listeners must excuse me if I do not reply to all those of purely a complimentary nature."

"Quite so," I interrupted, "but give me some idea as to the way in which you start your day's work."

"I look through the mail. I supervise the purchases of all material required for the upkeep and maintenance or construction of stations. One of my first duties is to receive and examine reports regarding the previous day's transmissions of all our broadcasting centres, both main and relay. These are carefully checked, and this chart shows at a glance how these stations are working. Notwithstanding occasional breakdowns, which are inevitable—Bournemouth, for instance, had its aerial brought down by a gale—I am pleased to say that the actual breakdowns or interruptions, in the aggregate, only amount to, roughly, one quarter per cent. of the entire transmitting time.

Engineers' Duties

"Now let us see. Oh, well, there are six or seven engineers on duty every day. One man comes in early and places all the batteries on charge, tests all the plant, and generally cleans up preparatory to the first transmission. Tests are continually being made, not only because they are necessary, but also for the benefit of the engineers we train for our new stations. Engineers are on duty eight hours per day. In the morning the programmes are examined, and the various men allotted to their respective jobs. There is always one man on duty in the control-room, and as the work demands exceptional care and concentration he is only given a two-hours' spell of it, after which another acts as relief. Don't forget that, apart from the actual studio transmissions, we have the outside relays, and much of our day's work is taken up by coping, or endeavour-

ing to cope, with emergencies, such as sudden outside transmissions, and of which, as frequently happens, we get but very short notice."

Checking the Transmissions

"I notice you have headphones in almost all the rooms here."

"Yes. Whenever there is a 'show' on we listen from any room in which we happen to be at the time. We are all severe critics. It is essential I should hear the transmission in the same manner as the outside listener. I always judge of the quality from his point of view. I have a set at my private house, and when off duty in the evening I always listen to the programmes."

"What! all of them?" I queried.

"Well, not right through, but 'rom time to time, in order to form my own opinion of the transmission. I aim at the best quality possible."

"By the way, has howling decreased or increased of late?"

"Oscillation is spasmodic. It is like influenza. We get an epidemic at times, after which it dies down for quite an appreciable period."

"Do violent outbursts of howling coincide with school holidays?"

"Better not talk about oscillation. The public hears so much of it from me; but 'howling' does, as you know, spoil people's enjoyment. One person alone, either wilfully or through sheer ignorance, can mar several hours' enjoyment."

The New 2 LO

"What are your plans for the new transmitting station in West London?"

"We have erected a three-kilowatt transmitter on a new site. We hope that the energy and range may be greater than our present 2 LO station. Tests will prove whether our expectations are realised. It is possible to build something which may be theoretically perfect, but practical results depend on so very many factors. If I get the same results as I am getting now I shall be pleased; if they are better I shall be delighted. We shall know when we have made some tests."

"Will not the extra energy render the task more difficult of cutting out 2 LO to receive other stations?"

"It may, but in my opinion the listener should render his receiver more selective. It is quite possible to do so. Although complaints are received regarding the difficulty of tuning-in some of the provincial and foreign stations, I could take you upstairs to our testing-room, and there, whilst 2 LO is working, you could get re-

(Concluded on page 492)

EXPERIMENTAL TRANSMISSION.—XI

MORE ABOUT MODULATION

Aerial-absorption Principle

A WELL-KNOWN American company provides a modulator acting on the aerial-absorption principle, which, it is claimed, has none of the disadvantages of direct connection and yet retains the good

transformer, thus altering the internal impedance of the valve and directly controlling the aerial.

The modulator may be an ordinary receiving valve if only small powers (not much over 10 watts) are employed, and

a certain amount of glow is also caused by the radio-frequency potential derived from the aerial inductance.

When the microphone is spoken into, the potentials set up across the secondary of the transformer vary the conductivity of

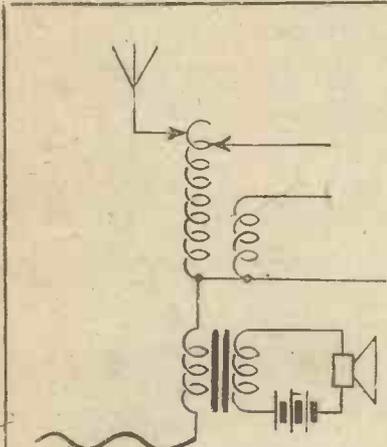


Fig. 43.—The Magnetic Modulation.

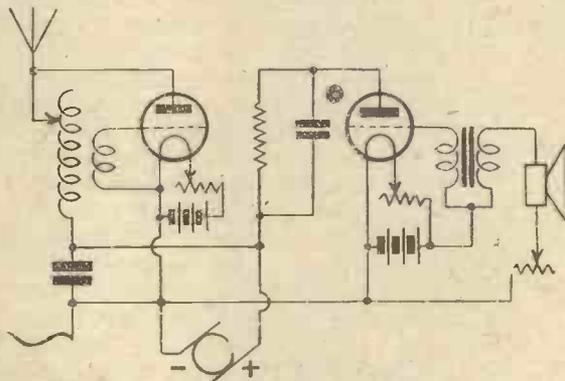


Fig. 44.—Valve Control of the Aerial.

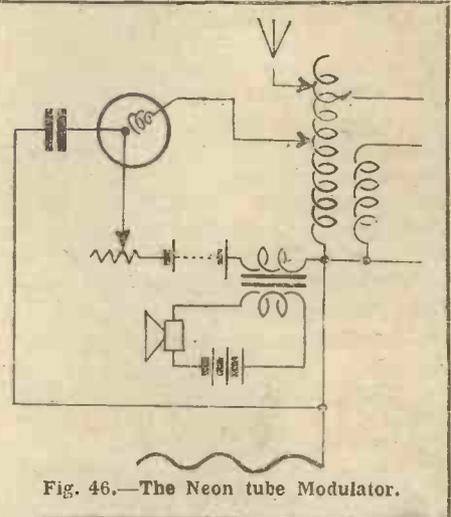


Fig. 46.—The Neon tube Modulator.

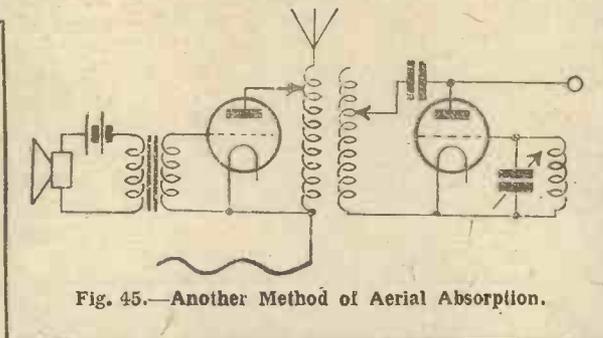


Fig. 45.—Another Method of Aerial Absorption.

quality of modulation obtained by normal methods of aerial absorption.

The microphone acts through a magnetic modulator, a device which utilises the magnetic properties of iron at radio-frequencies in the same way as the Alexander-son magnetic amplifier employed in large transmitting stations, which is operated by a variable impedance connected across the high-frequency generator. The magnetic modulator is connected directly into the aerial circuit near the ground connection, and acts simply as a variable resistance modulated by the microphone.

Another advantage of such a system is that in Fig. 42 (p. 392, No. 144) the microphone leads must be as short as possible, as any capacity effects will reduce the variation of resistance, whereas in Fig. 43 the leads may be as long as is desired, since no radio-frequency currents are passing through the microphone.

Another advantage of such a system is that in Fig. 42 (p. 392, No. 144) the microphone leads must be as short as possible, as any capacity effects will reduce the variation of resistance, whereas in Fig. 43 the leads may be as long as is desired, since no radio-frequency currents are passing through the microphone.

Another Method

A second method of employing aerial-absorption control on powers of the order of 10 watts is to use a three-electrode valve as the absorbing medium, and to control the grid of this by means of the microphone in the usual way.

The connections of such a scheme are shown in Fig. 44. Here the grid of the modulating valve is controlled by the microphone through a step-up microphone

for this reason a resistance is shown in the anode lead to this valve to cut down the plate supply. Common filament batteries may be used if desired.

Such an absorbing element may be coupled inductively to the aerial circuit, or tapped off across the inductance as shown in Fig. 45; in either case it is desirable to employ a loose-coupled oscillator to minimise capacity effects and to abolish battery trouble.

Neon-lamp Modulator

It would perhaps be as well to explain here how it is possible to use a neon-lamp as a modulating unit. The simplest modulation scheme using a neon tube is shown in Fig. 46. Shunted across the aerial circuit is the lamp in series with the secondary of a step-up modulation transformer and a source of plate voltage, if it may be so termed. About 150 volts is suitable. By means of the resistance R the lamp is adjusted till it just glows feebly;

the lamp, causing a varying damping on the aerial circuit.

This method certainly gives very satisfactory results, especially on low powers, and as it is inexpensive in initial outlay and upkeep it is to be strongly recommended.

KENNETH ULLYETT.

(To be continued)

NOISY RECEPTION

INTERMITTENT crackling and sizzling noises which are often put down to atmospherics are frequently due to bad contact between the valve legs and the sockets in the filament circuit.

This trouble is more often experienced when using bright-emitter valves rather than with those of the .06 class, and is due to the fact that the effect of a slight increase in the resistance of a circuit is more pronounced when a comparatively large current is flowing.

A remedy for this is to clean the pins of the valve with fine emery-cloth and afterwards increase slightly the diameter of the pins by inserting a pocket-knife in the centre slit. The valve should then be a good fit in its socket and the troublesome noises cease.

S. J. M.

A popular orchestral programme will be broadcast on March 20.

TWO-VALVE REINARTZ RECEPTION SET

IT is a source of wonder to the writer why the Reinartz tuning system has not "caught on" in England as it has done in America. The originator of the circuit is John L. Reinartz, a young American who has produced an astounding number of tuner designs. In all probability the reason for its lack of popularity in this country is that hitherto a special coil has been necessary for the tuner, thus limiting the range of wavelengths on which it will receive. By using plug-in coils, however, all these disadvantages are overcome.

The Reinartz tuner is simplicity itself to handle. Once the correct position of the coils has been found there is no need to alter the setting. Tuning is then accomplished by the rotation of the two condenser dials seen on the right of the panel in the photographs.

Another great advantage of this system is the great selectivity that can be obtained. Although perhaps not quite as sensitive as some circuits possessing one or more stages of high-frequency amplification, it is quite sensitive enough to receive all the broadcasting stations on the headphones provided that a good outdoor aerial and a good earth system is employed.

The Theory of the Circuit

Referring to the circuit diagram Fig. 1, it will be seen that a semi-aperiodic aerial coil is conductively and magnetically coupled in a fixed manner to a tuned grid

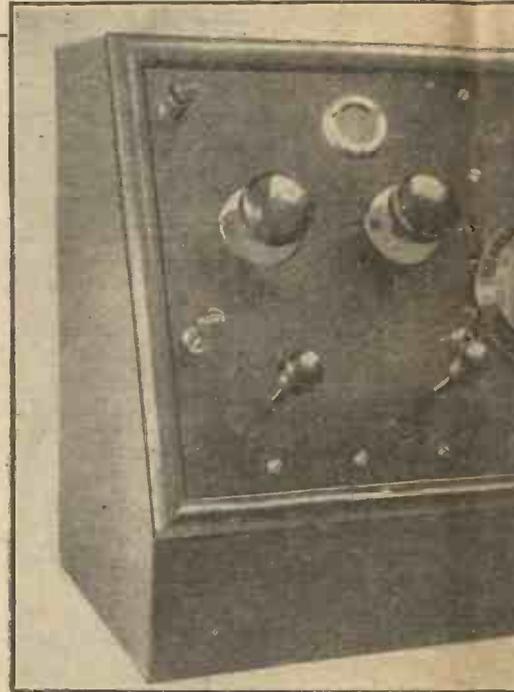
coil. The semi-aperiodic aerial and the grid coils take the form of ordinary plug-in coils in a three-coil holder, the third socket being used for the plate or reaction coil.

In practice the aerial and grid coils are kept permanently coupled tightly together, while the plate coil is adjusted until a suitable coupling is obtained. Once adjusted, it is left so, and reaction control is carried out by the reaction condenser alone.

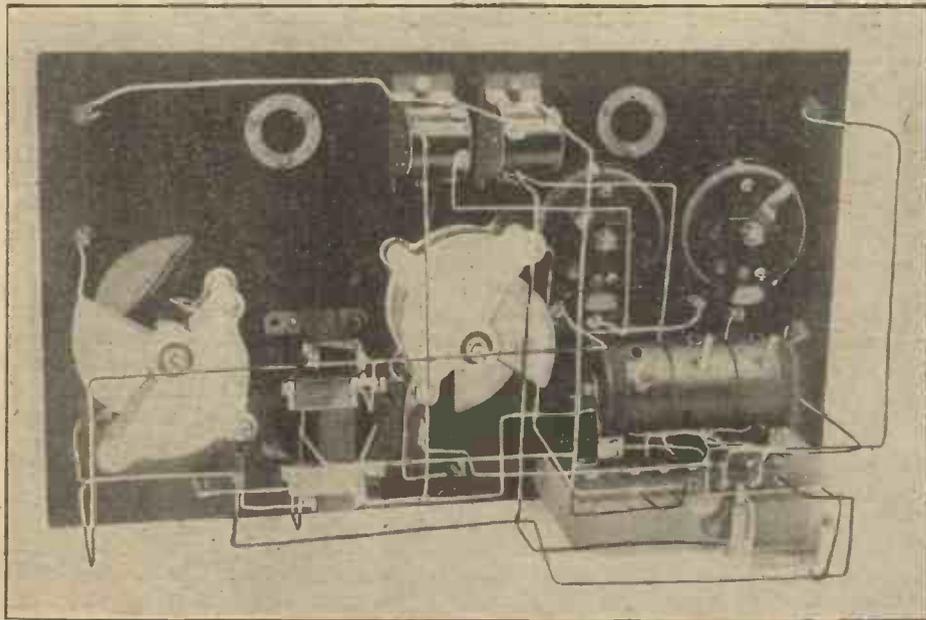
In order that the reaction coil and condenser should function properly it is necessary that the H.F. oscillations should pass through the coil and condenser and not be able to pass through the L.F. transformer by means of the capacity of this instrument. This necessitates the use of a transformer having a very small self-capacity. Using a transformer having a fair amount of self-capacity, it is essential to incorporate a high-frequency choke coil between the plate of the valve and the transformer, as shown in the circuit Fig. 2. Using a McMichael transformer the choke coil was found to be superfluous and was omitted.

Component Parts Required

Any good make of components may be used, provided, of course, that they possess identical electrical values to those given in the following list. For the benefit of those who prefer to make a set similar



The Complete Reception Set



Plan View of Back of Panel.

in every respect to the original, the manufacturer's name is given, in parenthesis, after each component.

One Radion ebonite panel, 14 in. by 8 in. by $\frac{3}{8}$ in. thick (American Hard Rubber Co.); one three-coil holder

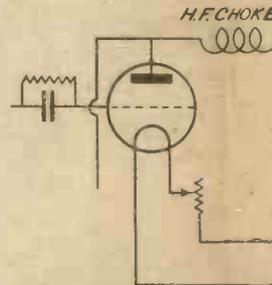


Fig. 2.—Diagram Showing H.F. Choke

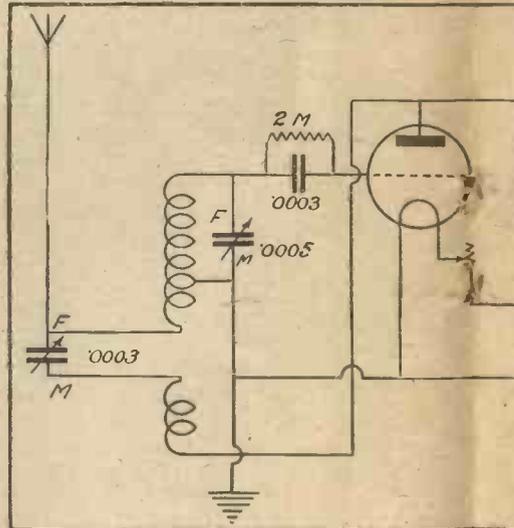
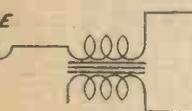


Fig. 1.—The Circuit

RECEIVER WITH PLUG-IN COILS

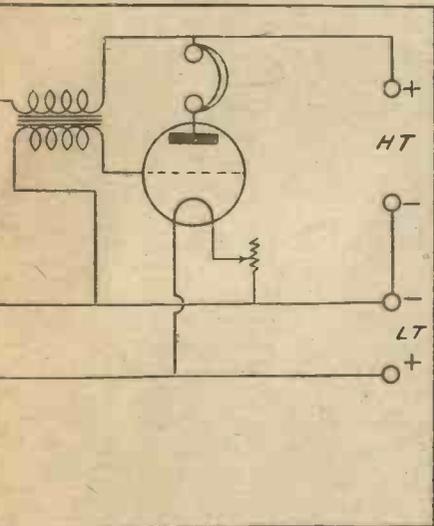


Receiver.



(Lissen); one variable condenser, .0005 microfarad ("Utility" square-law with vernier); one variable condenser, .0003 microfarad ("Utility" square-law with vernier); one 2-megohm grid leak and a .0003 microfarad

Position of Choke.



Wiring Diagram.

fixed condenser (Dubilier); one low-frequency transformer (McMichael); two filament rheostats (Burndept dual type); ten terminals; two valve windows; two valve holders (Aermonic); one oak cabinet to suit panel (Henry Joseph and Co.)

The Cabinet

Messrs. Henry Joseph, of Victoria Street, London, S.W.1, have supplied us with a very suitable cabinet for this set. It has the great advantage that the panel fits into place and is held rigidly without the use of wood screws. This is done by means of four turn-buttons clamping the panel tight against the beading round the front of the cabinet.

Drilling the Panel

Too much emphasis cannot be laid on the necessity of using good ebonite. For this reason it is advisable to buy branded ebonite in preference to the cheaper unbranded material. If, however, the latter is used, remove the polish with fine emery-paper, afterwards rubbing the surface with a rag moistened with a little oil. In this way the black surface of the ebonite is restored.

On a piece of paper measuring 8 in. by 14 in. mark out the centres of the holes shown in the panel-drilling diagram (Fig. 3). Lay this piece of paper flat on the panel and mark through at the centres with a sharp steel point. Holes of the

sizes indicated in Fig. 3 should then be drilled at these points.

Mounting the Components

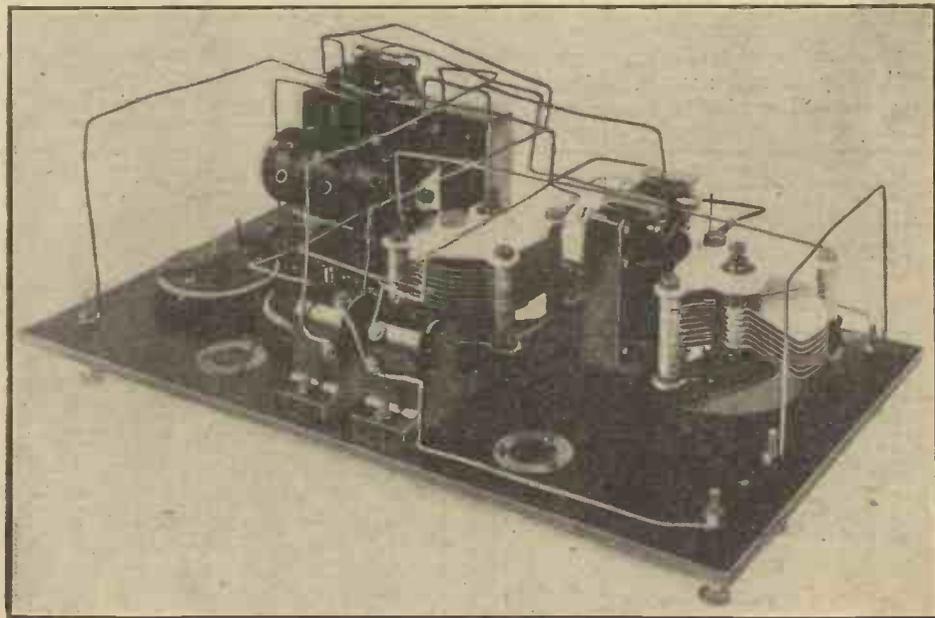
The next step is to mount the various components on the panel, and this should be done in the following manner. Mount the two valve holders, the two rheostats and the terminals on the panel first, and wire up the filament lighting circuit before anything else is done. When wiring allow plenty of room for the mounting of the other components. Next the variable condensers, the coil holder and the L.F. transformer are mounted and wired.

The three-coil holder is screwed down on to a piece of wood 1 in. thick, 4 in. long and 2½ in. wide. This piece of wood, when screwed to the panel by means of three 1½-in. brass wood screws, forms a rigid support for the coil holder. The fixed grid leak and condenser are seen screwed down on the side of this wooden bracket.

No difficulty should be experienced in making the various connections if reference is made to the wiring diagram Fig. 4 and the photographs of the under side of the panel.

Valves

The Burndept "dual" type of filament resistance is suitable for either dull- or bright-emitters. In the original receiver a Cossor plain-top bright-emitter valve was used for the detector and a Mullard type



Another View of Back of Panel.

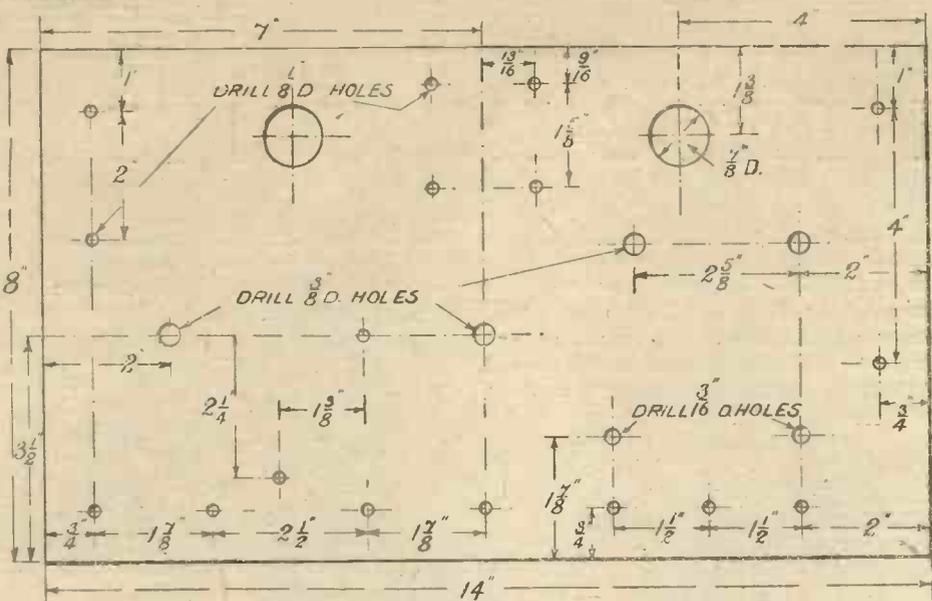


Fig. 3.—Lay-out of Panel.

the other coils until the set just starts to oscillate. This will be indicated by a slight hissing sound in the phones. The plate coil should next be separated from the other coils by a slight amount and it will now be found that, by turning the reaction condenser the set will once more start to oscillate. The three coils should be left in this position. Tuning is now very simple. Signals are picked up by the tuning dial and strengthened by merely turning the reaction dial.

ANOTHER MAGIC BOX

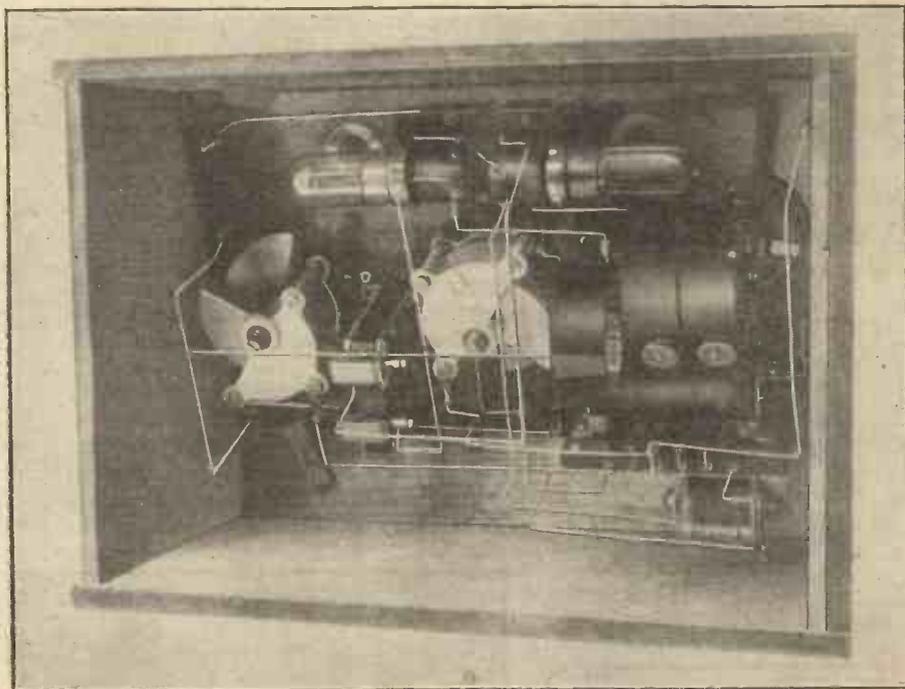
THE newspapers have recently been greatly interested in the so-called Abrams box, which is alleged to cure practically any variety of sickness by tuning-in to the electronic frequency of the diseased cells and administering high-frequency current of the appropriate wavelength.

DFA₁ for the amplifier. With this combination signals were exceptionally loud and free from distortion. Approximately 80 volts seems to be a suitable H.T. value, and for the filament lighting a 6-volt accumulator is necessary.

Operating the Set

As soon as the wiring is completed the aerial, earth, batteries and phones may be connected up and the valve inserted for a preliminary test. Suggestions for suitable coils are: aerial coil, a No. 25 or No. 35 (or their equivalent); grid coil, No. 50; plate coil, No. 50 or No. 75.

Couple the aerial and grid coils close together and set the plate coil at right angles to the other two coils. Set the reaction condenser at zero. Turn on the filament current and search for signals by very slowly turning the grid-coil tuning condenser dial. Having picked up the local station, turn the reaction condenser dial to see whether the set oscillates, which in all probability it will not do. Now bring the plate coil gradually nearer to



Back View showing Receiver in Case.

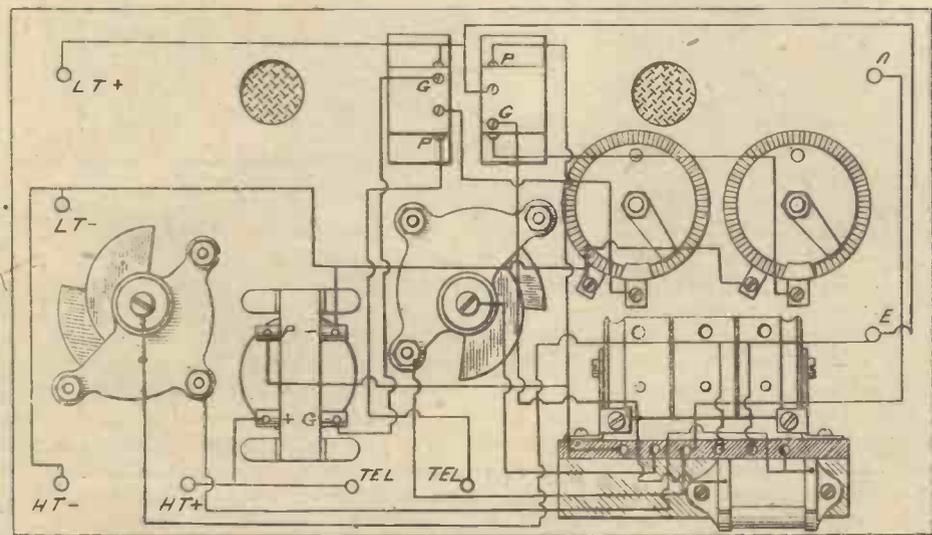


Fig. 4.—Wiring Diagram.

A rival to Abrams has now appeared in the person of Dr. G. R. Rogers, formerly of Texas. He has designed a mystic contrivance called the Neurophonometer, by which he claims to be able to deduce the "variance from the normal capacity and inductance of the brain, which generates the life-force of the body." He is also prepared to determine the patient's electronic frequency (each person having a specific and characteristic frequency of his own) and thence to deduce the "exact point of interference with the transmission of the vital vibratory-fluid."

It is fairly clear that if the electronic type of medical treatment develops much further, every doctor will have to become sufficiently expert in wireless methods to look down upon mere super-hets, neutrodynes, and the like.

M. A. L.

SIDELIGHTS ON THE SUPER CIRCUITS

The second and concluding article dealing with the principles of super circuits.

LITTLE further progress in the design of receivers with super circuits was made during the war period, apart from the design by Marius Latour of various types of multi-valve reflex circuits in which a valve detector was used in place of the crystal. The advent of broadcasting, however, caused a keen revival of interest in dual amplification. At a time when valves were an expensive luxury, the use of reflex meant a considerable saving in the number of amplifying stages required to cover a given range, or to operate a loud-speaker. As a result many detail improvements were effected, chiefly with the object of improving stability and making the circuit less difficult to handle.

The Voigt Circuit

Fig. 3 shows one arrangement, due to Mr. Voigt, in which no low-frequency transformer is required, thus eliminating one of the most expensive of the circuit components. The amplified radio-frequency currents are transferred to the crystal K across an air-cored H.F. transformer T. The rectified currents from the crystal are fed back across a condenser M, which is inserted directly in the grid circuit so as to apply corresponding L.F. variations between the grid and filament of the valve as before.

The Armstrong Reflex

Fig. 4 represents a one-valve reflex circuit due to Professor Armstrong. In this case advantage is taken of the fact that H.F. currents (as well as rectified cur-

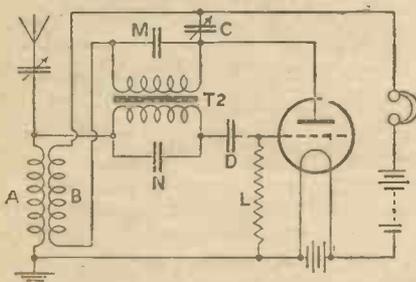


Fig. 4.—The Armstrong Reflex Circuit.

rents) are always present in the output circuit of a detector valve. By using the H.F. currents as a means of introducing ordinary retroaction, and at the same time feeding back the low-frequency components to the grid circuit for reamplification, the efficiency of a single detector valve can be greatly increased.

The valve acts normally as a detector by virtue of the grid condenser D and high-resistance leak L. The tuned-plate

circuit comprises an inductance coil B and variable condenser C, and also the primary of an L.F. transformer T₂, the secondary of which is inserted directly in

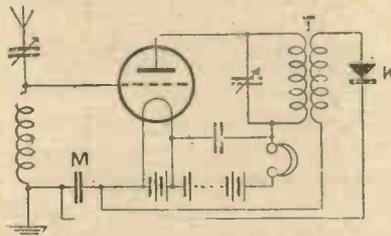


Fig. 3.—The Voigt Circuit.

the grid circuit. By-passing condensers M, N shunt the windings of the L.F. transformer in order to give free passage to the radio-frequency currents.

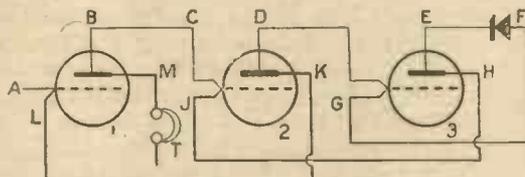


Fig. 6.—The Grimes Inverse Feed-back Circuit.

Ordinary reaction takes place between the H.F. currents in the coil B and those in the aerial or grid coil A, whilst there is a simultaneous feed-back of the rectified currents across the transformer T₂ for further amplification.

The Round Feed-back

Fig. 5 shows an interesting variation in the standard method of feed-back, attributed to Captain Round. Instead of feeding both the high- and low-frequency currents to the grid in series, the different currents are applied in parallel through separate paths.

Incoming energy from the aerial reaches the grid via the condenser C, a choke coil S being inserted as shown across the grid and filament. This prevents the passage of radio-frequency currents, so that the coil A is not short-circuited. The rectified currents from the crystal K are fed across the transformer T₂ as usual, but cannot reach the grid via the coil A, as before, because that passage is now blocked by the condenser C. Instead they flow through the choke coil S, which offers very little resistance to their passage, and so reach the grid by a separate path from that traversed by the high-frequency input. The parallel-feed method has proved very useful as a means of stabilising the circuit by preventing leakage interaction, and consequently low-frequency "noises."

The Grimes Inverse Feed-back

One of the latest improvements in reflex circuits is that known as the Grimes "inverse feed-back" illustrated diagrammatically in Fig. 6. When several valves are used in series, each carrying a simultaneous load of high- and low-frequency currents, it is obvious that where the direction of travel through the set is the same for both frequencies (from left to right) the valves at the right-hand end of the receiver will be overloaded relatively to those at the left-hand end.

In order to avoid this defect the low-frequency sequence is reversed relatively to that of the high-frequency currents. For instance, the radio-frequency currents follow the path ABCDE, passing through the valves in the order 1, 2, 3, as usual. The rectified currents from the detector K, on the other hand, are led back through the valves in the order 3, 2, 1, following the path FGHJKLM, the telephones T being located in the plate circuit of the valve 1, as shown.

B. A. R.

THE AERIAL WIRE

IF your aerial has been up for a year or more the surface of the wire has in all probability corroded, due to the action of the weather, and as radio-frequency currents travel on the surface of the wire, loss of signal strength may often be due to this corrosion.

This trouble is particularly prevalent in

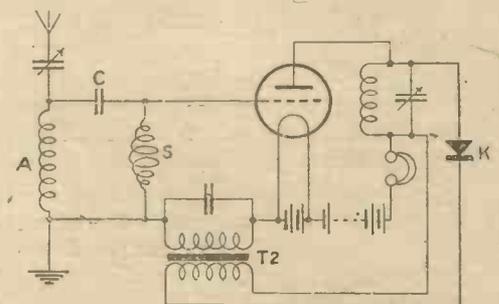


Fig. 5.—The Round Feed-back Circuit.

large cities where the air is contaminated by soot and fumes from manufacturing plant. It is, of course, desirable to keep the wire in quite a clean condition always, but this would necessitate a clean-up at least weekly.

The use of enamelled wire for the aerial is therefore highly desirable, as the enamel protects the surface of the copper from gases and other corrosive elements in the atmosphere.

S. J. M.



THE Copenhagen broadcasting station has installed a relay plant on board the ss. *Aalborgus*, which retransmits the main station's 775-metre transmissions on 445 metres. This novel relay station operates on Tuesdays, Thursdays and Saturdays, when the vessel is lying in Aalborg harbour.

5XX is being received on the other side of the Atlantic well enough to relay, and an early attempt to carry this out is to be made by the Radio Corporation of America.

Some idea of the weight of a broadcast transmitting aerial can be gained when it is stated that each of the insulators usually weighs 10 lb., while the swivel shackles, two in number, weigh 20 lb. each.

Scores of applications have been received by the B.B.C. from people who wish to become wireless inspectors.

The Transmitters' Section of the Bristol and District Radio Society has arranged to carry out various tests and experiments with a view to minimising the oscillation nuisance in Bristol and district.

When the aerial of 5IT was lowered recently it was found that nearly an eighth of an inch of soot had collected on the insulators and wire.

Wireless programmes are to be relayed through a loud-speaker to a recreation room of the Storthing building for the entertainment of Norwegian M.P.'s while off duty.

A military band programme will be given on March 27 by the band of H.M. Grenadier Guards, the artistes being Miss Florence Holding (soprano), Miss Adelina Leon ('cellist), and Miss Leslie Elliott (entertainer at the piano).

Railwaymen at Nine Elms locomotive depot have given a three-valve wireless set to St. Thomas's Hospital as a thank-offering for the care bestowed on their comrades when in hospital.

Lieut.-Colonel Moore-Brabazon, M.C., Parliamentary Secretary to the Ministry of Transport, has installed a two-valve set, with an inside aerial, in his room at the House of Commons.

"The Roosters" will broadcast a series of cameos on March 23. In the last half-hour's programme, commencing at 10 p.m., the orchestral items will be separated by a group of original Cockney sketches given by Miss Mabel Constanduros.

The British Broadcasting Co. warns the

public that persons representing themselves to be B.B.C. inspectors are calling on owners of receiving sets and attempting to get possession of the sets on various pretexts.

The German authorities are losing close on 6,000,000 marks a year owing to the large number of unlicensed receivers.

A member of the Wireless Retailers' Association states that if the trade got a free hand they could have a broadcasting station erected in the Free State before next September.

The Bishop of Southwark says that listening to broadcast religious services will never take the place of worship within a church.

The Universala Esperantista Asocio (International Esperanto Association) has decided to build its own broadcasting station in Geneva. The total cost—a matter of some 90,000 Swiss francs—has been almost entirely subscribed by members of the association.

Belgian wireless experimenters are up in arms against the post and telegraph authorities, who have stated their intention to tax low-power transmitters to the extent of 300 francs per annum. The Belgian amateurs have combined to lodge a protest in view of the fact that their French colleagues are only asked to pay 100 francs yearly for the same type of licence.

Arrangements are being made to increase the power of the Hamburg station to 9 kilowatts.

The first hour of the programme from 5XX on March 19 will be given by Robert Carr and his "Georgians" concert party. Part of the Hallé concert from the Free Trade Hall, Manchester, will be relayed at 8.30 p.m.

The new Algerian broadcasting station, which is being erected at Bouzareah (in the neighbourhood of Algiers) will be ready for tests in the course of a few weeks. The wavelength has not yet been fixed, and tests will be made on lengths varying between 300 and 450 metres. This station will broadcast local programmes from its own studio in Algiers.

During the course of a trunk call between Perth and Dundee recently the conversation was interrupted by what the Dundee man thought was singing outside the other speaker's door, while at Perth it was believed a gramophone was playing at the Dundee end. It was ultimately dis-

covered that the music was a broadcast item from the Glasgow studio.

Questions have been asked in Parliament as to whether detailed financial accounts of the B.B.C. will be published showing the number and salaries of the staff employed, the number and remuneration of the artistes employed, and generally how the income of the company has been expended.

Mr. Ammon is to ask the Postmaster-General in Parliament whether he has any evidence that the British Broadcasting Company is overstaffed, and if he will state the full details and remuneration of the staff employed.

The second reading of the Wireless Telegraphy and Signalling Bill has been postponed until after Easter to enable the Post Office authorities to confer with the interests concerned, with a view to revision of the Bill's terms.

Electrical engineers are engaged in wiring up in St. Mary's Church, Nottingham, the necessary apparatus for broadcasting. The first service will be relayed from the church at 8.15 p.m. on March 29.

Transmitting station U1AVY, belonging to Mr. G. D. Rogers, of New Bedford (Mass.), has received in broad daylight signals transmitted from Castres (Tarn) by M. Sacazes on wavelengths of 100 and 47 metres.

PTT, Paris (450 metres), began an Esperanto course on March 12.

The St. Malo fishing fleet, which goes to Newfoundland waters, has three ships fitted with wireless this year. Last year only one vessel was equipped with wireless apparatus.

Radiopol, the Warsaw broadcasting station, is now testing daily on 375 metres between 17.00 and 18.00 G.M.T.

Broadcasting stations are being erected at Kovno (Lithuania) and at Riga (Lettland).

The East Fife Musical Association has presented a four-valve receiving set with loud-speaker to the inmates of Thornton Poorhouse.

A Gecophone three-valve cabinet-deluxe model receiving set, complete with loud-speaker and frame aerial, has been supplied to H.R.H. the Crown Princess of Roumania. This set was used to entertain Her Royal Highness whilst on a visit to London.

De Groot and the Piccadilly Orchestra have for months retained a wonderful popularity in evening programmes. Their programme for the afternoon of March 22 will therefore be anticipated with exceptional interest; it will provide items all of which have been specially requested by many listeners, including the "Rosenkavalier" Waltz, the Fantasy from *Manon*, an effective selection of Russian folk tunes, Liszt's "Liebestraum," and finally Liddle's "Abide with me."

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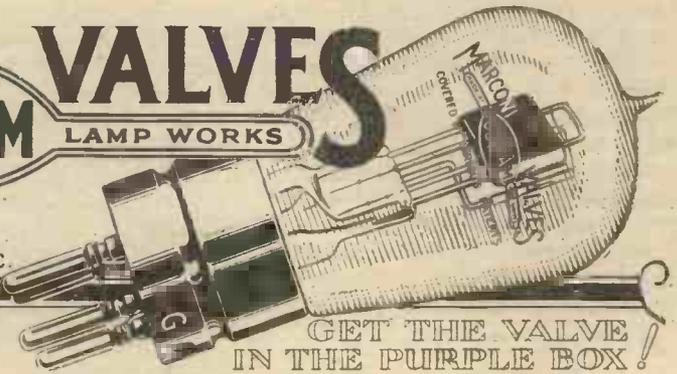
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Pipless Valves

SIR,—With reference to the remarks by THERMION on page 397 of No. 144, we would like to point out that we have been manufacturers of pipless valves for the past five months. These are the B₃ and B₅ types. Up to the present our B₄, B₆ and B₇ valves have not been made pipless.—BRITISH THOMSON-HOUSTON CO., LTD. (London, W.C.2).

Amateur Transmission

SIR,—The Postmaster-General's attention has been called to the articles in AMATEUR WIRELESS entitled "Transmission Step by Step," number one of which appeared in the issue dated February 21. He is advised that the use of a buzzer transmitter in the way suggested would undoubtedly cause serious interference for some distance around the neighbourhood in which it was being operated, even when unconnected with an aerial, and that more serious interference would result from any attempt of an experimenter to connect the apparatus with an aerial in accordance with the diagrams of the article.

The author of the article also appears to be under the misapprehension that spark transmission is permissible on a wavelength of 440 metres outside broadcasting hours; and he proposes to describe a simple spark transmitter in a later issue. I am therefore to point out that the use of spark transmission is strictly forbidden at any time under all Post Office experimental licences.

In all the circumstances I am to ask, in the general interests of the large body of users of wireless apparatus, that the facts may be explained in an early issue of the journal and the readers warned also that a receiving licence does not cover the use of wireless-sending apparatus in any shape or form.—F. W. PHILLIPS, General Post Office, London.

SIR,—With reference to the letter from the General Post Office, dated March 7, 1925, which you submitted to me as the writer of the article, I note that the Postmaster-General is advised that the use of a buzzer wavemeter circuit would undoubtedly cause serious interference.

I have no comments to offer on this paragraph except to say that so far as my knowledge goes my own buzzer wavemeter cannot be heard on a three-valve set stationed ten yards away, and I cannot see that the P.M.G. has any jurisdiction

over the use of a buzzer wavemeter, which was one of the circuits referred to, if such is suggested.

As regards the second paragraph, nothing in these articles should be read as an incitement to transmit messages by wireless telegraphy without first applying to the Postmaster-General for permission so to do. The Wireless Telegraphy Act of 1904, paragraph 2, section 1, lays down that "where the applicant for a licence proves to the satisfaction of the Postmaster-General that the sole object of obtaining the licence is to enable him to conduct experiments in wireless telegraphy, a licence for the purpose shall be granted subject to such terms, conditions and restrictions as the Postmaster-General may think proper. . . ." It is maintained by many experimenters that there is a field still existing for useful experiments in spark transmission, especially on short waves, and it seems that should the applicant prove to the P.M.G. that such a field exists, the P.M.G. has no alternative but to issue the required licence.

My observations concerning transmission after broadcast hours were prompted by consideration for broadcast listeners, the wavelength of 440 metres being that allocated by the P.M.G. for experimental transmission outside broadcast hours.—A. J. C. (London).

"Seeing Music"

SIR,—In No. 144 E. E. H. takes exception to my original letter under the above heading in No. 141, and states: "It is perfectly obvious that the needle of a milliammeter in the H.T. lead of a L.F. amplifier would fluctuate. If there were no fluctuations no signals would be heard, as it is the variation in the steady plate current that affects the telephone diaphragm."

May I be allowed to point out that when voltage variations of speech or music frequencies are impressed on the grid of a valve they produce a variation in the normal anode current. If this anode current variation is confined to the straight portion of the characteristic of the valve it will be in linear ratio to the applied grid voltage. The milliammeter is a D.C. instrument, and is not therefore responsive to current variations of such frequencies. If, however, the applied grid volts due to the signal are of such values that the anode current is brought to the curved portion of the characteristic, a rectifying effect is produced and a movement of the

needle of the milliammeter may occur. In addition to this rectifying effect, the conditions governing this deflection are, of course, very largely those of the amplitude, the time period of the grid-volts swing, and both the inertia of the moving system of the instrument and the artificial damping.—C. E. W. (Parkstone).

SIR,—I am surprised to see in your columns (Correspondence, page 412, No. 144), under the heading "Seeing Music," that in these enlightened days people think that the reading of a milliammeter in the H.T. lead of an L.F. amplifier would fluctuate with speech or music. It is, or should be, well known that speech or music in electrical terms consists of alternating currents of various frequencies, and an ordinary direct-current milliammeter does not respond to alternating currents.

It is a criterion of linear amplification by valves that the D.C. or mean plate current should not vary when an alternating current is superimposed upon it.

I should like to point out that in our broadcasting stations we use, on the average, ten stages of L.F. magnification. We have meters in the various circuits, and under proper conditions there is not a flicker on these needles.—P. P. ECKERSLEY.

[This correspondence is now closed.—Ed.]

A New Peruvian Station

SIR,—As it will be of interest to your numerous readers, I enclose a cutting from the *West Coast Leader*, Lima, Peru, regarding the new broadcasting station there (OAB) which will commence operations this month.

Some of your readers will doubtless like to try to pick up the programmes from this new station, and on this point I would mention that Lima time is five hours behind Greenwich.—F. C. S. (London, S.W.).

[The wavelength of the new station is 360 metres, and the station is the property of the Peruvian Broadcasting Co., which has been granted a concession by the Peruvian Government.—Ed.]

Other Correspondence Summarised

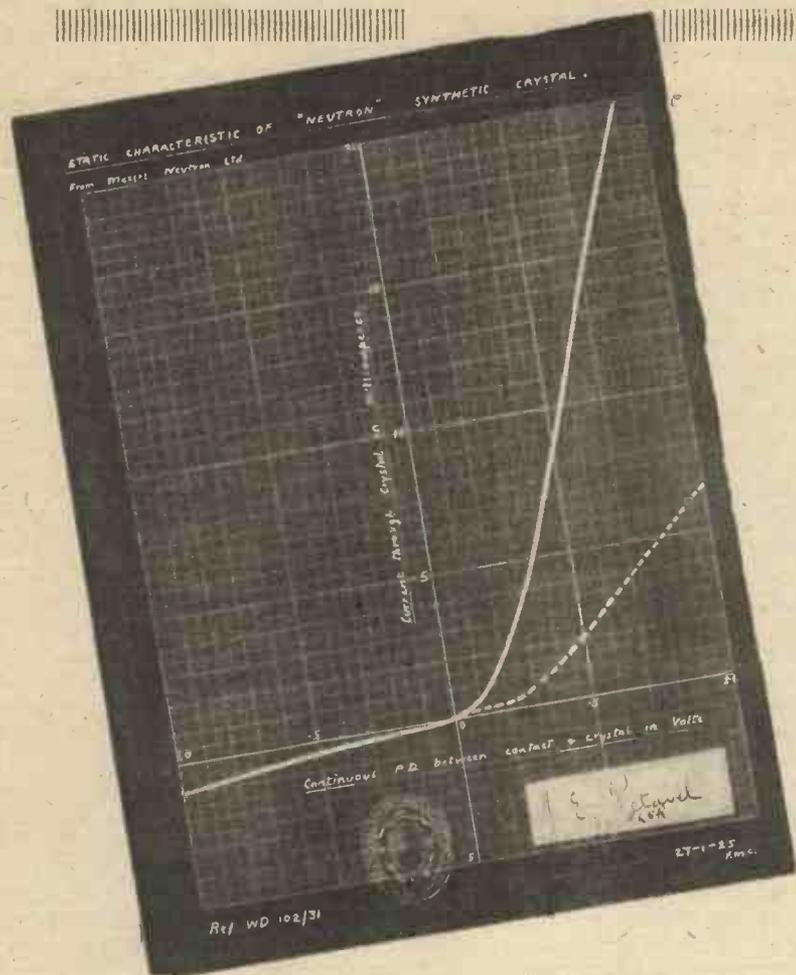
H. W. T. (Mildmay Park) would like to make known the kind treatment he received from the Cossor Valve Co., Ltd., of Highbury. His faulty P₂ valve was immediately replaced.

J. H. S. (East Sheen) writes us that reception in his district is completely spoilt by the oscillation fiend.

J. A. P. (Heme Hill) regularly receives W.P.G.

W. J. H. (Ulster) has received all the main B.B.C. stations and fifteen Continental stations on his two-valve set.

A. C. (Bolton) considers that the unequal conductivity of the earth is responsible for a great deal of the variation in broadcast reception.



THIS is a photographic reproduction of a curve supplied by the National Physical Laboratory, Teddington—part of a complete report, the other sections of which will be published from time to time. The only addition made to this photograph is the DOTTED curve, which is explained below.

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"A TALK WITH CAPT. ECKERSLEY" (continued from page 482)
 ception of each of our stations in turn. The solution of the problem lies in the 'superhet,' and I think the public will soon realise that more selective receivers are desirable."

Daventry

"What power do you hope to get from the new Daventry station?"

"Twenty-five kilowatts. This will cover quite an appreciable range, and should add greatly to the reception by crystal sets in districts somewhat remote from a main or relay station. We shall not do away with our relays, even should we eventually increase the power of our main stations. The relays have local interests, and in any case we do not aim at one programme for the United Kingdom."

"What are your views regarding the relaying of Continental programmes? Some of the foreign stations have officially stated that this would be an accomplished fact in the very near future."

"When foreign engineers have called here to study our organisation this matter has frequently cropped up, and in every instance I have stated my willingness to make the necessary experiments. On the other hand, I consider that they are somewhat too optimistic as to the success of the results in the present circumstances. Relaying is certainly possible, as we have already proved; but there is considerable interference on this side from morse

stations, one of which—I will not mention names—is particularly troublesome. In some instances it can, and has, wiped out our reception entirely, and until some improvement has been made in this respect the trouble will persist. We shall persevere in our efforts, and I have no doubt that at some period—it may be early, it may be remote—it will be possible for the possessor of a crystal set to hear concerts from Vienna, Stockholm, Madrid, Rome or elsewhere, on one and the same evening, through the local station. But when I cannot definitely say."

"When Daventry is opened will you retain the same wavelength?"

Captain Eckersley gave me just one look.

"I fought for the 1,600 metres for quite a long time, and now I've got it I intend to keep it, if I possibly can."

"What about Radio-Paris and the interference from Chelmsford?"

"I deeply regret it. I have never desired to spoil the reception of that station on this side."

"There is a question of Radio-Paris reducing its wavelength to 1,125 metres owing to incessant morse interference from PCH (Scheveningen). How would this affect matters?"

"It would be all to the good. You really must excuse me now. I—"

"You've been very good," I graciously replied as I withdrew the three chairs. "Just one more question. Are you in love with your new 'opening note,' a noise

which resembles the tuning of a very 'tinkly' piano?"

"No, and we are seeking something better. It has its advantages, as it allows the listener to tune his receiver and adjust his loud-speaker."

"It is hardly worthy of 2 L O, and not in keeping with Big Ben," I continued.

"Let your readers submit suggestions," replied Captain Eckersley, rising to show me the way out. "I will consider any practical idea."
 JAY COOTE.

SCHOOLS RADIO SOCIETY

THE Schools Radio Society has decided to hold an exhibition of wireless work in schools, at some date to be decided later on, in the hall of the Beaufoy Institute, London. Members of the society will exhibit apparatus, and it has been decided to extend an invitation to all L.C.C. schools and technical institutes interested in the scheme.

The object is to acquaint educationalists and the public who are interested in the work which is now carried on in schools.

The exhibition will probably be opened by some prominent authority in the wireless world. A prize of five guineas has been offered for the best show of school radio apparatus.

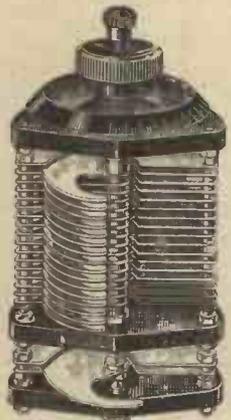
It is hoped that the result of this exhibition will be an increased interest in the whole subject of wireless as part of the school curriculum.

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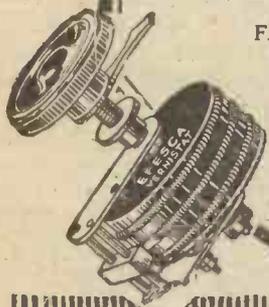
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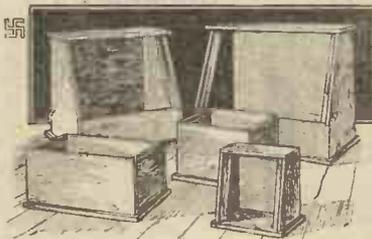
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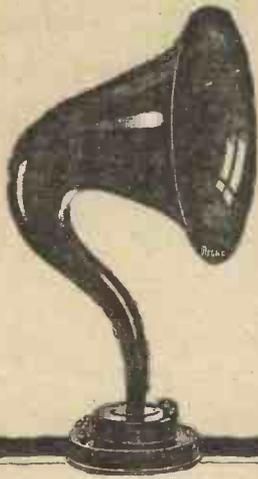
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Brown

Wireless Apparatus

Gilbert Ad. 2485.



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. Tues. and Thurs. 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** (511), 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), 326 m. **Plymouth** (5PY), 335 m. **Sheffield** (6FL), 301 m. **Stoke-on-Trent** (6ST), 306 m. **Swansea** (5SX), 481 m. **Chelmsford** (high-power station), 1,600 m.

Experimental transmission every Monday at 10-30 p.m. from one or other main or relay station.

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 (Radio Wien), 530 m. (1 kw.). Daily: 08.00, markets (exc. Sun.); 10.00, con.; 12.05, time sig.; 12.20, weather; 14.30, Stock Ex. (exc. Sun.); 15.00, news, con.; 15.10, children (Wed.); 17.00, lec. (Tues., Wed., Thurs., Sat.), children (Mon., Fri.); 17.20, women (Tues.); 18.00, news, weather; 19.00, time sig., con., news; 21.00, dance (Wed., Sat.).
Graz (relay), 404 m. Testing.

BELGIUM.

Brussels, 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) (250 w.), 1,100 m. (250 w.). 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), 1,180 m. (1 kw.). Weekdays: 13.00, Stock Ex., weather, news; 17.30, con. (Thurs.); 09.00, con. (Sun.).

Strasnice 430 m. (1 kw.). Testing.

DENMARK.

Copenhagen (Kjobenhavns Radiofoni station), 475 m. (1 kw.). 18.35, notices, lec., con.* (Tues., Thurs., Sat.). * This con. is also relayed by the Aalborgshus ship station on 510 m.

Lyngby (OXE), 2,400 m. and 2,700 m. Weekdays: 18.20, news, Stock Ex. (2,700 m.); 20.00 and 21.00, news, weather, time sig. (2,400 m.). Sundays: 15.00 and 20.00, news (2,400 m.).

Ryvang, 1,025 m. (1 kw.). 19.00, con., news (Tues., Wed., Thurs., Fri.).

FRANCE.

Elfe 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); 18.45, Paris fashions (in English)—temp—(Wed. and Sat.); 19.00, weather; 20.30, con. relayed from PTT (Fri.); 22.10, weather (exc. Sun.). Frequent tests on 1,500 m.

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

Radio-Paris (SFR), 1,780 m. (3-4 kw.). Sundays: 12.45, orch.; 13.45, news; 16.45, con.; 20.30, news, &c.; 21.00, dance music. Weekdays: 12.30, orch.; 20.00, Stock Ex., news; 16.30, markets, Stock Ex., con.; 17.45, Stock Ex., news, women; 20.50, con.; 21.00, time sig.; dance (Thurs.). Tests probable on 1,125 m.

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.).

Lyon (Radio Sud-Est), 87 and 440 m. Testing.

GERMANY.

Berlin (2), 505 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.

Königswusterhausen (LP), 2,450 m. (5 kw.). **Wolff's Buro. Press Service:** 06.00, 20.00, 2,900 m. (5 kw.); 10.30, con. (Sun.), Esperanto lec. 3,150 m.; **Telegraphen Union**, 06.45-18.45, news, 4,000 m. (10 kw.); **News**, 06.00-20.00 (daily).

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

Breslau, 418 m. (1½ kw.). 10.15, Stock Ex., weather; 11.00, factory con. (weekdays), sacred con. (Sun.); 11.55 (Sun.), time sig., weather, Stock Ex.; 14.00, news (weekdays); 15.00, children (Sun.); 16.00, orch., children (Fri.); 16.45, con. (Sat.); 17.00, shorthand (Sat.); 18.00, Esperanto (Mon.), Engl. (Thurs.), lec. (other days); 19.00, con., weather, time sig.; news; 20.30, dance (Sun.); 21.15 (Mon.).

Cassel, 288 m. (1½ kw.). Relay from Frankfurt.

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

Eberswalde (Lorenz Co.), 280 m. Testing daily about 22.30.

Frankfurt-on-Maln, 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.); 18.00, lec. (daily), shorthand (Wed.), Esperanto (Fri.); 18.30, educat. hour; 19.00, lec., Engl. (Mon.); 19.30, con. (daily), jazz band (Fri.); 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., chess; 12.00, con., lec.; 16.00, children; 17.00, 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.; 12.20, Engl. (Wed.); 14.00, political news, markets; 15.00, women; 15.30, lec., Esperanto (Mon.); 16.05, orch.; 17.00, con., lec.; 18.25, lec., Engl. conv. (Tues. and Fri.), Spanish

(Continued on page 496)

Louden Valves



THE Louden Dull-Emmitter at 13/6 combines the undoubted economical upkeep of the Dull-Emmitter, the low initial cost of the ordinary "bright" valve, and the Silver Clear qualities common to all Loudens.

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Amplification.

Filament Volts 4—5
Filament Amps 0.1

Price 13/6



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

"BROADCAST TELEPHONY" (cont. from page 494)
(Mon. and Thur.); 19.00, weather, con. or opera; 21.00, weather, markets, news; 21.50, news (in English), dance (not daily). Will shortly be increased to 9 kw.

Hanover, 296 m. (1½ kw.). Relay from Hamburg. Also own con., 16.00.

Königsberg, 463 m. (1 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. (700 w.). 07.30, 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). Will shortly be increased to 5 kw.

Münich, 485 m. (1 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.).

Munster, 410 m. (1½ kw.). 11.00, sacred con., news (Sun.); 11.30, news (other days); 11.55, time sig.; 14.30, markets; 15.30, 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.).

Nuremberg, 340 m. (800 w.). Relay from Munich.

Stuttgart, 443 m. (1 kw.). 06.30, time sig., weather (weekdays); 10.30, con. (Sun.); 15.00, time sig., con., news (Sun.), children (Sat.);

16.45, children (Wed.); 18.30, lec. (weekdays); 19.00, con. (daily); 20.15, time sig.; 22.00, weather, news, dance (Sun.). Will shortly be increased to 6 kw.

FINLAND.

Haelsinki, 400 m. (temporary w.l.). Testing daily.

HOLLAND.

Amsterdam (PCFF), 2,125 m. (1 kw.). Daily: 07.55-16.10 (exc. Mon. and Sat., when 10.10-11.10), news, Stock Ex. (PX9), 1,070 m. (400 w.): con., 20.40 (Mon.). (PA5), 1,050 m. 19.40, con. (Wed.).

Hilversum (HDO), 1,090 m. (2½ kw.). 17.40, children (Mon.); 19.40, lec. (Fri.); 19.40, con. (Sun.), relay of Mendelberg orch. (Thurs.); con. (Sun.); 19.55, Radio talk (Wed.); 21.40, lec. (Sun.).

Bloemendaal, about 345 m., 09.40 and 16.40, sacred service (Sun.).

HUNGARY.

Buda-Pesth (1½ kw.). Testing shortly.

ITALY.

Rome (IRO), 425 m. (3 kw.). Weekdays: 16.00, orch., Stock Ex.; 19.30, time sig., news, con.; 20.15, news, Stock Ex., con.; 21.10, dance, weather. Sundays: 09.30, sacred con.; 15.45, children, Stock Ex.; 16.15, orch.; 16.45, jazz band, con., dance.

Milau, 650 m. (temp. W.L.). Testing shortly.

JUGO-SLAVIA.

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

NORWAY.

Oslo, 320 m. (500 w.). Testing, daily; about 19.30.

POLAND.

Warsaw (Radiopol), 385 m. (1 kw.). 17.00, tests.

RUSSIA.

Moscow (Central Wireless Station), 1,450 m. Sundays: 12.45, lec.; 15.30, news and con. Weekdays: 13.00, markets; 15.30, news or con. (**Sokolniki Station**), 1,010 m. Sundays: 14.30, con.; 17.00, lec. and con. (Tues, Thurs., Fri.). (**Trades Union Council Station**), 450 m. 17.00, con. (Mon., Wed.).

SPAIN.

Madrid (Radio-Iberica) (3 kw.), 392 m. 12.30, news, talks (weekdays only); 22.00, weather, Stock Ex., time sig., con., news.

Barcelona (EAJ1), 325 m. 18.00, lec., Stock Ex. markets, con. or relay of opera; 20.30, news and con.

Seville (EAJ5), 350 m. 18.30, lec., con., news.

SWEDEN.

Stockholm (SASA), 430 m. (500 w.). Sundays: 09.55, sacred service; 16.00, children; sacred service; 19.00, con., news, weather. Weekdays: 11.30, weather, Stock Ex., time sig.; 18.00, lec. (irr.); 19.00, con., lec., news, weather.

Gothenburg (SASB), 290 m. (500 w.), also 700 m. 10.00, fishery reports (700 m.); 11.55, time sig.; 19.00,* programme s.b. from Stockholm.

Malmö (SASC), 270 m. 11.00, weather; 19.00,* programme s.b. from Stockholm.

Boden (SASE), 1,200 m. 18.00, con. (Tues., Fri., Sun.).

* Local programmes are also broadcast at times.

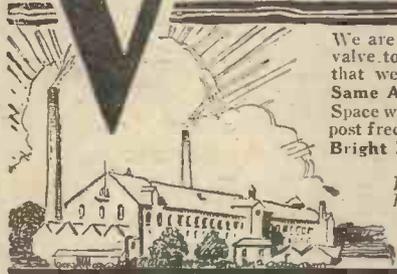
Sundsvall (SASD), 450 m. (500 w.). Testing.

SWITZERLAND.

Geneva (HB1), 1,100 m. (500 w.). 13.15, lec. No Sun. transmissions.

(Continued at bottom of third column on page 498)

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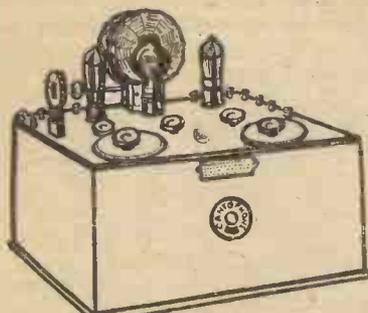
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4v-40a .. 17/-	4v-100a .. 32/8	6v-80a .. 40/-
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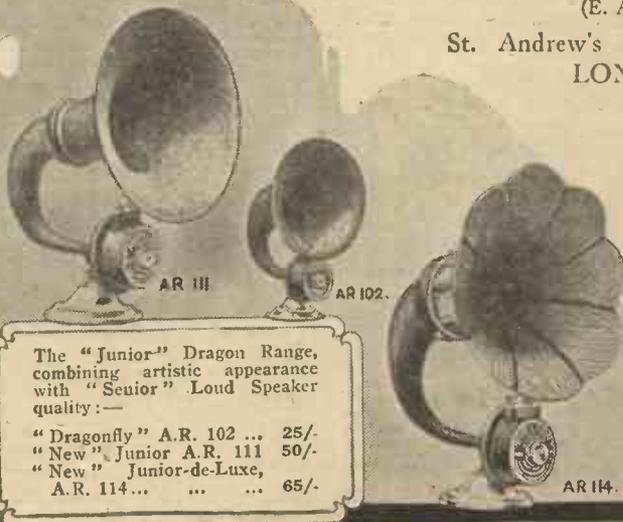
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AR 114.

WIRELESS IN PARLIAMENT



From Our Own Correspondent.

IN reply to a question by Mr. Stephen Mitchell, Sir William Mitchell-Thomson, the Postmaster-General, stated that there was no intention to place obstacles in the way of useful experiments in wireless telegraphy, and some 2,200 licences for the use of wireless apparatus for experimental purposes were now in force. It was the practice to give permission to qualified experimenters to undertake wireless telegraph experiments in coal mines, provided that the consent of the authorities responsible for the safety of the mines was obtained.

The high-power wireless station at Rugby is, according to a statement made by Sir Wm. Mitchell-Thomson, expected to be completed in about eight months' time. A smaller station for communication on the beam system with a similar station in Canada is expected to be completed in September or October next. Permission had been given to the Marconi Company for the erection of a group of beam stations near Dorchester for communication with the United States and with South America, but the terms of the licence to be granted for the stations were still under discussion with the company.

In reply to a question by Lieutenant Commander Kenworthy, who suggested that the wireless licence fee might be paid quarterly or half-yearly, Lord Wolmer, the Assistant Postmaster-General, said that there were at present 1,200,000 licences, and the cost of collecting and accounting for the fees and securing the renewal of licences is already considerable. The introduction of a system of half-yearly payments of 5s., or quarterly payments of 2s. 6d., would practically double or quadruple this work, and the additional expense involved would be out of proportion to the benefit derived by the public.

"A Distortionless Loud-speaker Set."
With reference to this article in No. 144, it should be noted that the coil converted for reception of 5XX was a No. 200 Igranic, and not a No. 250 coil as stated.

The new broadcasting station in course of erection at San Sebastian (Spain) will work with a power of 500 watts.

"BROADCAST TELEPHONY" (cont. from page 496)

Lausanne (HB2), 850 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), 515 m. (500 w.). 11.00, weather; 11.55, time sig., weather, news, Stock Ex.; 15.00, con. (exc. Sun.); 17.15, children (Mon., Wed., Thurs., Sat.); 18.00, weather, news (exc. Sun.); 19.15, lec., con., dance (Fri.); 20.45, news.

"Building a Portable Workshop" is the title of an article appearing in the current issue of "The Amateur Mechanic and Work" (3d.), and describes a structure that is also suitable for the storage of bicycles, etc. Other articles appearing in the same number are: "On the Proper Way of Doing a Job," "A Garden Seed-frame and Plant Protector," "Our Small Car Page," "An Efficient Crystal Receiver Made in Two Hours," "Helpful Notes on Keeping the Wireless Set in Good Condition," "An Anti-tampering Switch," "A Variometer for the Crystal Set," "Notes by the Way," "A Mincer for Marmalade Making," "Making Money by Inventing," "Practical Photography: Getting Ready for the Spring," "Motor-cycle Practicalities," "Pip Lamps for Country Dwellers."

Mr. T. W. MacCallum, professor at the University of Vienna, will broadcast a course of English lectures from the Radio Wien station every Monday and Wednesday at 18.45 G.M.T.

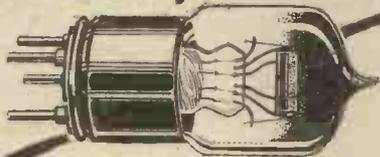
The Prague broadcasting station is now connected by landline to the National Theatre.

Finland has under construction a new broadcasting station to work with a power of 20 k.w.

Two further relay stations are under construction in Germany: at Kiel, to serve Schleswig-Holstein, and Dortmund, for the Ruhr district.



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DON'T scrap your burnt-out valves—send them to us for repair. Our valve renewal plant is of the very latest type, and process employed ensures a high vacuum.

We guarantee to return your valves equal to new and to function at the maker's voltage and consumption. Delivery in 7 days.

PRICE BRIGHT EMITTERS ONLY

6/6

WATSON, JONES & CO.,
VALVE REPAIR DEPOT, 6, ST. STEPHENS HOUSE,
VICTORIA EMBANKMENT, S.W.1

TRADE ENQUIRIES INVITED.

Please find enclosed 2 valves for repair... The last one I had repaired is working quite well both as H.F. and Detector. I will recommend your firm to all my friends. A. W. Walsall
I beg to acknowledge safe receipt of one M.O. valve... This is excellent treatment and I shall not fail to place your address with my wireless friends.
O. J. C. Brighton.

My repaired valve received... was tested on a 2 valve set working both as H.F. valve and detector... equally good as any other valve. I am highly satisfied and will recommend. E. C. S., B'ham.

Phone Victoria 7571

The Radio Mail

For sensitiveness
USE
Wuncell
Valves

Published periodically in the interest of Valve Users

A new type of Dull Emitter

Experts declare new Wuncell Dull Emitter likely to revolutionise Valve design

TO produce a Dull Emitter Valve which operates with a glow that is almost invisible in daylight is a feat that has just been accomplished by the London firm of A. C. Cossor Ltd. This new Valve—called the Wuncell because it requires only one cell to operate it—is certainly the nearest approach to the ideal of a "cold valve" that we have yet seen. Viewed under working conditions the filament could just be seen glowing in daylight, while in a dark room it could readily be likened to the embers of a dying match.

Asked to give some approximate idea of the actual temperature, a representative of the firm stated that, according to pyrometer tests, the reading was 800 degrees as against the 2,000 degrees required by Bright Emitters and even some types of Dull Emitters. For our benefit actual tests were made between the amount of heat (or light) generated by a Wuncell and other types of Valves. The differences were most marked, and demonstrated to the lay mind in a very striking manner that such a low filament temperature must mean a vastly increased life for the Valve.

The British Valve still the best

But it was on actual Broadcasting tests that this new Wuncell showed that, so far as this country is concerned, we have nothing to fear from Continental Valve manufacturers. For the purposes of demonstration a good four-Valve set was used. For the first Valve—which acted as a high-frequency amplifier—a Wuncell type W.2 was used, while for the last stage one of the new Wuncell Loud Speaker Valves was used as a power amplifier. The other two Valves were the standard W.1 Wuncells.

Connected to a fairly good aerial in North London, 2LO had to be considerably de-tuned even for three Valves in order to prevent "blasting" from the Loud Speaker, while with the fourth valve in operation every B.B.C. main station, with the exception of Cardiff, was brought in with incredible volume and exceptional purity. Cardiff

—owing to our close proximity to 2LO—could not be tuned in. The following Continental stations were also received at good Loud Speaker strength: Hilversum (a Dutch broadcasting station with call sign HDO), Bremen on 330 metres, Zurich, Radio Iberica of Madrid, and a further Continental station which could not be identified owing to "fading" but which corresponded in wave-length to Vienna.

Wuncells just as sensitive as Bright Emitter Valves

The result of these tests certainly demonstrated that the new Wuncell Valves are not one whit less sensitive than standard Bright Emitter Valves. Another remarkable feature of these Wuncell Valves was their complete freedom from microphonic noises. It has hitherto always been an inherent disadvantage of other dull emitters that even footsteps in the room or other slight vibrations are communicated to the Valve to cause ringing noises in the headphones or Loud Speaker. All the usual tests, such as tapping the table on which the receiver was placed, adjustments of the rheostats, etc., failed to produce the slightest suggestion of a microphonic noise.

We understand that the reason for this improvement is to be found in the special Wuncell method of mounting the filament. Instead of being supported between two electrodes, sprung apart to counteract expansion and contraction, its filament is arched (following standard Cossor practice) and supported at the centre by a third electrode. No doubt, too, the grid—cleverly designed and very rigid—is a contributory factor to this result.

Use Wuncells along with Bright Emitters in the same Set

We were most impressed, not only by the very neat appearance of the Wuncell, but with the vast amount of forethought and research work that must obviously have been put into its construction. For instance, because it was realised by the designers that

many multi-valve users would like to try out one Wuncell in conjunction with their ordinary Valves, a special base was designed. This base carries a resistance in series with the filament to permit the valve being used with either a 4- or 6-volt accumulator. Normally, of course, the Wuncell functions at rather less than 2 volts. This excellent idea gives any amateur a chance of trying out one of these new Dull Emitters and comparing its behaviour with the Bright Emitters he may be using. At any later date—by the use of a small screw—the resistance can be short-circuited and the Wuncell used at its correct current of 2 volts. It is worth while noting, too, that all Wuncell Valves are being supplied with the new black low-capacity base in which air only is used at the dielectric between the leads to the four valve legs.

Experts that have witnessed demonstrations of Wuncell valves have expressed their satisfaction at the production of a Dull Emitter which can compare most favourably with the best Bright Emitters. It has always been felt that hitherto a sacrifice of at least 20 per cent. in volume has been the price that must be paid to obtain the conveniences offered by Dull Emitters.

Valves to be in sealed boxes

One well-known manufacturer definitely decides to issue all future Valves in sealed cartons only

A move of the utmost importance has been made by A. C. Cossor Ltd.—the well-known British Valve manufacturers. They have decided that, in order to protect the public and to ensure their Valves being used in absolutely new condition, they are now sealing every Valve in its carton at the Works. Asked how it would be possible for the shopkeeper to be certain that he was selling a sound Cossor Valve, a member of the firm explained to a representative of the *Radio Mail* that this was a matter which had certainly presented some difficulties. Various methods had been carefully tried out, including sealing the legs of the Valves and other devices, but none had proved so satisfactory in practice as the method they were now adopting. This consists of wrapping the Valves in a very generous covering of cotton wool, after having first brought two copper wires from the filament legs to two studs on the end of the box. When a customer wants a Cossor Valve, these two brass contacts are placed in series with an electric flash-lamp battery and a bulb. If the filament should happen to be damaged, the circuit will not be complete and the lamp will not light. This test can be easily carried out without breaking the seal of the box by means of a very ingenious showcard, which we understand Cossor's are supplying free of charge to all Wireless dealers.

A prominent manufacturer of Broadcast Instruments emphatically endorsed this new idea. He agreed that it was a wise move that had been long awaited. The public, he declared, welcomed any method of purchasing usable accessories under a seal. In his opinion the Wireless dealer—while not shirking responsibility—considered that the manufacturer ought to take steps to see that his (the manufacturer's) responsibility ended only when the article reached the actual user.

How long should Valves last?

Many keen wireless amateurs get over twelve months' service

How long a Valve lasts depends very largely on how it is used. Some men can make their suits last very much longer than others—a little care and attention now and again will prevent creases forming and the material from losing its freshness. The same applies to Valve. For instance, how many amateurs know that the use of filament switches in a Receiving Set—although a great convenience—shorten the lives of the Valves very considerably. Rheostats should be used for the purpose of turning current on and off; to throw the full load on at the turn of a switch is to cause a sudden expansion of the wire used in the filament, and to switch off suddenly is to cause a sudden contraction. No Valves built can withstand such strains indefinitely.

Treat your Valves properly and you'll find they'll last very much longer. For instance, Mr. G. H. Hasauer, of 9 Galliard Road, writes as follows:—

"I think it is only right to testify to the excellence of Cossor Valves, more particularly as far as I am concerned the P.1. On December 1, 1923, I purchased two of these Valves and they have been going strong ever since, and are functioning well now.

They have been in use on an average of 2½ hours per day from date of purchase, which brings present life up to nearly 1,000 hours. How long they will last I cannot say—perhaps you can estimate. However, I shall certainly repeat a selection of Cossor P.1."

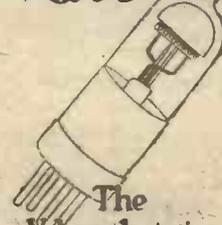
While Mr. J. Harris, of 13 Stepeny Bank, Newcastle-on-Tyne, thinks that sixteen months' regular service for one Cossor Valve is something of a record. Writing on January 27, 1925, he says:—

"In September of 1923 I purchased a P.1 Cossor Valve, and wish to state that it has given me excellent service until to-day. The Valve in question has never missed the Savoy Bands, nor Official News of the B.B.C. Total life of Valve, sixteen months. Perhaps there are others who can beat this record, but I, as an old user of Cossors, am perfectly satisfied."

Even this record would seem to be eclipsed by a Cossor P.1 which has been doing yeoman service every day for a period of 1,700 working hours on a One-Valve Reflex Set. The owner, Mr. Harold Cooper, of 8 Cotherstone Road, London, S.W. 2, expresses his satisfaction in these terms:—

"I should like to mention that I have used a Cossor No. V. 9132 in use since last September, and averaging at four hours per day (very moderate average for afternoons and evenings) it has given over 1,700 working hours and is still going strong, and therefore bears out conclusively all you claim in your advertisement: my circuit is One-Valve Crystal Reflex."

Cossor Valves



The Valves that give your Set that long distance feeling!

Gilbert Ad. 2479

Have you got down to the short waves yet?

Get ready for the new Broadcasting Stations operating on 100 metres or less

There's lots of enjoyment to be obtained from short-wave reception. If you can read Morse, you should certainly alter your set so that you can get down to 80 metres and under. Any evening will find scores of British amateurs corresponding with their friends across the seas. The most extraordinary thing about these short waves is their tremendous power of penetration. Using but very little power, amateurs can send messages immense distances. Incidentally, the tuning of short waves means

the use only of high-grade components and suitable Valves. How far American amateurs can send on short waves is a matter of conjecture—it is sufficient to say that signals have been received in this country without aerial or earth. In this connection, Mr. J. Gordon Richie, the well-known Glasgow experimenter, writes as follows:—

"10th December, 1924.

"Some time ago I wrote you concerning the excellent reception of American broadcasting obtained with two of your P.1 Valves. They have since demonstrated their capabilities in another way.

I am now using a Reinartz-type receiver on the very short waves of 80 metres and under, consisting of detector and one low-frequency, and during the past fortnight have logged 106 American amateurs, of which twenty were heard on one night without either aerial or earth. Either of my two 'Cossors', now almost two years old, are the only Valves I have got to oscillate below about 60 metres.

Considering the constant use and incidental knocking about to which these Valves have been subjected, I think this speaks highly for your products, and I am looking forward to a further period of their usefulness."

CHIEF EVENTS OF THE WEEK

SUNDAY, March 22.		
London	3.0	De Groot and the Piccadilly Orchestra.
London	9.0	Ballad Programme.
Birmingham	3.0	Classical Programme.
Cardiff	9.0	The Song of Miriam (Schubert)
Manchester and 5 X X	9.0	Wagner Programme by the B.N.O.C.
Glasgow	9.0	"Art in Italy."
MONDAY		
Bournemouth	8.0	Winter Gardens Programme.
Glasgow	7.30	"In Days of Old."
TUESDAY		
5 X X	7.30	Casano's Octet.
All Stations except 5 X X	7.30	A Ballad Opera, <i>The Red Pen</i> .
WEDNESDAY		
London and 5 X X	7.30	Popular Classics.
Birmingham	7.30	Operatic Programme.
Cardiff	7.30	Early Italian Opera.
Cardiff	8.30	A Few Welsh Favourites.
Manchester	7.30	Band of the Prince of Wales Volunteers.
Glasgow	7.30	"Where the West Begins."
Belfast	7.30	Symphony Concert.
THURSDAY		
5 X X	7.30	Chamber Music Evening.
Cardiff	7.35	An Hour with Beethoven.
Manchester	7.30	The Hallé Orchestra Pensions Fund Concert.
Aberdeen	7.35	Music and Drama.
FRIDAY		
London and 5 X X	7.30	Band of H.M. Grenadier Guards.
Birmingham	7.30	Ballad Programme.
Bournemouth	7.30	"Bournemouth Calling Belgium."
Cardiff	7.30	"A Night of Adventure."
Manchester	7.30	Symphony Concert.
Aberdeen	7.30	Brahms and Schumann.
Glasgow	8.0	John Ireland Recital.
SATURDAY		
Birmingham and 5 X X	7.30	Light Symphony Programme.
Newcastle	7.30	Music and Drama.
Aberdeen	7.30	The Barnardo Musical Boys.

TRADE NOTES

FROM Romac Motor Accessories, Ltd., 14-18, Bloomsbury Street, W.C.1, we have received a neat type of "Crawford" aerial earthing jack. Many other uses will suggest themselves to the users of this handy little plug and jack. We have also received an illustrated leaflet dealing with this component.

An illustrated catalogue of wireless sets and components has been sent us by the U.S. Radio Co., Ltd., 155, High Street, Lewisham, S.E.13.

From R. F. Winder, Cross Belgrave Street, Leeds, we have received an illustrated folder describing the Derwin battery carrier.

We are informed by the St. Helens Cable and Rubber Co., Ltd., that in order to give better service to their London customers it has been found necessary to install an extra telephone line in the London office (70, Petty France, Westminster, S.W.). This has meant changing over the telephone number to Franklin 6181 and 6182.

We are informed by J. H. Collie and Co., of 8, Harrington Street, Liverpool, that the retail price of the Chaslyn battery tester is 4s. each, and not 5s., as stated in a recent issue of AMATEUR WIRELESS.

Ripaults, Ltd., the well-known specialists in motor electrical components, are undertaking extensive addi-

tions to their works in order to deal with the demand for their wireless products.

A catalogue of Marconi valves at the reduced prices has been sent us by the Marconiphone Co., Ltd., Marconi House, Strand, W.C.2.

Constructors who are faced with the difficulty of fixing screws in awkward places may be interested to know that the use of the special Recess screws, manufactured by The Rawlplug Co., Ltd., Gloucester House, Cromwell Road, S.W.7, simplifies an otherwise awkward job.

The new Radio Association Handbook for 1925 will shortly be published, and may be obtained from the Secretary, The Radio Association, Sentinel House, Southampton Row, W.C.

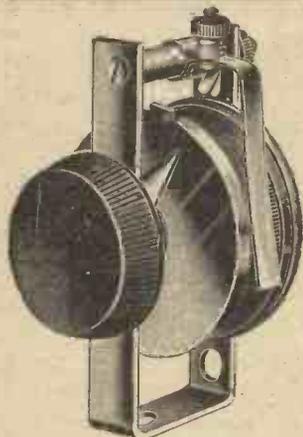
On March 24 will be given the first performance of a "sort of opera" in two acts entitled *The Red Pen*. This is by A. P. Herbert, the music being by Geoffrey Toye.

The annual Pensions Fund Concert of the Hallé Concert Society will be relayed from the Free Trade Hall, Manchester, on March 26.

Arrangements are being made in Germany to broadcast warnings to towns in danger of sudden floods.

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IGRANIC Filament Rheostat for D.E. Valves, 20-30 ohm.

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- HONEYCOMB DUOLATERAL COILS.
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All carry the IGRANIC guarantee.

Safety for Dull Emitter Valves

The sensitivity of the dull emitter valve calls for a resistance which is heat resisting and so does not allow a fluctuating resistance. Many are the Dull Emitter Valves whose lives have been prematurely cut off by the rheostat failing to remain constant. Don't let it happen to yours — fit Igranitic Dull Emitter Rheostats.

They are smoothly and evenly variable over their whole resistance range and afford very fine selectivity. Suitable for controlling up to four valves according to the type of valve used. Current carrying capacity 0.4 amp. Price, with screws and drilling template for panel mounting, either 20 or 30 ohms resistance ... 7/-.

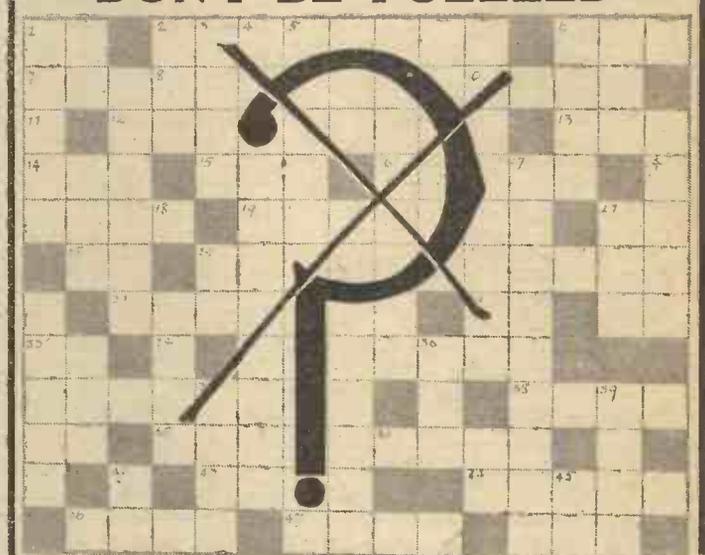
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Attached to every Bowyer-Lowe Square-Law Condenser is a little green tag which certifies the tested maximum capacity of the instrument. Why is it there?

It is a promise that the condenser you are buying will have a bigger wavelength range than any other obtainable anywhere. It tells you that this condenser obtains the square-law effect in a way that has remarkable results.

Bowyer-Lowe Square-Law Condensers do much more than make tuning easy. They have the lowest losses of any, and so give signals of unusual musical purity. They give increased wavelength range and enable you to separate stations which previously jammed.

Instal them, and you will find that they make your sets more responsive in every way because they are built with knowledge.

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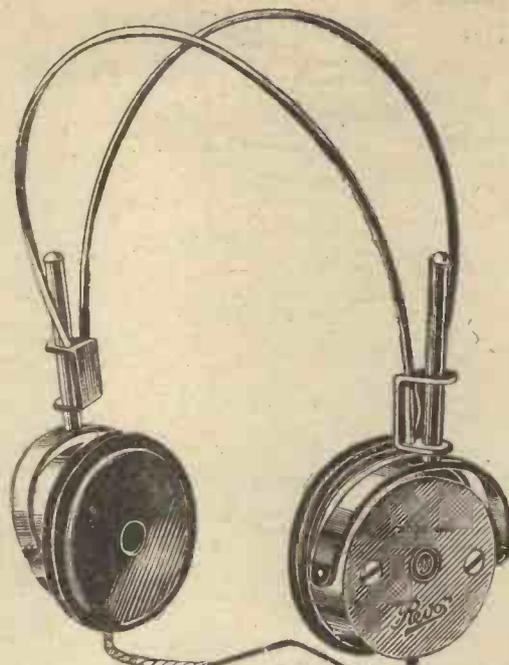
Including Dial, Drilling Template and 3 Calibration Charts.

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Send name and address with 1½d. stamp to cover postage for informative new Price List of all our TESTED LOW LOSS PARTS. They make responsive sets.

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THE guarantee on Revco Headphones is like the hall mark on Silver or "Sheffield" on steel. It's the outward sign of inward worth. Unsurpassed for sensitivity and clarity—whether on broadcast or morse reception.

No nipping, no heavy head pressure, just a gentle lightness hardly felt. Can be worn for hours. Just the telephone for the feminine listeners-in of your family. At all good agents. If unobtainable locally send us your nearest dealer's name.

Let us send you illustrated and informative literature descriptive of our loudspeakers, crystal and valve sets, amplifiers, etc.



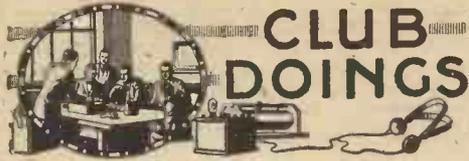
19/6

A worthy contemporary of Revco Headphones — the Revco Loudspeaker in three sizes, Senior, Junior and Baby: 80/-, 48/-, 25/- respectively. Like the Telephones are guaranteed for 12 months.

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“Revco”

“The Name for Perfect Radio”



Singapore Radio Society
Hon. Sec.—MR. B. C. WALTERS, 3, Malacca Street, Singapore.
 The above society has just been formed and new members will be welcomed. All particulars can be obtained from the secretary.

North Middlesex Wireless Club
Hon. Sec.—MR. H. A. GREEN, 109, Pellatt Grove, Wood Green, N.22.
 The annual general meeting was held on March 4 when the officers of the club presented their reports.

Coventry and District Co-operative Radio Society
Hon. Sec.—MR. A. CURTIS, West Orchard, Coventry.
 At the meeting held on March 4, a resolution of protest was carried against the "Search" clause in the new Wireless Telegraphy and Signalling Bill, and a copy will be sent to the local M.P., the P.M.G. and others. Mr. I. Oscar lectured on "How to Add One Stage of High Frequency and One Stage of Low Frequency to a One-valve Receiver."

Dublin Wireless Club
Hon. Sec.—MR. A. C. BRIDLE, 29, South Anne Street, Dublin.
 A MEETING was held on March 5 when Mr. J. C. Mangan delivered an instructive lecture on "The Use and Abuse of Reaction," in which he dealt with the various means of obtaining reaction, and pointed out the way of intelligently using reaction.

Colders Green and Hendon Radio Society
Hon. Sec.—MR. W. J. T. CREWE, "The Dawn," 111, Princes Park Avenue, N.W.11.
 ON March 4 Mr. Maitland, a representative of Messrs. L. McMichael, gave a lecture on high frequency amplification which was followed by a discussion.

Liverpool Co-operative Radio Association.
Hon. Sec.—MR. J. KEARNS, 107, Walton Breck Road, Anfield, Liverpool.
 At a recent lecture on radio transmission and amateur transmitters Mr. H. Hardy outlined the history of wireless transmission of signals, describing the open-aerial spark system, tuned spark

and coupled systems with quenched gaps. The I.C.W., C.W. and W/T tests were received on a four-valve set and loud-speaker 20 ft. from the transmitter, which was working on a dummy aerial.

Inland Revenue Radio Society
Hon. Sec.—MR. J. O. CLAXTON, 570, Salisbury House, E.C.2.
 The regular meeting was held on February 20, when the evening opened with Morse practice. Mr. M. A. Beeston, M.I.E.E., gave a lecture on the subject of induction and its application in regard to transformers, and Mr. A. H. Sheffield talked about "The Control Room at 2 L.O."

Ilford and District Radio Society
Hon. Sec.—MR. F. W. GEDGE, 157, High Road, Ilford.
 ON February 17 Mr. A. E. Gregory lectured on "Selective Circuits." He explained the properties of a selective receiver, mentioning all the circuit arrangements for ensuring selective reception, and discussed double-circuit tuning (including the Marconi multiple tuner), wave traps and rejector circuits.

Dublin Wireless Club
Hon. Sec.—MR. E. JACKSON, Redan Lodge, 188 Rathcar Road, Dublin.
 A MEETING was held on February 19 with Mr. T. H. Lurring in the chair. Comm. J. Smyth delivered a lecture on "Laboratory Experiments in Wireless," when he dealt with the calibration of a wavemeter.

Barnet and District Radio Society
Hon. Sec.—MR. J. NOKES, Sunnyside, Stapylton Road, Barnet.
 At the monthly meeting held on February 19 Mr. H. B. Gardner, Barnet's first amateur transmitter, gave an instructive talk on "Transmission." The secretary reported that he had drafted a letter to Col. Fremantle, M.P. for the St. Albans division, pointing out that certain clauses in the Wireless Bill, now before the House of Commons, were likely seriously to retard the progress of wireless and urging the revision of the Bill. The letter was approved.

ANNOUNCEMENTS

"Amateur Wireless and Electrica." 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

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LOUD SPEAKER
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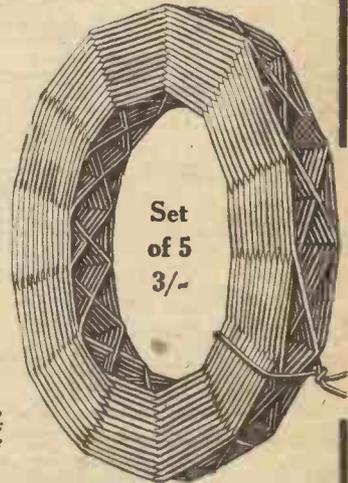
With tension-winding we are able to dispense with all ebonite, empire tape, or other substances which introduce additional self-capacity, and at the same time secure a unique low-capacity formation that makes TUNING SHARPER, SIGNALS STRONGER, and REACTION READIER.

The Tension-wound formation of Reactone Coils gives them greater rigidity, complete uniformity, and thin structure (better for coupling). They are the only correctly tension-wound, former-less Coils.

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 Agents wanted in all Broadcasting Centres.



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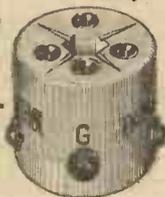


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Amateur Wireless

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50	480	850	250	800	5/-	
60	590	950	285	900	5/4	
75	600	1,300	380	1,100	5/4	
100	820	1,700	500	1,550	6/9	
150	1,065	2,300	700	2,150	7/7	
200	1,855	3,200	925	3,000	8/5	
250	2,300	3,800	1,100	3,600	8/9	
300	2,500	4,600	1,400	4,300	9/2	

GALVANOMETERS are largely used to detect electrical currents. There is, for instance, the type known as the linesman's galvanometer, and there is the fine mirror spot-light galvanometer which costs quite a lot of money. Both are the same in so far as they are used to detect electrical currents, but there is a vast difference in the sensitivity of the two types of instruments. The spot-light mirror galvanometer will detect currents where no deflection of the needle at all could be obtained with the linesman's instrument.

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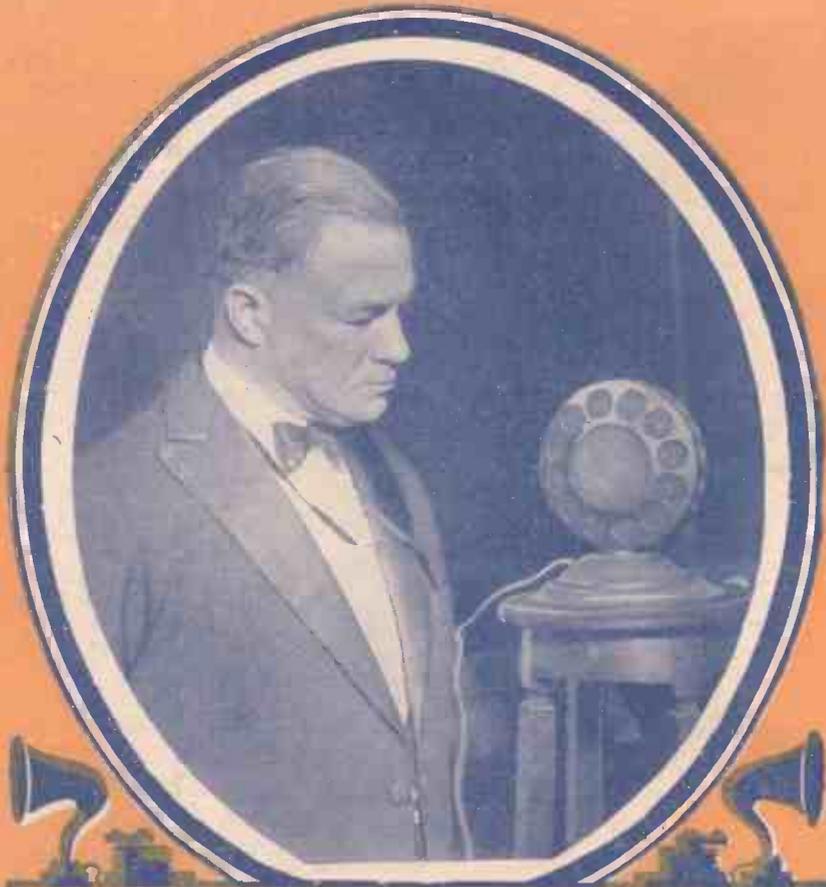
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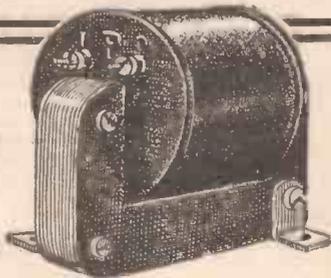
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Cossor discards the Dry Battery

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* * * * *

Dry batteries are not built to give a constant output—they were originally developed for ringing bells and other intermittent work. They have to generate their own electricity, and in so doing are apt to polarise. Their output fluctuates: at first it is high and then it falls off. All the time you need to keep constantly adjusting the rheostats to be getting the best results.

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Vol. VI. No. 147

March 28, 1925

ARE YOUR CONNECTIONS A PUZZLE?

This article will help you in your difficulties.

ALTHOUGH most amateurs in making a receiver commence by following implicitly the instructions published in some technical journal, it is usually not very long before they decide to design a set for themselves. They immediately find themselves in a peculiar difficulty. Upon

taking a consensus of opinion, however, he is as bewildered as ever. Some advocate one way and some the other, and probably quite a large number express the opinion that either way will do.

It is the purpose of this article to point out the advantages and disadvantages of the different methods and to let him decide which is the best to use in his own particular case.

Position of the Crystal Detector

In the simplest crystal circuits the crystal and phones are connected in series with each other and across the tuning device (see Fig. 1). At first sight it would seem to be immaterial whether one side of the phones or one side of the detector were connected to the aerial side of the tuner. Such, however, is not the case. The phones, when worn on the head, possess a large capacity (through the body) to earth, and when the phones are on the aerial side of the tuner, this capacity is in parallel with the tuner. As the beginner will probably know, for strongest signals we require as much inductance and as little capacity as possible in such a circuit as is shown in Fig. 1, and so it is preferable to connect the phones on the earth side of the tuner.

Position of Series-aerial Condenser

When we wish to tune to wavelengths which are short compared to the natural wavelength of the aerial, it is, of course, necessary to insert a condenser in series with the aerial. This condenser may occupy either of the positions shown in Fig. 2. In order to obtain as large a tuning range as possible without changing coils, the minimum capacity of this condenser should be small in comparison to its maximum capacity.

Now the filament accumulator, H.T. battery and phones have a considerable capacity to earth, and when the variable condenser is connected on the earth side of the inductance the capacity of the batteries and phones is added to that of the variable condenser. Even when the latter is set at zero, quite a large capacity may exist between the bottom end of the inductance and earth. Hence for a large tuning range it is better to connect the

series condenser on the aerial side of the inductance.

The H.T. Negative Connections

When we say that the plate is so many volts positive with respect to the filament, we mean with respect to the negative

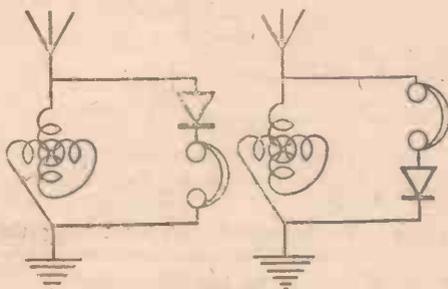


Fig. 1.—Alternative Connections for Crystal Detector.

looking for a suitable circuit they notice that in many cases there is apparently more than one way of connecting up a certain piece of apparatus. For instance, whilst in some diagrams the negative H.T. terminal is shown connected to the positive terminal of the filament battery, in other diagrams the two negatives are joined together. Again, sometimes the filament resistance is connected between the negative of the L.T. battery and the filament, and sometimes in the positive lead to the valve. Usually no reason is given as to

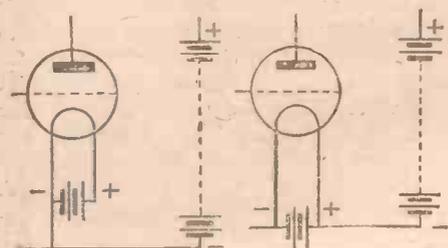


Fig. 3.—Alternative Connections for H.T. Battery.

why the particular method used was chosen.

Feeling sure that there must be a right and a wrong way in any particular circumstances, the beginner perhaps decides to ask his more experienced friends. On

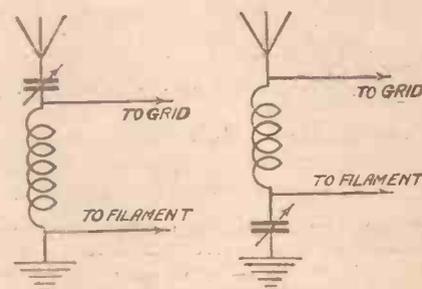


Fig. 2.—Alternative Connections for Series-tuning Condensers.

end of the filament. It is obvious, as one end of the filament may have a difference of potential of some .4 volts with respect to the other end, that we must choose some particular point of the filament from which to reckon the H.T. voltage applied to the plate. Now when the negative of the H.T. battery is connected to the positive of the filament accumulator (as in the right-hand diagram of Fig. 3), the H.T. and L.T. batteries are in series as far as the plate is concerned. To find the actual potential applied to the plate,

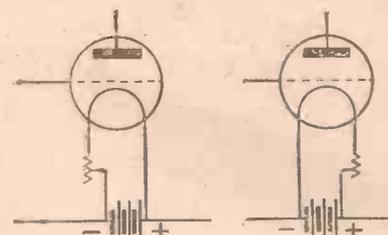


Fig. 4.—Alternative Connections for Filament Resistance.

therefore, we must add the voltages of the two batteries together. Thus if a 6-volt accumulator is used and a 60-volt H.T. battery, the actual potential difference between the plate and the negative

(Concluded at bottom of next page)

EDDY-CURRENT REACTION CONTROL

THE "swinging-coil" method of introducing reaction seems to retain its popularity in spite of the difficulty of fine adjustment due to the imperfections of the average coil holder. As a rule extraneous means, such as damping the grid circuit

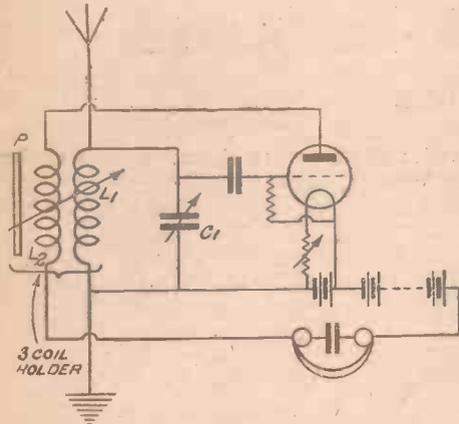


Fig. 1.—Eddy-current Control of Reaction.

by the use of a potentiometer, etc., are employed. Tuning or de-tuning the reaction coil also has its advocates and sometimes works very well, though in the ordinary way it involves an extra variable condenser, which is both bulky and costly. But a similar result can be obtained by the "eddy-current" method, which only requires the use of a three-coil, instead of a two-coil holder.

"Eddy-current" Tuning

Eddy-current tuning is not new. It was employed long ago by the Marconi Co. in crystal receivers, and a very neat and attractive little instrument with this system has recently been placed on the market by Lissen, Ltd. Fig. 1 shows how it may be used to control reaction in an ordinary straight single-valve regenerative circuit.

Reaction Control

In this figure L1 and L2 are the ordinary A.T.I. and reaction coils, mounted in two of the sockets of a three-coil holder. P is a plate of 3/8-in. brass or copper of the shape shown in Fig. 2, which also indicates the method of mounting. This plate is inserted in the third socket of the holder and is turned almost at right angles to the reaction coil (which should be in the centre socket). If the set tends to oscillate when applying reaction, instead of reducing the size of the coil, the plate can be brought up a little closer to it. If the angle between them is kept fairly large the movement will have only a slight effect on the coil value and thus a fine adjustment is possible even when the coupling between aerial and reaction coils is close. It should be noted that the effect is always to reduce the inductance. So the reaction coil should be on the large side,

Further Refinements

For those who care to add a variable

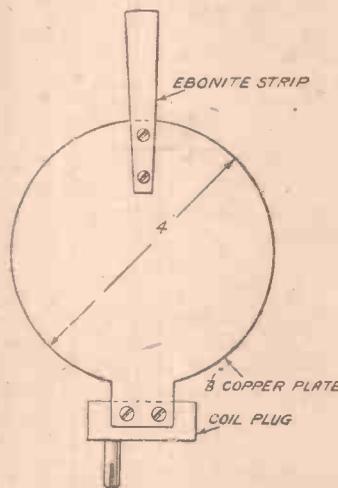


Fig. 2.—Plate for Eddy-current Tuning.

condenser, finer adjustment still is possible by the use of the arrangement shown in Fig. 3. Here a "phantom" stabilising circuit, consisting of coil and parallel condenser, is used instead of the eddy-current plate. By this means a double-vernier

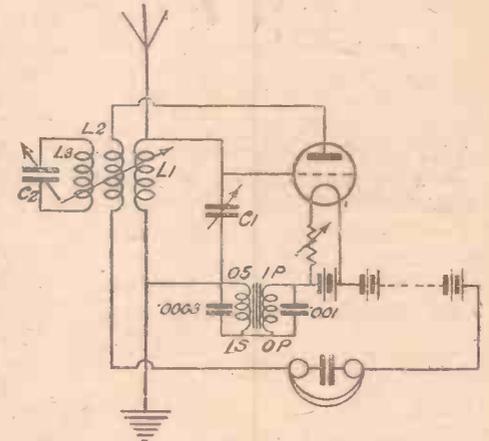


Fig. 3.—Circuit with Coil and Condenser Instead of Plate.

adjustment of reaction is possible—firstly, as above, by varying the coupling between L2 and L3, and, secondly, by tuning the condenser C2. This phantom circuit acts as a kind of acceptor circuit to absorb more or less of the energy of the reaction coil. The values of L3, C2 are not critical, but should be of the same order as L1, C1.

A Loud Single-valve

The circuit shown in Fig. 3 is one used by the writer for one-valve loud-speaker reception of 5 XX at a distance of about seventy miles. It will be noted that it embodies an L.F. transformer specially connected in the filament-earth lead and no grid condenser or leak. Such circuits, which have been previously described, are very effective for the purpose. H. W. S.

"ARE YOUR CONNECTIONS A PUZZLE?" (continued from preceding page)

end of the filament is 66 volts. There is a serious disadvantage, however, in having the two batteries in series, and this is that if any point of the anode circuit at a high potential (such as phones or reaction coil) is accidentally earthed there is a great likelihood of the valve being burnt out. Therefore it is far safer to connect the two negatives together as shown in the first diagram of Fig. 3.

In the hands of the careful experimenter the few extra volts applied to the plate may make the risk worth while, but whenever dull-emitters are used the two negatives should always be connected. In any case, it would be very desirable for the H.T. negative connection to be standard-

ised, as at present people often buy amplifiers for adding to their sets, only to find that different methods of connecting the H.T. negative have been adopted in sets and amplifiers.

Position of the Filament Resistance

The principal function of the filament resistance is to control the brightness of the filament. This it will do equally well if it is connected in either of the positions shown in Fig. 4. There is, however, a secondary use to which the filament resistance can often be put. It is sometimes of great advantage to be able to apply a small negative bias to the grid of the valves, especially in L.F. amplifiers. This can often be done, without the aid of extra batteries, by suitably connecting the

filament resistance. When a 6-volt accumulator is used to supply current to a filament only requiring 4 volts across it, there is, of course, a drop of potential of 2 volts across the used portion of the filament resistance. Thus if the filament resistance is connected between the filament and the negative side of the L.T. battery and the grid return lead also connected to L.T. negative, the grid will be maintained at a potential 2 volts negative with respect to the negative end of the filament. When the alternative arrangement shown in Fig. 4 is used the grid, of course, is at the same potential as the negative end of the filament. The reader must be left to judge which method of connection suits his particular requirements best. J. F. JOHNSTON.



Fig. 1.—The First Type.

THE pleated-diaphragm loud-speaker is excellent in both tone and volume, and can be made in a few hours by anyone who can handle a screwdriver.

The loud-speakers here illustrated differ from those which have already become popular in that the diaphragms, instead of being flat, are conical in shape. This modification was attempted in order to ascertain by experiment the effect on tone and volume of the differently shaped diaphragm, and also in an endeavour to devise an instrument which should be more pleasing in appearance than the flat type. The flat type, particularly when gilded, is far from being unsightly; but its flatness is not a virtue.

The Reversed-cone Type

The first type tried was that shown in Fig. 1. In this the diaphragm sloped inwards towards the actuating earpiece. The appearance was good, except for the difficulty of making a neat job at the central joining of the pleats; but after careful tests it was decided that the tone was somewhat thin. Two instruments were made of this type, but both of them lacked the roundness and mellowness of the flat type. This may have been due to other causes than the shape of the diaphragm. The texture of the paper, or the method of securing the centre (by a cone-shaped piece of cork), or the manner of insertion in the wooden rim may have been responsible.

Fig. 2 illustrates the second type tried, and here results were more satisfactory. The diameter of the diaphragm shown is 10 in., instead of the usual 12 in. This tends to sharpen the tone, and most people prefer sharpness to woolliness. There is certainly no tendency to "boom" on heavy orchestral passages, and with a .004 condenser across the terminals, the tone of this loud-speaker is excellent.

Fig. 3 shows a similar diaphragm mounted so that it may rest over the mouth of a vase, or a piece of 3½-in. cardboard tube suitably decorated. By placing a dia-

THE CONICAL PLEATED-PAPER LOUD-SPEAKER

phragm in this position there is, of course, some apparent loss of volume, for the sound is thrown downwards, to some extent, into the vase and on to the table. Nevertheless, the instrument illustrated, which measures 12 in. across, is quite loud enough for an ordinary room, and is pleasant in tone. It might have been



Fig. 3.—Vase-Loud-speaker.

Construction

The principle on which these loud-speakers work is the same as that which has already been described, on more than one occasion, in AMATEUR WIRELESS. The vulcanite cap and metal diaphragm of a Brown's A-type telephone earpiece are removed. The central hole of the cap is enlarged to about ¼ in., and a short length of No. 18 s.w.g. round wire is screwed into the small threaded hole in the reed of the earpiece. The screwed hole will cut a thread on the soft wire. The other end of this wire is made to touch, lightly but firmly, the centre of a diaphragm of pleated paper. Instead of a piece of No. 18 wire a length of brass rod, threaded 12 B.A., may be used; or a match-stick, sharpened at one end, will give quite good results.

For the construction of the diaphragm, parchment substitute and an embroidery frame (or other suitable double hoop) are required. If a 12-in. frame is used, the paper (which must be truly rectangular) should be about 6½ in. wide and 39½ in. long. For a 10-in. frame the measurements should be 5½ in. by 33½ in. Pencil lines should be ruled parallel to one of the shorter edges, and distant therefrom ½ in., 1½ in., 2½ in., 3½ in. and so on. If, in order to obtain a sufficient length, it becomes necessary to join the paper, care should be taken that the overlap falls between one of these lines and another line drawn ½ in. farther on.

An easy way to mark off the 1-in. spaces and ensure that all lines are perpendicular to the longer edges, is to place the parchment substitute over a piece of squared graph paper, and mark off from the printed squares.

A line should also be drawn parallel to one of the longer edges, at a distance of ⅜ in.

Having marked off the paper, nip it between finger and thumb along each of the longer edges at the marked intervals. Then crease firmly along the pencil lines,

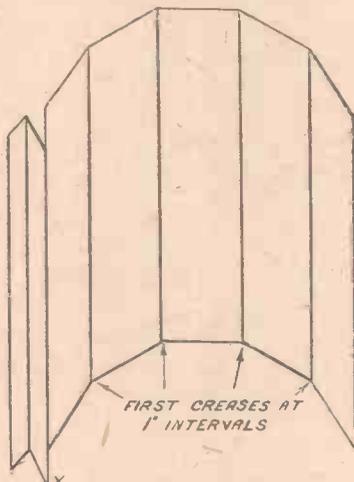


Fig. 4.—Method of Folding Paper.

better still if the parchment substitute used had been heavier. The piece used for this was a little thicker than butter paper.

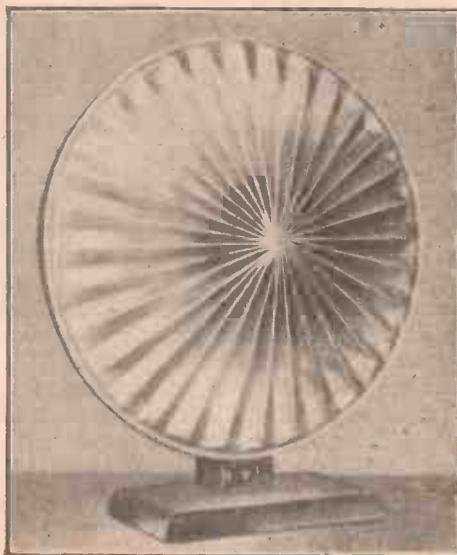


Fig. 2.—The Second Type.

all creases being in the same direction, so that the paper curls up as you proceed. Next bring each crease up against its neighbour on each side, and crease in the opposite direction, as shown at X in Fig. 4.

Now shorten at one end all the creases which protrude in the same direction by cutting as shown by the dotted line in Fig. 5, the extent of the cuts being indicated by the pencil line already drawn $\frac{1}{2}$ in. from the edge.

The paper may be varnished at this stage, and a coat of gold paint applied to the side which will be visible from the front when finished. A second coat will be necessary later, but gilding may, if desired, be left until after completion. The writer has found New Discovery paint very good.

The two ends of the pleated strip should next be joined securely, so as to make a tube of the paper. In doing this it is essential that the shorter creases should be on the inside of the tube. In order to make a neat overlap, it is well to cut $\frac{1}{8}$ in. off one end of the paper, the overlap then being $\frac{3}{8}$ in.

When the join is secure stand the pleated tube on a smooth surface, bunch the top ends (where alternate creases have been shortened) in both hands, and press down gently until the paper will spread out no further, and there is a circular hole between the ends of the paper in the centre about $\frac{1}{4}$ in. in diameter.

A piece of cheap wooden penholder is now required, about 2 in. long, to fit closely in this hole in the manner indicated in Fig. 6. One end may be finished to a blunt point, and the other end cut off straight and made smooth.

Release the paper, place a drop of Seccotine or similar adhesive (do not use ordinary glue) in each fold of the paper where it is to be pressed together, smear the penholder thickly for about $\frac{3}{4}$ in. at the pointed end, and press the diaphragm down again, fitting the penholder into

place. Put a breakfast cup upside down over the cone of paper, to prevent it from

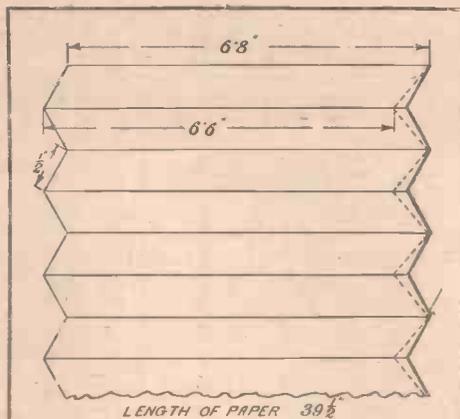


Fig. 5.—Method of Cutting Paper.

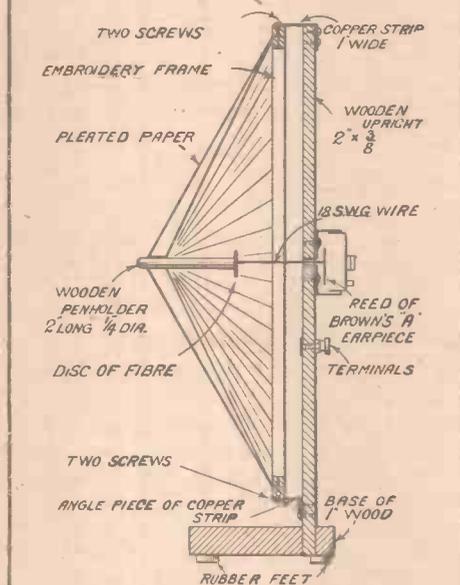


Fig. 6.—Section of Loud-speaker.

springing back, and a small book on top of the breakfast cup.

The diaphragm should be left thus for

two or three days, to allow the adhesive to set hard. Then a small disc cut from fibre should be stuck to the smooth end of the penholder.

When the cone is quite firm the smaller of the two hoops of the embroidery frame should be placed on a table, the cone placed over it, and the edges of the paper pressed down carefully over the hoop. The larger hoop of the frame should then be forced slowly over the paper, so that the edges are gripped between the two hoops. This operation is not difficult, but it will be helpful if the hoops are sand-papered beforehand.

The method of mounting the diaphragm and telephone earpiece for a loud-speaker of the type shown in Fig. 2 will be apparent from Fig. 6, but this plan admits of variation. The upright support, for example, may be screwed to the back of a wireless set. The cap of the earpiece is screwed to the upright, through which a clearance hole has been drilled to correspond with the enlarged hole in the centre of the cap. The paper diaphragm is attached to the upright by pieces of bent copper strip. If this is at all brittle, it may be made soft and easy to bend by heating until it is red hot and then being left to cool.

An important detail is the gluing of small pads of rubber underneath each corner of the wooden base. If these are omitted, the vibration of the loud-speaker will cause jarring noises when it stands on a wooden table.

For a loud-speaker of the type shown in Fig. 3, the support for the earpiece is held in position by two screws driven through the embroidery frame into each end of the support, scraps of cloth being inserted to prevent jarring. Cloth is also affixed to the parts of the support which rest on the vase. The top of the piece of penholder may be finished off, as in the illustration, by fixing a bead or other suitable object on it.

H. A. P.

ELIMINATING A.C. HUM

CONSIDERABLE interference is sometimes caused when a valve set is working near powerful A.C. mains, such as are used for carrying house-lighting current.

In some cases shielding of the receiver has no effect in reducing the A.C. hum, and amateurs may be glad of a tip by which the interference may be reduced, if not entirely eliminated. If a 1-microfarad fixed condenser be connected between the negative filament socket and earth the objectionable hum will be greatly reduced. Various values for the condenser may be tried.

U.

Moscow now possesses a high-power broadcasting station working on about 1,400 metres. Tests are being carried out almost every evening between 17.00 and 18.00 G.M.T

CUTTING OUT THE H.F. VALVE

IF the plate and the grid circuits of the H.F. valve are both broken by a double-pole double-throw switch, capacity effects may be very marked when the switch is of small dimensions, as is commonly the case. A simpler method is not to break the plate circuit, but to use merely a single-throw double-pole switch, connecting the arm to the aerial terminal and one contact to the grid of the H.F. valve, and the other contact by way of a condenser to the grid of the detector. This condenser should be of the same value as that already provided between the plate of the H.F. and the grid of the detector, the same grid leak serving for each. There is no need to break the filament circuit of the H.F. valve. It can be switched off or on and at leisure and introduces an additional capacity.

A. H. B.

RENOVATING A PANEL

A PANEL riddled with borings and tap-pings used in previous "hook-ups" presents a none too tidy appearance.

To remedy this, obtain a small piece of cobbler's black wax (heelball) and either press or mould it into the unused holes. Trim off flush with the panel and smooth over with the hot blade of a pen-knife.

Lastly, rub over the whole surface of the panel with an oily rag, using a circular motion until the surface is dry.

The final result will be a vast improvement both in neatness and general appearance.

F. C. S.

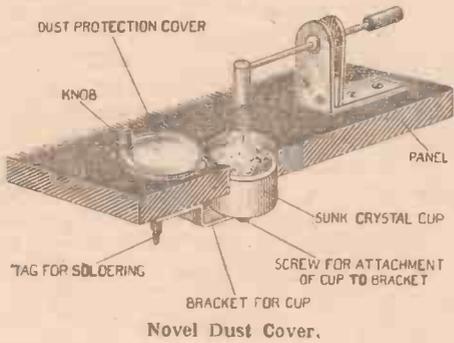
A wireless station is to be erected outside Salisbury (S. Africa), and a sum of £12,000 has been placed on the Estimates for the purpose. Direct communication is to be established with the Union.

PRACTICAL ODDS AND ENDS



Crystal Protector

A DUST protection cover for a crystal when the detector is not in use can be easily made from a piece of thin brass. In order to fit snugly over the recessed

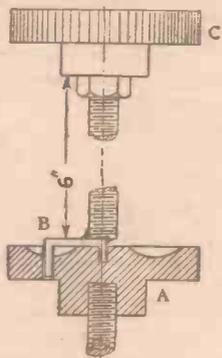


crystal, the cover may be made slightly concave. This may be done by beating with the ball pane of a hammer. Afterwards the cover can be cut to shape. A 6 B.A. screw and nut can be used as a pivot. For convenience, a small terminal to serve as a knob may be soldered on to the cover.

As brass quickly tarnishes, it is advisable to lacquer the cover. Other details of construction can be seen from the drawing. L. D.

Condenser Extension Handle

THE writer has found that many types of extension handles foul other components on the panel. Perhaps that was



Details of the Extension Handle.

because extension handles were designed more for the purpose of fine tuning than for the elimination of hand capacity effects. Fine tuning is better accomplished by fitting a vernier condenser, and to

eliminate hand capacity effects the design of handle should take the form of an adaptable extension of the condenser spindle. The diagram shows a handle which the writer has constructed. A piece of No. 16 S.W.G. wire was bent to the shape shown at B and soldered on to one end of a 6½-in. length of 2 B.A. screwed rod. On the other end of the rod was screwed a spare condenser knob C, which was secured by a lock-nut. Two holes about ⅜ in. in diameter were drilled in the condenser knob A, one of the holes being directly in the centre and the other ½ in. from it. The method of using the handle requires no explanation. With this handle the writer found that receivers employing such circuits as the Flewelling, Armstrong, etc. (in which the tuning is critical) could be more easily managed. J. W.

Small Fixed Condensers

A LOW-CAPACITY fixed condenser suitable for use in the grid circuit can be easily made by twisting together two lengths of silk-covered wire. One end of each wire is taken to the terminals on the set. Care should be taken to see that the insulating cover is not damaged at all or no condenser effect will result, since the insulation of the wires forms the dielectric of the condenser. M. B.

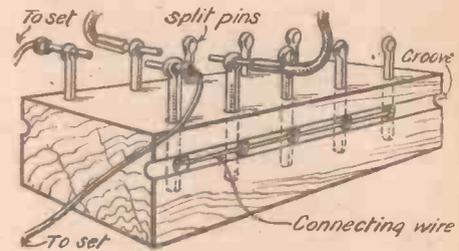
Wander Plugs

WANDER-PLUGS such as are used on high-tension batteries can be made quite easily from valve legs and an old fountain-pen. Inch or half-inch lengths of the pen should be sawn off, and the valve legs fixed into them by means of sealing-wax (or melted sulphur) after the wire connections to the legs have been soldered on. Very cheap and effective plugs can thus be made. U.

Details of Phone Connector

TO make this handy phone connector, take a piece of varnished wood 3 in. by 1½ in. and ⅞ in. and bore holes ⅜ in. deep into it, ¼ in. from each edge, five each side (that is, if the connector is required for four pairs of phones); ⅜ in. from the top of the wood, five holes on each side are bored horizontally. A groove is made along the first row of holes. In the first hole a split pin is placed, a piece of wire about 4½ in. long, of which one end is placed in the hole, is connected to the pin and then brought out

again, then to the next hole, to the next pin, till all the pins on one side are connected. A piece of wood, if desired, can then be fastened over the groove to hide all traces of the wire. The split pins must be about 1 in. long, and the hole in them of such a size that will grip the telephone tag tightly. The holes in which the pins



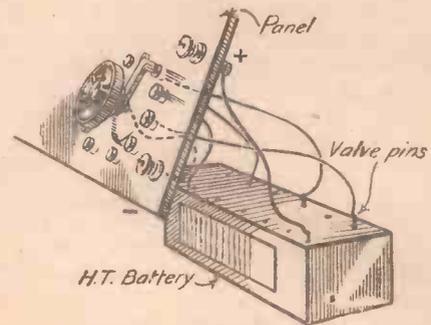
A Useful Phone Connector.

fit must hold the pins tightly, and when the connections have been made should be filled with glue. The first pin of each side is connected to the telephone terminal of the set. A. S.

Tapping the H.T. Battery

ALTHOUGH a tapped H.T. battery is often of great advantage when different kinds of valve are being used in a set, many amateurs like to have the battery hidden away so that no unsightly wires are left showing.

The diagram shows a simple method of taking tappings from a concealed H.T. battery by means of wires taken from the various tapping points to the contacts of a switch.



Selector Switch for H.T. Battery.

When only one valve is in use the tappings should preferably be taken from the negative end as shown in the figure, but when two or more valves are used this is, of course, impossible. R. H.

IF I WERE "VANGUARD"

(If You Know of a Better Component—Buy One.)

AFTER a super-supper of bread and cheese and beer and mustard-pickles, I staggered to my chair, placed my hands upon my corpulency, and passed into a state of vivid imagination—in other words, slept the sleep of the replete.

And there arose from the shimmering ether in the hearth a genie of most extraordinary structure. His upper parts were of a colour ruddy; massive muscles rippled over his naked breast; egg-like ditto ran up and down his folded arms like mice in a cage or oscillations in a trap. His lower parts were not; but about his middle was a circle of burnished brass supported by four valve-pins.

And he planted his pins upon my toes, and from his mouth issued many volts of reddish hue as he spoke. "Where is your copy?" he demanded.

I writhed. The pickles fought with the beer. I gurgled. The cheese got the upper hand. I smiled perkily. "No components; no copy!"

Then there came into the room, borne upon etheric waves that entered via the keyhole, components of every variety. And immediately, upon the table beside me, the pickle-jar became as nothing, and in its place were paper (ruled feint) and pen and ink. And the pen stood upon its nib at the top left corner of the paper, and a component fluttered down and settled upon my western hemisphere.

I spoke and the pen wrote:

For Carrier Waves

An interesting wave-carrier has been put on the market by Mr. Walker Rydsir. The design shows great originality on the part of the maker; in fact, so much originality is shown that it is safe to predict that Mr. Rydsir will be compelled to go out of business, having exhibited his total originality. The gadget is particularly useful for D.X. work, also for fans with rheumatically hams or corns. The carrier is carried on the back when not in operation, but with a little patience it can, when empty of waves, be trained to carry itself.

Value In Valves

I rejoice to know that valves have suffered another price reduction. All makes that sold at 15s. are now 14s. 11¼d. On inquiring the reason for this unexpected windfall, I was informed that it is estimated that an almost infinite supply of the special silver necessary for lining valves will be unearthed in the Ural Mountains a few years hence, and the makers are passing on to the consumer the resultant benefits at once!

Advance in Loud-speaker Production

A soft-speaker with rubber heels on the diaphragm is the latest addition to the family of speakers made by Messrs. Denser Vane, of Vauxhall. It will be much appreciated by mothers and fathers of lightly-sleeping babies. Placed in juxtaposition to any sleeping infant, the dove-like cooing is guaranteed to soothe the disturbed darling more effectively than the most dog-tired of sleepy cradle-songs. This Vauxhall firm's range now comprises: His Master's Mouthful, The Ham's Herald, The Smoke-room Spitfire, The Boudoir Bastinado, and the above-mentioned Little Lady's Lullaby.

A New Invention

The Bi-tuner is a product of that enterprising house, Messrs. Ome, Ode and Cathode. It is realised by these thoughtful and up-to-date manufacturers that a young man exhibiting his "Transatlantic" to his best girl and desiring to log station upon station considers it a nuisance to be obliged to use two hands for knob-turning. They have therefore manufactured an instrument by which the operations can be carried out with only one hand, the other being free to take up a position round the waist of the to-be-disillusioned victim of "this wicked wireless." The apparatus is made on the lines of the cranked car-starter, with square-law differentials and bevelled whip-action, the backlash being taken up by an eccentric come-back with

staggered cogs and false teeth. Distance control may be arranged so that, treadle-fashion, the set may be tuned by a spare-foot.

The Supersonic Tonic

It is not generally known that many supersonic circuits do not function satisfactorily for the reason that the electrons on arrival at the aerial promptly become infected with a kind of foot-and-mouth disease known as "wind-up." This malady is suffused as it were in a field the length of the aerial wire. If wires were occasionally lowered, scraped and sprayed with a vaporiser, the trouble would be prevented. Prevention is considered by all the other eminent authorities to be better than cure, though the old slogan "Experience makes clams clever" suffices me, and I always think that "the man who can cure prevents twice."

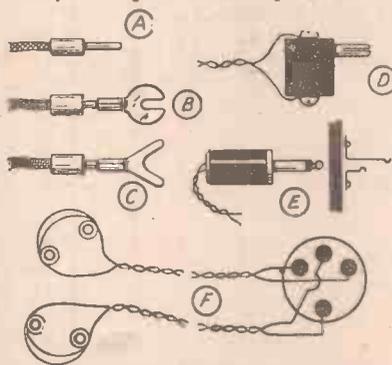
For the benefit of those who agree with me (if any), Messrs. Oddfolks, Very and Co. have patented a contraption to overcome, or cure, "wind-up." The object of this component is to boost up diminishing signals, the boosting to be at a greater speed than the diminution. The gadget is simplicity simplified, being nothing more than an electrical funnel, with a telemeter at the mouth, through which are poured volts and amps mixed according to instructions and the seriousness of the disease at the time of operation.

CEETEE.

TAG TIPS

HERE are a few useful tips chiefly concerning phone tags.

Nearly all phones are provided with



Details of Connectors.

plain pin tags at the ends of the leads, as shown at A in the diagram. Several con-

structors use pillar or W.O. terminals throughout on their receivers, and for this purpose spade terminals should be soldered to the pin tags, as shown at B. It may, however, be useful to adapt the phone tags to either type of terminals and this difficulty is easily overcome by making a spade terminal, as shown at C. D shows how a coil plug may be brought into operation for quick connection, a corresponding coil holder being embodied on the receiver for this purpose. A telephone jack is shown at E. This provides a very neat and efficient method of plugging the phones into circuit. F shows how two pairs of phones connected to four valve pins, as shown, may be brought into circuit by simply inserting the plug into a corresponding valve holder, which, of course, is on the receiver. The device is extremely useful.

RADIO.



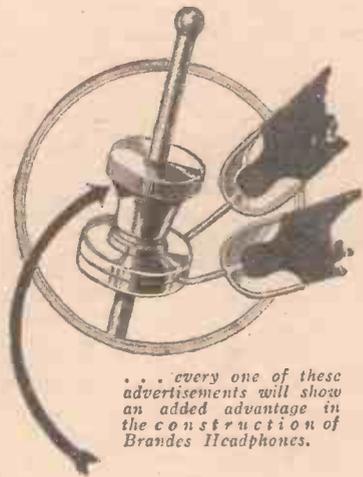
*Brandes Superior
Matched Tone
Headphones*

PRICE

20/-

*British Manufacture
(B.B.C. Stamped)*

All Brandes products carry our official money-back guarantee, enabling you to return them within 10 days if dissatisfied. This really means a free trial.



... every one of these advertisements will show an added advantage in the construction of Brandes Headphones.

Matched Tone means that you hear the same sound in both ears at the same instant, and you learn a new beauty of tone. Brandes Headphones are subjected to special tests definitely to establish this advantage, thus gaining the concentration of the two earpieces towards one perfectly synchronised sound. This achieved, they bring purer tones, greater volume, and keener sensitivity. Primarily designed for long-range work, they are excellent for trans-Atlantic or trans-Continental telephony, and bring home stations with delightful ease. They are sold with a definite money-back guarantee—ask your Dealer for Brandes.

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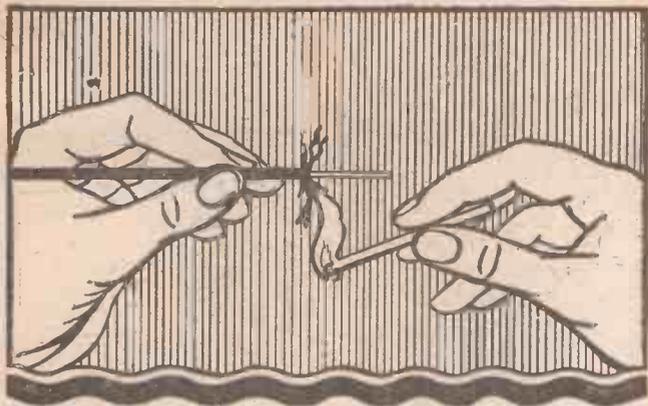
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Brandes Limited, 296, Regent Street, W.1.
WORKS: Slough, Bucks.



Superior "Matched Tone Headphones

TRADE MARK



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You can quickly make a neat end to "Glazite"—the new coloured connecting wire—by burning off the frayed cotton with a match. The charred ends can be rubbed away with the fingers, leaving a perfectly clean finish.

"Glazite" consists of a tinned copper wire covered first with cotton and then with a film of heavy insulating material which makes it flame-proof and impervious to moisture. It has a high dielectric strength and is easily flexible.

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S.T. 100 increased 30% in Volume/ merely by changing a Crystal.

"... It may interest you to know of the results I have obtained using a 'Uralium' Crystal on my S.T. 100 Reflex Receiver.

"I make no boast of any freak long range receptions, although I can get most of the European stations, but since replacing the crystal in my set for a piece of 'Uralium,' I have consistently obtained signals, not only of an increase of 30% in loudness, but of a purity which really surprises me. . . . All the fidgeting to find a good 'spot' is done away with, since 'Uralium' seems to be one large Sensitive Spot."

Such is the experience of a "Uralium" user, set down in these brief extracts from his letter to us. In fact, many hundreds of crystal or crystal-valve set users are daily replacing their old crystal for "Uralium" and finding such remarkable results to follow.

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Uralium

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"One Large Sensitive Spot."

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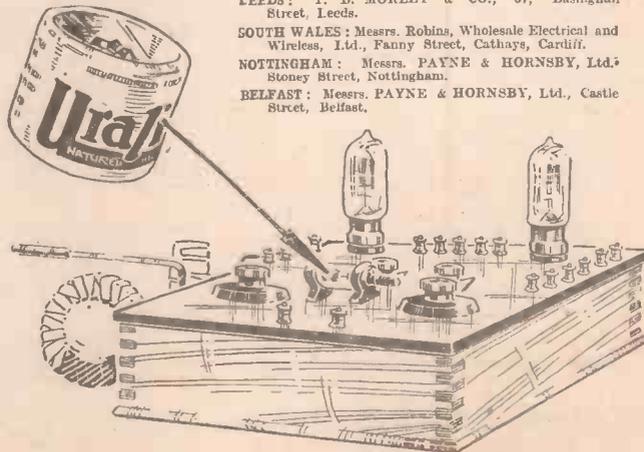
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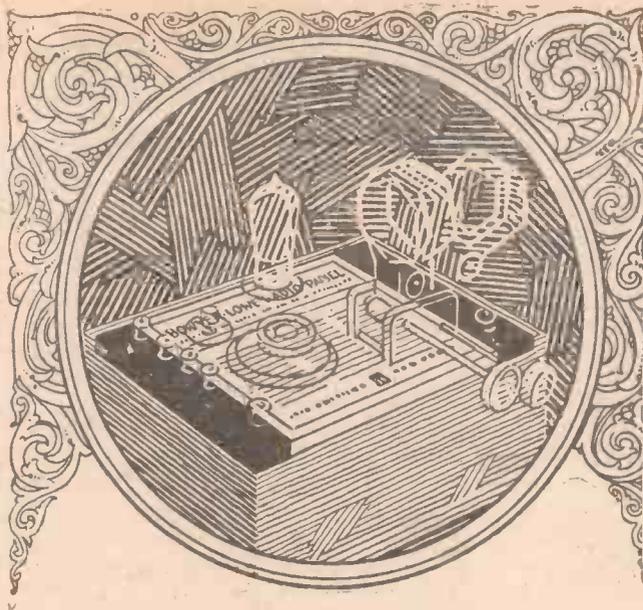
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If you could stand by while your Radio Panel was being cut, engraved and polished, you could not be more certain of its quality and beauty of finish than you are when you buy Bowyer-Lowe Tested Panels Sold under Seal.

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"The 24" X 10" Drilled and Engraved Panel is a beautiful piece of work. Several of my friends, who said I was mad to pay 30/-, bought theirs of another brand. When they saw

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A PERMANENT substitute for the high-tension battery. Ideal for power amplifier work. Worked from the ordinary 6-volt accumulator, the consumption is low—1.15 amperes. Perfectly smooth reception. Continuous adjustment of H.T. voltage and not by steps.

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24000 TURNS

OF WIRE ON EVERY G.R.C. 83 TRANSFORMER

That's only one of the many reasons why it is the *best* low-frequency amplifying transformer made.

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This Audio Frequency Transformer has been most carefully tested before leaving our works, and is guaranteed for one year to function efficiently if correctly used.



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CLARKE'S ATLAS FILAMENT CONTROL

Works on an entirely new principle. No wires to scrape and scratch. No powder to cause troublesome "packing."

Gives astoundingly easy control of bright or dull emitters—a marvel of noiseless efficiency.

Economises current: lengthens the life of your valves, and it is a deciding factor in bringing in those elusive stations. 50 ohms resistance. One-hole fixing.

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"NOW I can listen in for hours"

The new "KUMFI" de Luxe Ear Pad adds greatly to your comfort when listening-in. It is a soft velvety pad, not too thick to be unsightly, but quite sufficient to relieve your ears entirely of the pressure from the headphones, and prevent that unpleasant throbbing sensation. Moreover, this antiseptic pad keeps out all exterior noises, and absorbs all moisture thereby helping to keep the diaphragms free from rust.

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Q8

PATENT APPLIED FOR.

On Your Wavelength!

{The Seal of Approval

NOT long ago there was a considerable amount of argument among musical experts about the quality of wireless transmissions. One of them, at any rate, maintained that though the receiving set was quite a pleasant thing to listen to, its reproductions could not be regarded as music with a capital "M." That was a good many months ago, and many improvements have been made since then in both transmission and reception.

The fact that Tetrizzini and Paderewski, both of whom ought to know something about music, have broadcast from 2 LO within a week should be proof, if any proof is needed, that wireless nowadays really can reproduce music to the satisfaction of the most delicate ear. Had either Paderewski or Tetrizzini felt that there was any defect in wireless reproduction such as to mar their performances, you may feel quite sure that they would have been equally flat in their refusals to have anything to do with it. As it was, they gave us two very great evenings. I hear that a new invention for bringing out the tone of the piano was in use that night. If this is so it is certainly most successful.

The Disappointment

Though nearly everyone that I have spoken of about these two great recitals joined in the chorus of appreciation, there were one or two who were disappointed, especially with the Tetrizzini programme. What they found was that the transmission was not up to its usual quality and that there was a lack of tone and roundness! This is particularly curious, since those who are enthusiastic about the two evenings emphasise especially the excellent quality and the mellowness of the transmissions. How does it come about that even in the same town one finds apparently both good and bad reception of the same programmes? The obvious explanation is that the receiving sets of the disappointed were not up to the mark; but this will not hold water, for they perform excellently.

The Cause

The trouble, I think, is due almost entirely to the effects of radiation from neighbouring aeriols. You have probably discovered that your neighbour can have a considerable effect upon your reception without going so far as to cause interference by actual howling. If he gets his set into mild oscillation, and if his aerial is not very far from yours, you may require to make a slight alteration in your tuning, and even after you have done this the quality of your reception may be

poor. It all depends upon the sharpness of the tuning of the radiating set and on the degree of oscillation. I have one neighbour who not infrequently lets his set get into what we may call the border-line state—that is, it is oscillating, though not to such an extent as to produce a howl. Whenever he does this my reception, which is usually pretty good, becomes harsh and woolly; nor will any adjustment of the controls remedy matters.

The symptoms of the border-line condition are very easily recognised by the operator of a receiving set. There is a kind of rustling noise in the telephones or loud-speaker, and though signal strength may be big, it is accompanied by tinny sounds when music is coming in and by indistinctness when speech is being received. If you want to get first-rate reception yourself and at the same time to avoid any kind of interference with your neighbours, the set should always be worked well within itself. Any kind of forcing by means of capacity or magnetic reaction will quite spoil the quality.

Beam Progress

I see that a big wireless station working on the beam principle is shortly to be erected in India. There can be little doubt that before long all the big commercial stations of the world will adopt this method of "narrow-casting" instead of the present broadcast system which wastes about ninety-nine per cent. of the power used. When this happens we shall find a tremendous difference in the condition of the ether when we search round with a receiving set. Instead of the babel of signals now to be heard on 300 and 600 metres or above 12,000, we shall hear very little indeed upon these wavelengths, unless our aerial happens to be in the line of one of the beams. In this case I imagine that should the beam emanate from a powerful station we shall rather get it in the neck.

My own aerial is not a very long way from Northolt, whose mush is bad enough as it is. What will happen if Northolt, converted to the beam, is communicating with someone directly beyond poor me, I shudder to think. Instead of getting *some* of the mush, I suppose that one will have the lot. It is a dreadful thought.

Rome—and Others

Have you managed to tune in Rome yet? It is not always very easy to do so when our own stations are working, since his wavelength of 425 metres is pretty close to Glasgow's 420 and Belfast's 435. The German station at Breslau, too, can

be a nuisance, for he is apt to wander rather above his allotted wavelength of 418 metres. Still, if you care to search for Rome on Sunday evening between 7.35 and the time that our own stations open, you will very probably be able to pick him up. Rome is a powerful station, being rated at 3 kilowatts, and in a good many places in this country his transmissions come in with amazing strength. His programmes are always worth listening to if you can manage to tune him in.

Breslau, of which I have just spoken, is the best of all the German stations so far as I am concerned. When I tuned him in the other evening he was coming through quite as powerfully as Radio-Iberica. I believe that this and one or two other German stations are shortly to increase their power to something pretty hefty. I am afraid that this will mean the blotting out of a good many other Continental stations so far as this country is concerned, which will be a thousand pities.

America Still There

In spite of the rapid advances of spring, it is still quite possible to pick up American stations on many a night when atmospheric conditions are not too bad. I have not sat up specially for them lately, but on one or two occasions after working late I have spent half an hour or so in trying round for them, and usually I have been successful in getting hold of one or two. Their strength is not what it was a month or two ago, but they still come in pretty well. I have not been able since the end of January to bring any of them up to respectable loud-speaker strength.

2 LO was successfully received and relayed by American stations a few nights ago, a special late programme being put on for the purpose. This is, I believe, the first time that Big Ben's chimes have been broadcast on the far side of the Herring Pond. Some of those who go in for American reception wonder why it is, that though atmospheric conditions may be almost entirely absent when less distant signals are being received, they so often make themselves heard as soon as one tries for those from across the Atlantic. The reason is that in order to pick up these very weak signals it is necessary to bring the set into its most sensitive condition—that is, just a little short of the oscillating point. When this is done the very small atmospheric signals which are constantly occurring, though we know nothing of them in the ordinary way, are picked up and amplified very largely. Further, any noisiness due to the batteries—and even in the best-regulated set there must always be some of this—is magnified.

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

A Bone of Contention

The note that I wrote a few weeks ago on "seeing music" has provoked a good deal of correspondence. I omitted to state originally that the milliammeter would beat time only if the grid-biasing battery were removed. This point has given rise to a certain amount of argument. One side contends that any movement of the needle indicates overloading, whilst the other maintains that it ought to move. When a signal has been dealt with by the low-frequency part of the set there are, of course, great variations in the plate current owing to the modulation. Therefore it seems at first sight as if the milliammeter should register the fluctuations. When, however, you come to consider that the lowest note of the audible scale has a frequency of sixteen per second, whilst the highest has a frequency of many thousands, matters take on a different complexion.

Delicate though the milliammeter is, inertia prevents its needle from swinging even at the rate of sixteen times a second. What the instrument does is to register the *mean* current. If the valve is properly adjusted, current will rise and fall equally above the normal, and in registering the mean the instrument will show no change. If, however, the grid battery is removed, the grid is approximately at zero potential. In this case the positive half of each wave gives rise to what may be a very large flow of grid current, with the result that partial rectification takes place. This means that there is a gradual building up of negative potential on the grid, with a consequent comparatively slow drop in the plate current. This the instrument records, making speech or music "visible."

From this it follows that if you wish to adjust your grid-bias potential to the exact amount needed for perfect reproduction the milliammeter will be of the greatest service. When its needle remains stationary during reception the grid of a note-magnifying valve is properly adjusted.

Can You Get Sweden?

I have had a good many shots recently at picking up Swedish stations, and I cannot say that I have met with any success. One would think that they would come in well in the north of England, for they use quite respectable power and our stations are received quite well over there—in fact, until the native stations started, our own were the main stand-by of Scandinavian wireless enthusiasts. The chief difficulty, I think, is that both Gothenburg and the two Stockholm stations work on wavelengths so near those used by shipping spark transmitters. Gothenburg's wavelength is 460 metres, whilst Telegrafverket has a wavelength of 440 and the Radio Aktiebolaget of Stock-

holm one of 470. These are rather too near the direction-finding stations on our north-east coast to be pleasant.

On Mondays, Wednesdays and Thursdays the Gothenburg transmission is on 700 metres, which gets mixed up with the 600- and 700-metre ship and coastal transmissions. The other chief Scandinavian station is Boden, whose wavelength is 1,200 metres. Anybody who has a set which will tune to the fairly long wavelengths ought to be able to get him if he is transmitting when F L is not working. Unfortunately Boden sends out only on odd days, and I have never yet succeeded in coming across him when I have tried round between six and seven in the evening, which is his broadcasting time.—

American Components

I am interested to see that a certain number of American components are already finding their way into our markets. Uncle Sam had nearly a year's start of John Bull in the matter of broadcasting, and wireless has made such strides over there that there are now at least three million receiving sets in use. Some of the components made on the other side are extremely good. Americans have discovered, for instance, that to be really satisfactory a variable condenser must be a sound engineer's job. Some of theirs are beautifully designed and constructed—in fact I do not think that we have anything to touch them in this country at anything like the same price.

L.F. Transformers

But there are other components which are not up to this standard. I am thinking just now particularly of low-frequency transformers, in respect of which we hold a very long lead. Americans are not nearly so keen as ourselves on *quality* in reception, and their designers seem to be content to turn out transformers made chiefly with a view to obtaining a high degree of amplification. After all, why should they not be if that is what the public over there wants? I am not saying that there are no good low-frequency transformers made in the States. There are; but there are not many of them. Most of those which I acquired in order to test them out have since been presented to my foes!

If American components ever do become popular with us we shall have to learn their wireless language, which is quite different from our own, in order to be able to use them. If, for example, you see the letter "G" against a terminal, you should attach it not to the grid, as you naturally would, but to the earth connection, for "G" stands for ground. In the same way "A" does not mean anode, but filament battery.

Pure Reception

I am more and more convinced that the ideal set for loud-speaker work for those who live within about twenty miles of a broadcasting station and have decent aerials consists of a crystal and two valves coupled in this way. Purity of reception is remarkable, and the valves give absolutely no trouble, for any tendency to oscillate is entirely absent provided that the L.T. negative is earthed.

When you are using intervalve transformers it is a tremendous problem to get rid of interaction between them. Even if you place them a foot apart and earth their cores it is likely to be present to some extent and to cause slight distortion. With transformers, too, there is nearly always a small amount of noise even when no transmission is coming in.

In a resistance-capacity-coupled set one can obtain a background of absolute silence, which is an immense advantage. This form of low-frequency amplification is very much used on the Continent, particularly in France, but it does not seem to have received here the attention that it deserves from amateurs.

The High-brows Again

If the amount of really high-brow music given us in the course of this month alone is really "by request," it speaks strongly for the "musical up-lift" of this country, but, frankly, I doubt it. I believe there are many thousands who were interested to hear such a master as Paderewski himself play for an hour and a half without a break, but I honestly doubt whether ninety-nine per cent. wanted this followed the next night by such works as Paderewski's own Concerto (even brilliantly played by such a pianist as Gordon Bryan) and by a Dvorak Symphony, as well as being preceded by nineteen variations on "Three Blind Mice."

The Afternoon Concerts

These should be the "bright spot of the day," but, alas, to misquote a popular song, "The talkers come in two by two; they come in two by two," and as most of us have got our own feminine talkers at home too, I think we'd like a spot more music of the "tea and cakes for two, miss," kind; don't you? Personally I like that "Nippy" band at the Troc.

For the Victorian Folks

Manchester, however, is going to take pity on the few Victorians who are left and give us some music of the "good old days" on Saturday night. Instead of the "bunny-hug" and the "turkey-trot," and other barnyard performances, we shall hear the old mazurka and the polka, perhaps a waltz or two, and the time-honoured Roger de Coverley.

THERMION.

A NOVELTY CRYSTAL RECEIVER

THE crystal receiver shown by the photographs will appeal to readers of "A.W." on account of its novel character. Although small enough to be enclosed in a cigarette packet, it is almost as efficient and as easy to adjust as many larger and more conventional types of receiver.

It is tuned by the basket-coil type of variometer. For this a piece of flexible card is required as a former which will bend on the dotted centre line (Fig. 1) without breaking and then have sufficient "spring" in it to open out again. Outside diameters are $1\frac{3}{4}$ in. and the centres $\frac{3}{8}$ in. Seven slots, each just over $\frac{1}{16}$ in. wide, are spaced equally on each half.



ing to the ebonite base. After soldering they are bent at right angles as in Fig. 7.

Two crystals, one copper pyrites and the other zincite, of sizes small enough to go easily into the tube, are placed in the centre, touching one another, and next to each a small pellet of tinfoil (Figs. 2 and 3). Assembly is completed by placing the brass ends in position and fixing all to the ebonite base with $\frac{1}{4}$ -in. screws. A $\frac{3}{4}$ -in. 4 B.A. screw is screwed into the end of the detector previously prepared for it.

The loose end of the bottom coil is taken to the aerial terminal (left). The end of the top winding is coiled to a small

The loose end of the bottom coil is taken to the aerial terminal (left). The end of the top winding is coiled to a small

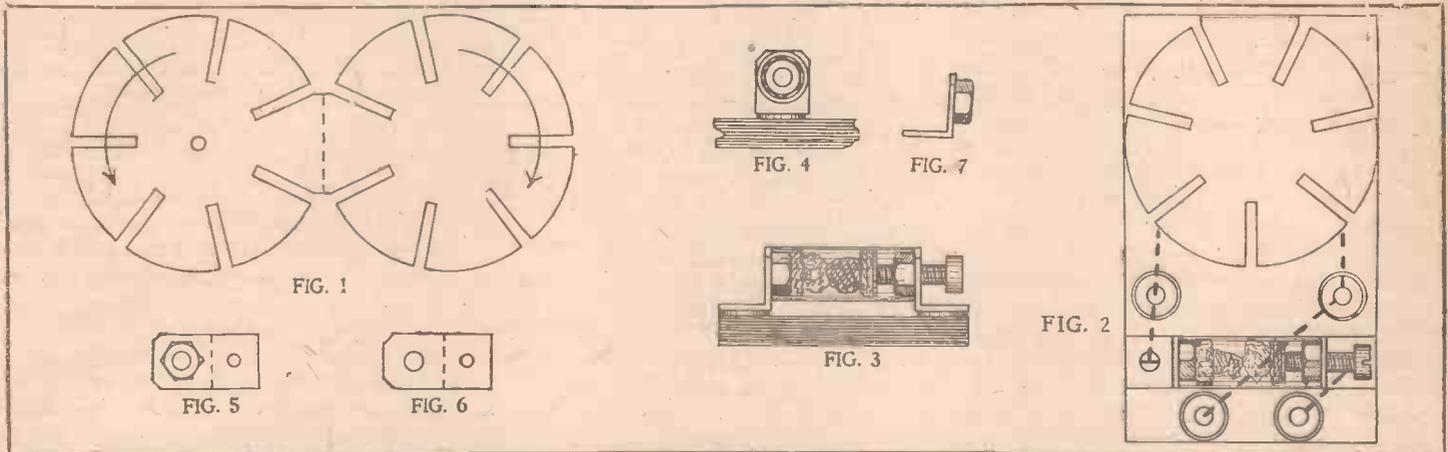


Fig. 1.—The Tuner Former. Fig. 2.—Arrangement of Components. Fig. 3.—Detector. Fig. 4.—End View of Detector. Figs. 5, 6 and 7.—Details of Detector Brackets.

The wire used for winding is No. 40 d.s.c., forty complete turns being wound on each half. This was found by experiment to give the best results with the writer's aerial and for broadcast wavelengths. The best results for other conditions can be found by experiment, extra turns increasing the wavelength range and fewer decreasing it.

The windings for the two halves are put on in opposite directions without breaking the wire.

The ebonite panel is 3 in. by $1\frac{3}{4}$ in. by $\frac{1}{8}$ in. The coil after winding is fixed to this with a $\frac{1}{4}$ -in. brass screw through the centre of one half, and four small cheese-headed screw terminals are also fixed as shown in Fig. 2, the heads being sunk flush.

A piece of fairly thick glass tubing 1 in. long and about $\frac{3}{8}$ in. in diameter is required for the detector. Two thin 4 B.A. nuts are selected to fit into the open ends of the tube (Figs. 3 and 4) and these are carefully soldered to thin strips of soft brass about $\frac{3}{4}$ in. long and $\frac{1}{8}$ in. wide (Fig. 5). One of these has a hole drilled



Photograph showing how the Receiver is Tuned.

spiral to allow movement and then taken to the earth terminal (right). Other connections are shown by the heavy dotted lines in Fig. 2.

If a springy piece of card were chosen as a coil former it will open out again after bending. This is made use of in tuning, the end of the ebonite base being inserted into or withdrawn from the outer case, thus opening or closing the angle of coupling between the coils. Adjustment to the detector is made by turning the cheese-headed screw with a wooden-handled screwdriver. Success with this type of detector depends on having just the right amount of pressure between the two crystals. The writer has found loudest results are obtained with the copper pyrites on the aerial side of the detector.

Results obtained with the set compare favourably with much larger types of receiver. At four and a half miles from 2 LO they are very loud in the phones. On several occasions an amplifier has been added and a loud-speaker worked successfully.

E. M. K.



ABOUT YOUR PANEL

vent the accumulation of minute particles of dust which are sufficient to cause a short-circuit of the H.F. impulses received in the aerial.

Highly polished surfaces are to be avoided, however, as the process employed to secure the polish considerably lowers the insulation resistance of the ebonite so treated. It would not be fair to make this statement without mentioning the highly polished panels known as Radion and Mahoganite, which are guaranteed by the makers as being free from this defect; disinterested experiments by the writer have proved this to be the case.

Another point to be noted when purchasing is that the surfaces are both equal in quality.

Leakage Test

A good test for surface leakage can be carried out as follows.

The phones and H.T. battery are re-

moved from a valve set and the panel to be tested is laid on a flat surface. The lead from the H.T. plus is connected up to one of the phone cords. The H.T. minus and the remaining phone cord are brought into contact with the panel surface and moved across it. If there is any leakage present a series of scratching noises in the headphones will denote its presence. Care should be taken not to bring the two loose wires together, as this will short the H.T. through the phones with, perhaps, harmful results.

Good ebonite can also be told by the "feel" of it. When held at the corners and pressure applied it will bend slightly and spring into its original plane immediately the pressure is removed. Ebonite which gives the impression of being "soft" should be avoided.

W. A. A.

Keep the H.T. battery leads short and they are less liable to short-circuit.

THE basis of good reception is a good panel. No matter how good the components are, if the ebonite upon which they are mounted is defective the receiver will not bring in distant stations and it can never be really efficient.

A good panel should have a high resistance to the passage of high-frequency currents, a low dielectric constant, and be non-hygroscopic. The surface should be as smooth as possible as this helps to pre-

A CRYSTAL LOOSE-COUPLER CONVERSION

NOW that two nightly programmes are available to crystal set enthusiasts who live within a hundred-mile radius of Chelmsford, it is desirable that receivers should be fitted with a loading coil, or other similar device, for tuning-in either 5XX or the local station. The addition of a loading coil to a single-circuit crystal set is quite an easy matter. A coil socket connected in series with the ordinary tuning inductance, a loading coil for 1,600 metres and a shorting link for the short wavelengths are the only additional pieces of apparatus necessary.

The alteration of a loose-coupled crystal set for the long wavelengths is not quite so simple. It is, of course, possible to use two loading coils, one in the primary (aerial) circuit and one in the secondary (closed) circuit, but as some form of coupling of these coils is necessary for the best results, the change is apt to be somewhat complicated. Perhaps the best and simplest way to increase the wavelength is to use a switch cutting out the secondary coil and leaving the plain single-circuit tuner and loading coil for Chelmsford.

The diagram shows a method of wiring a set so that the change of wavelength may be easily accomplished.

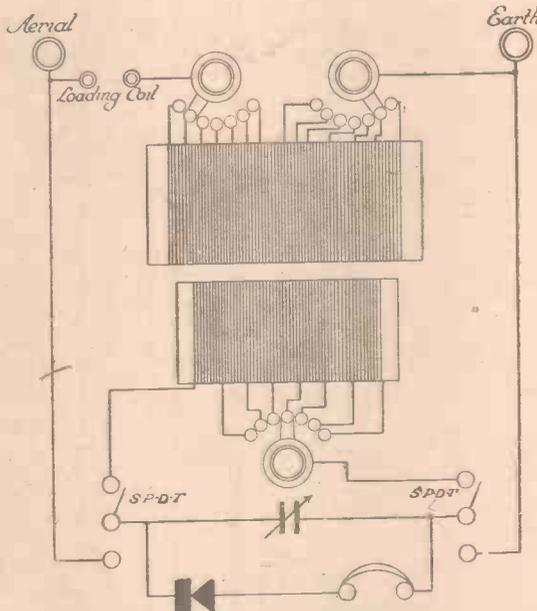
Two single-pole double-throw switches (or alternately one double-pole double-throw switch) are used for changing the

connections. When the contacts are in the upright position (as shown in the diagram) we have the loose-coupled circuit for 2 L.O. Tuning is then accom-

plished by the coarse and fine tappings on the primary coil and by the tappings and condenser across the secondary. The secondary is then out of action, and should be moved away from the primary to prevent eddy-current losses.

The tuning condenser should have a value of about .0005 microfarad, for while such a large capacity as this is not necessary for tuning the secondary coil, it is advantageous to have a variable condenser of large maximum capacity for tuning the A.T.I. on 1,600 metres.

S. S.



Method of Converting a Loose-coupler for Long Wavelengths.

plished by the coarse and fine tappings on the primary coil and by the tappings and condenser across the secondary.

When the switches are in the downward position the detector and phones are con-

LACQUERING TERMINALS

AN easy way to keep the terminals on the set polished and bright is to lacquer them with ordinary shellac varnish, such as is sold for electrical purposes. The varnish should, however, be diluted before use or it will spoil the appearance of the metal when dry. If a small quantity of varnish is thinned with about six times its volume of pure methylated spirit, a clear lacquer for terminals will result.

M. B.

A low-power station belonging to the Berlin Radio Association is making daily transmissions on 85 metres. Announcements are repeated in English.

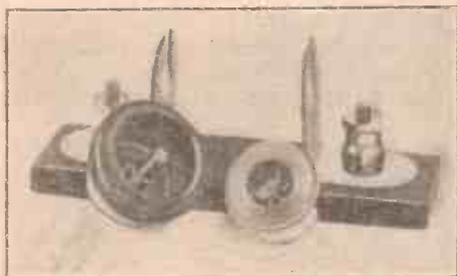
AROUND THE SHOWROOMS

Semi-permanent Detector

THE Gravity detector, manufactured by the Portable Utilities Co., Ltd., of 8, Fisher Street, W.C.1, is a totally enclosed crystal detector that is notable for its originality of design.

The photograph clearly shows the construction of the detector.

A small piece of crystal is supported by a spring plunger between the two metal



Gravity Detector.

end pieces, but is prevented from making direct contact with one of them by means of a small ring of insulating material.

Five small weighted contacts are free to move in the interior of this insulated end piece and fall, by the action of gravity, on to the crystal as the ring is rotated.

Thus by a slight turn of the ebonite ring a number of contacts may be made.

The high-frequency losses in this detec-

tor should be very low and, on test, the detector certainly gave excellent results. The crystal itself can be changed in a moment, and the contacts are suitable for almost any specimen of crystal.

The Gravity detector is supplied complete with clips and one piece of tested crystal.

A Sensitive Crystal

I HAVE had the opportunity of testing a specimen of Talite, a sensitive type of natural rectifying crystal.

The results obtained were very good and there appeared to be no difficulty in finding a sensitive spot.

The crystal was tested in the ordinary type of catwhisker detector on a standard single-coil crystal set, which was detuned until signals were only just audible, as a more accurate test of sensitivity can be made when signals are weak. The catwhisker was moved several times, and a satisfactory point was found nearly every time when it was replaced for a fresh trial.

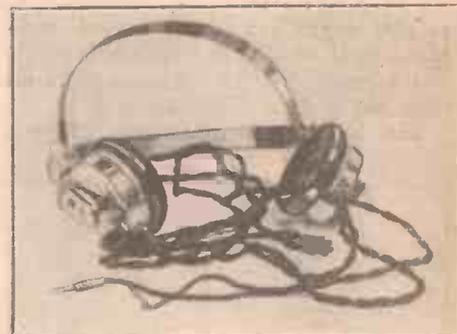
Talite is sold in sealed tubes, and each piece is guaranteed by the manufacturers, who are Harding, Holland and Fry, Ltd., of 52, Queen Victoria Street, E.C.4.

Comfortable Phones

MOST phones of reputable make are sensitive enough to please even those who are slightly hard of hearing, the

quality of speech obtainable generally being very good. It is only on the score of comfort at which one can find anything to grumble.

A number of phones that are otherwise efficient have an unhappy knack of catching the hair when adjusted to fit the head closely.



Ediswan Phones.

Phones that can be adjusted to fit even "outsizes" in heads, that do not catch the hair when removed, and that feel "just right" are manufactured by the Edison Swan Electric Co., Ltd., of Queen Victoria Street, E.C.4.

Cords five feet long are supplied with each pair of phones, so that there is little danger of the set being dragged on to the floor through the wearer moving away from the set. VANGUARD.

PROGRESS AND INVENTION

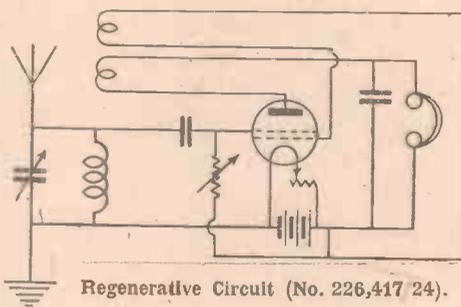
Four-electrode Valve Circuit

PATENT No. 226,417/24 (Rodo Patents, Ltd., Grape Street, W.C.2) referred to a certain type of four-electrode valve circuit in which no added H.T. potential was necessary. Patent No. 228,428/24 describes a method of obtaining more easily the reaction effect which is so necessary for good results on a single-valve circuit.

The theoretical circuit is shown in the diagram, and it will be seen that essentially the circuit is that of the ordinary one-valve regenerative receiver, except that the variable grid leak is connected to the positive low-tension terminal, and that no provision is made for an H.T. battery.

There is, however, a fourth electrode, or grid, in the valve, and it is to the connections to this that the patent refers. A third coil, coupled magnetically to the aerial coil and the usual reaction coil, is connected between the extra grid in the valve and the positive terminal of the filament.

It is claimed that the addition of this coil facilitates the use of reaction. The coil is coupled up to the A.T.I. in the



Regenerative Circuit (No. 226,417 24).

usual manner when reaction is desired, and the coupling is then loosened until the critical point is reached.

Stranded Wire

IT is now generally recognised that the use of stranded wire for acrias is desirable, if not absolutely necessary.

The high-frequency resistance of a single wire is too great for the wire to be employed for short waves, and so the majority of acrias consist of wires stranded or bundled together to reduce the H.F. resistance.

Patent No. 229,058/24 (Ernest Makinson, Lytham, Lancaster) describes a novel type of stranded wire that should prove most useful for acrias for short-wave and long-distance work.

Bunches or sets of finely drawn wires of copper or phosphor-bronze constitute the main conductors of the aerial. The sets are each bound round in a spiral fashion with a wire of greater cross section to increase the spacing of the various parts of the cable. The whole is then bound with flat copper or phosphor-bronze ribbon in such a manner that a single multi-stranded wire is formed.

It is claimed for an aerial of this type that an increase in the clarity and volume of the signals will be noticed as a result of the decreased H.F. resistance.

WAVELENGTH AT A GLANCE

THE object of this article is to enable those who are not fortunate enough to possess a wavemeter to read by means of an attachment to the variable condenser or variometer the wavelength of any station tuned in.

The usual calibration method adopted is to plot a graph with the condenser dial readings of stations of known wavelength. But a graph, besides having a short life, does not give a direct reading.

The attachment illustrated was cali-

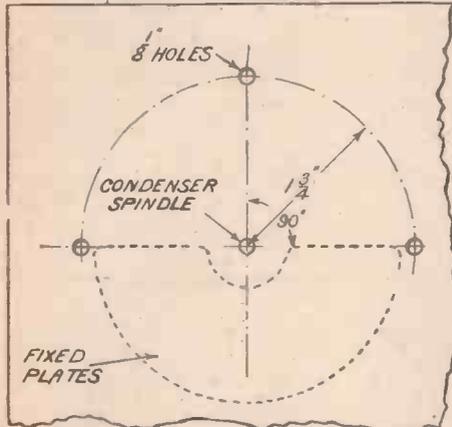


Fig. 2.—Method of Drilling Panel.

brated for a 75-turn hexagonal coil with a .0005 microfarad condenser and a standard P.M.G. aerial in series.

To make the attachment, cut a template of a suitable size to the shape shown by Fig. 1. Paste this on a piece of thin three-ply wood, cut to shape and finish the edges with glasspaper. A stiff piece of cartridge paper is pasted to the reverse side and trimmed flush with the edge of the wood. Drill three 1/8-in. diameter holes in the positions indicated.

Three valve pins cut down to 1/4 in. are secured in these holes, the pins projecting from the side opposite to the cartridge paper. Before the pins are mounted other attachments, if required, should be marked out by means of the first.

Drill three 1/8-in. diameter holes in the panel in the position indicated in Fig. 2. These serve as sockets into which the attachment is plugged, when it will be found to just clear the dial of the condenser.

When the condenser is revolved from its minimum- to maximum-capacity position the 0 degrees mark should advance from point A to point B on the attachment. This is shown in Fig. 3.

The next thing is to obtain a calibration curve of the tuning system.

For the benefit of those who are not familiar with graphs, this is described in

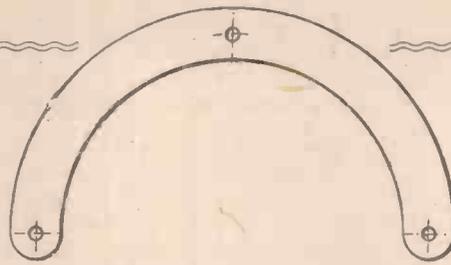


Fig. 1.—Shape of Template.

detail. A piece of squared paper is required 7 in. wide and 10 in. long. A vertical line XY (see graph, Fig. 4) is drawn to the left of the sheet, meeting a horizontal line YZ at the bottom. XY is divided into 180 equal divisions, the smaller squares counting as two units. These are numbered, starting with 0 at Y to X.

YZ is divided after wavelength readings have been found in the following manner: A station is tuned in, identified, and its wavelength noted. The number on the condenser dial opposite A is written beside the wavelength. As many readings are obtained as possible.

If a condenser with an integral vernier is used the vernier should be placed in its middle position and not touched while the readings are being obtained. The approximate extent of the waveband covered by the condenser can now be arrived at—for the graph in question 320-475 metres. The line YZ is divided, starting from Y, so that it accommodates the waveband. In this case each small square represents 2 1/2 metres, this being increased

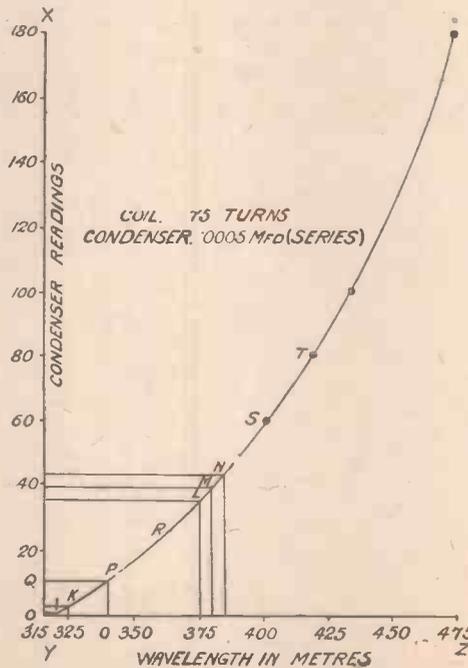


Fig. 4.—Diagram showing how the Calibration Curve is Obtained.

for the higher wavebands and decreased for the lower.

A station of 338 metres, say, gives a condenser-dial reading of 10 degrees. From the point representing 338 metres on YZ a thin vertical line OP is drawn upwards. A similar horizontal line QP is drawn from the 10 degrees mark on XY to meet OP. The meeting point P is marked by a dot.

The rest of the readings are treated in the same manner, resulting in a chain of dots, R, S, T, etc. These can be joined

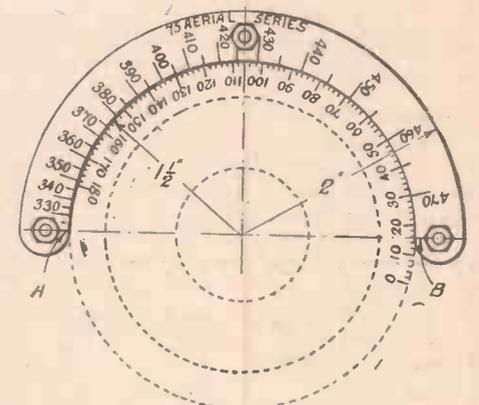


Fig. 3.—The Attachment in Position.

freehand, but if a French curve is used a neater and more accurate calibration curve will be the result.

It is now necessary to find corresponding condenser dial readings for every increase in wavelength of 5 metres—that is, readings for 320, 325, 330, 335—475 metres in this case.

The points IK, LM, N, etc., where every second vertical line, commencing from the one representing 320 metres, cuts the curve, are noted.

Horizontal lines from these points divide XY into the corresponding condenser dial readings. Thus 375 metres gives a reading of 35 degrees, 380 gives 39, etc.

The condenser is set so that the readings in degrees so obtained are successively opposite point A on the attachment. For each setting the position of the 0 degrees mark is indicated by radial lines.

The lines which represent tens of metres are drawn twice as long as those representing the fives. To the longer lines the corresponding wavelength is neatly printed.

As a number of attachments are necessary, three for each coil if the coil is used in the anode of an H.F. valve as well as in the aerial circuit, with series or parallel condenser tuning, the size of the coil with which it is used and the con- (Concluded in third column of page 530)

VARIOMETERS—IN THEORY AND PRACTICE

THE tuning of an aerial is effected by varying its inductance or capacity, or both. Two methods of varying the inductance of an aerial are by means of the sliding and tapped coil. There is, however, a third method, which, for reasons to be explained presently, offers distinct advantages over either of the former. This third method is provided by means of an instrument known as a variometer. The principle on which this instrument works will readily be understood when we have noted one or two effects produced by the passage of a current of electricity through a coil of wire.

Magnetic Fields

When an electric current begins to flow in a wire it takes some little time to attain its full strength. It grows gradually—though very rapidly, of course—from zero

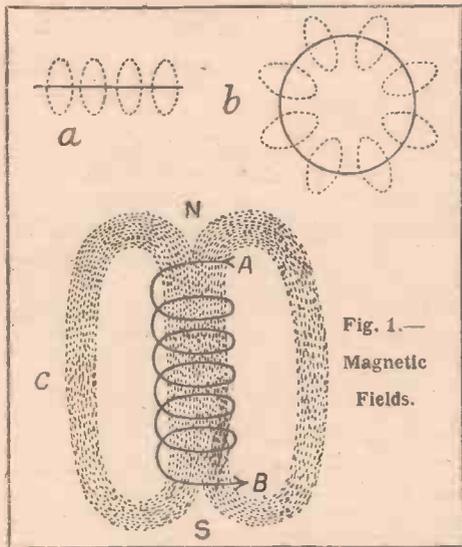


Fig. 1.—
Magnetic
Fields.

strength to maximum strength. As the current grows in strength there grows with it a magnetic field, which acts round the wire in the form of little rings of magnetic flux, as shown at *a* in Fig. 1. The strength of the magnetic field thus produced is always proportional to the strength of the current that produces it. As the latter increases in strength the rings expand; that is, the field gets stronger. When the current is at a maximum the field is at a maximum. And if the current begins to decrease in strength, the field also begins to decrease in strength.

If the wire which carries the current be bent in the form of a loop, as shown at *b*, the latter will have the characteristics of a magnet. One side of the loop will have a north pole, and the other side a south pole. The same effect, in a much more

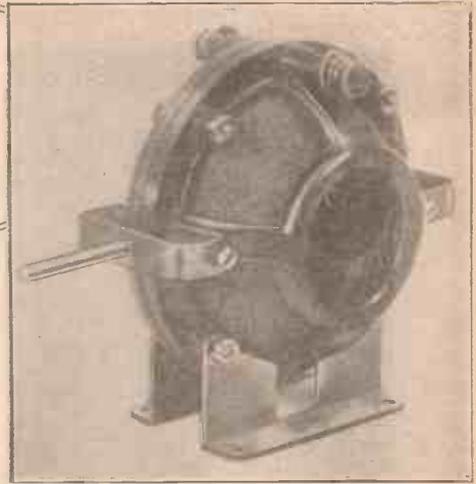
marked form, will be experienced if a coil of wire be used (see *c*). The important thing to note is that the polarity of the coil depends upon the direction in which the current flows through it. Thus when the current enters the coil *AB* at *A* and leaves it at *B* (Fig. 1*c*), the top end of the coil becomes a north pole and the lower end becomes a south pole; *but if the direction of the current be reversed the poles become reversed too*. If the current be made to enter at *B* the lower end becomes a north pole and the top end a south pole.

Connections

If we connect two such coils in series, therefore, each will act as a magnet. When placed with their ends adjacent to one another they will attract or repel in the same way as do ordinary bar magnets. At *a* in Fig. 2 are shown two coils in series between the aerial and earth of a wireless receiver. Let us assume that when a positive charge flows in the aerial it produces north poles at *A* and *C*, and south poles at *B* and *D*. The adjacent poles *B* and *C* will therefore be "unlike," and, as the reader is aware, "unlike poles attract." The two coils will thus mutually attract and assist each other. If, however, the current be reversed in the coil *CD* (by connecting *B* to *D* and *C* to earth, as shown at *b* in Fig. 2), the polarity of this coil also becomes reversed, with the result that the two adjacent poles are now south poles, which, being "like," repel one another. Instead of reversing the connections on the coil *CD* we could, of course, have obtained the same effect by just turning this coil round, so that the end *D* (south pole) became adjacent to *B*, as shown at *c* in Fig. 2.

Inductance

Now the *inductance* of a coil of wire depends upon other factors besides the length of the coil, though the latter is, of course, as every amateur knows, a very important factor. It also depends upon the strength of the magnetic field that cuts the coil. When two coils, each with a separate field, are placed in the same circuit, therefore, the *total* strength of the field can be altered by altering the relative positions of the coils. When they are set so as to oppose one another (as at *b* in Fig. 2), the effective field is reduced; and when they are set so as to assist one another, the effective field is increased. Needless to say, the closer they are together the more marked will be the attraction or repulsion they exert on one another. Thus by adjusting the distance between them and altering their relative positions a range of inductance can be obtained.



Ball-type Variometer.

Practice

A variometer consists of two coils, connected in series, whose relative positions can be varied at will. If the two coils be placed as close as possible together, and in such a way that their fields assist one another, the inductance of the circuit will be a maximum. And if they be placed as close as possible together, with their

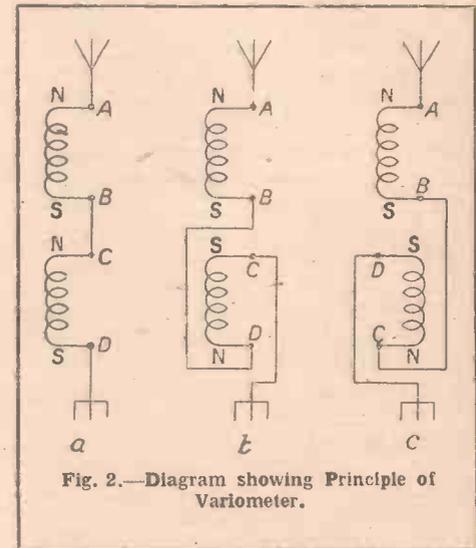
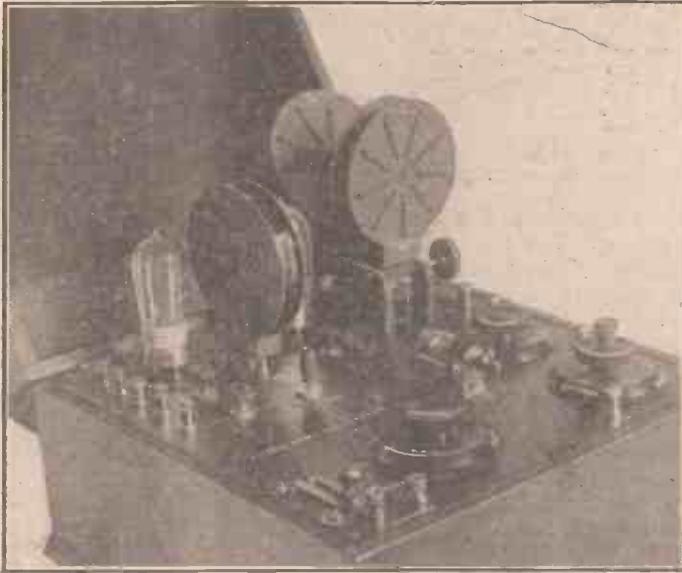


Fig. 2.—Diagram showing Principle of
Variometer.

fields opposing one another, the inductance of the circuit will be at a minimum. One of the easiest ways of securing close coupling between the coils is by winding them on formers of different sizes and sliding the coil of larger diameter over the coil of smaller diameter, as shown in Fig. 3. The polarity of *CD* can be reversed by removing the coil from its present position, turning it round, and replacing it again. Tuning with such a variometer is effected by sliding the larger coil over the smaller until signals are at their loudest. The dimensions of the aerial with which the instrument is used, as well as the wavelength of signals to be received, determine whether the fields should assist or oppose one another. In practice this can be ascertained by experiment.

(Concluded at bottom of page 532)



View of Receiver with Case Open.]

BOTH main and relay broadcasting stations are naturally erected in thickly-populated areas, thereby enabling the greatest possible number of listeners to receive a programme with the minimum of apparatus. An unfortunate consequence is, however, that a large number of listeners meet with "jamming" from the local station when they endeavour to receive others. Very selective receivers to obviate this are not difficult to design, but are generally far from simple to operate, unless efficiency, as judged by the number of valves it is necessary to employ, is sacrificed.

The set illustrated was designed primarily to overcome these difficulties by providing a very simple way of cutting out the local station at close range. Fig. 1 shows the circuit diagram and Fig. 2 the wiring.

To ensure stability, freedom from distortion and constant tuning it was necessary to omit reaction; in order, therefore, to obtain the necessary range and volume with two valves, the first is made to perform the two functions of high- and low-frequency amplification and a crystal is used as a detector. The second valve is an L.F. amplifier, which can be thrown in or out of circuit by a switch. In addition, there is a separate oscillatory circuit loose-coupled to the grid circuit of the first valve, which may be used for various purposes, as later detailed.

The expectations arising from previous experiments with the circuits possible on this receiver were more than justified when it was connected up for test at five miles from 2LO. The London station was entirely cut out by simple rule-of-thumb tuning, then, with the second valve "off" and searching with one control only, a number of other broadcasting stations were quickly found. Really powerful loud-

speaker results were obtained on 2LO and 5XX, whilst both Madrid and Hilversum (Holland) have been received with sufficient strength to operate a small loud-speaker intelligibly in a small room. Such volume from distant stations cannot, of course, be relied upon with two valves.

This set is quite stable in all the recommended methods of operation, and no low-frequency oscillation has been experienced, even with the crystal out of adjustment. A stabilising resistance, marked + bias on the panel, was, however, introduced in case it should be necessary.

Operation

The methods of operating the receiver will be of more particular interest to those constructing it, but may be followed by reference to the circuit diagram Fig. 1 and the photographs.

With the aerial and earth connected to the terminals so marked, the set can be used as a straightforward reflex receiver, tuning being carried out with the grid and anode variable condensers; the separate circuit consisting of a coil and condenser in parallel marked A1 and E (since it is used as the aerial circuit when loose coupled) is disregarded in this method.

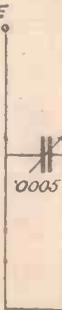
The first few stations received should be used as the basis of a graph showing the anode condenser readings corresponding to the wavelengths. A square-law condenser is used for anode tuning, and a straight line should result which will enable the condenser to be set at any desired wavelength when searching for other stations. The tuning of this circuit is flat, and absolute accuracy is not essential to the finding of a transmission; when received, an improvement may be effected by retuning. The readings will remain constant for the same coil in all the methods detailed.

An alternative reflex circuit may be tried by connecting the earth to the terminal EA. For one-valve reception this circuit is very efficient and is less likely to pick up hum from electric mains than the first, in which the first L.F. transformer is in the aerial circuit. If the second valve is switched in with the earth so connected, particularly when receiving on short wavelengths, hand-capacity effects may be noticeable. It is accordingly not recommended for tyros except for reception with the first valve.

Where interference is experienced from electric

AN ULTR

Constructional



A-SELECTIVE TWO-VALVER

details of a loud-speaker set with which it is possible to cut out the local station.

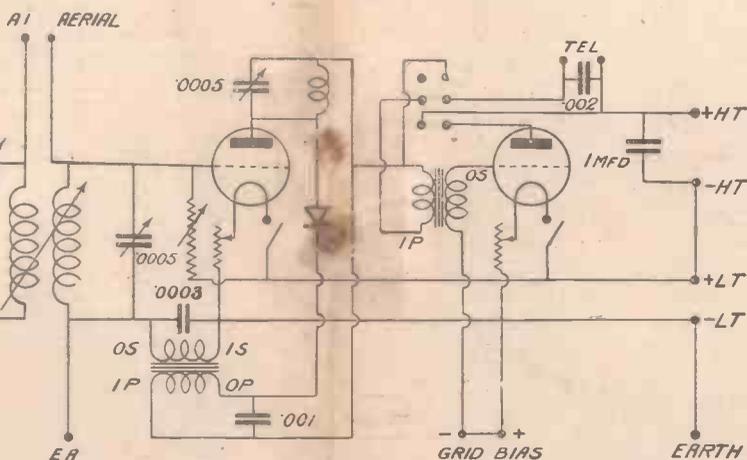


Fig. 1.—The Circuit Diagram.

mains and other electrical apparatus this can usually be entirely eliminated by the loose-coupled method of reception.

Wave Trap

When in close proximity to a broadcasting station a simple form of wave-trap has been found to be the most efficient method of cutting out the local station. Although there are three condensers to operate, no difficulty need be apprehended, as they can be dealt with individually, and

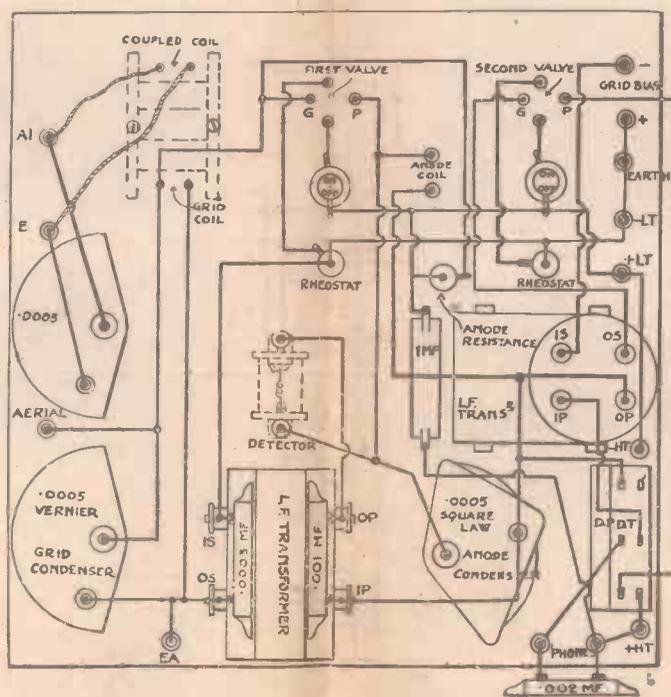


Fig. 2.—Wiring on Under Side of Panel.

no knowledge of the underlying principles is necessary.

A coil of similar wavelength range to the anode coil is plugged into the moving-coil holder and tightly coupled to the grid-(aerial) circuit coil. Connections are the same as for straightforward reflex reception. The local station is first tuned in at full strength. Next the loose-coupled wave-trap coil must be tuned by means of the A.T.C. to the wavelength of the local station, and at one position signals will entirely disappear. All the oscillations are transferred to the separate circuit, which offers much less impedance to the incoming radio-frequency currents of its own wavelength than the damped aerial circuit.

The tuned-anode condenser must now be set by the graph at the wavelength of the station it is desired to pick up. A good spot on the crystal will have been found on the local station, and the tuning of the grid condenser, to which a vernier attachment is desirable for final adjustment, should bring in the stations sought.

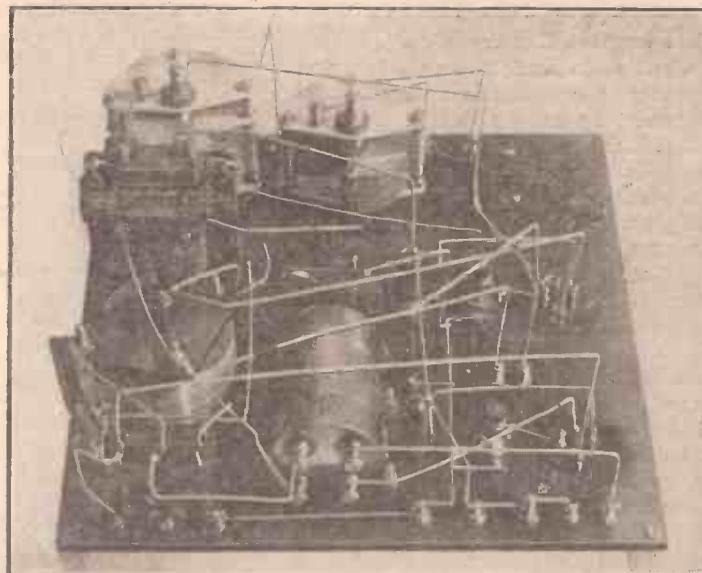
The greater the distance one is from a local station the less tightly need the coils be coupled, but at a distance of eight miles and over from a main station loose-coupling should prove equally efficient.

Loose-coupling

In the wave-trap method we cut out one station entirely and then pick out from the others the one we desire to receive. By loose-coupling we reverse the procedure, and making the separate circuit the aerial circuit, pick out from this the one station we wish to hear. We have then the advantage that other forms of interference will also be lost and a particularly silent background obtained. The tuning, however, has not the simplicity of the wave-trap method.

The aerial and earth must be connected to A1 and E respectively and the position of the two coils used in the wave-trap method reversed in the two-coil holder. The distance of the two coils apart will depend upon circumstances, but they should be as near as will admit of the local station being inaudible.

The anode condenser may be again set by graph, but the grid condenser and A.T.C. should be tuned simultaneously. The beginner may find it better to move the A.T.C. regularly by stages of two or three degrees at a time and the other slowly through the entire scale. When experience is gained the more ambidextrous method will come naturally.



View of Under Side of Panel.

A number of other methods of operating the set are possible.

Reaction may be introduced as an experiment, connecting A1 and E to the anode-coil holder by means of short leads and a spare coil mount. The A.T.C. will be set at zero and the anode coil plugged in the moving-coil holder.

For frame aerial reception use the terminals AERIAL and EA. If A1 and E are connected to these terminals both condensers may be used for tuning, giving the equivalent of a .001 condenser, which is desirable.

Construction

The construction of the receiver should, with the assistance of the photograph and diagrams Figs. 1 and 2, prove a straightforward job. Care should be taken that reliable components are chosen. A shrouded transformer is desirable for the second stage. Whilst the components are shown mounted on a 12-in. by 12-in. panel, if different makes are used make sure that this size will be sufficiently large before commencing operations. The spacing and components required will be obvious from the diagram of connections.

In following this diagram reference should be made to the under-panel photograph, and parallel wiring similarly avoided. It will be noticed that both E and EA are connected to the fixed plates of the respective condensers.

The grid-bias terminals will normally be connected above the panel by a short wire. Whether grid bias is necessary will depend upon the kind of valve used, but unless more than 90 volts is applied to the plate this can be omitted. No grid bias was used to obtain the results mentioned, which were obtained with 1-volt valves and 90 volts high tension.

(Concluded at bottom of next page)

CRYSTAL RECEPTION WITHOUT AN EARTH

It often happens that reception is spoilt by a bad earth lead; this can, in most cases, easily be remedied in a very simple way, namely, by using no earth at all.

All that is necessary, where plug-in coils are used, is to replace the normal coil by one which, when the set is connected to earth, would be too large for the particular wavelength required. Say, for instance, that a certain aerial and earth system requires normally a 35 coil, identical results will be obtained by completely disconnecting the earth lead and replacing this coil by, say, a 100; it must be understood that the right coil can only be ascertained by experiment, as this greatly depends on the efficiency of the aerial. It will be found that if a 100 coil with no earth connection gives the desired result with an aerial of, say, 100 ft., a 150 coil may be necessary with a smaller aerial.

This fact should prove a great benefit where an efficient aerial is used but where the earth connections are defective; it will be found that better results are actually obtained with no earth and with a larger coil, as explained above, than with the ordinary sized coil and a bad earth. Identical effects are obtained with other coils; all that is necessary is to ascertain the exact amount of inductance required by increasing the number of turns until signals are heard. It will be found that, given a certain coil, additional capacity will bring in signals. In other words, where a variable condenser is used this will help the larger coil to bring in signals using the aerial alone. R. R.

The programme for April 2 will contain several of the works of Liza Lehmann, including the song cycle "The Golden Threshold." Entertainment will be given during the evening by Miss Ray Wallace and Mr. Mark Aubien.

LOOKING BACKWARD

It is perhaps not generally known that the scheme of broadcasting as we know it to-day was first outlined in a very interesting book published in 1888. The author was Edward Bellamy, who was for some years on the staff of the *New York Evening Post*. Bellamy, who was born in 1850, was educated in America and Germany, studied law and was admitted to the bar. He did not practise, however, and in 1875 began to devote himself to literature.

His greatest success was his socialistic novel "Looking Backward," its theories creating a widespread agitation. Upwards of 300,000 copies were sold in America within two years of its first appearance.

Practically a whole chapter of "Looking Backward" is devoted to the broadcasting scheme, which in some ways is in advance of 1925. The book was supposed to have been written in the year 2000.

Bellamy's programme was for twenty-four hours, or, in other words, there was a continuous performance. There were four simultaneous performances in the same town to give a large variety of instrument and *motif*, and special programmes were arranged for the sleepless, the sick and the dying.

Small wonder that one of the characters in the story, a Mr. Julian West, should exclaim that if his predecessors could have provided everybody with music in their homes, perfect in quality, unlimited in quantity, suited to every mood, and beginning and ceasing at will, they would have considered the limit of human felicity already attained, and would cease to strive for further improvements.

S. G. C.

An interesting feature of the Edinburgh programme on March 26 will be a mock trial.

One-valve reflex receivers make good portable sets.

SULPHATION AND THE REMEDY

SULPHATION is the term applied to an undesirable local action which occurs upon the lead plates of an accumulator cell when it has been discharged below its safe minimum and allowed to remain in that condition for any period of time. A sulphated cell is easily distinguished by the whitish grey coating which forms on the plates, which are normally dark in colour. This coating is set up by the action of the sulphuric acid upon the discharged plates forming an insoluble chemical known as lead sulphate.

When such a cell is placed in a valve circuit it may be the source of parasitic noises during reception, usually diagnosed as being due to a faulty H.T. unit or to atmospherics. The affected cell when put on charge gases abnormally and will not retain its charge as it should. In its advanced stages the formation of sulphate may actually cause a short-circuit between adjacent plates, in which case there is no remedy.

In fact, in any cell where the sulphating is very bad there is no effective remedy, and it is wise to scrap the cell entirely. For batteries which are only slightly affected, however, the writer has used the following remedy with every success. The acid is first of all poured out of the affected cell and the latter refilled with a strong solution of soda and water. The cell is now put on full charge for a period of about an hour, the polarity being reversed several times, when the sulphate will show signs of dissolving slightly. This solution is thrown away and the cell rinsed thoroughly with distilled water.

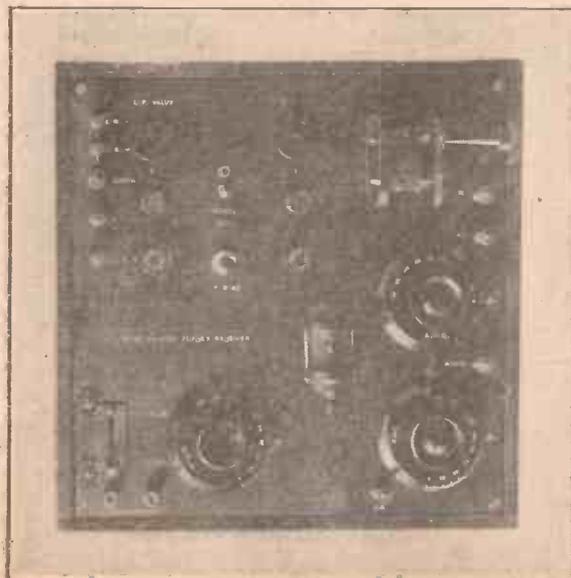
A warm solution of ammonium acetate (3 oz. to the pint) is now poured into the case until it is filled to one-fourth of its capacity. A vigorous shaking will now help to dislodge the sulphation, which will change the liquid to a dirty grey colour. This is repeated until the entire deposit has disappeared. The rinsing process is repeated with distilled water and the cell refilled with new sulphuric acid. A slow charge completes the cure, and providing the affected cell is taken in hand very soon after the symptoms have appeared the result will prove entirely satisfactory.

W. A.

A Viennese firm who recently required the services of a shorthand-typist broadcast the request from the "Radio-Wien" broadcasting station. A business letter was dictated through the microphone at normal speed, and candidates for the situation were requested to send it in with their formal application for the situation.

The new Graaf station, which is to relay the Radio Wien programmes from Vienna, will work on 404 metres.

K D K A recently attempted to broadcast the roar of Niagara Falls.



"AN ULTRA-SELECTIVE TWO-VALVER"

(Continued from preceding page)

Snap-type terminals were used for both H.T. connections. This example might well be followed; as even the experienced have been known to burn-out their valves by connecting the H.T. to the L.T. terminals.

The cabinet shown has a sloping lid, which closes over both coils and valves, but the choice of this can well be left to the taste and resources of the constructor.

S. E. N.

(Left) Plan View of Panel.

for Sunny days are near —and Radio is here

Sterling radio has a place in outdoor life, for everywhere on sunny days it is ready to provide the constant charm of music, song and speech. On the river, in the garden, by the sea—what prospects of happy pleasures it opens up for spring and summer!

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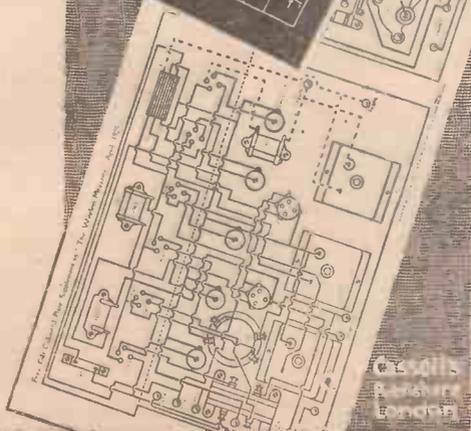
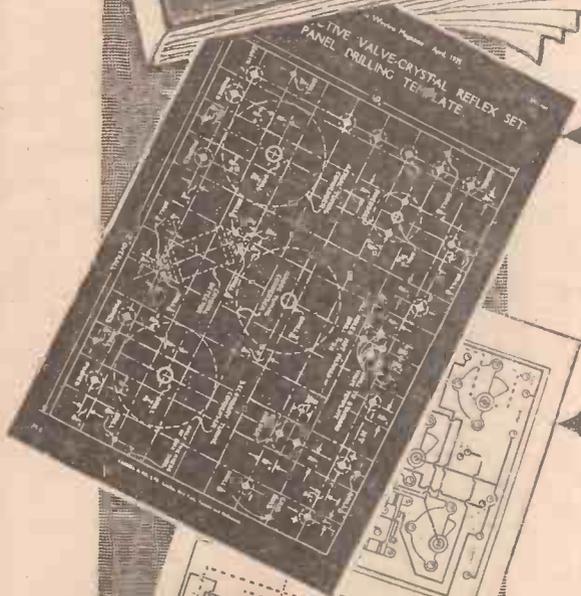


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- UNDER MY AERIAL. The Chat of the Month.
- FOREIGN EXCHANGES. By E. V. KNOX ("Evoc" of "Punch").
- THE PUBLIC AND THE P.M.G. By A BARRISTER-AT-LAW.
- SPORT AND WIRELESS. By L. R. TOSSWILL.
- IDEAS FOR ANTIQUE CABINETS.
- A HIGHLY-SELECTIVE VALVE-CRYSTAL REFLEX SET.
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- BROADCAST MUSIC AND MUSICIANS OF THE MONTH.

In addition to the many important technical articles, this superb monthly contains numerous features of interest for every wireless enthusiast. Its contributors include some of the most foremost writers and artists of to-day, and its pages are beautifully illustrated. The high standard set by "The Wireless Magazine"—which has already made it pre-eminent among wireless periodicals—is well sustained by No. 3.

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The Wireless League is **CONSTRUCTIVE** in purpose. It aims solely at helping the development of Wireless. It is *not* antagonistic to any existing wireless organisation.

ENROLMENT FORM

(Valid only up to 31st March, 1925)

To the General Secretary,
THE WIRELESS LEAGUE,
 116, Fleet Street, LONDON, E.C.4.

Please enrol me as a Founder member of The Wireless League. I enclose one shilling, * being one year's subscription, which entitles me to full membership with all the privileges and rights as enumerated in the constitution of the League.

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WRITE IN CAPITAL LETTERS.

Name (in full)

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A NEW broadcasting station is now nearing completion in Milan; it is also proposed to erect transmitters in Florence, Naples, Palermo and Venice.

A Scottish amateur states that he has heard 5CH (Prince Rupert, British Columbia).

The Radio Circle of the Glasgow station is organising a bazaar this month to provide additional loud-speaker sets in children's hospitals in the city.

One of the most attractive features of Scottish programmes in the past winter has been the relaying of Scottish orchestral concerts. Appreciation was expressed from long distances, particularly from the south of England.

Two American doctors claim to have developed a system of treating cancer by wireless, and it is stated that the apparatus has proved beneficial hundreds of miles away from the source of treatment.

Two Napier aeroplane expresses were approaching Cologne from London when they received a wireless warning that an exceptionally heavy snowstorm was raging over Cologne aerodrome. The two airmen on receiving this message flew towards Cologne with the utmost care, and were able to locate the snowstorm before they became involved in it.

The new offices of the Second Radio World's Fair were formally opened on February 27, and the directors are already arranging the final details of the big exhibition which is to be held in the 258th Field Artillery Armoury, September 14 to 19, 1925.

The Algiers Radio Club has appointed a technical committee to organise North African wireless societies.

A programme of light British orchestral music for March 30 will contain light ballads sung by Mr. David Jenkins (bass), with duets by Mr. Louis Dare and Miss Doris Burns, and entertainment by Miss Gladys Merredew, Nelson Jackson and Mr. Michael Raglan.

An attempt to re-broadcast a London concert from an American station has met with partial success, for, though reception suffered greatly from atmospherics, many listeners-in were able to distinguish the chimes of Big Ben.

At one of the largest cafés in Nottingham a wireless set and two loud-speakers have been installed. Shoppers can now enjoy afternoon tea while listening to wire-

less talks on needlework and cookery, or to the music relayed from a local cinema.

The French wireless amateur association, "Les Amis de la Tour Eiffel," is now providing concerts which are broadcast by the Eiffel Tower, Paris, on 1,500 metres. The concerts are at present being given every Wednesday at 20.00 G.M.T.

Clock chimes at 1 p.m. and at 9 p.m. are now sent out from Radio-Paris on 1,780 metres.

The Cambridge Town Council has decided to tax every council tenant who erects a wireless aerial. The reason given for the charge is that there is a certain amount of danger from lightning in fixing aerials to a house.

On April 2 a short entertainment will be given by the Novelty Trio from 7.35 p.m. till 8 p.m., when the chamber music will include violin and piano sonatas played by Mr. Albert Sammons and Mr. Evelyn Howard-Jones. They will play also Beethoven's Sonata in F, usually known as "The Spring" Sonata.

The popularity of wireless was advanced as a reason for the winding-up of the Wigton Literary and Scientific Society at the close of its sixteenth session. It was stated that people preferred to listen-in than attend the lectures.

The Union of Welsh Societies has appointed a commission to inquire into details in respect of the suggestion of an All-Welsh wireless station.

Negotiations are proceeding for the purchase by the Postmaster-General of a site 200 acres in extent at North Petheron, Somerset, for the erection of a large wireless station.

The broadcasting station of Geneva, Cointrin (HB1), has ceased its transmissions for the time being. A more powerful transmitter is being installed.

The new Finnish station erected at Helsinki (Helsingfors) is now testing daily on 380 metres between 17.00 and 19.00 G.M.T.

The new 5-kilowatt broadcasting station planned by the "Radio-Wien" broadcasting station will shortly be under construction. It is expected that the wavelength will remain under 550 metres.

For some few days past Hamburg has been experimenting with the relay of our home transmissions. It is hoped to pick up one of the London or Bournemouth

concerts and to broadcast it throughout Germany, connecting up the various stations by land lines, as is usual in this country. Berlin, not to be outdone, intends to deal in the same manner with Chelmsford (5XX).

The programme by De Groot and the Piccadilly Orchestra to be broadcast on March 29 contains songs by Miss Mavis Bennett, the successful coloratura soprano.

In order to meet the wishes of the Flemish-speaking portion of Belgium, the Brussels broadcasting station has decided to transmit a certain number of the weekly talks in that language.

Concerts on 1,500 metres will be given at 8 p.m. by the Eiffel Tower in addition to the daily programme on 2,600 metres at 6 p.m.

A popular Saturday-night type of programme will be provided on April 4 by the orchestra with English concertina solos.

A military band programme will be provided on March 31 from 5XX by the Kneller Hall Band under Lieut. H. E. Adkins, Mus.Bac., with songs at the piano by Miss Doris Grover, pianoforte solos by Miss Anita Harrison, and entertainment by Mr. Foden Williams.

A symphony concert conducted by Sir Edward Elgar will be broadcast on March 31.

Direct communication between the transmitting station at Nauen and Buenos Aires is maintained nearly every night on a wavelength of 30 metres.

Steps to equip all the weather observation stations in the Alps with modern wireless apparatus are being taken by the several countries which have Alpine territory within their frontiers.

"WAVELENGTH AT A GLANCE" (continued from page 522).

dition of tuning should be denoted on the attachment.

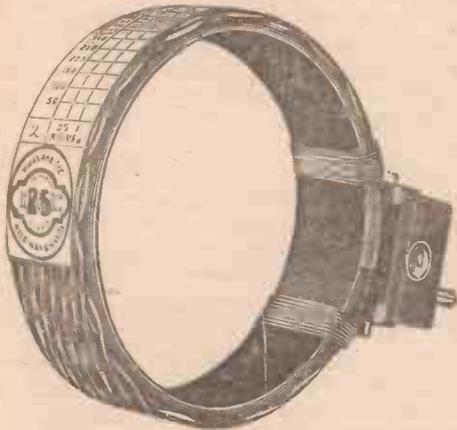
It should be fairly obvious that for higher wavelengths two adjacent markings must cover about 50 metres. Such is the case with a Chelmsford coil, while for a KDKA coil each mark may only represent an increase of one metre.

As before, when obtaining the curve the variable condenser vernier must be placed in its middle position for tuning in order to keep conditions the same. When the condenser is set at the required wavelength the vernier can then be used for fine adjustment.

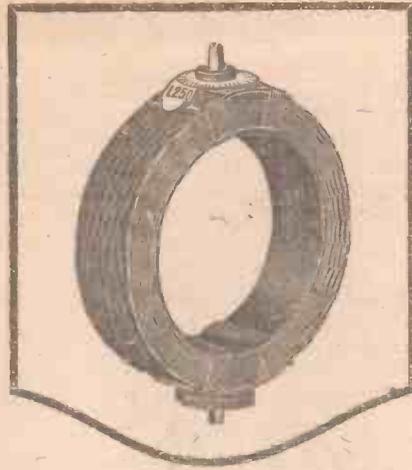
This attachment is invaluable when searching for distant transmissions, especially America. When a carrier wave is brought in it can be fairly accurately identified by its wavelength as given by the attachment.

As an addition the wavelengths of regularly received stations can be marked by their call signs, thus enabling other members of the family to handle the set with greater ease.

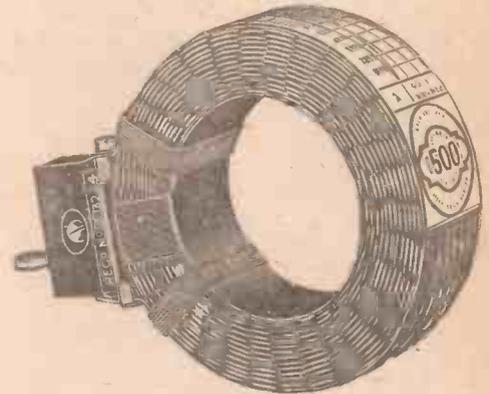
B. H.



IGRANIC Concert Coil



IGRANIC Honeycomb Duolateral COIL Gimbal Mounted



IGRANIC Plug Mounted Coil

There's an Igranic Coil for every need

For all general purposes there is the plug type Igranic Honeycomb Coil—long acknowledged the standard by which all coils are judged. This type is available in nineteen sizes giving wavelength ranges of from 150 to 23,000 metres, including intermediate sizes of 30, 40 and 60 turns. Prices vary from 5s. to 15s. each, according to wavelength range.

For the perfect reception of music there is the Igranic Honeycomb Concert Coil. This coil has been specially developed in order to give listeners distortionless reproduction coupled with maximum volume when receiving B.B.C. concerts. It is made in four sizes—110 to 285 metres, 4/10; 205 to 500 metres, 3/8; 348 to 706 metres, 5/- each; 495 to 1050 metres, 5/2. Fits all standard plug-in coil holders.

For highly selective tuning there is the Gimbal mounted Igranic Coil. The special method of mounting—two studs or gimbals which form the terminals and means of fixing to the holder—is the unique feature of this coil. Not only is a precise angular adjustment of the coils possible, but in addition, by reason of the fact that each coil is rotatable about its own axis—a very fine and critical adjustment can be made. In critical selective, regenerative and rejector circuits particularly this fine tuning is greatly appreciated. As in the case of the plug type coil, there are nineteen sizes available.

In all Igranic Coils the famous De Forest Honeycomb Duolateral winding is employed and thus you are assured low self-capacity, small absorption factor, minimum H.F. resistance and high self-induction—the qualities of the ideal inductance.

All reputable dealers carry stocks. Write for List Z449.

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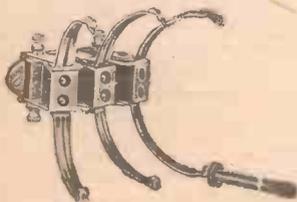
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149 Queen Victoria St., London

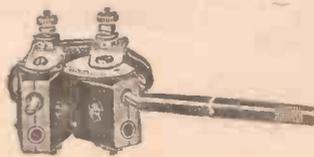
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The Coilholders for IGRANIC Honeycomb Duolateral Coils



IGRANIC GIMBOLDER COIL HOLDER

Without stand, panel mounting for 3 coils, 15/-
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Price, with stand and ebonite operating handle, 16/6
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IGRANIC TRI-PLUG COIL HOLDER

Price, with stand and ebonite operating handles, 21/-
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IGRANIC GIMBOLDER COIL HOLDER

With Stand for 3 coils - - - 21/-
" " " 2 " - - - 16/6

"VARIOMETERS—IN THEORY AND PRACTICE!"
—(continued from page 523)

This particular type of variable inductance has one great advantage over coils which operate on the tapped or sliding principle. With either of the latter kinds of coil there is always a certain amount of the wire out of use. This unused wire forms a dead end to the coil, and dead ends are always to be avoided in wireless circuits; they lead to a slight waste of energy. With a variometer tuner there

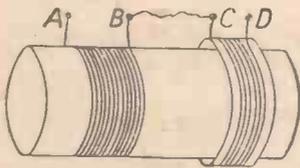


Fig. 3.—A Simple Variometer.

can never be a dead end. All the wire on the coils is always included in the circuit, their inductance being solely determined by their relative positions.

Variometers are assembled in many different ways. For instance, a very neat and compact variometer can be made by fitting one coil inside the other and mounting the inner one on a vertical spindle, as shown in the photograph. This spindle, it will be seen, passes freely through a hole in the former on which the outer coil is wound, its upper end being fitted with a small ebonite knob. When this knob is rotated the small coil revolves on an axis inside the

large coil, the latter remaining stationary. By this means the widest possible range of inductance values can be obtained. When the coils are set at right angles to one another there is a minimum of interaction between their fields, and when set so that their planes are parallel to one another there is a maximum of interaction.

Pancake coils, consisting of concentric circles of wire wound on flat discs, are sometimes used in the construction of variometers, different values of inductance being obtained by sliding one coil over the other. Variometers are used widely today for the purpose of tuning the aerial circuits of crystal receivers. M. E.

The Radio Association has written to the Postmaster-General giving their observations on the Wireless Bill now before Parliament.

The Beam system in South Africa will be ready by September 1.

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. 544) and stamped addressed envelope are sent us.

A NEW FREQUENCY METER

A NEW and rather elegant method of measuring the frequency of alternating currents was submitted to the French Academy of Sciences recently by M. A. P. Rollet.

The current is sent through a potash or soda solution, the electrodes being two silver wires 1 mm. thick. The liquid is allowed to run out of the vessel, and the rate of subsidence is noted. On examining the silver wires it is found that they are marked in regular stripes. These stripes are produced by a black oxide of silver formed while the current is passing out of the metal into the liquid. The subsidence of the liquid prevents the oxide being dissolved by the return phase of the alternating current. Thus the black cross-markings remain on the silver to show the alternations of the current. If, for instance, the liquid subsides by one inch per second, and there are twenty-five stripes to the inch on the wire, the rate of alternation is twenty-five per second.

Frequencies already measured by this method range from 25 to 75, but probably they can be increased to over 100 per second.

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

"FAMA" DUTCH VALVES

	Retail Price
Dull-Emitters, Filament 1'6 to 2'0, Plate 20 to 100 Amps. 0'06	12/6 each
'R' Type (Amplifier), Filament 3'8 to 4'0 Plate 60 to 100, Amps. 0'5	4/9 each
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High Tension Batteries (best quality), 60 volt, tapped every 3 volts	6/9 each
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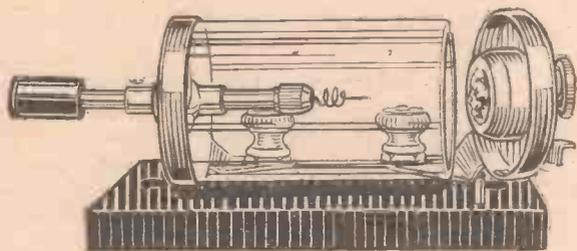
DAILY GRAPHIC

ONE PENNY

GECOPHONE

WIRELESS COMPONENTS

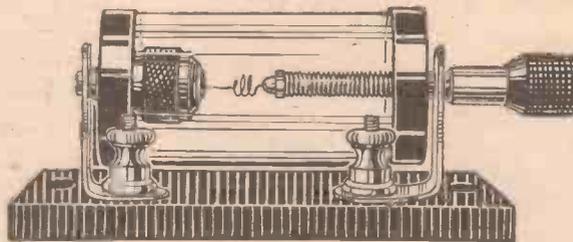
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Instant accessibility by lifting small lever when detector swings open. Universal ball joint self-contained in spring cage. Constant contact. Crystal breech fed from outside of tube.

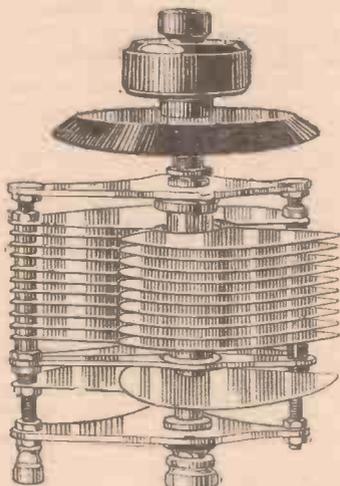
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GECOPHONE MICROMETER CRYSTAL DETECTOR

Screw on crystal cup. Detector arm has free sliding movement for quick contact. Micrometer movement for final adjustment. Operated from one knob.

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Even tuning over entire scale. Minimum capacity unusually low. Low dielectric losses.

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B.C. 204	.0003	" 10/3	B.C. 205	.0003	" 15/3
B.C. 206	.0005	" 10/6	B.C. 207	.0005	" 15/6
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Cutting Out the H.F. Valve

SIR,—Referring to the letter from "G. W." (Bromley), in No. 144, which has reference to mine in No. 142, his connections to the H.F. valve switch are quite correct as far as they go. The difference in the connections arises from the fact that I inserted the switch *before* the H.F. valve, in which case, since the aerial connection was required to be switched from the first to the second valve, it was taken to the centre terminal of the switch as shown in the accompanying diagram.—P. S. B. (Newcastle, Staffs).

SIR,—The correspondence regarding the above subject has interested me very much, inasmuch as I have been using a SPDT switch for this purpose.

I am now using a straight four-valve circuit (H.F., detector and two L.F.), and, not caring for switching on the H.F. side, used two DPDT switches for the two L.F. valves only.

Using the first two valves I find that signal strength is decreased very little, if any, when the filament of the H.F. valve is simply turned off. On the other hand, with the H.F. valve on, a remarkable increase in range is experienced when searching for distant stations.

My circuit is the usual tuned-anode with reaction, using a three-coil holder, reaction coil in the middle.

With the filament of the H.F. valve simply turned off and both L.F. valves switched off, London comes in considerably louder than on an ordinary one-valve set.—H. A. P. (Leyton).

"Tuned-earth Connections"

SIR,—I was interested in R. H. J. McC.'s contribution in No. 144, entitled "Tuned-earth Connections." He states that the experimenter will have to rely on his judgment to get the earths into balance.

Surely this difficulty can be overcome in

the following manner: Connect the counterpoise to the free end of the inductance L (the other earths being disconnected). Tune in a C.W. or telephony station to its silent point, the set, of course, being in a state of oscillation. Disconnect the counterpoise, and try connecting one of the earths to different parts of the inductance until the same station is again tuned in. Proceed similarly with the other earths, keeping note of the points at which each is attached to the coil. Now connect them all to their respective points on the inductance. All should now be in tune, although a slight adjustment of the tuning condensers in the set will be required to tune-in the original station.—C. C. J. (Chelmsford).

Britain Behind in Broadcasting!

SIR,—New York has sixteen broadcasting stations, Chicago eight, and London only one. Even Paris, where broadcasting is not so popular, has four stations.

Why are we so behind in this regard? How would the citizens of London like to be dependent upon one solitary place of entertainment, in which at the discretion of the management a lecture was given one night, a musical comedy the next, and a classical concert on a third? Now that broadcasting programmes are improving, more programmes from which to select are vitally necessary.—PARK GOFF (London, S.W.).

(Continued on page 536)

IF IT'S "CHASEWAY" IT'S THE RIGHT WAY—ALWAYS

A TRIUMPH OF BRITISH ENGINEERING

The 'CHASEWAY' NEW HOME BATTERY CHARGER for ALTERNATING CURRENT

Whilst others have been arguing about "safeguarding" British Radio Industry, "CHASEWAY" engineers have been busy on the best "safeguard," namely giving a better article at a reasonable price.

The "CHASEWAY" DIRECT CURRENT CHARGER was produced only last September, and an infinitely better product at nearly half the price of its nearest competitor—thousands sold. Then the "CHASEWAY" GRIDLEAK caused a stir by establishing itself as the ONLY reliable gridleak on the market—a really scientific instrument, scientifically tested and guaranteed.

Now the "CHASEWAY" ALTERNATING CURRENT charger has come—a real feat of engineering. The only BRITISH product of its kind. Most A.C. chargers are foreign, and this BRITISH product is vastly superior—and at a lower price. Read the following points and then write for fuller details, naming the voltage and periodicity of your local supply.

1. Used by connection with lamp socket or wall plug and consumes very little current.

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Send stamp for illustrated Catalogue of "CHASEWAY" PRACTICAL PRODUCTS.

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WHEN YOU BUY

an L.F. Intervalve Transformer, you should know the factors governing its EFFICIENCY. They are:—

1. A sound closed Iron Core of ample dimensions leaving the absolute minimum of air space.
2. A long Primary Winding, having correct impedance with negligible variation of amplification, over the whole of the audible range.
3. Secondary having Turns relative to Primary, times the steps up required.
4. Perfect Insulation.
5. The whole correctly screened with Iron, and thorough protection of the inside from dampness.
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Add to these factors an outside finish that leaves nothing to be desired, an earthing nut fixing, a clearly marked terminal board with large terminals, in neat leather cover, and you have the distortionless, soundly constructed, British, guaranteed

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30,000 TURN AMPLIFIER CHOKES. 7/6
RATIOS: 5:4:3:2: TO 1. PRICE 8/4 POST FREE.

We are still repairing any make of L.F. Transformer for 5/-, post free.

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Range, Volume, Tone! THE "P.P.S.3"

Build the "P.P.S.3" and obtain a dependable range of at least 600 miles under any conditions, and often 4000 miles. Get the maximum volume from three valves working in a simple straightforward fashion, and get a tone quality that will amaze you.

Keep a Symphony Orchestra in your Home!

A turn of your condenser brings in station after station at good readable—Often times loudspeaker—strength Your own station will be loud enough to be intolerable were it not for the pure unblemished tone of the reproduction.

Get RADIO PLAN No. 4

which tells the raw amateur how to assemble this circuit from a few simple parts, with no fear of failure. Simple diagrams and pictorial explanations make mistakes impossible.

RADIO PLAN No. 4 TWO SHILLINGS from:—

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of the
HOUSE of GRAHAM**

*—A statement of interest to
All Radio users*

DO YOU already possess a Loud Speaker? Have you only tried one—tentatively—and been disappointed? Would you like to obtain more sensitivity or volume from your receiving set, and get *distinctly better* Loud Speaking results?

If there are any such problems requiring a solution, do not hesitate to take advantage of our Service. It is at your disposal in words, when you want advice—and in deeds, when you want results. It is offered entirely free of charge.

Every AMPLION is guaranteed to afford satisfactory results whenever it is associated with a reasonably well-designed and properly tuned receiving set, and this guarantee is unconditional.

The Service Section of the House of Graham is, moreover, in a position to offer positively unbiased advice and information to users of AMPLION Loud Speakers, whether the set used is of any particular make or simply an assembly of components.

This work is regarded as a "mission" towards the universal aim of:—

BETTER RADIO REPRODUCTION

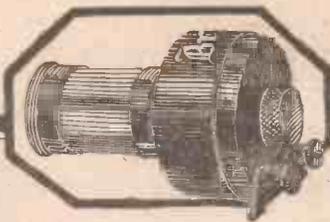
which becomes in every case a practical certainty for those who use the

The **AMPLION** Wireless
World's Standard Loud Speaker.

**A PRODUCT OF THE
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*Obtainable from AMPLION STOCKISTS and
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**ALFRED GRAHAM AND COMPANY,
(E. A. GRAHAM)
St. Andrew's Works, Crofton Park, London, S.E.4.**



Have you a Gramophone—then why not use it as a Loud Speaker?

MANY wireless enthusiasts have overlooked the fact that any good Gramophone can be readily converted into a first-class Loud Speaker by the attachment of a **BROWN Gramophone Wireless Adaptor** (in either of its two types).

No alterations are necessary, merely remove the Sound box and fit the Adaptor. A rubber connection ensures that it will fit practically every type of Gramophone.

You will be surprised at the volume of mellow tone that either of these Adaptors can produce—with a good Gramophone the results should be practically indistinguishable from a standard **BROWN Loud Speaker**.

Prices \$⁹
SOLD IN TWO TYPES:
Type H1.

120 ohms £4 : 7 : 6
2000 ohms £4 : 10 : 0
4000 ohms £4 : 12 : 0

H2. (as illustrated)
120 ohms £2 : 0 : 0
2000 ohms £2 : 2 : 0
4000 ohms £2 : 4 : 0

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Showrooms:
19 MORTIMER STREET, W.1
15 MOORFIELDS, LIVERPOOL
67 HIGH ST., SOUTH AMPTON

Brown
Wireless Apparatus

CORRESPONDENCE (continued from page 534)

KDKA on a Crystal

SIR,—With reference to the letter of "W. P." (West Ealing) in No. 175, how did I know it was KDKA?

This was actually assumed and published for verification or contradiction.

My reasons are as follows: (1) The speech heard was decidedly American, the nasal twang and drawl being very marked. (2) The fact that it was a very long-distance station was emphasised by signals coming in waves, as may be noticed on valve sets or during a relay through Chelmsford, but, of course, considerably modified in my reception, being only just detectable. (3) The wavelength I determined by listening to the speech on approximately 400 metres until it faded right out, and then rapidly reverted to 326 (approximately), when speech was again audible, but still fading. This I tried twice with the same result.

I am afraid your correspondent was slightly misled concerning my statement regarding the exceptionally good signal strength. I did not actually infer that speech was clear enough to be understood, this being impossible, due to distortion. Had it been twice as strong I doubt if I should have been able to decipher it. I meant to infer that signals were exceptionally good considering the apparatus used. This, of course, may possibly have been another American

station, but highly improbable, as KDKA is a high-power station and more likely to be received.

I should like to point out that KDKA is often received on one-valve sets in this country, and I quite believe my set to be equal to many one-valvers I have heard. The reception took place on January 2, not February 2 as stated.—S. M. S. (Thrapston).

Other Correspondence Summarised

G Y G (102, Woodside Road, Bowes Park, N.22) would be glad of reports on his transmissions.

F. M. (Ealing) informs us that the American station WBZ (Springfield) is now operating on a wavelength of 333.1 metres with a power of 1,500 watts.

"Renewing Damaged Floors" is the title of a very useful article in the current issue of "The Amateur Mechanic" (3d.). Other articles and features appearing in the same number are: "Experiments with a Tesla Coil," "How to Buy Wood," "A Footstool in Three-ply," "The Care of Acetylene Headlamps," "A Simple Crystal Receiver," "Erecting the Indoor Aerial," "Notes by the Way," "Building a Portable Workshop," "Melting Brass in the Kitchen Fire," "An Easily-made Soldering Lamp," "Re-fining Motor-car Brake-shoes," "A New Idea for Hammer Heads," "Making Money by Inventing."

CHIEF EVENTS OF THE WEEK

SUNDAY, MARCH 29		
London	3.0	Chamber Music.
London	9.0	De Groot and the Piccadilly Orchestra.
Manchester	3.0	Light Orchestral Programme relayed to 5 X X.
MONDAY		
Bournemouth	8.45	Chamber Music.
Manchester	7.30	The Gamblers.
Glasgow	7.30	Popular Concert.
Belfast	7.30	The Merchant of Venice.
TUESDAY		
London	7.30	Sir Edward Elgar conducts programme of his own works, S.B. to all stations.
5 X X	7.30	Military Band Night.
WEDNESDAY		
London	7.30	Liza Lehmann Evening.
Birmingham	7.30	Radio Fantasy No. 4: For the Crown.
Cardiff	7.30	A Night Out.
Newcastle	7.30	Scenes from The Song of Hiawatha.
Glasgow	7.35	Pole to Pole.
Edinburgh	7.30	Operatic Programme.
Leeds Bradford	7.30	Yorkshire Evening News Concert.
THURSDAY		
London	8.0	Chamber Music Programme.
Newcastle	8.0	Newcastle Symphony Orchestra.
FRIDAY		
London	7.30	The Elements.
Glasgow	7.30	Poetry in Music.
SATURDAY		
London	7.30	Popular Night.
Manchester	7.30	Military Band Night.
Aberdeen	7.30	Music—Drama.

WHICH ?



Brown lived next door to Jones. They both made their sets. Same sort of Components—same valves—same condensers, in fact same everything, except for one small thing—and that was all the difference. Jones fretted, whilst Brown sat continually "listening in." In no way was Jones' reception to be compared with Brown's. And that provoked Jones sadly. You see, Brown methodically soldered the

wiring of his circuit. Jones despised that as unnecessary—and called soldering a finicky and difficult job. Soldering is made simple by using the wonderful FLUXITE; so follow Brown's example and solder your connections right away and so avoid imperfect reception.

Ask your Ironmonger or Hardware Dealer to show you the neat little

FLUXITE SOLDERING SET

It is perfectly simple to use, and will last for years in constant use. It contains a special "small-space" Soldering Iron with non-heating metal handle, a Pocket Blow-lamp, FLUXITE, Solder, etc., and full instructions. Price 7/6. Write to us should you be unable to obtain it.



FLUXITE SIMPLIFIES SOLDERING

All Hardware and Ironmongery Stores sell FLUXITE in tins, price 8d., 1/4, and 2/8.

Buy a Tin To-day. FLUXITE, LTD., 326, Bevington Street, LONDON, S.E.16.

ANOTHER USE FOR FLUXITE. Hardening Tools and Case Hardening. ASK FOR LEAFLET on this new method.

YOUR OPPORTUNITY LASTS ONLY UNTIL STOCK IS CLEARED

GUARANTEED BEST QUALITY LONDON MADE VARIABLE CONDENSERS WITH KNOB & DIAL

Square Law Plain		Vernier	
108 only	'001 7/- each	108 only	'001 8/- each
216 only	'0005 5/6 each	77 only	'0005 7/- each
108 only	'0003 5/3 each	82 only	'0003 6/6 each
Standard Plain		Vernier	
108 only	'0005 5/- each	42 only	'0005 6/- each
216 only	'0003 4/- each	52 only	'0003 5/6 each

ALL THE ABOVE ARE POST PAID

OUR GUARANTEE

Money refunded in full for all goods returned within 3 days

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The BRETWOOD GRID LEAK with the N. P. L. Report Patent No. 224953

PRICE 3/-

Post 3d



Another Guaranteed BRETWOOD Speciality is our Improved ANODE RESISTANCE

which gives accurate readings consistently from 10,000 ohms to over 100,000 ohms. It is constructed on the same principles that have made BRETWOOD Components famous, and, of course, it carries the BRETWOOD Guarantee. Patent No. 20292/23. Obtainable from all wireless dealers. Price 3/-; or by post, 3/3

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The Latest Watmel Improvement

The new contact! By means of an ingenious bronze spring (shown in the enlarged illustration) any slackness between the bush and adjusting screw is automatically rectified and perfect electrical contact maintained at all times. Other features worthy of special mention are:—Continuously variable, silent in operation, dust and damp-proof and constant in any temperature.

VARIABLE GRID LEAK, Black Knob, 5 to 5 megohms 2s
VARIABLE ANODE RESISTANCE, Red Knob 50,000 to 100,000 ohms 3s
Send P.C. for Descriptive Folder.

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We are open to accept offers for large quantities of these goods

(800 Fuller Block Accumulators, brand new, with guarantee, absolutely the finest to be obtained for wireless, to be cleared at half retail price, 2-volt 120 amp., 15/- each, post 1/6; 4-volt 120 amp., 30/- each, pass. train, 2/6; 6-volt 120 amp., 42/-, pass. train, 3/6.) (700 Fuller's Inert Batteries, 1½-volt 15 amp. in ebonite cases, 2/6 each, post 1/6.) (600 Ebonite 2-Valve Panels. These are already drilled and beautifully engraved ready for assembling. Size 13¼ x 7" x 1/16" thick, all new. Price to clear, 3/- each, post 9d.) (8,000 Telephone Cords, 6-8 ft. long, various colours, 6 complete cords for 1/-, post 6d.) (8,000 Loud Speaker Bobbins already wound to 1,000 ohms, 6d. each.) (600 Hydrometers. Best make, to clear, 2/- each, post 3d.) (300 M.IV. 3-Valve Amplifiers, having the most expensive fittings, also 3 Intervalve Transformers, 1 Telephone Transformer, Condenser, Stud Tapping, Fil. Rheo., H.F. and L.F. Switch, Cost £12, price to clear, 50/-, post 1/6. Brand new R. Amplifying Valves, 5/- each, only supplied with set.) (2,000 D.III. Microphones, these are well known as very sensitive, loud-speaking and a perfect amplifier, to clear, 2/6 each, post 3d.) (400 M.III. Single Valve Transmitters, range 300-1,450 metres. Containing Stud-tapped tuning, 2 variometers, condensers, wound leak, switches, meter, key, lamp; all coils on heavy ebonite, brand new, cost £15, to clear, 35/-, pass. train, 2/6; Microphones with these sets, 2/6 extra.) (8,000 Pairs 4,000 ohm Headphones, latest type, best make, comfortable and extremely loud. List price, 15/-, our price to clear, 8/6, post 9d., all brand new.) (4,000 yds. Heavy Rubber-covered Lead-in Wire, 2/- per doz. yds., post 3d.) (Heavy Vulcanised Flex, 2/- per doz. yds., post 3d.) (Covered 1/8" wire for wiring sets, very neat, 1/6 doz. yds, post 3d.) (Positive and Negative coloured Flex for H.T. leads, etc., 2/- doz. yds., post 3d.) (400 Aerial Ampmeters, high grade 1.5 amps, panel mounting, 7/6 each, post 6d.) (500 Mansbridge Condensers, 1 M.F., 2/- ea., 2 M.F., 2/6 ea., post 3d.) (800 Brand new Intervalve Transformers. List price, 20/-, to clear, 10/6 each, post 6d.) (50 Brand new Ethovox 2,000 ohm Loud Speakers, to clear, 35/- post free.) (700 Choke Coils, 500 ohms, iron wire enclosed core wound with 38 silk covered wire, 2/6 each, post 3d.) (100 Mine Exploder Dynamos in mahogany case containing 150 Watt D.C. Dynamo, solid built com., variable brush gear with hand-driven plunger, will light 10 25-volt lamps with one push of plunger; high grade machines, cost £18, to clear, 20/- ea.) (50 D.C. Motors, 100-volt ¼ H.P., 25/- each, pass. train, 2/6, price complete with blower mounted on base, 30/-) (60 Marconi D.C. High Tension Hand Driven Generators, 600-volt 30 milliamps, brand new, to clear, 80/- each, pass. train, 3/-) (100 Brand New Marble Switchboards, complete with all fittings, worth £3, to clear, 10/- ea., carriage, 2/-) (100 Mk. III. 2-Valve Receiving Sets, high grade instruments, 100-1,800 metres wavelength. The finest sets the Government used, guaranteed to receive British and Continental Broadcasting at loud-speaker strength, all brand new, cost £18 ea., price to clear, £4 10s. each. 2 brand new R Valves given away free with each, pass. train, 2/6.) (200 Aerial Panels, containing 3-way rotary switch, aerial ampmeter, condenser, 7-8 ft. 4-way cord, 10/6 each, post 1/-) (1,000 Lengths of Steel and Copper Covered Aerial Wire, 1/- per 100 ft., post 3d.) (50, 10 Line Telephone Cordless Exchange Boards, containing 30 Dewar switches, 10, 1,000 ohm chokes, indicators, magneto, bell, handphone transformer, etc., etc., in teak case. Brand new, cost £50, price to clear, 70/- each.) (700 pr. Plug and Jacks, standard type, 2/- per pair, post, 3d.) (1,000 Dewar Switches, 2/- each, post 3d.) (800 Complete Spark Transmitting Sets, useful to experimenters either to use, or break up for parts, cost £15, price to clear, 7/6, post 1/6.) (400 pr. Lightweight 4,000 ohm Headphones, brand new, 7/6 per pair, post 9d.) (1,000 Heavy Transmitting Morse Keys, beautiful instruments, 2/- each, post 3d.) (Ebonite Rods, 12" x 5/8, 6d. each, post 3d.) (500 Single Earphones, Western. all tested, 2/3 each, post 3d.) (5,000 7-piece Terminals, 4 B.A., 2/- per doz., post 3d.) (Egg and Shell Insulators, 1/- per doz., 7/- per gross, post 3d. and 1/-) (100 Copper Earth Mats 20 ft. x 2 ft., 12/6, post 1/6; these will give a perfect earth for long distance stations). (5,000 Ebonite Ear-caps, 2/- per doz., post 3d.) (1,000 Brown's Type Aluminium Headbands, will fit any phones, and comfortable, 2/6, post 3d.) (50 4-Way Fuse Boards with main switches, maker Tucker, in teak polished case with glass front, to clear, 10/6 each, post 1/3.) (500 Boxes Assorted Crystals, 8 different sorts, including genuine Hertzite and Zincite, retail price, 6/6, price to clear, 2/6.) (Useful Wireless Scrap consisting of odd instruments, ebonite, terminals, etc., etc., etc., 9 lb. 6/6, post 1/3.) (Special Clearance 20 only Genuine Lumiere Large Loud Speakers. Brand new in cases. List £7 10s., to clear £5 10s., carriage, 4/-) (In stock also. The Twin Polar Marval 2-Valve Set which brings in many B.B.C. and Continental Stations with ease. Can be heard on Loud speaker. Price £6 15s., post, 1/6. Micro Valves, 12/6, post, 6d. We stock everything new at lowest advertised prices.) (Copper Earth Wire, price per 12 yds., 6d., post, 3d.) (400 M.III Star Tuning Coils, wound with Litz wire on ebonite former, tapped 100-700 metres, cost 20/-, to clear, 4/- each, post 6d.) (500 Valve Boxes padded to hold 3 valves in oak, 1/- each, post 6d.)

NOTICE.—We have recently purchased a large stock of Moving Coil Laboratory standard meters, all new, such as milliampmeters, all ranges, combined instruments, volts, amps, milliamps, voltmeters, up to 2,000 volts. Meggers, ohm meters, switchboard instruments, micro ampeters, etc., etc., all at half prices. These instruments will not be for sale until 3 weeks hence.

Foreign orders must be accompanied by extra postage.



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. Tues. and Thurs. 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), 326 m. Plymouth (5PY), 335 m. Sheffield (6FL), 301 m. Stoke-on-Trent (6ST), 306 m. Swansea (5SX), 481 m.

Chelmsford (high-power station), 1,600 m. Experimental transmission every Monday at 10.30 p.m. from one or other main or relay station.

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 (Radio Wien), 530 m. (1 kw.). Daily: 08.00, markets (exc. Sun.); 10.00, con.; 12.05, time sig., weather; 14.30, Stock Ex. (exc. Sun.); news; 15.10, children (Fri.); 17.10, lec. (Mon., Tues.), con. (Fri.); 17.30, lec. (Thurs., Sat.); 18.15, Eng. (Mon., Wed.); 18.30, news, weather, time sig., con., lec.; 20.30, dance (Wed.).

BELGIUM.

Brussels, 265 m. (1 1/2 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) (250 w.), 1,100 m. (250 w.). 13.00, 14.00, 16.50, 18.50, weather.

CZECHO-SLOVAKIA.

Prague (Strasnice Stn.), 555 m. (1 kw.). 09.00, Stock Ex.; 10.00, con. (Sun.); 10.30, Stock Ex. (weekdays); 16.00, Stock Ex., con. (Tues., Sat.); 17.00, Stock Ex. (weekdays); 18.15, con., lec., weather, news; 20.00, dance (Sat.).

Brünn (OKB), 1,180 m. (1 kw.). 09.00, con. (Sun.); 13.00, Stock Ex., news; 18.00, lec., con. (Tues., Thurs., Sat.).

DENMARK.

Copenhagen (Kjøbenhavns Radiofoni station), 775 m. (1 kw.). 18.35, notices, lec., con.* (Tues., Thurs., Sat.). *This con. is also relayed by the Aalborg ship station on 445 m.

Lyngby (OXE), 2,400 m. and 2,700 m. Weekdays: 18.20, news, Stock Ex. (2,700 m.); 20.00 and 21.00, news, weather, time sig. (2,400 m.). Sundays: 15.00 and 20.00, news (2,400 m.).

Ryvang, 1,190 m. (1 kw.). 19.00, con., news (Tues., Wed., Thurs., Fri.).

FRANCE.

Eiffel Tower, 2,650 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.; 19.00, weather; on 1,500 m. con. (Wed., irr.) at 20.00; 22.10, weather (exc. Sun.).

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

Radio-Paris (SFR), 1,780 m. (3-4 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; 20.50, con.; 21.00, time sig.; dance (Thurs.). Tests probable on 1,125 m.

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.).

Lyon (Radio Sud-Est), 87 and 440 m. Testing.

GERMANY.

Berlin (2), 505 m. (1 1/2 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, time sig.; 14.30, children (Sun., Wed.); 15.00, Esperanto (Sat.); 15.30, orch., French (Tues.); 17.30, lec., women; 18.00, French (Mon.), lec. (Tues. and Sun.); 18.30, lec., Engl. (Thurs.), theatre news (Tues.); 19.30,* con., weather, time sig.; 21.30, chess (Mon.), dance until 23.00 (Thurs., Sat.).

(Continued on page 540)



What the PRESS says of C.A.V. TRANSFORMERS—

"When connected after a power valve, its true value was at once apparent. The tone was excellent, in each case equalling our standard."

WIRELESS TRADER 18th FEB., 1925.

2 3/4 Miles of wire in every C.A.V.

TRANSFORMER

If your aim is to reproduce the original sounds transmitted, without distortion, fit C.A.V. TRANSFORMERS, which are capable of a high degree of amplification, from the lowest to the highest frequencies.

The primary and secondary windings are on separate bobbins, thereby reducing self-capacity to a minimum, whilst the all-enclosed metal case acts as a shield, preventing interaction and excluding moisture.

No. 5150, High Ratio for first stage 27/6 No. 5151, Low Ratio for second stage

IMMEDIATE DELIVERY

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THE ONLY VALVE FITTED WITH THE PATENTED MOLYBDENUM FILAMENT



FILAMENT VOLTS
1.5 to 2
FILAMENT CURRENT
3 amps.

18/-

If your local dealer cannot supply you with the "SIX SIXTY," communicate with us.

DISTRIBUTORS WANTED

Every discerning dealer will want to stock this important valve innovation.

Quantities are ready for delivery and dealers are invited to write in AT ONCE.

Show cards, posters & leaflets supplied.

—which means that the "Six Sixty" is the only valve which will give you 50% greater volume than any other standard valve—bright or dull emitter.

The processes of manufacture of the "Six Sixty" valve are fully covered by patents. It represents an advance in radio valve science which is rapidly winning the enthusiasm of keen wireless amateurs everywhere.

A leaflet containing a selection of users' opinions of the "Six Sixty" awaits your request. It will be sent on receipt of your application, together with our Folder which tells you why "Six Sixty" valves will give you approximately 50% greater volume than a bright emitter, whilst consuming only one-tenth of the quantity of current they require.

Write now, giving your local dealer's name and address.



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Phone: Regent 5336.



I may be lazy!



—but I'm not selfish. I don't insist on having the Loud Speaker going full blast when I want to listen-in at my ease and the rest of the family want to be quiet; for even my family want to be quiet sometimes. Of course I must admit I'm not really quite as unselfish as appears at first sight. Listening-in on Fellows Headphones is no handicap to enjoyment, but actually makes a pleasant change from the blare of a Loud Speaker.

The 'phones fit so well that discomfort is a minus quantity. They are also easily adjusted to suit everybody's head, and they never get tangled in your hair and won't in your wife's hair either.

The quality of reproduction is perfect. It is attended to by experts who know as much about sound and its reproduction as they do about electricity.

And all for 16/6. I think you'll admit

"Quality Apparatus at Low Cost."

Mueh Fellows

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Well-equipped Sales and Demonstration Offices for Fellows Wireless Products.



The Lightweight Headphones.

Highly finished. Duralumin non-rusting Headbands. Weigh only 6 ounces with cord. Resistance 4,000 ohms.

PRICE **16/6**

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



No. 4 of a Series.

The Living Artiste

JUST as the balance wheel is to the watch so is the L.F. Transformer to the Receiving Set.

Without the proper functioning of the one, even the finest gold watch is utterly useless. And without a Transformer capable of an equal amplification over all the usual frequencies, even a super-Receiver and the most expensive Loud Speaker are little more than ornaments.

There's about as much difference between the ordinary cheap type of Transformer and the superb Eureka Concert Grand as there is between a cheap

German watch and an English lever.

The Eureka Concert Grand is a laboratory production. Its 2½ miles of wire are wound with scientific precision and its turn ratio is calculated to a nicety. Its design is not based on academic theory but on the results of many hundreds of pounds' worth of actual research work.

A non-laminated core—a coppered steel case—an extremely generous primary winding—these are some of the factors that have caused the Eureka to be considered Britain's Transformer-de-Luxe.

The Transformer which enables the Loud Speaker to re-create the living artiste.

Concert Grand. **30/-** Portable Utilities Co., Ltd. Eureka No. 2. **22/6**
Fisher Street, London, W.C.1 (For second stage).

Supreme **EUREKA** for Tone

Gilbert Ad. 2:25

"BROADCAST TELEPHONY" (cont. from page 538)
Sun.) * If opera relayed, at 18.30. Telefunken Co. tests on 290 m. about 22.30.

Königswusterhausen (LP), 2,450 m. (5 kw.). Wolff's Buro. Press Service: 06.00, 20.00, 2,900 m. (6 kw.); 10.30, con. (Sun.), Esperanto lec. 3,150 m.: Telegraphen Union, 06.45-18.45, news, 4,000 m. (10 kw.): News, 06.00-20.00 (daily).

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

Breslau, 418 m. (1½ kw.). 10.15, Stock Ex. weather; 11.00, factory con. (weekdays), sacred con. (Sun.); 11.55 (Sun.), time sig. weather, Stock Ex.; 14.00, news (weekdays); 15.00, children (Sun.); 16.00, orch., children (Fri.); 16.45, con. (Sun.); 17.00, shorthand (Sat.); 18.00, Esperanto (Mon.), Engl. (Thurs.), lec. (other days); 19.00, con., weather, time sig.; news; 20.30, dance (Sun.); 21.15 (Mon.).

Cassel, 288 m. (1½ kw.). Relay from Frankfurt.

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

Eberswalde (Lorenz Co.), 280 m. Testing daily about 22.30.

Frankfurt-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.); 18.00, lec. (daily), shorthand (Wed.), Esperanto (Fri.); 18.30, educat. hour; 19.00, lec., Engl. (Mon.); 19.30, con. (daily), jazz band (Fri.); 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., chess; 12.00, con., lec.; 16.00, children; 17.00, 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.; 12.20, Engl. (Wed.); 14.00, political news, markets; 15.00, women; 15.30, lec., Esperanto (Mon.); 16.05, orch.; 17.00, con., lec.; 18.25, lec., Engl. conv. (Tues. and Fri.), Spanish (Mon. and Thur.); 19.00, weather, con. or opera; 21.00, weather, markets, news; 21.50, news (in English), dance (not daily). Will shortly be increased to 9 kw.

Hanover, 296 m. (1½ kw.). Relay from Hamburg. Also own con., 16.00.

Königsberg, 463 m. (1 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. (700 w.). 07.30, 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). Will shortly be increased to 5 kw.

Münich, 485 m. (1 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.).

Munster, 410 m. (1½ kw.). 11.00, sacred con., news (Sun.); 11.30, news (other days); 11.55, time sig.; 14.30, markets; 15.30, 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.).

Nuremberg, 340 m. (800 w.). Relay from Munich.

Stuttgart, 443 m. (1 kw.). 06.30, time sig., weather (weekdays); 10.30, con. (Sun.); 15.00,

time sig., con., news (Sun.), children (Sat.); 16.45, children (Wed.); 18.30, lec. (weekdays); 19.00, con. (daily); 20.15, time sig.; 22.00, weather, news, dance (Sun.). Will shortly be increased to 6 kw.

FINLAND.

Helsingfors (Helsinki), 380 m. Testing 17.00, daily.

HOLLAND.

Amsterdam (PCFF), 2,125 m. (1 kw.). Daily: 07.55-16.10 (exc. Mon. and Sat., when 10.10-11.10), news, Stock Ex. (PX9), 1,070 m. (400 w.): con., 20.40 (Mon.). (PA5), 1,050 m. 19.40, con. (Wed.).

Hilversum (HDO), 1,090 m. (2½ kw.). 17.40, children (Mon.), con. (Sun.); 19.40, lec. (Fri.); 19.40, con. (Sun.), relay of Mendelberg orch. (Thurs.), con. (Sun.); 19.55, con. or lec. (Wed.); 21.40, lec. (Sun.).

Bl. mendaal, about 345 m. 09.40 and 16.40, sacred service (Sun.).

HUNGARY.

Buda-Pesth (1½ kw.). Testing shortly.

ITALY.

Rome (1RO), 425 m. (3 kw.). Weekdays: 16.00, orch., Stock Ex.; 19.30, time sig., news, con.; 20.15, news, Stock Ex., con.; 21.10, dance, weather. Sundays: 09.30, sacred con.; 15.45, children, Stock Ex.; 16.15, orch.; 16.45, jazz band; 19.45, con., news, weather, dance.

Milan, 650 m. (temp. W.L.). Testing shortly.

JUGO-SLAVIA.

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

NORWAY.

Oslo, 320 m. (500 w.). Testing, daily, about 19.30.

POLAND.

Warsaw (Radiopol), 385 m. (1 kw.). 17.00, tests.

RUSSIA.

Moscow (Central Wireless Station), 1,450 m. Sundays: 12.45, lec.; 15.30, news and con. Weekdays: 13.00, markets; 15.30, news or con.

(**Sokolniki Station**), 1,010 m. Sundays: 14.30, con.; 17.00, lec. and con. (Tues., Thurs., Fri.).

(**Trades Union Council Station**), 450 m. 17.00, con. (Mon., Wed.).

Reval, 350 m. Testing.

SPAIN.

Madrid (Radio-Iberica) (3 kw.), 392 m. 12.30, news, talks (weekdays only); 22.00, weather, Stock Ex., time sig., con., news.

Radio España (EAJ2), 335 m. 8.00, con. and tests.

Radio Espanola (8 kw.), 370 m. (abt.). Testing shortly.

Barcelona (EAJ1), 325 m. 18.00, lec., Stock Ex. markets, con. or relay of opera; 20.30, news and con.

Seville (EAJ5), 350 m. 18.30, lec., con., news.

SWEDEN.

Stockholm (SASA), 430 m. (500 w.). Sundays: 09.55, sacred service; 16.00, children; sacred service; 19.00, con., news, weather. Weekdays: 11.30, weather, Stock Ex., time sig.; 18.00, lec. (irr.); 19.00, con., lec., news, weather.

Gothenburg (SASB), 290 m. (500 w.), also 700 m. 10.00, fishery reports (700 m.); 11.55, time sig.; 19.00,* programme s.b. from Stockholm.

Malmoe (SASC), 270 m. 11.00, weather; 19.00,* programme s.b. from Stockholm.

Boden (SASE), 1,200 m. 18.00, con. (Tues., Fri., Sun.).

* Local programmes are also broadcast at times.

Sundsvall (SASD), 450 m. (500 w.). Testing.

(Continued in second column of page 544)



The
Secret

To understand the reason for the extra amplification demonstrated with the R.I. transformer, it must be clearly understood that the secret lies in the peculiar construction of winding the core.

THE SECRET OF R.I. SUPREMACY LIES IN THE WINDING

If you look at the illustration, you will see the sectionalising of the windings, the six primary sections and the six secondary separated by heavy walls of the finest insulation, giving that extremely low self-capacity of only

18 MICRO-MICROFARADS

This bare minimum self-capacity is the basis of

DISTORTIONLESS AMPLIFICATION

THE LOW SELF-CAPACITY PREVENTS THE EXAGGERATION OF THE OVERTONES, ENSURING UNIFORMITY OF THE HIGH AS WELL AS THE LOW FREQUENCIES.

No transformer can receive a poor tone and make it sound beautiful. It does not create tones, it amplifies and reproduces them. Its utmost achievement is to amplify and give you from a distance the full depth and volume of perfect music and speech.

Over 350,000 R.I. users have proved for themselves that the R.I. gives

BEAUTIFUL REPRODUCTION

They would not change the R.I. for any other transformer on the market.

You can be sure of R.I. results if you demand the R.I. TRANSFORMER.



PRICE 25/-

Ask for the new R.I. Catalogue.

12 HYDE ST OXFORD ST LONDON W.C.1

WIRELESS IN PARLIAMENT



From Our Own Correspondent.

SIR WM. MITCHELL-THOMSON, the Postmaster-General, informed Lieut.-Commr. Kenworthy that the number of experimental sending licences in force at the end of February was about 2,200, and the number of receiving licences was about 1,311,000.

Replying to Sir Joseph Nall, Sir Wm. Mitchell-Thomson said he was advised that the practice of charging fees for experimental wireless licences was not contrary to the provisions of the Wireless Telegraphy Act, 1904. The scale of fees was reduced in January.

In answer to Mr. Day, who asked if he would consider reducing the fee charged for licences for wireless crystal sets, the Postmaster-General said he did not consider that differentiation could properly be made between a crystal set and a valve set in fixing the fee payable for a wireless receiving licence. If it should be found possible at some future time to make a reduction in the present licence fee, it would apply to both crystal and valve sets.

Mr. Macquisten asked whether the proposed Ministry of Health broadcast talk by Dr. MacFadden, a permanent paid

official of the Crown, on questions relating to food was to be free of controversial matter; was Dr. MacFadden being paid for this lecture by the British Broadcasting Co. or by anyone else; and, in view of the departmental rule against officials of the Crown engaging in publicity, would inquiry be made into the matter?

Mr. N. Chamberlain, the Minister of Health, said the answer to the first part of the question was in the affirmative, and to the second part in the negative. The answer to the third part was that officers of the Ministry who provided information by this means did so by his direction and on his authority.

GENERAL FERRIE ON WIRELESS PROGRESS

GENERAL FERRIE, Chief of the French Military Service, and Air Vice-Marshal Sir W. G. H. Salmond were the guests of honour at the annual dinner of the British Wireless Club, held on Saturday, March 14, at the Trocadero, London. Admiral of the Fleet Sir Henry Jackson, who occupied the chair in the unavoidable absence of Senatore Marconi, laid stress on the fact that short wavelengths and high frequencies were the present order of the day.

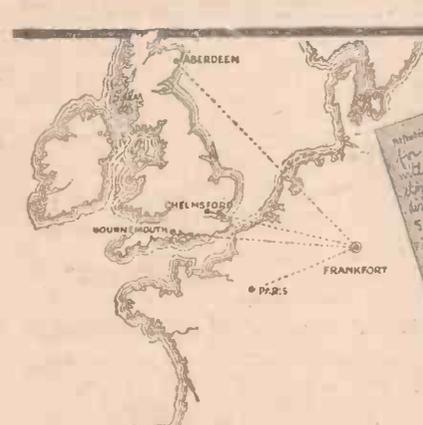
The new "beam" system of the Marconi Co. showed the possibilities of this

type of short-wave transmission for commercial use, whilst in another direction the amateurs had succeeded on short waves and low power in opening up two-way communication with the Antipodes.

The wireless work of the fighting services, had necessarily to be kept more or less secret. The civilian amateur was, however, under no such necessity. The amateur, as a class, had not only done exceptionally good work, but he was always ready and keen to explain exactly how it had been done.

Replying to the toast of "Our Distinguished Visitors," General Ferrié said that during his visit to England he had been much impressed by the high standard of wireless technique everywhere in evidence. By close co-operation, and by pooling their resources, the different Government services interested in wireless had brought the art to an enviable state of efficiency.

On the civilian side broadcasting was already firmly established as a national institution. From this aspect wireless held immense possibilities in the wider sphere of international life. Ether waves were not barred out by mere frontiers. They swept over these artificial barriers set up by different nationalities to keep each other apart. The future development of the broadcasting system must result in making different communities and races better known to each other. In this way it would promote the sacred cause of universal friendship and good will. B. A. R.



The Postcard, reproduced here, reads as follows:—
"I bought one of your Crystals here on Saturday last, and would like to tell you of my results. Frankfort o/M., one-and-a-half miles off, on the L. Speaker, Radio-Paris and 5XX loud on one pair of 'phones, and still easily readable on five pairs. Sunday morning I got the concert from Koemigswusterhausen on 2,800m.; and after dinner 2-3 W.E. time, Radio-Paris. Monday evening I tuned in Bournemouth, 5XX, R-Paris, some other stations, which I did not wait to identify, and finally I got Aberdeen perfectly clear. I think for pure Crystal reception, without any amplification, this is nearly a record, the distance being over 1,200 Km. 5XX and R-Paris I can tune in while Frankfort is transmitting (with a wave-catcher). My aerial is non plus ultra. With hearty congratulations on the excellence of your fabric, I am,
(Signed) HENRY HERZ-MILLS.
Wilhelmstrasse, 20, Frankfort o/M.

Aberdeen, Chelmsford, Radio-Paris and Bournemouth—received at Frankfort, Germany, on a Neutron Crystal, without amplifiers.

An endorsement from Germany

Not only in this country, but also abroad, the fame of Neutron Crystals is spreading. Already widely known here as the crystal that breaks records for "distance," Neutron is being widely used by the amateurs of Germany, France, Spain and the British Colonies, who find it the most reliable, the most sensitive, and the Crystal that gives greatest volume—and distance.

Stocked by the Best Radio Dealers. Packed in tin, with silver cats-whisker. Insist on Neutron, in the Black and Yellow tin. If unable to obtain, send 1/6 with dealer's name, and this wonderful crystal will be mailed by return.

1/6



Concert Tested & Guaranteed Radio Crystal

Produced by NEUTRON, LTD., Sicilian House, London, W.C.1. Phone: Museum 2677.

Sole distributors: V. ZEITLIN & SONS, 144, Theobald's Road, London, W.C.1. Phones: Museum 3795 & 6841.

Sylverex users become our Ambassadors

There is never a disappointed Sylverex purchaser; our most rigorous system of triple-testing makes it impossible for a faulty Crystal ever to be labelled "Sylverex." Not only is Sylverex sensitive *all over* and *right through*, but it is also *consistently* sensitive, so that whether you buy Sylverex in the Strand or in Edinburgh, or *anywhere*, you always get a *picked specimen*. Thus every Sylverex User becomes our Ambassador—spreading the news of Sylverex amongst his friends, and even, as *this* writer has done, telling his local *Dealers* about it, too.

"Will let all his Wireless Friends know that he has FOUND A WINNER."

"C. F." of Hythe, Kent, writes:—"The 'Sylverex' Radio Crystal I received from you on Monday last is the best and by far the most sensitive that I have had. I tried it on Monday night, and no matter where the Catswhisker touched it, it was sensitive, and the signals were both loud and clear... I have seen the manager at

—'s this morning, and told him the result of my trial and shall see others during the week. For I think that others should know of a good thing. It means a lot to me, as my health will not let me go out at night, and the Wireless is my only pleasure... I shall let all my wireless friends know that I have found a 'Winner.'"



Sylverex

RADIO CRYSTAL

Silver-Toned Silver-Alloy

In air-tight container, with Special Catswhisker and full **2/-** directions.

Ask your Wireless Dealer for Sylverex—or write to us. 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.

Produced by

SYLVEX, Ltd. (Dept. C), 25, Victoria St., London, S.W.1

Phone: Franklin 6003.

TRADE ENQUIRIES INVITED.



HINDHEAD, Surrey.

"As a keen experimenter both with Crystals and Valve. With your wonderful Talite Crystal I have got London, Bournemouth, Cardiff, Newcastle, Glasgow, etc. Talite is the best Crystal I have ever used, and has given remarkable results. . . . W. H. COOK.

READ this TESTIMONIAL one of many that can be pooled.

Another tribute to TALITE CRYSTAL

Keen wireless users are constantly telling us that Talite is the best of all Crystals. The reason is that Talite is *all over* active, extremely sensitive and thoroughly tested and guaranteed before being sold to the public. Wonderful clear reception all the time. Of all wireless dealers or sample piece, 1/9 direct from

HARDING, HOLLAND & FRY, Ltd.

Chemical Manufacturers & Mineralogists

52 Queen Victoria Street, London, E.C.

You cannot do better!

—for Results and Economy

and sheer value for money

Designed and perfected by the Service Co. to bring the best within the reach of all. Come and hear it.



Deposit of **42/6**

Twelve Payments of **15/9**

THE "SERVICE" 2-VALVE LONG RANGE RECEIVER

Complete in Mahogany Cabinet with 2 Marconi D.E.R. valves, 6 ov. H.T. Battery, Accumulator, 1 pair headphones, 100 ft. Aerial wire. Insulators, Battery connections, Wander Plugs and Earth Wire.

CASH - £10 . 12 . 10

SEND FOR LEAFLET AND FORM TO DEPT. A.W.

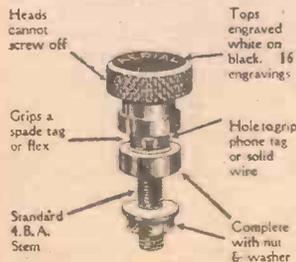
THE SERVICE COMPANY, LTD.

273-274 HIGH HOLBORN, LONDON, W.C.1

"BELLING-LEE"

INDICATING TERMINALS.

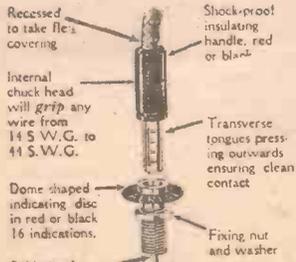
Patent No. 580724



PRICE **3½d.** EACH BRASS
4½d. EACH NICKEL

MULTY-KONTACT PLUGS & SOCKETS

Patent Nos. 205010 & 2874324



PRICE **7d.** per set
NICKEL PLATED

Your dealer can supply you. In case of difficulty, write direct to—**BELLING & LEE, LTD., Queensway Works, Ponders End**

TELEPHONES RE-WOUND

to 4,000 ohms. Guaranteed. All makes 5/6, except Brown "A" 6, and Sullivan. Wax filled, 10/6 per pair. Ex army convert to high resistance 2/6 each earpiece. Re magnetisation 9/- per earpiece. Postage extra 6d. per pair. Write for prospectus.

JOHN W. MILLER, 68 Farringdon St., E.C.4
(2nd and 3rd Floors) Phone: CENTRAL 1950

WHO WANTS CABINETS?

PICKETTS—are used for Finest Sets.
Estimates Per Return.
Send for Cabinet Lists FREE
PICKETTS CABINET (A.W.) WORKS,
BEXLEY HEATH, S.E.



PROMPT REPAIRS

TO HEADPHONES
TO LOUDSPEAKERS

Rewound to any resistance, remagnetized and made equal to new. Prices quoted on receipt of instruments. First class workmanship only.

Established 27 Years

THE VALLEY MAGNET CO.
Phone: Woolwich 884. Woolwich, S.E. 18.



Exide
the long-life Battery.
Type D.F.G.
in glass boxes.

For D.E. valves, capacity 45 amp. hours, on slow intermittent discharge.

PRICE 10/-

219/229, Shaftesbury Ave. W.C.2.

ACCUMULATOR BARGAINS

C.A.V. & Fuller's, solid, but guaranteed 12 months. Sent on approval against cash.

27-40a .. 9/6	47-80a .. 27/6	67-60a .. 32/6
47-40a .. 17/-	47-100a .. 32/6	67-80a .. 40/-
47-60a .. 2/9	67-40a .. 25/-	67-100a .. 46/-

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IF YOU ARE IN THE CITY VISIT SPENCER'S STORES, LTD.

4-5, MASON'S AV., COLEMAN ST., E.C. 2
Telephone: London Wall, 2292

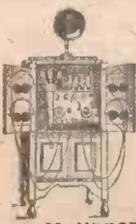
VALVE RENEWALS ALL TYPES
KENITE PANELS ANY SIZE
BEST PHONES from 10/9
INDIVIDUAL ATTENTION AND ADVICE

A BOOK BARGAIN

THE HOME RADIO. How to make and use it. By Verrill. For those interested in improving their sets or installing more efficient ones. Published 3/6. Offered, new, for 1/9, post free.

Quote offer 104

FOYLES, 121, Charing Cross Road, London.



"MORRIS" SOLID OAK STANDARD CABINET WITH LOCKS

For any kind of receiver and panel. Height, 3 ft. 6 in., depth, 15 1/2 in.

BACK PANEL REMOVABLE

Guaranteed first class workmanship and quality. Immediate delivery from stock.

WILLINGLY SENT ON APPROVAL

Prices: 24 in. inside width £4 10 0

" 24 in. " £4 15 0

" 36 in. Model de Luxe £7 15 0

SOLID OAK WIRELESS TABLE

with large drawer: 25 in. by 16 in.; height 26 in., 27/6. carriage paid. Sold at most wireless stores also at LEWIS'S, LIVERPOOL, or direct from

M. VERSTRAETEN, Dept. 10, 50a, LORD STREET, LIVERPOOL

"BROADCAST TELEPHONY" (cont. from page 541) SWITZERLAND.

Lausanne (HB2), 850 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), 515 m. (500 w.). 11.00, weather; 11.55, time sig., weather, news, Stock Ex.; 15.00, con. (exc. Sun.); 17.15, children (Mon., Wed., Thurs., Sat.); 18.00, weather, news (exc. Sun.); 19.15, lec., con., dance (Fri.); 20.45, news.



CLUB DOINGS

Groydon Wireless and Physical Society

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

A LECTURE on dual amplification was delivered by Mr. P. G. A. H. Voigt on March 10. He explained, and illustrated by numerous diagrams, the gradual improvements effected upon the original valve-crystal circuit. Two sets of dual receivers were brought by the lecturer, by which he demonstrated distortionless reception of a L.O. on a frame and also an indoor aerial.

Ilford and District Radio Society

Hon. Sec.—MR. F. W. GEDGE, 157, High Road, Ilford. The display, judging, etc., of sets in connection with the society's constructional competition took place on March 3.

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.

SOMETHING NEW

The unique full-sized charts and explicit instructions in the F.S.2 Constructors' Guide are quite different from all others. The totally inexperienced can build the F.S.2 as easily and well as the expert. The F.S.2 Long Range 2-valve Loud Speaker Set—the "easy-to-operate" set with the professional look—and NO SOLDERING. Build it yourself and save pounds. The F.S.2 Constructors' Guide, 2/- post free. Cheques and P.O.'s payable to: H. J. E. Butler.

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EBONITE

Sheet, Rod and Tubing in all sizes kept in stock and cut to any required size while you wait or sent by post on receipt of cash.

WE CAN TURN ANYTHING IN EBONITE
BURGE, WARREN & RIDGLEY, LTD.
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PREPAID ADVERTISEMENTS.

FIT YOUR SPEAKER with the "ALLWOODORN."—Maddison, 2a, Ronalds Road, N.5. Manufacturer of wood horns. VALVES REPAIRED for 6s. only, and every repaired valve guaranteed. Delivered free in London, Provinces, postage 3d. Send at once to—The Eclipse Novelty Co., Francis Terrace, London, N.19. PATENTS and Trade Marks obtained—H. T. P. Gee, Patent Agent, Member Radio Society Gt. Britain, 51, 52, Chancery Lane, London, W.C.2. Phone, Holborn, 1525.

SETS, PARTS, PHONES, LOUD-SPEAKERS supplied on easy payment system. Send for latest Catalogue, just issued.—The Wireless Distributing Co., Ltd., Wireless House, Stoke Newington, Road, N.16.

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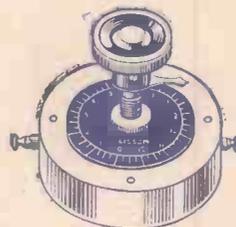
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