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THE "H.T.-LESS" VALVE MYSTERY

Amateur Wireless

And Electrics

Vol. IV. No. 103.

SATURDAY, MAY 24, 1924

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PRINCIPAL CONTENTS

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THE VALUE OF
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AERIALS FOR PORTABLE
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MATTING YOUR
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A PORTABLE VALVE
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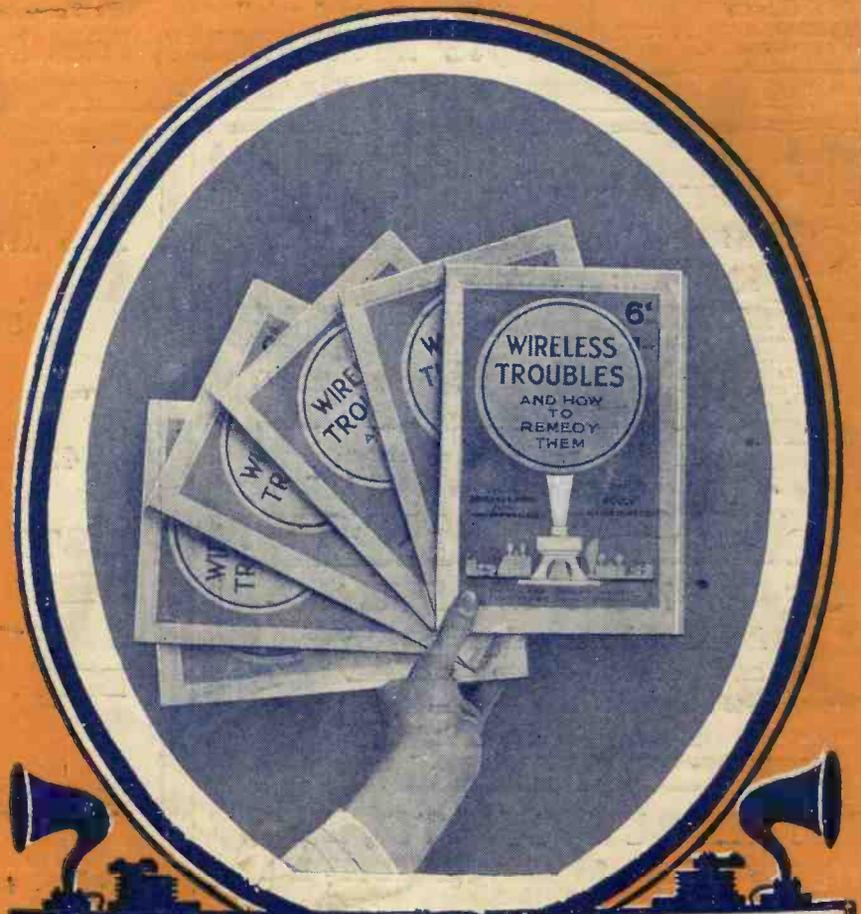
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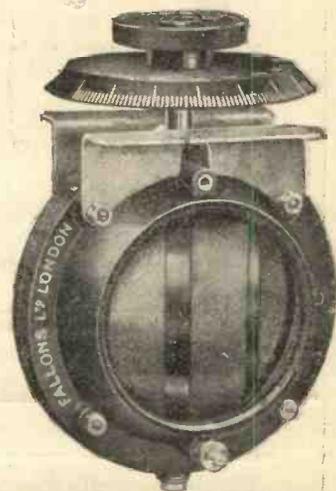
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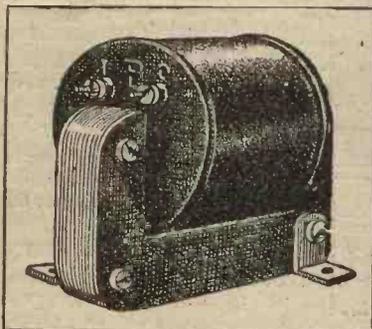
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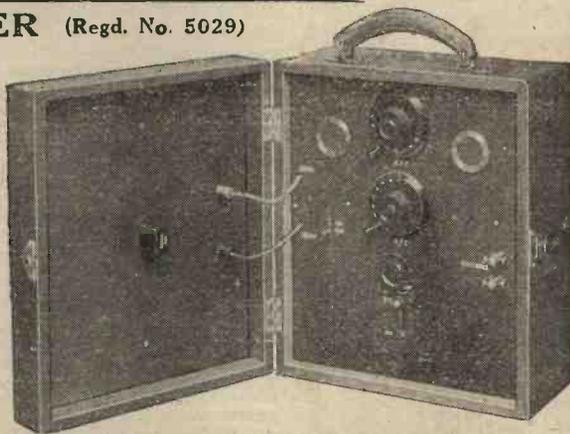
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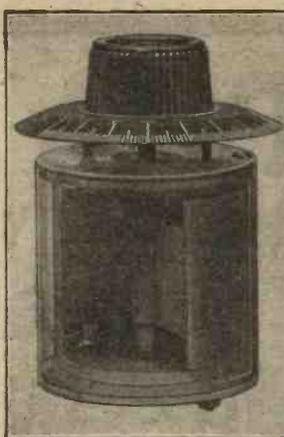
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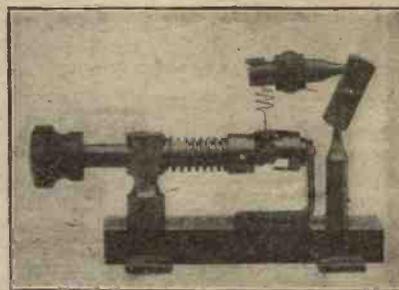
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Amateur Wireless

and Electrics

Vol. IV, No. 103

May 24, 1924

THE "H.T.-LESS" VALVE MYSTERY

Wireless engineers have long been aware of systems of valve reception that do not employ separate high-tension. Below we describe a valve—a costly four-electrode device—that makes one such system possible. On the face of it, the everyday methods of reception appear to be far more economical.

IN the following notes upon effects obtained with four-electrode valves no novelty is claimed by the author. The phenomena are all very well known to the wireless engineer, though little so far has been published.

All thermionic valves depend for their action on a stream of negatively-charged electrons liberated from a heated filament. These electrons, being all similarly charged, exert a force of repulsion on each other; electrons, therefore, in the space between the filament and plate repel fresh electrons issuing from the filament and tend to suppress further emission.

The Use of H.T. Batteries

In the two-electrode valve the electrical resistance offered to current flowing between the filament and plate is mainly due to this repulsion between the electrons, and it is this that gives rise to the necessity for high-tension batteries to overcome the resistances.

Normally the velocity of electrons issuing from a heated filament is small compared with the velocity which they ultimately attain under the influence of the high-tension voltage, so that the initial velocity of the electron does little to overcome the electrical resistance of the valve.

Again, due to the small diameter of the filament, the concentration of electrons near it is very great and the mutual

It is, then, fair to assume that if an anode is placed round the grid as shown in Fig. 2, a very small potential will be sufficient to drag the electron from the grid to the plate.

This in practice is found to be the case.

The Second Grid

Let us consider, therefore, the inner grid as the source of electrons and surrounded by a grid and anode as in Fig. 3. We have here a four-electrode valve whose impedance will be very small compared with that of a three-electrode valve. It is reasonable to

expect that very small plate voltages will be required.

Fundamentally, then, the four-electrode valve is equivalent to the ordinary three-electrode valve where the inner grid is considered as the source of electrons.

Bearing this point of view in mind, little difficulty will be encountered in designing and understanding the conventional four-electrode valve circuits.

There are, of course, besides these basic circuits an enormous variety of special usages to which the valve can be put.

Let us, however, confine ourselves to generalities, and leave the more special considerations to the specialist.

The circuit which such considerations suggest is given in Fig. 4.

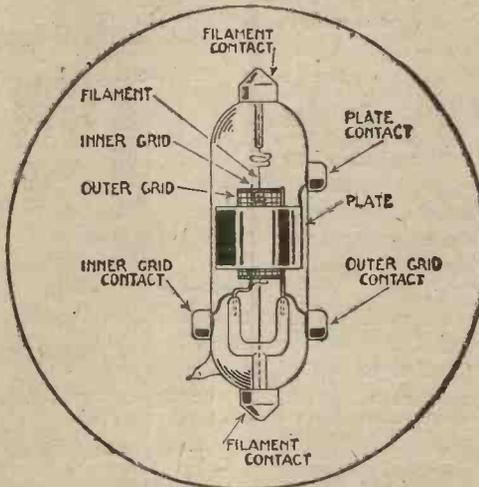
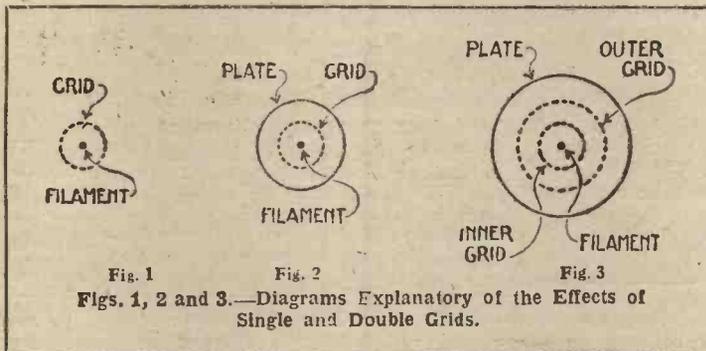


Fig. 1a.—Constructional Details of Four-electrode Valve.

repulsion of these electrons is consequently high.

The Effect of the Second Grid

Consider now a grid placed round the filament and very near it, as in Fig. 1. A small positive potential on this grid will speed up the electrons enormously, so that they will pass through the mesh at high velocity; they will also be distributed over a much larger area (that of the grid) so that their concentration, and their mutual repulsion, will be smaller.

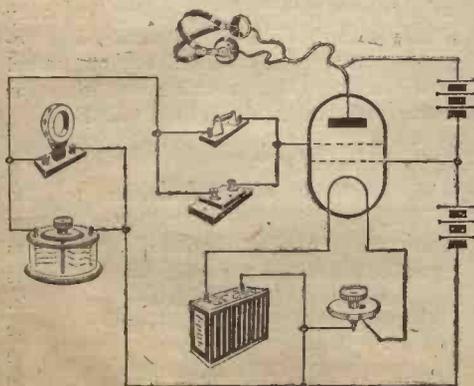


Fig. 4.—Circuit with Four-electrode Valve as Detector.

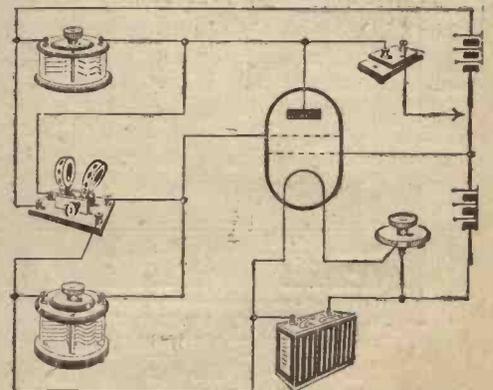


Fig. 5.—Circuit with Four-electrode Valve as H.F. Amplifier.

Dispensing with H.T.

The circuit represents a four-electrode valve used as a detector; it can easily be modified for high- or low-frequency amplification, as in Figs. 5 and 6. Actually it will be found in using these circuits that

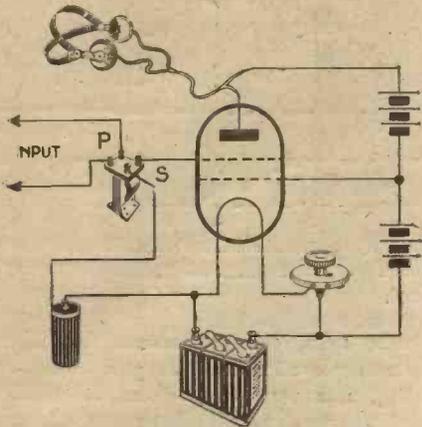


Fig. 6.—Circuit with Four-electrode Valve as L.F. Amplifier.

the high-tension battery can be dispensed with altogether and the filament-heating accumulator used instead, when its voltage is somewhat greater than the filament voltage of the valve, as with a 6-volt

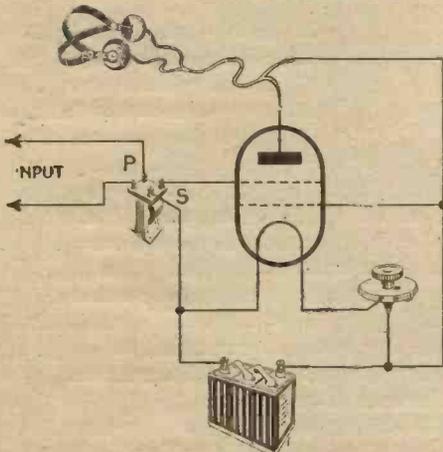


Fig. 7.—Diagram showing how the H.T. Battery may be Dispensed with.

accumulator used on a 4-volt filament. The circuit then becomes that shown in Fig. 7; this will be found to give excellent results.

Such four-electrode valves as have been described briefly have been manufactured by the M.O. Valve Co., Ltd., for the past three or four years and used in commercial receiving sets in a multiplicity of circuits which have been devised.

The illustration (Fig. 1a) shows the Marconi-Osram FE1, which works excellently with the circuits illustrated. F. W. P.

NEXT WEEK
"AN ALL-PURPOSE
TWO-VALVE
RECEIVER"

POWER THROUGH THE ETHER

The second and concluding article on the possibilities of Wireless Transmission of Power.

WHILE engaged in carrying out experiments on the transmission of wireless waves without material aerials, Mr. John Hettinger, an English scientist, conceived the idea of using ionised light beams as elevated conductors. It is well known that an ionised gas is a good conductor and also that it is possible to ionise a gas by means of ultra-violet light rays.

Recent researches have proved that the air above a certain distance is ionised to a great extent by the light produced by the sun and stars, and that this ionised air would prove a good electrical conductor, while the dense air between this conducting layer and the earth is practically an insulator. We have therefore the earth, itself a good electrical conductor, separated from a second conductor, the layer of ionised air, by the dense air which forms an insulating medium (see Fig. 2).

Power Beams

These two insulated conductors form an ideal arrangement for the transmission of electrical power or signals, the great difficulty, however, being in making a suitable connection between the conductors. This difficulty Mr. Hettinger now claims to have solved in the following manner.

He proposes to use an arc or mercury vapour lamp for producing ultra-violet light rays, and arranging by means of suitable apparatus for a powerful beam of these rays to be projected vertically, these light rays ionising the air through which they pass. Arcs capable of throwing a beam from ten to twenty miles have been constructed, and a beam of ionised air of this length will form a good connection between the earth and the upper conducting layer.

A very powerful arc must be used to

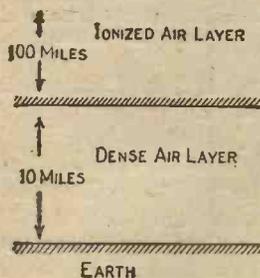


Fig. 2.—Diagram showing Layer of Ionised Air.

project a beam of this length, as the ionised beam rapidly loses its conducting power as the distance from the source increases and the intensity decreases. Fig. 3

will help to explain the proposed arrangements.

Metallic connection is made with the ionised light beams B, which are projected by means of the light apparatus L by a screen of metallic gauze O, which encircles the beam and extends upwards for a short distance. This screen is insulated from, but connected to, earth through the secondary winding of a transformer, the primary winding being connected to suit-

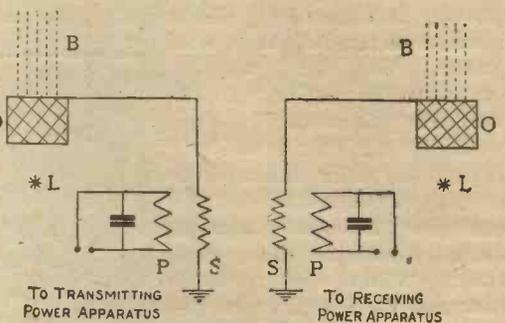


Fig. 3.—The Proposed Hettinger System.

able high-voltage high-frequency Tesla apparatus. The apparatus at the receiver is practically identical with that used at the transmitter, the transformer, however, in this case being arranged as a step-down.

M. J. M.

THE CRYSTAL AGAIN!

THE writer, having a three-valve set, until recently never really gave crystal sets a thought (being forty-five miles from Manchester, the nearest station). In "A.W." No. 96 there is an account of an amateur who had received all B.B.C. stations (except Manchester) on a crystal set with an indoor aerial. It was decided to make up this circuit. Using a bad outdoor twin-wire aerial only 25 ft. long and 25 ft. high, Manchester and Newcastle are received any night, using ordinary 4,000-ohm non-adjustable phones. Bournemouth has also been received, but faded considerably. This circuit seems ideal for crystal users.

K. E. H.

Mr. Allan Pelham, known to the children as "Uncle Felix," is the new announcer at Birmingham. He has travelled in all parts of the world, and is a fluent speaker in French and Japanese. Since the war he has served with the Marconi Company as assistant chief in the technical division of the Marconiphone department, and later was in charge of the Midlands area for that company.

A HORNLESS LOUD-SPEAKER

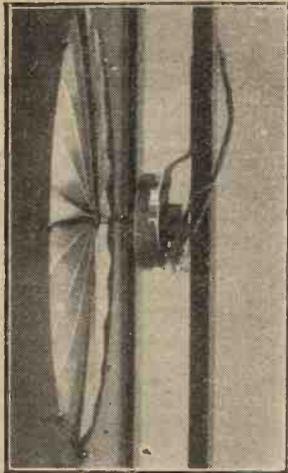


Fig. 1.—Detail View showing Attachment of Phone.

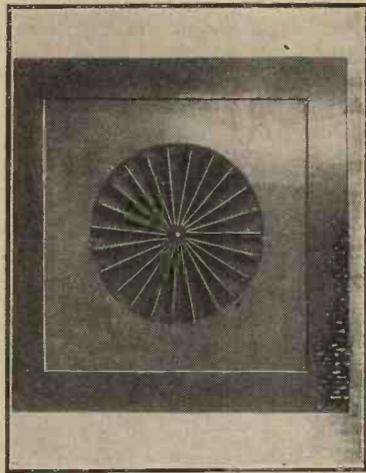


Fig. 2.—Front View of Panel.

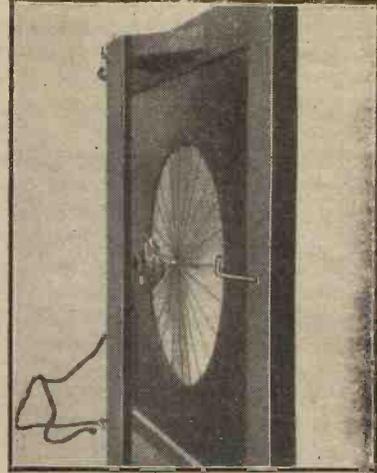


Fig. 3.—Rear View of Panel.

THE photographs Figs. 1, 2 and 3 show detail and front and rear views of a somewhat novel type of loud-speaker. The volume of sound which the writer's instrument produces is equal to that obtained from loud-speakers of the ordinary type and the quality is also as good. It is particularly faithful in its reproduction of the notes on the higher pianoforte scale.

The loud-speaker to be described is very easy to make and the cost is low, the only materials necessary being a Brown A-type reed earpiece (2,000 ohms), a length of cartridge paper, some three-ply wood and an oak frame. Should the constructor have available a spare Brown earpiece the loud-speaker will not cost more than a few shillings.

The Earpiece

The cap and diaphragm of the Brown

earpiece are first of all removed, leaving only the windings and the vibrating reed as shown in the photograph (Fig. 1). The reed is then drilled and tapped No. 8

AN EDITORIAL NOTE

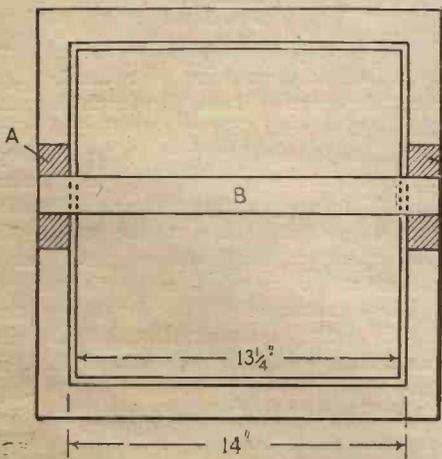
We are very satisfied with the performance of a loud-speaker of this kind which was lent us for test by the author, the quality of reproduction being really excellent and the volume reasonably good. We are given to understand that the device is covered by patents and consequently readers may not make it for any other purpose than to test the merit of the invention, which, while being new to wireless, has been known in another connection for many years.

B.A. The reed should be removed for this operation, and care taken that the hole is made exactly in the same position as that in which was positioned the screw

which originally held the centre of the aluminium diaphragm in place.

The Diaphragm

For the diaphragm prepare a heavy piece of cartridge paper 30 in. long by 10 in. wide by marking it with lead pencil with a number of parallel lines at distances of $\frac{1}{2}$ in. across its width. The paper is then folded in $\frac{1}{2}$ -in. folds, as is done by children when making paper fans, except that the folds should not be pinched up too sharply. A piece of fibre or cardboard tube $\frac{5}{8}$ in. long with a hole just large enough to take a No. 8 B.A. threaded rod is then glued to the centre of the strip of folded paper; the two ends of the fan are then brought together around this tube and glued together. These operations are illustrated in Figs. 4 and 5. Care should be taken that the tube



Figs. 7 and 8.—Back and End Elevations of Frame and Phone Support.

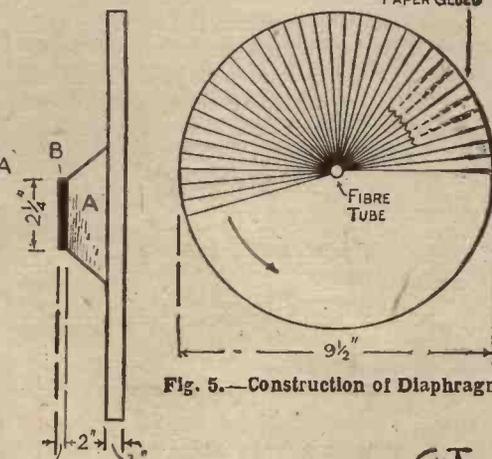


Fig. 5.—Construction of Diaphragm

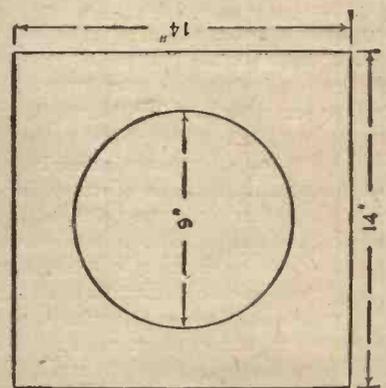


Fig. 6.—Panel.

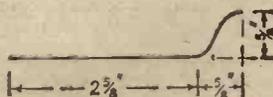


Fig. 9.—Phone Bracket.



Fig. 4.—Method of Folding Paper.

is fixed exactly at right angles to the folded cartridge paper.

The Clamping Pieces

Two pieces of three-ply wood are then prepared as shown in Fig. 6; the diaphragm is securely clamped between these and fixed with glue, the small screws and nuts being inserted and screwed up tight.

The Frame, Supports and Assembly

A stout wooden frame is now required, as shown by Figs. 7 and 8, together with the supporting piece and distance blocks shown by A and B respectively. Next two brass brackets $\frac{1}{8}$ in. thick are to be prepared as shown in Fig. 9. These should be made from hard-rolled brass $\frac{1}{4}$ in. wide and are used for fixing the earpiece to the cross-piece. The earpiece is rigidly fixed to the rear cross-piece by means of these brackets, and it is important that it should be quite firm, as the pull exerted by the magnets upon the reed, and the resistance offered by the large paper diaphragm is easily strong enough to cause a flimsy fixing to give way or to result in a loss of efficiency.

The reed and the paper diaphragm (mounted between three-ply boards) are now connected together by means of a

piece of No. 8 B.A. rod about 2 in. long threaded the whole of its length. The clamping pieces are, of course, screwed to the frame. The paper diaphragm is now positioned on the rod, and is securely locked by means of nuts. Two nuts at both front and back should be used for this purpose, and a lock-nut should also be screwed against the reed so that vibration will not loosen it. The whole should now present a rigid structure so that a light tap on the surface of the diaphragm gives forth a resonant sound. The reed is next adjusted in the usual manner at the rear and the whole is ready for use.

This loud-speaker gives forth sound both to the rear and front of the diaphragm, and may therefore be stood in the middle of a table supported by a suitable strut at the back of the instrument. It may also be hung on the wall like a picture, when the sound will be reflected from the wall. It is also, of course, possible to conceal it in a fire-screen with a light silk covering.

During the construction of the instrument rigidity should be made the first consideration, and care should be taken that the earpiece and diaphragm are exactly parallel to each other and that the connecting rod is truly central. A. J. C.

proof that they had aerials at army headquarters.

8. There is a gasometer at the bottom of my garden. How will this affect an aerial I propose to erect?

Any aerial you put up will undoubtedly be shielded by the gasometer. We have already drawn attention to the danger lying in having therms and ions in close proximity. Why not use the gasometer as an aerial-tuning condenser? Tuning could be accomplished by special arrangement with the gasworks. By the way, ought you really to call it a garden?

9. Can two receiving sets be worked off the same aerial?

Working two sets off the same aerial is a great idea. Try it on two of your worst friends, giving them a set each and asking one of them to tune in on London and the other on Manchester. At first they will carry on with the job with admirable sweetness, but after a while they will begin to get horrid to each other, and by the time an hour has gone you will have a regular rough house unless their wives call for them in the meantime.

10. What advantages has a frame aerial over an outside aerial?

First of all, a frame aerial being inside the house does not attract those who wish to listen-in in an inexpensive manner. Secondly, a frame aerial does not swing in the wind like an outdoor aerial and it is therefore easier to tune. The greatest advantage in a frame aerial, however, lies in the fact that it can be constructed in such a manner as to perform the functions of a harp when the accumulator runs down.

11. Down the side of my garden there are no less than a round dozen parallel telephone wires. What type of aerial should I put up?

A *tête-à-tête* aerial, bang in the middle of them. You will at least save the cost of the local weekly newspaper.

AMATEURS RESEARCH FUND

THE Derby Wireless Club have undertaken the formation of a fund called the "Amateurs Radio Research Fund." The idea is that this country is not doing so well as it might as regards the development of wireless science. For this reason the society suggest that a research fund be opened so that the science might be developed on the lines suggested at a conference to be called in the future.

The secretary of the society has written to 300 wireless societies, all of which, with the exception of three, have replied in favour of the project. The society now wish to get into touch with unattached experimenters, and any interested in this matter are invited to communicate with Mr. E. W. Kirk, hon. sec., Derby Wireless Club, 2, Riddings Street, Derby.

At their conference in March the R.S.G.B. cordially supported the scheme.

"Questions"—and Worse Answers!

By Bosphor Pronz

1. IS it all right for an aerial to enter a house by a bedroom window?

Decidedly not. On a dark night the police might mistake the aerial for a burglar. Besides that, you would be unable to close your bedroom window when the wind was blowing from off the soap works.

2. What useful purpose does the insulation covering on wire serve?

Exactly the same useful purpose as the curtain on a music-hall stage. It separates the turns and protects the turns from damage when threatened with rough treatment.

3. Has fog any effect on wireless?

The phenomenon of the effect of fog on wireless is rather obscure. In fact, one might describe the problem as an insoluble one. As far as the listener-in is concerned, the only troublesome feature about fog is that it causes the loud-speaker to cough a little more frequently than usual.

4. My neighbour and I have arranged to go half shares in a tall aerial mast. How can I best look after my own interests in the matter?

By insisting on having the top or upper half of the mast. If your neighbour does not see eye to eye with you over this arrangement, you can reason with him by pointing out that you have only taken a square yard of ground for your earth,

whereas you have left for his use the entire remainder of the surface of the globe.

5. May my little dog Fluff listen-in on her dog licence or is a wireless licence necessary as well?

There is nothing whatever in the regulations forbidding a dog to listen-in on a dog licence alone. The best plan is to place the dog licence flat on the floor as near to the receiving set as possible and to put the dog on the licence in a sitting-up or begging posture. Try to get the dog's front paws as near to an edge of the licence as possible so as to give the animal plenty of room in the steerage department.

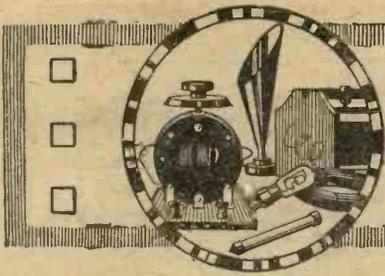
From the name and description of your dog, we should imagine that a dog licence will be quite large enough for the dog to listen-in on, but should the dog be larger than you have given us to understand, you might find it necessary to obtain an experimental licence.

6. Is Post Office telephone wire suitable for an aerial?

Not if it is your own telephone. Certainly, by all means, if it is your neighbour's.

7. Who invented the aerial?

History is somewhat conflicting on this important point, but there is no doubt whatever as to who put out the first clothes-line. The fact that the Normans had trench sets at the battle of Hastings is no



PRACTICAL ODDS AND ENDS

A Soldering Hint

IT may come as a surprise to some amateurs to learn that the real object of using a soldering bit is to heat the parts to be soldered and not merely to melt the solder.

When a bit is used this should be made reasonably (not red) hot and applied to the wires, etc., to be joined. These should not be smothered with flux—a little goes a long way. If too much flux is used it will run all over the panel. S.

Adjusting the Crystal

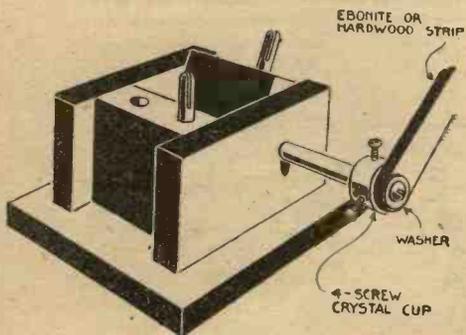
THOSE who wish to adjust their crystal detectors before the broadcasting begins (not having a buzzer at hand) will find the following a very simple way of doing so.

Connect one tag of the phones to one of the phone terminals, and after wetting the other tag rub it against the other terminal, at the same time adjusting the crystal detector until the loudest crackles are heard. G. W.

Anti-capacity Handles

BY purchasing one or two four-screw crystal cups (depending on whether a two- or three-coil stand is being used), an ordinary coil-mount may be fitted with quite efficient anti-capacity handles by the simple method shown in the illustration below.

After removing the existing control knob, or knobs, from the stand, the crystal cups are secured by means of the three crystal-clamping screws to the extremity



An Anti-capacity Handle.

of the coil-holder spindles, and strips of hard wood are attached to the base of the cups by means of the remaining screws, washers being added so that a firm attachment can be made. If a little extra expense is not objected to when making the alteration, ebonite strips may be used in place of hard wood. C. A. L.

Home-made Panels

OLD gramophone records make excellent panels providing a little care is taken in their preparation. Converting the disc into a square sheet is a fairly simple

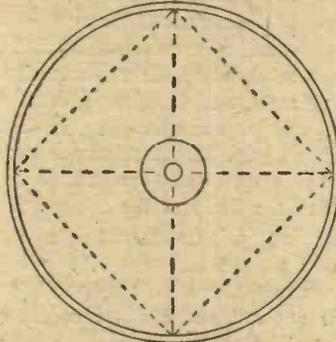


Fig. 1.—Cutting the Records.

matter if it is first marked off as shown in Fig. 1 and cut by means of a fine saw. The hole is then in the exact centre, and a switch-arm, rheostat or other component can be conveniently arranged to fit into

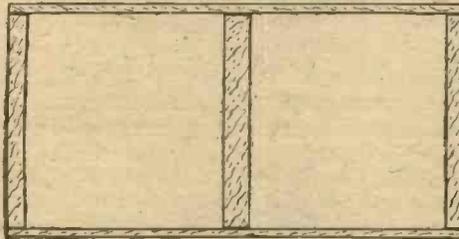


Fig. 2.—Mounting Panels.

this. If this is not possible, then the hole may be filled with some black sealing-wax or Chatterton's compound.

A single panel cut (as shown by Fig. 1) from a small record could be used for mounting a variable condenser in a box

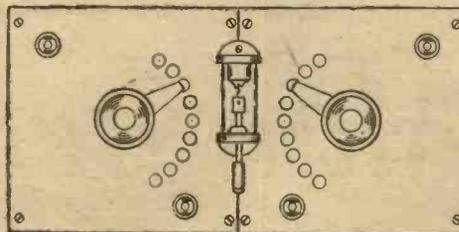


Fig. 3.—Design for Receiver.

or for the panel of a small variometer crystal set. Two or more panels may be used together if the top of the cabinet is provided with bridge pieces, as shown in Fig. 2. Fig. 3 is a suggested design for a crystal receiver employing a double tapped coil and two panels joined together in the manner described. O. J. R.

Phones and Loud-speakers

ONE sometimes wishes to adjust the set without interfering with the loud-speaker when the two are in different parts of the house. The phones are generally uncomfortable to wear at loud-speaker strength and, besides, the volume of sound is reduced when both phones and loud-speaker are in the same circuit.

A way of avoiding this when using a phone transformer is to wind about ten turns of bell wire round this transformer and connect the ends of the wire to the phones. This gives comfortable signals in the phones (which enable the adjusting to be more accurately done) and does not affect the volume of sound given by the loud-speaker. R. H.

A Dial Pointer

USEFUL dial pointers can be made by filing shallow contact studs to a triangular shape. Holes can be drilled in a panel and the apex of the triangle placed in close proximity to the dial edge. This method gives the panel a better appearance than scratching or amateur "engraving." D.

Connecting Batteries

THE following is a cheap and efficient method of connecting small batteries. Four Meccano strips are required, their length depending upon the number of batteries to be used. Several nuts and bolts are required also and two terminals. The whole is arranged as in Fig. 1.

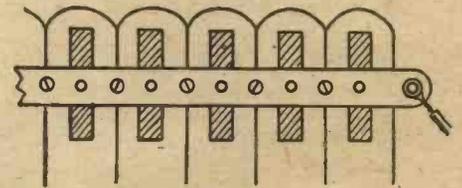


FIG. 1.



FIG. 2.

Figs. 1 and 2.—Method of Connecting Batteries.

As an alternative to Meccano strips, narrow lengths of brass may be used (necessitating drilling, however). Batteries may be connected in series by shorter strips. The whole set can be strapped up or boxed according to taste. Fig. 2 is a section of the connectors. A. S.

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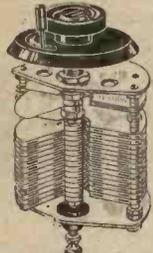


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Green 'Phone Cords, 54 in.		7 1/2d.
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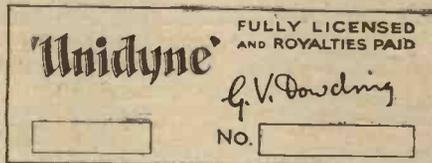
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On Your Wavelength!

The Healthy Two-year-old

NEXT week AMATEUR WIRELESS is two years of age, and I am sure that every reader wishes it many happy returns.

What amazing changes these two years have seen. Those of you whose wireless career dates back to beyond 1923 will know what I mean, but to others who have come into the game since, it will come rather as a surprise if I give you, for instance, some of the prices which prevailed before AMATEUR WIRELESS existed to advertise the makers' goods. In front of me is a 1922 catalogue. Turning over its pages, I find that the cheapest valve listed, one of the R type, cost 22s. 6d., whilst a very ordinary looking affair marked "specially recommended" that ate .75 ampere at 4 volts was priced 35s. A grid leak and condenser ran you in for 8s. 6d. in those days, and even a fixed condenser without any leak meant 6s. 9d. The cheapest variable condenser, with a capacity of .0003 microfarad, cost £1 5s., whilst a good .001-microfarad condenser reduced your banking balance by £2 15s. If you wished to make your own you could obtain vanes at 3½d. apiece (apiece, mark you, not a dozen!), spacing washers at 2s. 6d. a dozen, and engraved scales at 3s. 6d. each. There was no low-frequency transformer under 25s. and not many at that figure.

Telephones ran to about £3 a pair on the average. I quote the following just to make you sit up: "Filament resistances designed for mounting on customers' own sets, circular ebonite knob with resistance under panel, price 12s. 6d." You could get a detector, 'quite a good one, for a guinea, and a potentiometer at the same price. Terminals were from 3s. 6d. to 6s. 6d. a dozen, and selector switch-arms could be obtained at the modest price of 2s. 9d. each. How would you like to buy ebonite knobs nowadays at 1s. 9d. a time?

Now perhaps you will realise that wireless was not exactly a poor man's hobby in those days and that very few of us went much farther than the crystal or the single valve. My first four-valve set cost me over £30 to build, and I could make the same thing nowadays complete with every accessory for about a third of that amount.

What Did We Hear?

And when you had built your set, what did you find to listen to in those days which now seem so far off? Well, I suppose that the shipping traffic on 600 metres was our great stand-by, and most of us knew the characteristic notes of GNF, GLD, Grimsby, Ushant and Niton. Then if you were lucky enough to live in the

South of England you could actually obtain a certain amount of telephony at various times every day by tuning to 900 metres and listening for Croydon, Lympne and Le Bourget. How many people make much use of the air stations nowadays?

On Tuesday evenings—the one day in the week, by the way, on which I stayed in town and so could seldom use my set—actual broadcasting took place for about an hour from Writtle, the power used being, if I remember rightly, less than ½ kilowatt. How eagerly we used to tune him in and how we used to laugh over P. P. E.'s programmes, which were frequently a one-man stunt with never a dull moment from start to finish. If you were fortunate enough to possess some kind of gigantic inductance—most of us used loose couplers in those days and they ran rather to size—you could tune in FL on 2,600 metres, and receive French weather reports with an occasional concert during the afternoon. That is what we had to listen to, a little telephony and a lot of Morse signals—just that and nothing more. You may wonder why we were so keen about it.

Our Great Stand-by]

When I wrote "and nothing more" I was wrong, for I had forgotten for the moment our great stand-by in the evenings of that time. This was the amateur transmissions, to which we all listened in eagerly—far too eagerly for the liking of 2 Q M, 2 O D and others of the old stagers, who could frequently be heard saying: "Try another wave, old man (it was old man even in those days); I cannot hear a single word you say because some blithering fool is oscillating close by." The amateurs were always at it in the evenings, and on Sunday mornings you were pretty sure of picking up half a dozen of them if you tried round. Many of them used to put on quite good little concerts, sometimes using gramophone records (we welcomed even those at that time), and at others pressing their friends into service as instrumental or vocal performers. Yes, we found plenty of use for our sets, though you may now, having as much broadcasting as you can possibly want on tap, find it hard to believe this. There were not many of us—my own licence is No. 529—but we made up in enthusiasm what we lacked in numbers.

The Difficulty

Our great trouble was, though this again you may find hard to believe, the lack of wireless literature. Such textbooks as there were looked very formidable if you opened them, for the first thing that met your eye on any page usually

an appalling collection of figures interspersed with the terrible signs that mathematicians use to make their meaning "clear." Nearly all these books either presupposed a good knowledge of wireless, or skated over the difficulties, probably because the author himself was just as much at sea as his reader when he came to certain points.

If you wanted an answer to such a simple question as "How shall I add a high-frequency valve to my set?" you simply could not find it, though you might find pages of complicated stuff dealing with the theory of high-frequency amplification. You could not, as you can now, go out and find an expert friend and lay your troubles all before him. Why not? Well, simply because experts, friendly or otherwise, were so very few and far between. In this town, for example, there were only two of us using wireless sets at that time, and neither knew of the other's existence until a wireless club was formed after broadcasting had begun.

A most crying need was for a wireless paper which would put things in a simple and a straightforward way and which would answer your questions when you were in real need of information. That is where AMATEUR WIRELESS came in, and when it first appeared in the early summer of 1922 there was such a rush for it that unless you had ordered your copy you might go round to half a dozen bookstalls before you got one. I believe that No. 1 of AMATEUR WIRELESS is now worth quite a lot of money, for there are comparatively few copies of it in existence. With the exception of the institution of broadcasting itself, nothing has done so much to advance the greatest of all hobbies as the wireless paper written in plain language and suited to the requirements of the man in the street. It encouraged the formation of wireless clubs, where he could meet others and discuss his problems with them; it gave him simple, informative articles which helped him to increase his knowledge; it answered his questions; and, last but not least, it placed him in touch with firms who could supply the goods he wanted, and by helping them to increase their sales enabled them to reduce their prices without altering the quality of their products.

Within quite a few weeks valves were down to 17s. 6d. and 15s., variable condensers could be bought for well under a sovereign, and other components, all good, were becoming available at reasonable prices. This alone gave a tremendous impetus to the movement, for it enabled experimenters to use more ambitious sets and to investigate more complicated circuits.

On Your Wavelength! (continued)

Spain at Last!

I told you a week or two ago that, though my intentions at the time were excellent, I clean forgot to tune in the "splash" transmission from Madrid, when the Prime Minister and other notabilities were speaking to signalise the opening of the Spanish station. This omission has since been rectified, and Madrid has been entered into my log as one of the foreign stations captured. He is working now on Sunday evenings from 6 p.m. onwards on a wavelength which comes between Birmingham's and Aberdeen's. There is therefore a certain amount of spark interference, but Sunday luckily is not quite so bad in that respect as other days.

If you have one stage of high-frequency amplification or a really efficient single-valve set you will probably pick him up without difficulty by tuning in 5 IT and then going just a little higher up the scale. Of course, if Birmingham comes in rather strongly with you, you may have a little difficulty in getting rid of him, for actually the Spanish wavelength is only 5 metres above him. Should this be so, try during one of the intervals or, better still, before 5 IT begins his evening programme, obtaining the proper setting by tuning in Birmingham's afternoon transmission and then increasing a little upon that.

There are quite a lot of other little stations springing up on all wavelengths between 350 and 500 metres. When you are searching round you are often quite surprised to pick up a transmission at a setting which does not belong to any of our own stations. For a moment you think that something must have gone wrong with your tuning or with the wavelength of the transmission. But then you listen for a few moments and catch a word or two in German, French, Danish or Swedish and realise that you are in contact with one of the new-comers.

The Amateurs

5 Q M (Hastings) and 5 Q V (Clacton-on-Sea) appear to work telephony quite easily between them. I recently heard 5 Q M call 5 Q V on speech; the latter station answered promptly, and communication was at once established. 2 P X recently transmitted a whole broadcast programme from six o'clock until eight o'clock, and very nice it was. There was, however, a certain amount of resonance on the higher scale of frequencies. The transmission was carried out on a wavelength of about 180 metres.

Who is the mysterious GLP who nightly and regularly transmits "vics" and that call sign on a wavelength of 200 metres for an hour or more at a stretch? Night after night I hear him, but never once have I heard a coherent message

leave his key and, strange to say, he ceases immediately before broadcasting finishes.

Also, who is 2 W I T U, who recently jammed 2 L O with flatly-tuned spark?

5 J X is reported to have been received in Canada by 1 D D. He was using a Mullard o/20 valve at the time. This speaks well for this little valve, of which I have some knowledge. I am not certain,

arranged the programme with the help of the Spencer Dyke Quartet party, included the Sonata for violin and piano by Mr. F. Bennecke Hart, director of the Albert Street Conservatorium, Melbourne. He is the composer also of several operas which have been performed in Australia, as well as many orchestral suites.

Sullivan at Last

Considering that the season at the Princes Theatre for Gilbert and Sullivan operas has had to be extended, I can imagine that every phone was in request on Saturday night for the first Sullivan night at 2 L O. The popular overtures of *The Yeoman of the Guard*, *The Mikado* and *Ivanhoe* were included in the scheme. The latter contains some of Sullivan's most beautiful arias, and the work is one that would give enjoyment to opera-goers.

Symphony Music

Next to Saint-Saëns in depicting legends musically, comes the Belgian composer Cesar Franck, and included in the last Symphony Concert of the season at Manchester was *Le Chasseur Maudit*. The tale of the accursed huntsman is one of the most dramatic tales of Burger, and relates how an ancient count of the Rhine refused to be baulked of his daily hunt on the Sabbath. Breaking in on the joyous pealing of the bells and the hymns of the villagers sounded the "Tally ho, tally ho" of the count. Over fields and valleys he disturbed the peace and, cursing at the Church for venturing to plead with him, sweeps on his way. Suddenly silence falls, his horse stops short, his horn refuses to sound. A voice tells him that he shall be hunted for ever by the hordes of hell. Flames spring up, and the count and his steed take flight, maddened with fear, but in vain, for all time now he rides pursued by the demons by night and by day. Listen again to the work and note how faithfully and vividly the composer has interwoven the story and the music.

Poets and Their Works

There is no doubt a wide public for poetry, and of considerable interest has been the broadcasting of poems by such known writers as John Drinkwater, Alfred Noyes and John Masefield. I think the public deserve also to hear the nation's real poet, Rudyard Kipling, "in the voice." There is such an immense scope in his works for humour, pathos, sentiment and sound common sense, too. He is known to many only by his "Recessional," "If," or "The Absent-minded Beggar," but did they but hear some of his poems in "The Seven Seas" or "Five Nations" they would realise better his abnormal powers. "McAndrew's Hymn" in these days of iron and steel will take a great deal of beating.

THERMION.

Next Week's Broadcasting

May 25—31

Items Simultaneously Broadcast *

Sunday. Time Signal.
Monday. B.B.C. Literary Critic. The Savoy Bands.
Tuesday. Capt. P. P. Eckersley. Act III of *Rosenkavalier*.
Wednesday. Royal Horticultural Society Talk.
Thursday. B.B.C. Music Critic. Speeches from Dinner of the National Institute of Industrial Psychology. The Savoy Bands.

Friday. Prof. A. J. Ireland.
Saturday. The Savoy Bands.
* Except where otherwise stated, all items simultaneously broadcast originate from the London studio.

London (2 L O)

Sunday. The Luton Red Cross Silver Prize Band. The Rev. T. Carter. De Groot and the Piccadilly Orchestra.
Monday. Chamber Music Evening.
Tuesday. Shakespeare Night.
Wednesday. Popular Programme.
Thursday. Operatic Night.
Friday. Miscellaneous Popular Programme.
Saturday. Massed Bands from Wembley.

but I believe that 5 J X is the first to get across with such a low-power valve (20 watts).

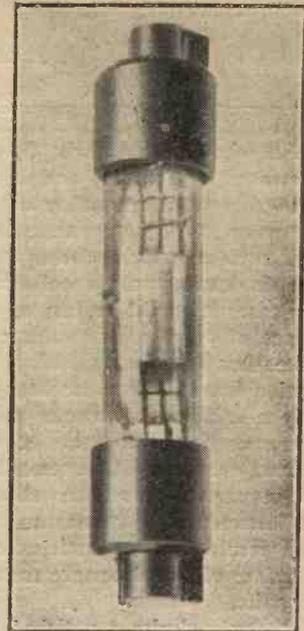
I recently heard 2 K T bemoaning the fact that he had called six stations on Morse and could get no reply. I sympathise with him, for the antipathy of many amateur stations to the key leads one to think that the usefulness of C.W. is likely to be lost sight of in the rush to use telephony.

Empire Music

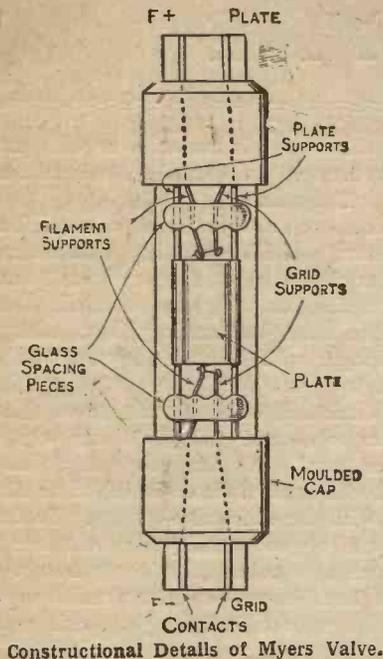
It was an excellent idea on the part of 2 L O to devote an hour to Australian chamber music, thus seeking to bind the Empire closer by links of art as well as by commerce; and prefixed as it was by the address of the Rt. Hon. Sir Joseph Cook, G.C.M.G., High Commissioner for Australia, their object was ensured. The works chosen by Mr. Philip Wilson, who

A VALVE OF ORIGINAL DESIGN

SOME TESTS OF THE MYERS VALVE



Photograph of Myers Valve.



Constructional Details of Myers Valve.

placed upon the set and was found to be doing business as usual. This was a very severe trial, but I then went one better by throwing it right across the room, its journey through the air before it landed on the floor being at least 10 ft. The valve was absolutely undamaged by this kind of brutal treatment. The maker's claim that the valve is practically unbreakable would seem to be amply justified, for I would not have cared to do the same kind of thing with any other type of valve.

This valve will not fit an ordinary holder, but it is intended to be mounted flat upon the panel either above or below it in a special set of clips. Four of these with necessary screws and nuts, as well as a drilling template, are given with each valve. It is quite possible to make an adaptor to enable the valve to fit into a four-pin holder, but it is not advisable to do so, for if it is mounted in this way its anti-capacity qualities must be to a great extent neutralised. The valve is particularly suitable for mounting in portable sets, heterodyne wavemeters and so on, partly owing to its robustness and partly because it occupies so little space. It measures over all just under $3\frac{1}{2}$ in., and the diameter of the caps is only $\frac{1}{8}$ in.

Types

The Myers valve is made in two types. There is first of all the high-voltage pattern, which requires 5 volts and consumes .25 ampere. Secondly, there is the dull-emitter designed to work on $2\frac{1}{2}$ volts and to consume $\frac{1}{4}$ ampere of current. With the bright-emitter Myers valve both the voltage and current consumption given by the makers were found to give good work. But the dull-emitter seems to vary a little in its requirements. Three of the latter were tried, one of which needed 3 volts before it would function satisfactorily, whilst the other two did well at a considerably lower filament potential.

The vacuum in both types of Myers valve is particularly hard, and grid current was found to be very small indeed. The grid-volts anode-current readings obtained with various plate potentials from 15 to 150 were exceedingly satisfactory. At medium voltage curves were obtained which gave good promise of satisfactory performances as a rectifier, whilst with 150 volts upon the plate the curve was steep and straight, being, in fact, just what one would look for in a low-frequency amplifier.

H.F. Amplification

The valve, however, excels, largely owing to its low capacity, as a high-frequency amplifier for short-wave work. Here the results obtained in actual tests upon the set were very good indeed. Though the set was easy to control, the valves can be made to oscillate when required even with very small plate voltages. As a rectifier the valve was found to be distinctly good, whilst as a low-frequency amplifier it gave very pure reception with a marked absence of distortion.

L.F. Amplification

The amplification on the low-frequency side of the set was not perhaps so great as that which can be obtained with some valves, but the purity of the reception left nothing to be desired. It should be noted that these valves will stand up to 300 volts upon the plate. If, therefore, extra high tension up to this amount had been available very great amplification at audio-frequency would have been obtained, a large amount of negative bias being applied to the grid.

The Myers valve, both bright- and dull-emitter, is a strong and well-made component which can be recommended with confidence. One use for it will doubtless occur to those who, like myself, have boys who are wireless enthusiasts. The ordinary valve is apt to be rather short lived in their hands, but the Myers would, I feel sure, withstand the rough handling that it is likely to experience in a boy's hands without suffering.

J. H. R.

It is suggested that listening-in with the phones is likely to develop the sense of hearing.

It is refreshing to come across a wireless valve of entirely original design. The Myers valve is made on lines which, so far as I am aware, are quite different from those of any other valve which has been placed upon the market. It is difficult to get a photograph which shows the details clearly, since a magnesium "getter" is used to clean up the vacuum and the glass opposite one side of the plate is rendered opaque by a metallic deposit.

Construction

The drawing will make the construction of the valve quite plain. The plate is held rigidly in position by two parallel rods of stout gauge, which are sealed into glass spacing pieces. Inside it is the grid, which is again supported by two rods, and the filament runs within the grid between a further pair of supports. Plate, grid and filament are securely fixed to the bulb by two supports sealed into the glass at each end. The bulb, which is of very thick glass, has two caps of stout moulded insulating material through which the contacts run. One of the caps is coloured red and the other black. The former contains the plate and filament positive contacts, the latter is for grid and filament negative. Examination of the drawing will show that its design reduces valve capacity to the minimum, since plate and grid leads come out at opposite sides of the valve and both are kept well away from the filament contacts.

Strength

Another feature of the valve is its strength. As a test during writing this article one of these valves was taken and deliberately thrown on to the floor. The distance which the valve fell on to a thin carpet was about $3\frac{1}{2}$ ft. It was then

MATTING YOUR EBONITE

WHEN ebonite is bought it usually has a shiny surface, and it is surprising to note what a number of experimenters mount their components straight on to this surface, which, although it may look nice, is detrimental to real efficiency. In many cases it would be just as well to use a piece of hard wood as this ebonite. The writer has found that with a 60-volt high-tension battery there has been a leak of nearly 2 milliamps between the H.T. terminals spaced 1½ in. apart on a piece of unmatted ebonite. The reason for this is that in manufacture the sheets are clamped between steel plates to harden, and as a result minute particles of steel on the surface of the plates are transferred to the ebonite.

For those who desire a polished surface on their ebonite there are several firms who supply it with a very highly finished surface. If this is bought from a reputable firm this ebonite is quite ready for immediate use, because after manufacture the surface has been matted and afterwards

repolished. Ebonite can also be bought with a matt finish. The repolished ebonite, owing to the greater amount of labour involved in its production, is naturally dearer than the ordinary kind.

If a matt surface only is required, this

NEXT WEEK
"CRYSTAL SET FOR
THE INDOOR
AERIAL"

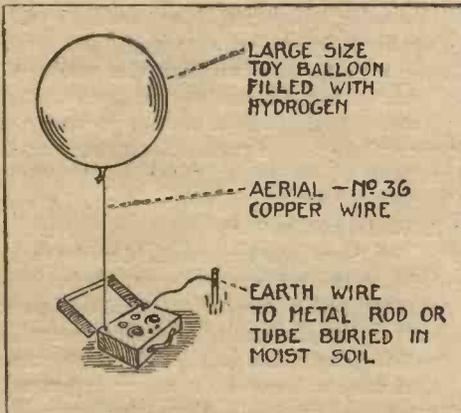
can be obtained very effectively by using valve-grinding paste, which can be obtained at garages. It is usually supplied in small tins containing coarse and fine grades. The best way is to rub the granules into the ebonite with a piece of hard wood with a circular motion. After the fine grade has been applied in the same

way the ebonite is rubbed over with petrol or methylated spirit and a dead matt surface will result.

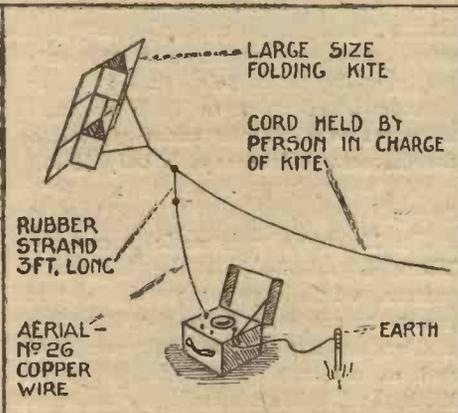
For those who prefer a polish finish it is better to do the matting with different grades of sandpaper, starting with a coarse grade and finishing up with the finest. The best and easiest way is to back the sandpaper with a flat piece of cork about 5 in. by 3 in. by 1½ in. Always rub in one direction, either from side to side or corner to corner. Keep rubbing with the coarse until all the original polish is removed, then continue in the same direction with the successive grades. To finish off, rub a good quality oil well into the surface and polish with a clean rag.

In both cases the underneath of the panel can be rubbed roughly with coarse-grade sandpaper with a circular motion. Particular care should be taken to rub around holes for terminals, valve legs, etc., and to further minimise leakage small circles can be cut around each hole on the under side of the panel. G. SPIERS.

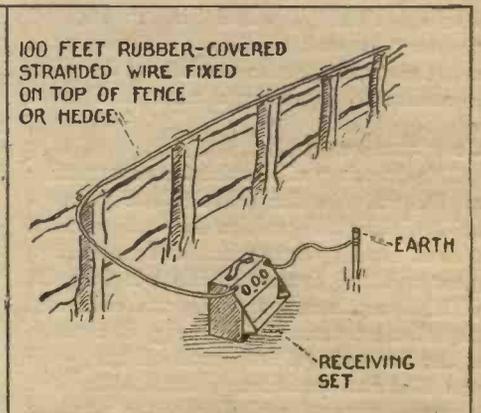
AERIALS FOR PORTABLE SETS



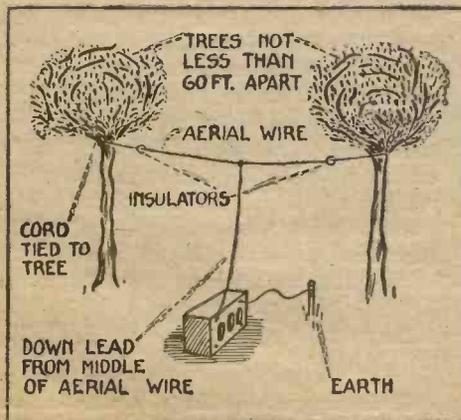
A toy balloon makes a simple aerial elevator on a still day.



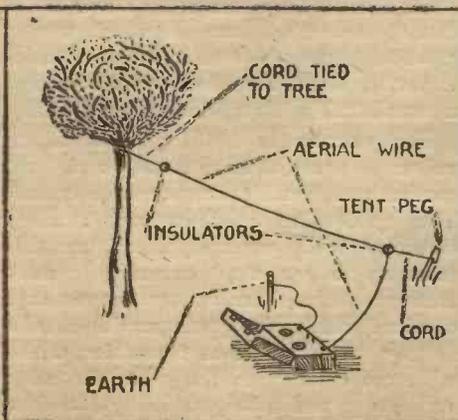
A kite may be used if the wind is blowing.



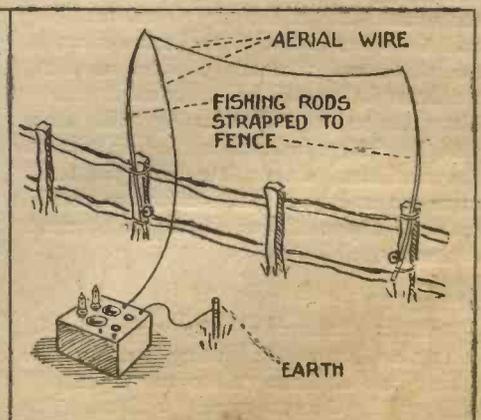
Insulated stranded wire laid on the top of a fence or hedge answers well.



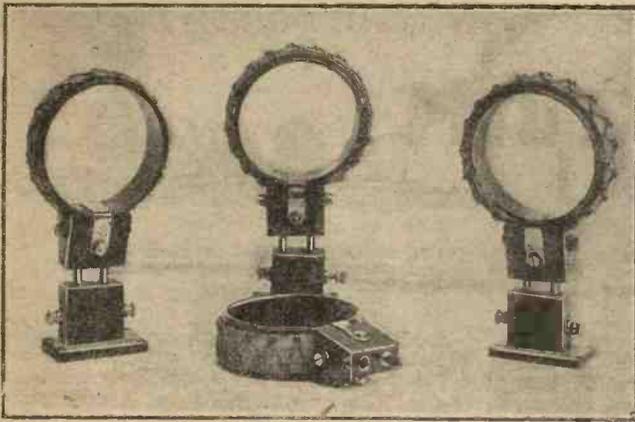
Trees may be used if the enthusiast can climb.



If only one tree is available a long single wire may be used.



On a fishing expedition you may make use of a couple of rods.



Tangent Concert Coils.

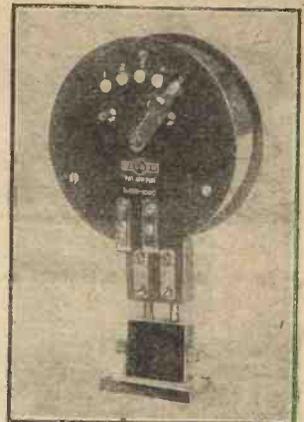
The Tangent Coils

TANGENT coils are made by Gent and Co., of 25, Victoria Street, London, whose excellent components are well known to the majority of wireless men. Those tested were the concert series of four coils, Nos. 25, 35, 50 and 75. These, if used as A.T.I. with a .001 condenser in parallel, have a wavelength range from 250 to 1,100 metres. But the series is so arranged that the coils provide suitable primary, secondary, tuned-anode and reaction coils to cover the broadcast band. These inductances are both neatly and solidly made, the windings being supported by a stout ring-shaped former of moulded insulating material $2\frac{1}{2}$ in. in diameter. The base containing a plug and socket is attached to this by a brass strip which makes the connection between the two as solid as could be wished for. These are single-layer coils, the windings being of stout wire; they are laced with twine to prevent their coming apart. They are very strong little coils which cannot possibly be broken unless a deliberate attempt is made to do so. For broadcast reception they are thoroughly efficient; in actual test the B.B.C. stations as well as L'Ecole Supérieure and Brussels were received at good loud-speaker strength, and the set was easy to handle. Those who go in chiefly for broadcast reception will find that a set of Tangent coils meets their requirements in every case.

The Magnum Tapped Coils

The Magnum tapped coils are made by Messrs. Burne Jones and Co. These are single-layer inductances, from whose windings tappings are taken to five studs, with which a selector switch makes contact. A coil of this type is most useful, especially for the A.T.I., for it allows the set to cover a very wide range of wavelengths without any change being made in the coil. These coils are made in two sizes, the first tuning from 180 to 1,000 metres and the second from 600 to 2,600 metres if a series-parallel switch is used. They are also most handy for use with tuned-anodes. In this case the smaller coil, with a .0003 condenser in parallel, will tune from about 200 to 1,500 metres. In spite of the dead ends which must occur with any type of

COMPONENTS YOU CAN RELY UPON INDUCTANCE COILS.—III

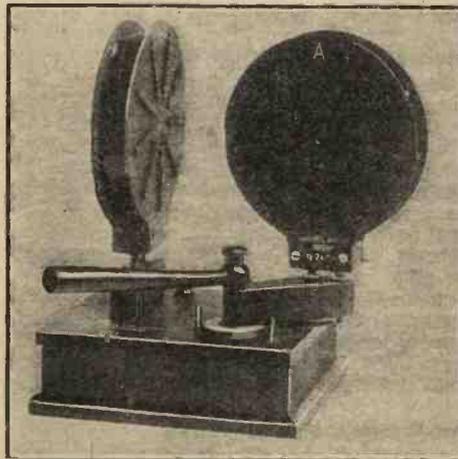


Magnum Tapped Coil.

tapped inductance the Magnum is a very efficient coil which can be recommended with every confidence. It is soundly constructed, robust and good-looking. Its diameter is 4 in., and height over all, including plugs, $5\frac{1}{2}$ in.

The Gambrell Inductances

The Gambrell coils have some special features which are well worth the attention of the amateur. To begin with, all of them, no matter what their wavelength may be, are of the same size. They are 5 in. in height over all, $3\frac{7}{8}$ in. across, and the width of the windings is $\frac{7}{8}$ in. This means that any pair of inductances placed in the two-coil stand will be concentric, an obvious advantage from the point of



Gambrell Inductances on Stand.

view of coupling. The self-capacity of these coils is remarkably low. For short-wave coils tuning up to about 600 metres it in no case exceeds .00004 microfarad, which is perhaps as near an approach to perfection in this respect as we are likely to see. Even in the big coils such as the "J" size, which will tune up to 24,000 metres, the distributed capacity is only .000021 microfarad. By making all their coils of the same size Messrs. Gambrell have been able to make them equally efficient upon all wavelengths. In the small coils which have only a few turns of wire the air space between the turns is very large indeed. Now short wave-

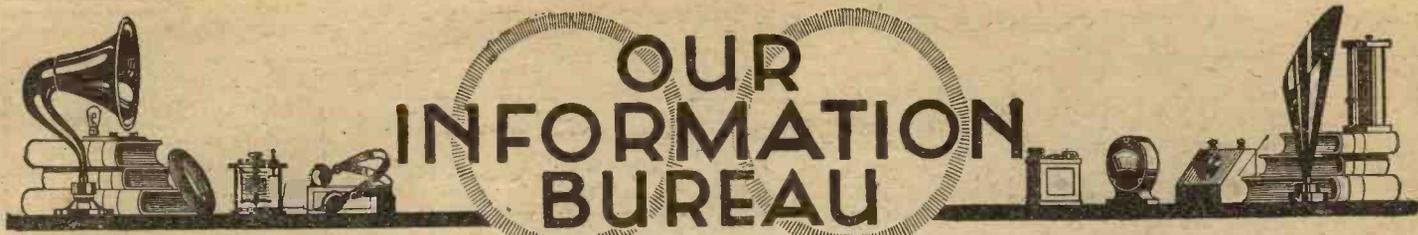
lengths mean high frequencies, and the higher the frequency the greater are the capacities which are likely to occur in a coil. In the Gambrell inductances the size of the air spacings increases with the frequency with which they are constructed to deal. Hence even on the shortest waves losses are cut down to something that is to all intents and purposes negligible. A further feature is the very large wavelength range covered by each of these coils. This, besides saving one the trouble of making frequent changes in the inductances when transmissions on different wavelengths are being picked up, means that much smaller condensers can be used in parallel, so that the damping effects of added capacity are kept down. With a .00065 A.T.C. and the average amateur aerial the Gambrell "A" coil will tune from 325 to 510 metres, thus covering all the broadcast wavelengths.

Gambrell Coil Tests

The "C" coil used as secondary with a parallel condenser of only .00025 microfarad, which is half the size of that generally employed, tunes from 240 to 610 metres. Practical tests of these coils were conducted first with one valve only and secondly with a five-valve set (two H.F., detector and two L.F.). The set in use was first tuned to a transmission of moderate strength, a set of basket inductances of good average efficiency being used. The coils under test were then substituted and any difference in signal strength was noted. With the single-valve set an attempt was next made with its own inductances to tune in a very weak transmission with the help of a wavemeter. The test coils were then placed in the holders and the attempt was renewed.

With the Gambrell coils results were extremely satisfactory, a distinct increase in signal strength being noted upon the Birmingham transmission which was used for the moderate strength test. With its own coils the single-valve set could not pick up L'Ecole Supérieure, but with the Gambrell coils in use this station was tuned in. On the large set it was found that whilst there was no appreciable increase in strength upon good signals the

(Concluded in third column of page 642)



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 Coupon (p. 633.)

Wavelength of Aerial

Q.—How can I calculate the wavelength of my aerial?—T. C. L. (Southampton).

A.—As in all wavelength calculations, the value will depend upon the inductance and capacity of the circuit, which in this case is the aerial circuit. This includes the aerial, lead-in, and earth lead. The actual value of capacity of an aerial is very difficult to calculate, and many things have to be taken into consideration. For instance, the capacity will depend upon the number of wires in the aerial, the length of the aerial, height from the ground, presence of conducting

bodies (trees, buildings, metal-work, etc.). Unless an absolute precision measurement is required, it can be taken for all ordinary purposes that the wavelength of an aerial is four times its length in metres.—B.

Audio- and Radio-frequency Amplification

Q.—What is the difference between audio- and radio-frequency amplification?—B. H. N. (London, N.).

A.—Audio-frequency amplification implies that amplification is made at frequencies within audible limits, which means that the signal is magnified after it has been rectified into audible form by a detector valve or crystal. Radio-frequency amplification means that the signals are amplified while they are still at the same frequency as when they arrive at the aerial. In this case the amplitude of the incoming waves is increased before they are passed to the detector for rectification into audible sounds.—P.

Valve for Flewelling

Q.—What type of valve do you advise for use with the Flewelling receiver?—R. H. M. (Burton-on-Trent).

A.—Almost any type of valve is suitable, with correct adjustment of the variable grid leak, but perhaps for best results a hard valve is to be preferred.—B.

Receiver Connected to Two Aerials

Q.—Would any advantage be obtained by connecting my receiver to two different aerials at the same time?—J. M. W. (Glasgow).

A.—An advantage would be gained by doing this if the two aerials were of exactly the same length and the same height from the ground, parallel, and were situated at least 6 ft. apart from each other. On the other hand, if the aerials were not exactly the same, it would come to the same thing as taking the lead-in from the aerial at a point somewhere remote from the centre. In such a case, the two portions of the aerial would have different natural wavelengths, and the result would be a weakening of signals.—P.

Best One-valve Circuit

Q.—Out of the following circuits, using one-valve, which is the best: Flewelling, Reinartz, or super-regenerative? Which is the most selective, and which the easiest to handle?—W. M. C. (Dover).

A.—The super-regenerative circuit will give londest signals, followed by the Flewelling, and lastly the Reinartz. The most selective of the three is probably the Flewelling, if its aerial tuning condenser is connected in series, while with regard to ease of handling there is very little to choose between the Reinartz and the Flewelling. What little advantage there is would be in favour of the Flewelling.—B.

Simplifying Three-coil Tuning

Q.—I am using the three-coil tuning system consisting of a three-coil holder containing the aerial coil, secondary coil and reaction coil, and find this arrangement very hard to tune. Can I obtain good results by simplifying the tuning in some way?—B. F. D. (Bath).

A.—There are, of course, several different adjustments to make when using the three-coil system, which has a variable condenser in the aerial circuit and also a condenser across the closed circuit inductance. You may omit the aerial-tuning condenser if the aerial coil alone, in conjunction with the aerial, tunes approximately to the station you want to receive. This will simplify tuning to the extent of having one condenser less to adjust.—B.

Shielding Receiver with Lead-foil

Q.—If I encase my receiver in lead-foil and earth it, will it make signals weaker?—C. M. (Watford).

A.—It may do so if certain precautions are not taken. For instance, if the aerial tuning inductance is mounted near the lead-foil, if the reaction coil is near the lead-foil, or if the top plate of the variable condenser is touching the foil. If the top plate of the condenser is on the earth side of the circuit, this last point does not arise. All wiring should be kept well away from the lead-foil lining. If these points are attended to there is no reason why you should suffer a reduction in signal strength; on the contrary, circuits of the super-regenerative type benefit very much by being suitably shielded.—B.

"COMPONENTS YOU CAN RELY UPON" (Continued from page 641)

set was distinctly easier to handle, there being a smaller tendency to fall into self-oscillation even when both anodes were closely tuned. Perhaps the most surprising feat of all was that Manchester, whose signals are always very weak at my station—I live thirty miles north-west of London—was picked up at quite respectable loud-speaker strength, a feat which I have never before accomplished. With coils "A" and "C" placed in the Gambrell two-coil stand shown in the photograph it was found possible to separate Manchester from 2 LO even whilst the latter was working, though the wavelength difference is only ten metres. I can thoroughly recommend the Gambrell coils as being sound and efficient components which will do good work upon any set.

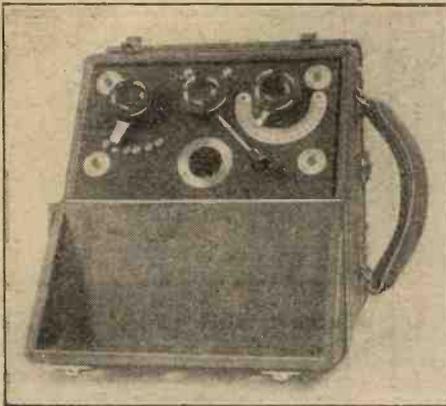
Conclusion

The tests brought out that the well-made inductance coil of to-day is a very great advance upon those which were obtainable only a few years ago. It is compact and robust, and the signal strength obtainable with it is distinctly greater than with coils of the basket type. The amateur who is about to invest in a set of coils will find that he obtains just what he wants for easy, efficient working if he provides himself with any of the types the tests of which have been described above. J. H. R.

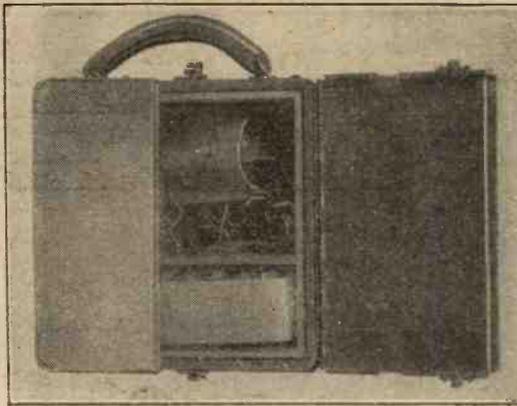
AN AMATEUR SET DE LUXE



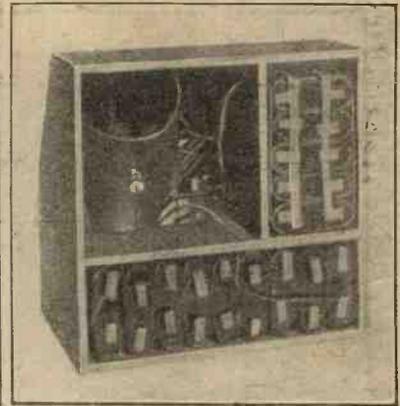
The photograph shows a three-valve set constructed by Mr. F. W. Thomas, of Southfields, S.W. Anything from a crystal to three valves can be used at will. Tuning arrangements allow for wavelengths varying from 150 to 2,800 metres. All the B.B.C. stations are received at loud-speaker strength without distortion. With all the cabinet doors closed the set makes a very fine piece of furniture. With the exception of the condensers and filament resistances, practically everything was home-made. Only 4 volts L.T. and 36 volts H.T. are used by Mr. Thomas. The dimensions of the cabinet are 2 ft. 6 in. square by 5 ft. 6 in. high.



The Receiver Open for Use



Back of Receiver



Inside View showing Components.

MAKING A ONE-VALVE PORTABLE RECEIVER

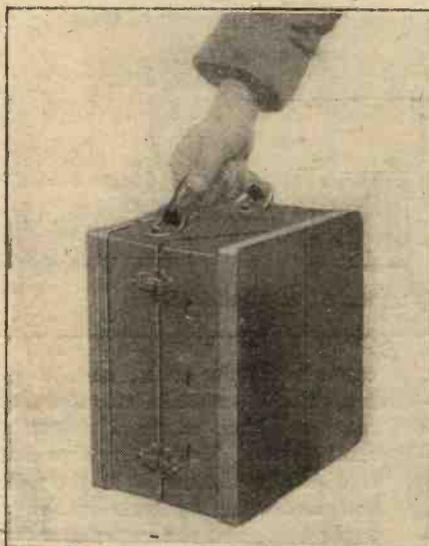
EXCELLENT headphone reception using quite a small aerial is obtainable with the self-contained one-valve portable set described below. The circuit employed, while giving good results providing reaction is not pushed too near the oscillation point, is—in common with all reaction circuits—capable of energising the aerial if improperly used; due care should therefore be taken in using the instrument not to cause the set to oscillate.

The complete receiver, apart from aerial and headphones, is built in the case of an ex-W.D. three-valve amplifier, but readers who cannot obtain such a case may quite easily make a suitable box.

Tuning

Tuning is carried out, as will be seen in the circuit diagram Fig. 1, by means of a tapped variometer, the stator of which consists of 90 turns of No. 26 d.c.c. wire wound on a shellacked cardboard cylinder 3 in. in diameter by 4 in. long, a tapping being taken at every fifteenth turn and led to a contact stud of the switch arm.

The rotor, which is arranged with its spindle between the fifteenth and six-



The Receiver Closed for Carrying.

teenth turns of the stator winding, consists of a shellacked cardboard tube 2 in. in diameter by 1½ in. long wound with 30 turns of No. 26 d.c.c. wire.

The Valve

Any type of .06-ampere valve may be used; that incorporated in the writer's set is a DE₃ and has proved quite satisfactory.

Suitable filament control is given by a "Microstat" filament resistance which, besides being very compact, allows of the gradual switching on of the filament current as recommended by makers of this type of valve. A further refinement which was found an advantage is the fitting of a small extension arm to the rheostat-control knob, thus enabling very fine adjustment to be made.

Batteries

Both low- and high-

tension current supply is obtained from ordinary 4½-volt flashlamp batteries, which besides being cheap are obtainable even in the most out-of-the-way places—a matter which will be found of convenience when using the set away from home.

Five flashlamp batteries connected up in parallel suffice for the L.T. current supply, and provided good-quality batteries are purchased quite a considerable number of hours of burning using the single .06-ampere valve will be obtained.

The H.T. battery consists of nine flashlamp batteries connected up in series; these give a total voltage of approximately 40. In order to bind the individual 4½-volt batteries securely together, two broad elastic bands are placed round the whole block, one near the top and the other near the base of the cells.

Condensers

Two small fixed condensers, which must be of good-quality (mica-insulated type), are used in the receiver, one of .0005 microfarad and the other—the grid condenser—of .0003 microfarad; this is used in conjunction with a grid leak of approximately 1 megohm.

Concluded on page 647)

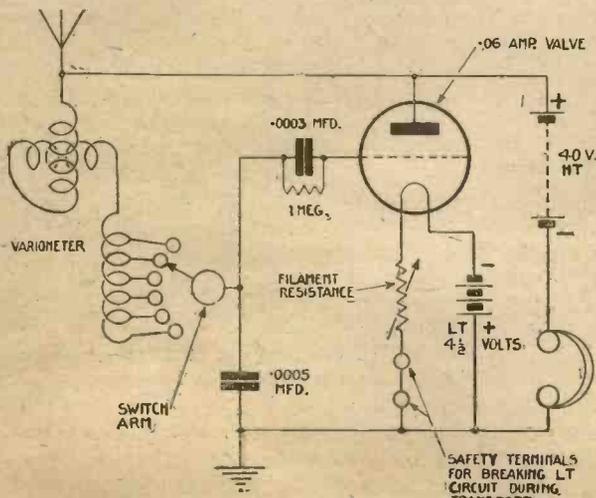


Fig. 1.—Circuit Diagram.

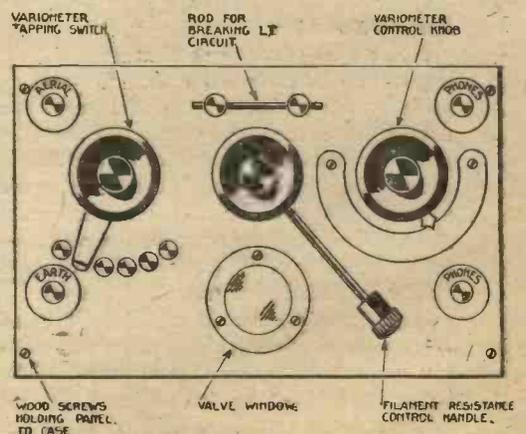


Fig. 2.—Arrangement of Panel.

THE VA SWITCH

series-parallel switch, which consists of two separate arms attached to an ebonite knob and eight studs. The condenser is shown in series; when the arms are moved round to the other four studs it is then placed in shunt with the coil. In this case it may be more correct to say that the coil is placed in series or shunt with the condenser. This type of switch is now

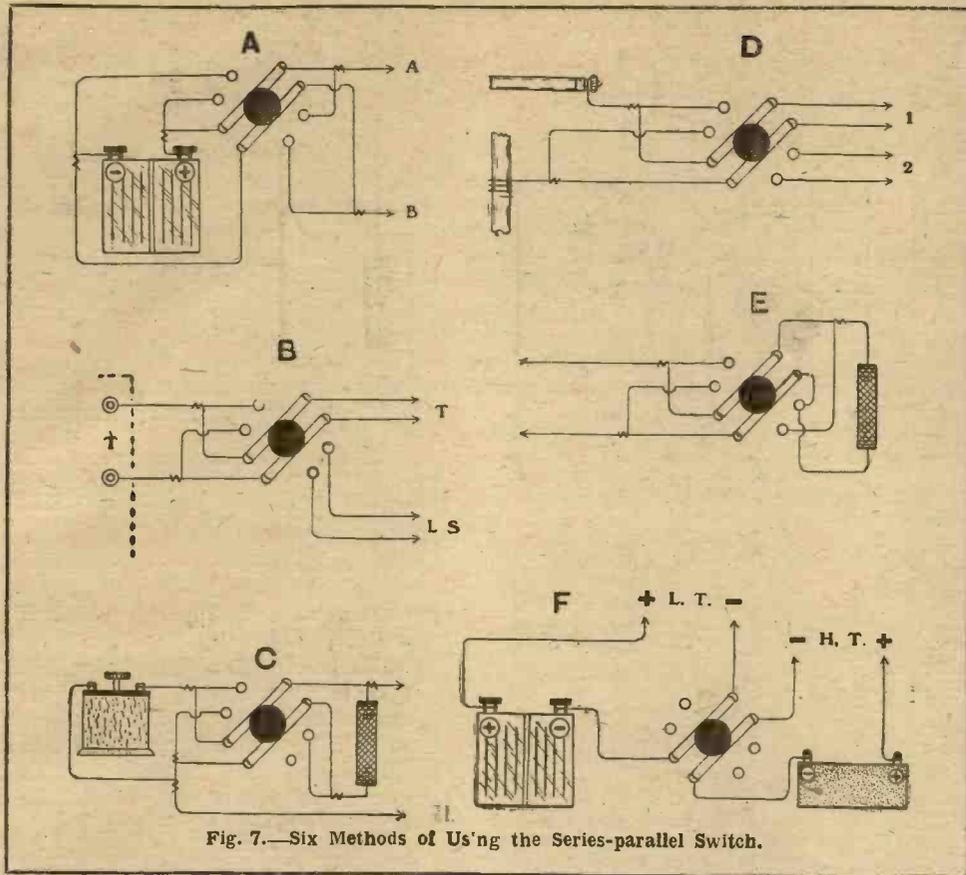


Fig. 7.—Six Methods of Us'ng the Series-parallel Switch.

TO describe the uses of all the different types of switches used in wireless circuits would necessitate writing a complete book on the subject. It is intended, therefore, in this article only to deal with those systems which are most commonly used. In some circles it is considered bad practice to employ too many switches in a circuit, owing to the capacity effects caused by the exposed metal fittings, but if a switch is properly designed there is no reason why we should not employ as many as may be convenient. Unfortunately these remarks do not apply to plugs and jacks, for however well these may be designed, the contact strips are essentially placed very close together, with the resultant production of undesirable capacity effects.

Simple Switches

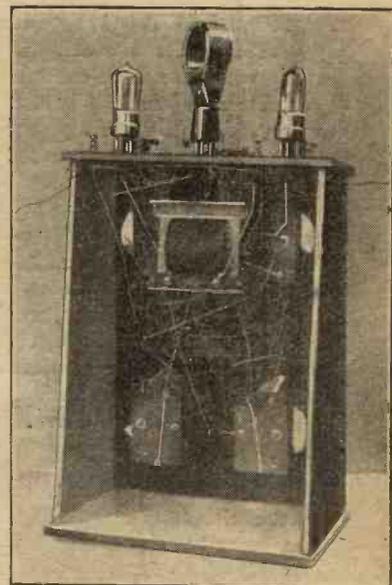
Fig. 1 shows how to connect up a simple single-pole double-throw or "two-way" knife switch to function as a change-over device from aerial to earth. A double-throw or two-way switch is essentially a change-over switch, and the double-pole double-throw knife switch shown in Fig. 2 is a decided improvement on the arrangement shown in Fig. 1, since it permits a more complete break from the receiver.

Figs. 3 to 5 show three different types of series-parallel switches, which are arranged to conveniently place the A.T.C. either in shunt or in series with the primary tuning coil. The first is an ex-

tremely simple affair, consisting of two arms and three studs, mounted on a small insulated base, or direct on the panel of the receiver. The setting shown indicates that the condenser is in series with the coil, and when the lower arm engages the lower stud, and the upper arm the centre stud, then the condenser is in shunt with the coil.

In Fig. 4 the ordinary double-pole double-throw knife switch is used, the condenser being in series when the arms engage the clips 1 and in shunt when engaging clips 2.

Fig. 5 shows the most common type of



The photographs show the "A.W." Nos. 94, 95 and 96. In this instrument Messrs. Peto-Scott, Ltd., 64, High Holborn, London, W.C.1, have made of the possibilities of switching, in this article. All the components may be

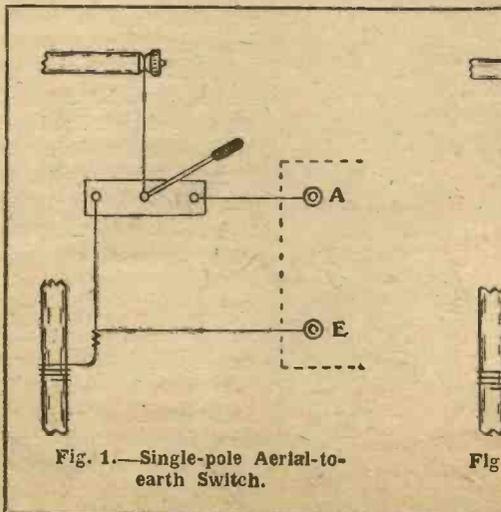


Fig. 1.—Single-pole Aerial-to-earth Switch.

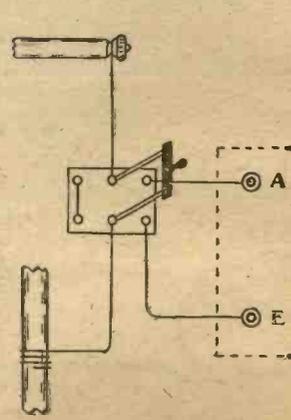


Fig. 2.—Double-pole Aerial-to-earth Switch.

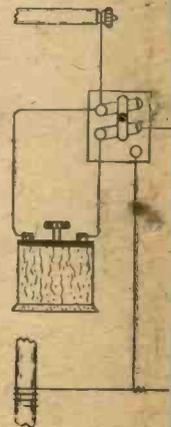
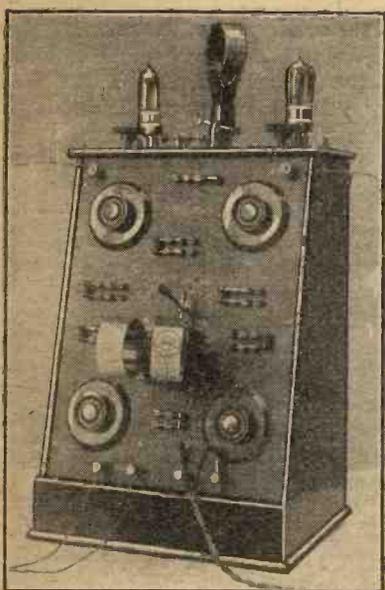


Fig. 3
Figs. 3 to 5.

VALUE OF SWITCHING

very popular, and a few other examples of its use are given to the left.

Fig. 6 gives a general idea of the arrangement of a tune-stand-by switch, the leads A and E being those from the primary tuning circuit, RR representing the leads to the receiver. It will be seen that when the switch arms engage the clips 1, the secondary or closed circuit is



All-station Receiver, fully described in *et*, which was specially constructed by *born, W.C.*, extensive use has been including many that are dealt with in *e* obtained from the above firm.

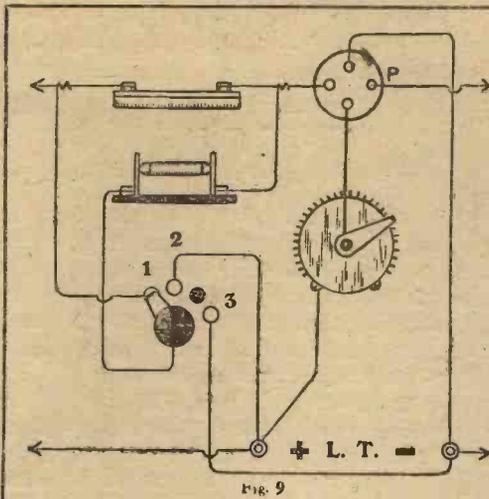


Fig. 9

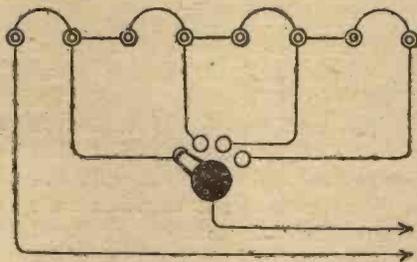


Fig. 8

Figs. 8 and 9.—Two Examples of the Uses of Multi-point Switches.

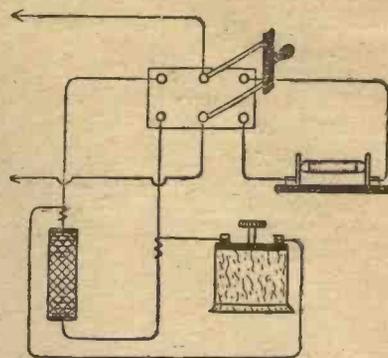


Fig. 10.—Switching Arrangements for Tuned-anode to Resistance-capacity Coupling.

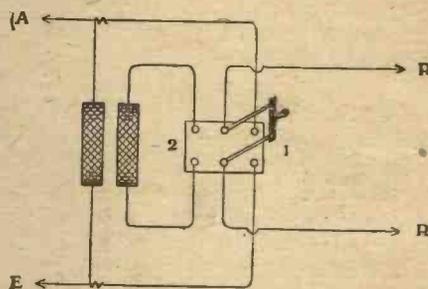


Fig. 6.—Arrangement of Tune-stand-by Switch.

entirely cut out, thus making it possible to tune in by using the primary circuit only. This is an advantage when rapidly searching for signals. When the signals have been roughly tuned in, the closed circuit is then cut in by throwing the arms over to clips 2. It is also an advantage to arrange reaction coils this way.

Fig. 7 depicts a few different methods of employing the series-parallel switch described in Fig. 5. In diagram A it is arranged to reverse the current of a battery, the setting shown indicating that A is the positive and B the negative lead. When the arms engage the other four

studs, B is positive and A is negative. Diagram B shows the switch wired up to effect a quick change over from phones to loud-speaker and vice versa. The same wiring will also apply where it is desired to switch over the telephones from one receiver to another, or to quickly change over to a spare accumulator. Diagram C shows how it may be arranged to place the *secondary* tuning coil either in series or shunt with the usual .0005-microfarad variable condenser; in diagram D it is employed to change over the aerial and earth from one tuner to another.

Reaction

Reversing the direction of a reaction coil is most conveniently accomplished by the method shown at E. In this case the switch arms may also be placed in a midway position so as to engage the two centre studs on each side; the coil is then short-circuited and thus cut out of circuit. The setting shown indicates that the current may be flowing in a clockwise direction, and when the arms engage the other two pairs of studs the current flows in an anti-clockwise direction. Diagram F shows how to connect up the switch in order to effect the simultaneous switching of the H.T. and L.T. batteries.

The uses of the ordinary multiple or multi-point switch are almost unlimited. Examples are given in Figs. 8 and 9. In Fig. 8 any number of phones may be connected up by providing a corresponding

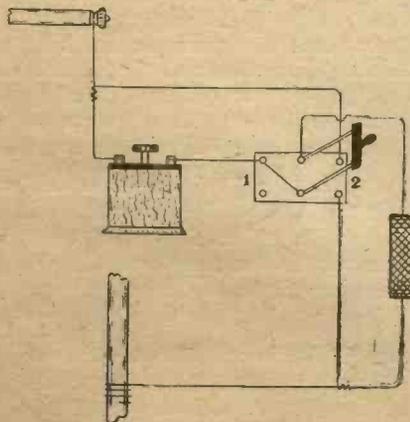


Fig. 4

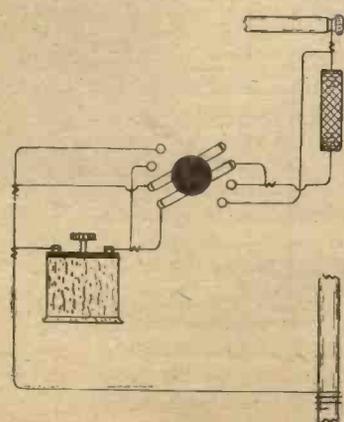


Fig. 5

—Three Types of Series-parallel Switch for Placing A.T.C. in Shunt or Series with A.T.I.

number of studs and a switch arm wired up as shown. A loud-speaker may also be included in the same circuit providing its resistance coincides with that of the telephones.

In Fig. 9 we employ a four-point multiple switch, having one blank stud, to conveniently effect the selective arrangement of the grid leak. The setting shown indicates that the leak is in shunt with the grid condenser. When the arm engages stud No. 2 it is placed in series with the grid and L.T. positive, and thus the grid is given a positive potential. When adjusted to stud No. 3 the grid is given a negative potential. Where an enthusiast intends doing a little experimenting, this switch is a very useful addition to his set. The blank stud, which is placed between the second and third "live" studs, prevents the L.T. battery from being momentarily short-circuited every time an adjustment is made from positive to negative. For the same reason blank studs should always be provided between the live studs of a multiple switch used on a high-tension battery unit made up from pocket-lamp cells.

Fig. 10 shows a double-pole double-throw knife switch wired up to effect a quick change over from the tuned-anode coupling used on short and medium wavelengths to the resistance-capacity coupling used on long wavelengths. It should be remembered that when using the latter method the value of the H.T. battery should be increased by about 50 per cent.

O. J. R.

(To be continued)

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

EMPIRE DAY BROADCASTING

It is to be expected that the B.B.C. would make special efforts to produce a fitting programme for broadcasting on Empire Day, and that they have done so listeners will be able to judge for themselves on Saturday, May 24. "A Commonwealth of Nations" is the title of the entertainment that will begin at 7.30 p.m. It is a "Seaview in Seven Episodes," distinctly original both in conception and treatment. The programme will be broadcast from 2 L O and relayed to all other stations.

Major A. Corbett-Smith is responsible for the entertainment, which promises to afford an exceptionally interesting evening's listening-in. The whole programme has been designed upon lines of human incident, and Major Corbett-Smith has carefully avoided the usual patriotic, imperial note, which is apt to be rather dull. Because of this "A Commonwealth of Nations" is expected to make a wider appeal than might otherwise be the case.

After a greeting to our King-Emperor, the Birth of the Empire will be depicted by the crash of sea waves, a great storm and the wreck of the Spanish Armada. The Spirit of England rises from the waves, and Miss Madge Titheradge (reciting a prologue specially written by Mr. Alfred Noyes) will invoke the Spirits of

Scotland, Ireland and Wales, sending them out far across the world to found new nations and colonies. In a series of dramatic episodes each of the overseas Dominions will be visited in turn, from Newfoundland (the oldest colony) to the Union of South Africa. Cable messages from the several Premiers will be read at the end of each episode.

Devon mariners, at sea in the *Matthew* under John Cabot, discovering the new land, will form the first episode. For Canada, a scene with a French-Canadian family in their log hut in the great North West will be given. An up-country steeple chase, with all the excitement of the actual race and the romping home of the favourite, will typify Australia. In India listeners will pass from a regimental dance near the frontier to a native bazaar and an attack upon the British outpost. A poetical episode in a meeting between a Scots settler and Ao-tea-roa forms New Zealand's contribution to the programme. The sea is, very properly, the link that joins the episodes together. The sound of the waves will be heard throughout the entertainment.

The second part of the programme, from 9.45 p.m. onwards, will be devoted to a selection of popular songs and tunes from the days of Queen Elizabeth down to modern times, the latter being typified by "Pack Up Your Troubles" and "Tipperary," all of which have played their part in consolidating the British Commonwealth.

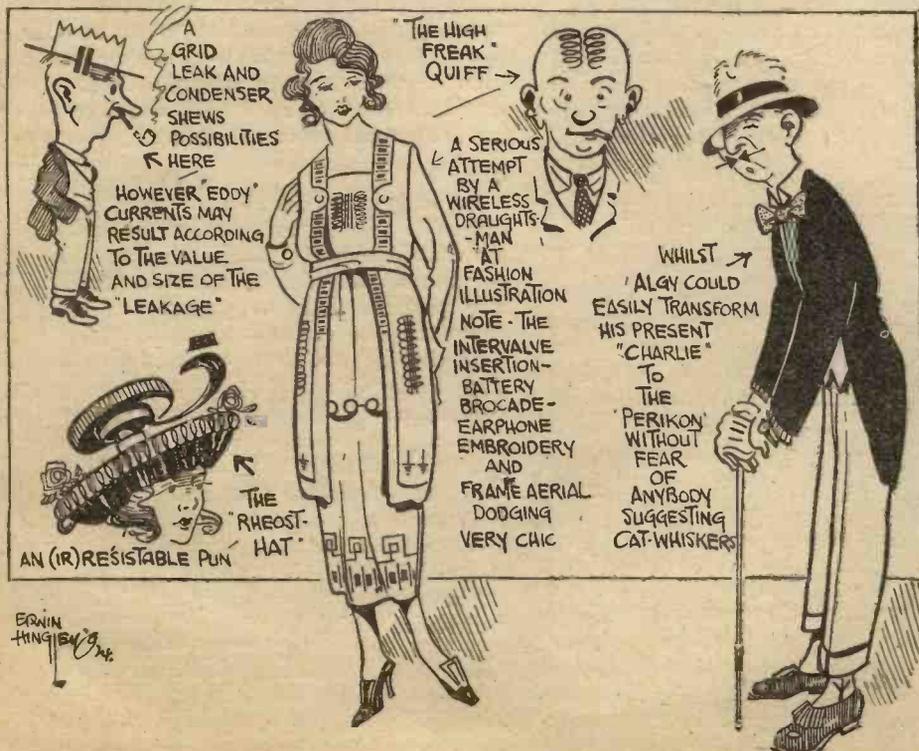
The project of broadcasting a special programme from 2 L O for the benefit of the Pope has been held over for a few weeks, as it is only possible to receive 2 L O irregularly at the Vatican just at present.

It is stated that Glasgow can be heard as clearly at a distance of fifty miles as Edinburgh can at two miles, using the same receiving set. Listeners are asking for the power of 2 E H to be increased.

New York is likely to have its own municipal broadcasting station. It is hoped to have the station in operation next month so that the proceedings of the Democratic National Convention may be broadcast.

Mr. J. Robinson, M.Sc., chief of the wireless department of the Royal Aircraft establishment at Farnborough, said, in the course of a paper recently read before the Royal Society of Arts, that it was an absolute certainty that the era of wireless navigation of ships was not far distant.

WIRELESS FASHIONS FOR ALL



WIRELESS AT WEMBLEY

The G.E.C. Exhibit

IMPOSING and worthy of the British Empire Exhibition is the G.E.C. Pavilion in the Palace of Engineering (Avenue 11-13, Bay 11-15) at Wembley. As can be seen from the photograph, the stand comprises two storeys. Wireless takes its fair share of space, but the comparatively small apparatus is rather lost amongst large electrical machinery. Nevertheless, there are plenty of interesting things to attract the attention of the wireless enthusiast. Complete sets, batteries, components and valves all find a place.

The wireless dealer is well catered for in the model electric shop that forms one corner of the ground floor of the pavilion. One of the show cases contains a Gecophone two-valve cabinet set and a representative display of Gecophone low-tension and high-tension batteries and Gecophone

condensers and filament resistances.

Several elaborate cabinet sets are exhibited separately. One, with one H.F., detector and two L.F. valves, has a self-contained loud-speaker, and is so arranged that any number of valves may be used. The batteries are also self-contained, and provision is made for storing six pairs of phones. The chief point of interest about the Gecophone five-valve cabinet receiver is that the three stages of L.F. amplification are resistance coupled. This method of coupling, being entirely aperiodic, gives an even range of amplification at all frequencies and renders the set remarkably free from distortion.

Probably the valve exhibit is of the greatest interest to the amateur. All kinds of valves are shown, from small dull-emitters giving an output of only a few milliwatts to a large water-cooled transmitting valve that takes 50 amperes on the filament and delivers something like 20 kilowatts of high-frequency energy.

Three valves especially should be noticed, the R5v, the DE5 and the DE6. The R 5-volt valve has been designed for use with a six-volt accumulator. (The practice of using what may be called "four-volt valves" with six-volt accumulators frequently results in burnt-out filaments.) For use in conjunction with the R5v, as a power valve, the DE5 (see photograph) has been designed. This takes .25 ampere on the filament at 5 volts, with 30-150 volts on the plate. This valve can also be used as a general-purpose valve. The DE6, which takes .4 ampere at 1.8 volts, is intended for use in conjunction with a DER valve.



The Marconi-Osram DE5 Valve.

low-tension accumulators. Special mention may be made of a compact three-cell dry battery for use with DE3 valves, which take only .06 ampere on the filament. This battery, which is supplied with either screw-down or plug terminals, will give 800 hours' service with one valve and is of sufficient capacity to operate two DE3 valves simultaneously.

On the first floor was a case that contained (last week) a display of the Gecophone two-valve constructor's set, the background being a silhouette of a boy at work on the construction of his set. Other sets and components are also shown on the first floor; these include popular crystal sets, the Gecophone two-valve cabinet and panel sets, and a range of variometers,



batteries and unfasten the four wood screws holding the panel.

Framework

In order that every part may be easily accessible without impairing the portable qualities of the set an inner case built up of 1/4-in. hard wood is used; all compartments for batteries are incorporated in this, the panel being attached to the sloping portion at the top.

Four valve sockets are mounted on a strip of ebonite attached to the base.

After placing the valve in its holder a strip of hard wood or ebonite should be secured in such a position that it projects over the shoulder at the base of the valve and thus prevents it working loose during transport.

Using the Set

Before actually using the set as a portable receiver the instrument should be tested with a small indoor aerial, the earth connection being taken to a near-by water-pipe; connect up the phones, which should, of course, be of the high-resistance type, and switch on the filament current, gradually increasing this until the valve filament is seen to be at a suitable heat; place the switch arm on the contact stud connected to the last tap of the variometer stator and slowly swing the variometer rotor through its 180 degrees range. If nothing is heard, move the switch arm to the next stud and repeat the slow swinging of the variometer. Continue these operations until signals are heard, and then bring them to their loudest by careful adjustment of the variometer and filament current controls. If in carrying out these adjustments there is any tendency to oscillation, the L.T. current should be immediately reduced.

When using the receiver away from home a temporary aerial and earth connection will, of course, have to be made before the set can be brought into use. Perhaps the best form of temporary earth is a 3-ft. length of clean metal rod pushed into the bed or bank of a stream or pond, the earth lead from the set being connected to a screw or terminal near the top of the rod.

For the aerial, see page 640.

P.

"MAKING A ONE-VALVE PORTABLE SET" (continued from page 643)

Panel

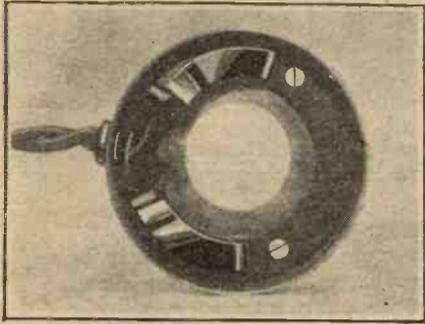
All components, apart from the valve and batteries, are mounted on a 1/4-in. ebonite panel, which should be of matt finish. Fig. 2 shows the outward appearance of this part with all components in position.

In order that the completed panel may be easily removed for inspection at any time, terminals—to which all connections for the batteries and valve are led—are arranged in an accessible position on the back of the panel; thus to remove this at any time all that is required is to disconnect the wires from the valve and

AROUND THE SHOWROOMS

Accumulator-charging Device

MANY methods of charging accumulators from the lighting mains have been described in "A.W.," most of which require some improvised connecting device



The "Neo" Switch Adaptor.

being attached to the lamp-holder or switch. For those who do not care to go to the trouble of making attachments there is now on the market a neat arrangement which is all ready and complete with wire to slip on any handy switch. This is the "Neo" switch adaptor, and it is shown in use in the photograph below.

The fitting of the adaptor is simplicity itself. The cover of the switch is unscrewed, the adaptor slipped on in its place, and a ring, which is provided, screwed on to hold it secure. The construction of the adaptor can be seen from the top photograph. It will be understood that the two spring blades make contact with the switch terminals when the adaptor is in position. The accumulator is, of course, connected up in the way that has been previously described in these pages.

The "Neo" adaptor has also another use. It may be used as a distant-control arrangement for any lamp and, as it does not interfere with the ordinary switch, it at the same time allows of dual control.



Adaptor on Switch.

The price of the adaptor is 8s. 6d., and it is made by Dimmers, Ltd., Berryman's Lane, Sydenham, S.E.26.

Raymond Components

THREE components recently put on the market by K. Raymond, of 27, Lisle Street, W.C.2, and of interest to every amateur, are a variometer, a tuning condenser and

a crystal detector. There are several points about the variometer that are worth noticing. The spindle is made in two pieces, these forming the connections between stator and rotor; thus there are no flexible wires to get twisted up. Two brackets for fixing the variometer to a panel also form the aerial and earth terminals, and are so marked.

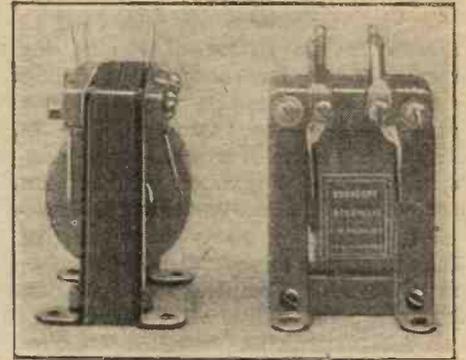
The variable condenser has the now familiar one-hole method of fixing. Terminals are provided for taking connections, this doing away with the necessity for soldering leads to the instrument. A quick-change crystal cup is included in the detector. Further details and photographs of these components will be given later.

Burndept L.F. Transformers

NO one can expect to get the very best results from an amplifier unless the valves and transformers are suitable for use together. This point frequently cannot be given great attention in practice, but it is a help if different ratio transformers are used in the various L.F. stages.

Two types of L.F. transformer are made

by Burndept, Ltd., of Aldine House, Bedford Street, Strand, W.C.2. One is a high-ratio transformer designed for use



Burndept L.F. Transformers.

with R-type valves; it is specially recommended for the first stage. The other is a low-ratio instrument for second and subsequent stages. It gives excellent results in conjunction with low impedance valves, such as the LS₂, LS₃ and LS₅.

VANGUARD.

PROGRESS AND INVENTION

New Valve Mount

A PROPOSED form of valve mount (as can be seen from the diagram, Fig. 1) allows the overall length of the valve to be considerably reduced as compared with the usual type. Another advantage is that the leads and contacts are

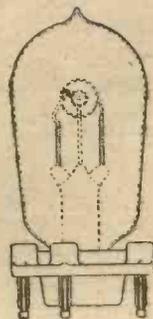


FIG. 1

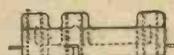


FIG. 2

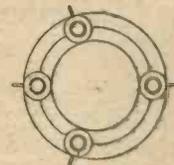


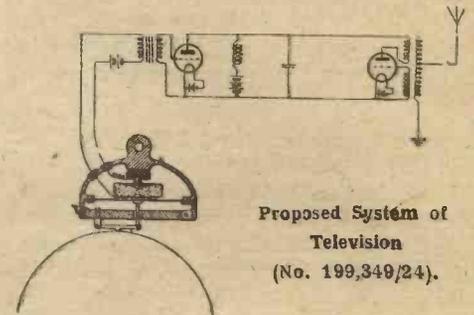
FIG. 3.

Figs. 1 to 3.—Details of New Valve Mount (No. 213,113/24).

further apart. An elevation and plan of a suitable form of socket for the new type of valve mount are shown by Figs. 2 and 3. This arrangement is described in Patent No. 213,113/24 (W. E. Barber, of South Farnborough, Hampshire).

A System of Television

A SYSTEM of television that is the subject of Patent No. 199,349/24 (Picturadio Corporation, of New York, U.S.A.) depends for its working on the



Proposed System of Television (No. 199,349/24).

translation of light and shade into sound. This is done by means of an instrument something like a gramophone. A transmitter working on this principle is shown by the diagram. Projections on a revolving drum corresponding to the density and shade of the subject to be transmitted cause the microphone to operate, and thus audio-frequency impulses are transmitted in the ordinary way.

CRYSTAL USER'S EXPERIMENTAL PANEL

MANY interesting hours can be occupied in experimenting with an ordinary crystal set. For example, to draw up a table of the relative efficiencies of various crystals when used in a special form of detector, one table being made when crystals are used with a copper-wire catwhisker and similar tables made when the same crystals are used in conjunction with other wires.

In order to simplify experiments, a panel of the following design can be made,

NEXT WEEK
"TELEVISION—AND THEN WHAT"?

the cost being approximately five shillings. The panel is made from a piece of dry, varnished three-ply wood and measures 12 in. square. The holes may be bushed with ebonite if desired. Twenty terminals are fitted to the panel as shown in the diagram or in any other convenient way; two switches are fitted in the central portion of the panel. The connections are made underneath the panel and are prevented from coming into contact with the table by means of a piece of square wood fastened round the panel (see Fig. 1).

When the construction of the panel has been completed, the experimenter can, by merely changing the external connections to the panel, carry out a multitude of experiments. He can compare the results obtained when using various tuning devices, such as the ordinary single-slide coil using a very long former full of wire, and a short coil or variometer; he can

rotor, the two basket coils in parallel planes, and the circular winding over a winding on a tube of smaller diameter).

The two-way switch will enable the sensitiveness, stability, and ease of adjustment of various crystals and styles of detectors to be compared.

Variable condensers can be used either in series or in parallel as desired, or a fixed condenser can be used either in series or parallel to decrease or increase respectively the range of wavelengths.

A loading coil may be inserted; but these terminals, as well as the "series-condenser" terminals, should be shorted by a piece of wire when not in use. If the experimenter has in his possession a set of mounted basket or honeycomb coils the terminals may be replaced with a coil plug and a corresponding shorting plug.

The phone condenser is fastened under the panel by means of screws. Two pairs of phone terminals are shown in the sketch, Fig. 1, but this number may be increased or decreased at will. An experimental circuit is shown by Fig. 2.

Besides using the panel for comparative purposes, it is useful for determining the

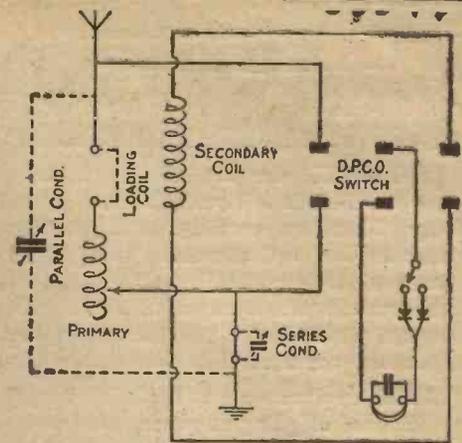


Fig. 2.—Experimental Circuit.

amount of wire required for a specified range of wavelengths when constructing other sets. If a condenser in series has to be used to receive a required station, less wire should be used, and if a parallel condenser is necessary, more wire should be added.

Very often friends bring sets which refuse to function, variometers and coils of uncertain wavelengths, crystals which refuse to rectify, or condensers which are suspected of acting as shorting switches. When one or more of these components are assembled in a set it is awkward to find the faulty part, but by testing each part individually on the experimental panel in conjunction with reliable components the trouble may be easily detected and rectified.

L. N.

THE ROMANCE OF WIRELESS

Capt. Eckersley on the Past, Present and Future of Broadcasting

RECENTLY, Capt. P. P. Eckersley, the chief engineer of the B.B.C., at the invitation of the Barnet and District Radio Society gave an absorbingly interesting address on "The Past, Present and Future of Broadcasting" before that society. The meeting was held at the Barnet Wesleyan Lecture Hall, which was well filled some time before the meeting commenced.

We are indebted to the *Barnet Press* for the following account of the lecture.

Capt. Eckersley at the outset said he was not at Barnet to apologise for the rotten programmes—(laughter)—but to give some small idea of the engineering side of broadcasting.

He wanted the audience first to imagine an obscure engineer working in an obscure place called Writtle suddenly

pitchforked out of his obscurity and told to take charge of a great scheme for the whole of the country. Had he realised what a big thing he was dealing with he might never have started, but he was pleased to think that now some of the difficulties had been overcome. (Applause.) When he first took over his duties he was confronted by a body of business men, and was told "immediately and at once"—a favourite term with business men—(laughter)—"to get out a scheme for British broadcasting."

The ideal was to give everybody good signals, even the man who utilised "a damp clothes-line, a knife and a piece of cheese. (Laughter)." This could only be done by shaking the very rafters of the houses with high-power broadcasting, with aerial masts towering into the sky, with engines developing thousands of kilowatts. But there was the Postmaster-General to consider, so the B.B.C. started with a power of 1½ kilowatts and found such power was not nearly enough.

(Concluded on page 654)

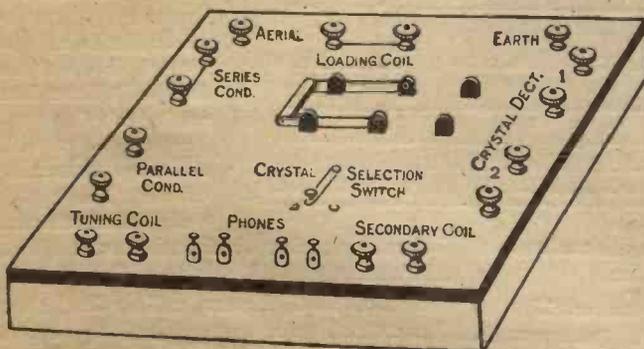


Fig. 1.—Sketch of Experimental Panel.

use a loose-coupler for selective work, or test the individual efficiency of different types of variometer (there is the ordinary type with a fixed stator and a revolving



WEMBLEY has not been forgotten by the B.B.C. Concerts will be given every Thursday evening until further notice in No. 1 Conference Hall, in the Palace of Industry. A special system of loud-speakers has been installed for this purpose. No charge will be made for admission, nor need tickets be obtained.

B.B.C. engineers are still at Edinburgh, at the time of going to press, endeavouring to improve the range of the transmitter. Trouble has been encountered in the aerial, which is fixed to a chimney lined with metal. B.B.C. officials were, of course, unaware of the existence of this obstruction at the time the station was erected. An entirely new site is being considered.

One of the finest bands in the country, the Luton Red Cross Silver Prize Band, will broadcast from 2 L O on the afternoon of May 25. The artistes are Miss Una Cheverton and Mr. Alec Sherman, two young violinists who have for some time specialised in violin duets.

It is hoped to broadcast the first concert from the Liverpool relay station on June 4, but the opening date may be altered. London programmes will be transmitted.

A debate is to be broadcast by the B.B.C. on Summer Time on May 28 at 10 p.m. Sir Kingsley Wood, M.P., will speak in favour, with Mr. Hope Simpson, M.P., in opposition. Fifteen minutes will be allowed to each speaker, and a further five minutes each to reply to one another. The debate will have special reference to the Early Closing Association's Bill to extend the period of summer time to September.

Chelmsford should "come over the ether" during the first week in June. The main part of the programmes will consist of Capt.

P. P. Eckersley, a gramophone and a piano, but an attempt will also be made to broadcast something more elaborate, probably a concert from London. At present there is no land-line available.

Speeches by Earl Balfour, Mr. Tom Shaw (Minister of Labour) and Sir Hugh Bell, Bart., at the dinner of the National Institute of Industrial Psychology, will be broadcast on May 29.

The Postmaster-General's Advisory Board at present deciding whether or not the 2 L O transmitter shall be moved to the roof of a West-end store has not yet given its decision.

A miscellaneous programme to be given from 2 L O on May 30 will include items by the Amboyna Banjo Quartette, the Timbertown Follies Concert Party, and Mr. A. W. Hayes in Dickens recitations.

A service at St. Chad's Cathedral will be broadcast on May 25 from Birmingham.

Capt. P. P. Eckersley will give his next monthly talk on "Technical Topics" at 9.45 p.m. on May 27, this being followed

Next week's chamber music evening at 2 L O, on May 26, will be devoted mainly to trios by the famous chamber music trio, comprising William Murdoch (pianist), Albert Sammons (violinist), and Cedric Sharpe ('cellist). Included in the programme are the Trio in One Movement in B flat, No. 8, by Beethoven; that in G major, No. 6, by Mozart; and the trio in D minor, Opus 32, by Arensky.

The children's hour from 2 L O on May 25 will be relayed from Newcastle.

An attempt will be made to broadcast part of the meetings of the Church Assembly in Scotland. Probably Mr. James Brown, the Lord High Commissioner will broadcast.

A "students' night" programme will be given from Aberdeen on May 26, on which evening also Newcastle will have a "country-side night."

There is now a fairly regular broadcast transmission from Spain. The School of Posts and Telegraphs, Madrid, broadcasts on Sundays from 6 p.m. to 8 p.m. The wavelength is 480 metres.

Last week an order affecting foot-and-mouth disease, which has again broken out in the North, was broadcast by the Ministry of Agriculture from Newcastle. This is the first time that wireless has been put to such a use in this country.

A series of educational lectures, similar to those recently broadcast from 2 L O, are to be broadcast from Cardiff. The first one, a lecture on "Music," by Sir Walford Davies, was given last Friday.

Using only a small Evershed and Vignoles hand generator for his power supply, 2 U V has been received in Philadelphia. The generator is only 11¾ in. long, including 4 in. for the handle.

Two Southend experimenters claim to have perfected a system for the transmission of power. It is stated that bells have been made to ring and lamps to light without any connecting wires. The system was demonstrated

before a number of electricians at Southend recently.

Mr. A. E. S. Hanan, a New Zealander, has created some records for long-distance reception. Both K G O, California, and W J A V, Chicago, have been received at Timaru, New Zealand, with wonderful clarity and volume.

Wireless courses are now given in a large number of American boys' schools.

by Act III of Strauss's *Rosenkavalier* relayed from Covent Garden.

At approximately 8.20 p.m. on May 26 will be given the fortnightly poetry reading, by Mr. C. A. Lewis, from 2 L O.

"King Henry the Fifth," specially arranged for broadcast by Major A. Corbett-Smith, will be given from 2 L O on May 27. Mr. Dan Godfrey, jr., will conduct the station orchestra.

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With every copy of this issue of "Amateur Wireless" we present our new booklet

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which has been specially prepared with a view to showing readers how to put their finger on a fault or defect, and how to remedy the trouble when found.

It is our pleasure to offer our readers this useful gift,

but obviously our action is not wholly sentimental. We are out for business! We want more and more amateurs to avail themselves of the good fare which we offer in "AMATEUR WIRELESS" week by week, and so we trust that

readers everywhere will say a good word on our behalf

and invite their wireless friends to buy a copy of this issue. In this way—surely, a very excellent way—we hope to add to our already extensive circulation. The bigger the circulation the greater the success of "A.W." and the more we can do week by week for all our readers.

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and to some old ones we make one definite suggestion. See that you get "A.W." every week and you can ensure that only by ordering it to be sent you. Here is an order form. Fill it in and send it to your Newsagent or Newstall without delay.

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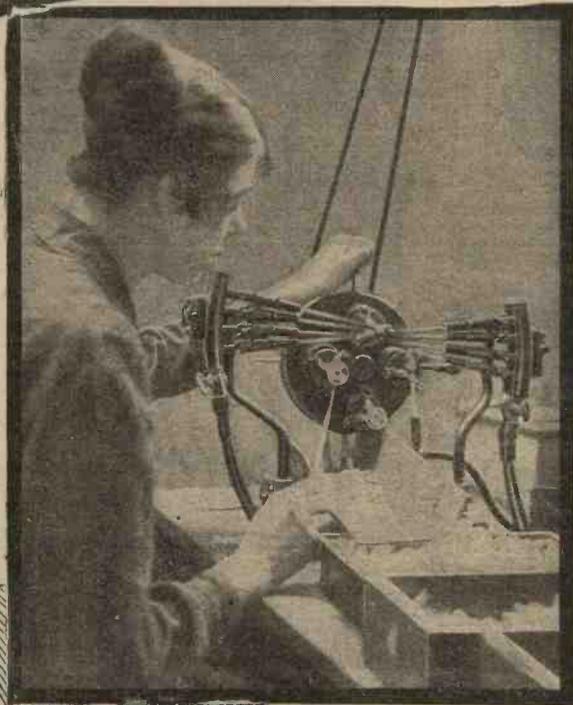
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then tells them how to make a two-, three- or four-valve set on quite good lines. Other chapters relate to transmission and broadcasting, the choice and use of batteries, telephones and loud-speakers. Altogether it is a first-rate volume and one which we should think will be bought everywhere for presentation to the keen schoolboy. What a birthday present!

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Manchester B.B.C. Station (2 Z Y), 375 metres. Weekdays, 3.30 p.m., concert; 5 p.m., women's half-hour; 5.25 p.m., farmers' weather report; 5.30 p.m., children's hour; 6.20 p.m. to 7.15 p.m. and 7.45 p.m. to 10.30 p.m., concert and news. Sundays, 8.30 p.m. to 10.25 p.m.

Birmingham B.B.C. Station (5 I T), 475 metres. Weekdays, 3.30 p.m. to 4.30 p.m., concert; 5.30 p.m. to 6 p.m., women's half-hour; 6 p.m. to 6.45 p.m., children's hour; 7 p.m. to 10.30 p.m., concert and news. Sundays, 8.30 p.m. to 10.30 p.m.

Newcastle B.B.C. Station (5 N O), 400 metres. Weekdays, 3.45 p.m., concert; 4.45 p.m., women's half-hour; 5.15 p.m., children's hour; 6 p.m., scholars' half-hour; 7 p.m. to 10.30 p.m., concert, news. Sundays, 8.30 p.m. to 11 p.m.

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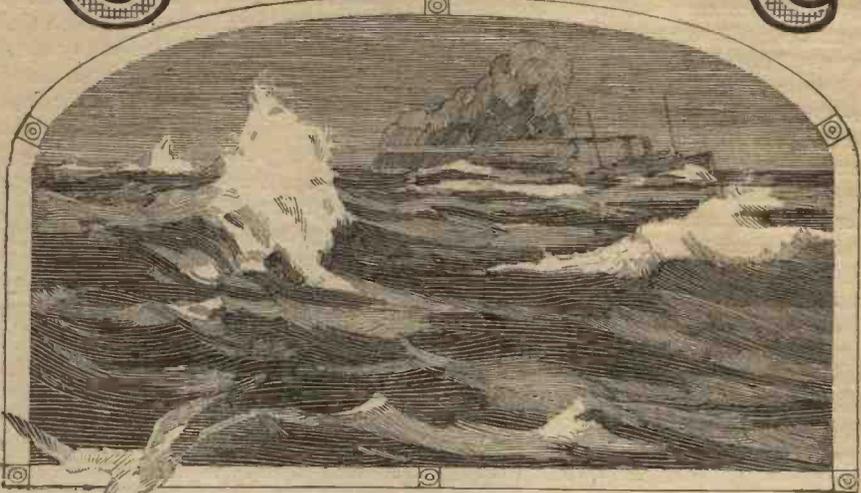
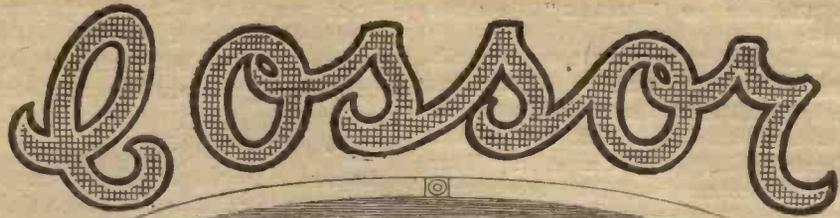
Königswusterhausen (L P), 2,800 metres. Sundays and public holidays, 11.50 a.m. to 12.50 p.m., concert. Berlin concert relayed daily on 680 metres at 8.30 p.m. Transmissions throughout day on 4,000 metres.

Croydon (G E D), 900 metres. Daily.

Eiffel Tower (F L), 2,600 metres. Daily. 6.40 a.m. to 7 a.m., weather forecast; 11 a.m. to 11.30 a.m., weather forecast; 3.40 p.m., Stock Exchange news; 5.30 p.m. (Saturdays excepted), Bourse closing prices; 6.10 p.m., 7 p.m., and 7.20 p.m. (Sundays only), concert and news; 10 p.m., weather forecast.

Paris Concerts Radiola (S F R), 1,780 metres. Daily. 12.30 p.m., concert and news; 1.45 p.m., first Bourse report; 4.30 p.m., Bourse closing prices; 4.45 p.m., concert and news; 6.45 p.m., news; 8.30 p.m. to 9.30 p.m., concert; also concert from 2 p.m. to 3 p.m.; 10 to 10.45 p.m. on Sundays.

Rome (I C D), 3,200 metres. Daily, 11 a.m. Ecole Supérieure des Postes et Télégraphes, 450 metres. 3.30 p.m. to 4 p.m. (Wednesday and Friday), 7.45 p.m. to 10 p.m. (Tuesday and Thursday), 2.30 p.m. to 7.30 p.m. (Saturday), concerts.



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If Radio has done nothing else, it most certainly has made us realise that we are no longer an island. Such is the rapid progress of international Broadcasting that anyone can—in one evening—hear French, Dutch, German, Italian, and Spanish spoken by natives in their own language.

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But long-distance work demands a careful selection of apparatus. Just as prismatic binoculars have rendered the telescope old fashioned, so the Cossor P.2.—the valve with the red top designed specifically for long-distance work—has superseded the ordinary Valve with long straight filament and open-ended Anode.

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This electron stream is the whole basis of valve amplification and rectification—turn your filament current off,

If you are dealing with the almost infinitesimal currents generated by a Broadcasting Station in, say, Madrid, you can't afford to take chances with inefficient valves. Be wise, therefore, and see that every Valve in your Set is a Cossor—and your results will be consistently good.

electrons cease to flow and your Set becomes dead.

Obviously, therefore, the greater the percentage of these electrons we can capture and put to a useful purpose the more efficient will be our Valve. Compare the construction of the Cossor and the ordinary Valve.

In the one case the filament is almost totally enclosed by the hood-shaped Grid and Anode—what chance has the electron stream to leak away here? On the other hand where the Anode is in the shape of a tube quite a considerable percentage of electrons travel direct to the glass without touching either Grid or Anode—a typical case of wasted energy.

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

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"THE ROMANCE OF WIRELESS" (continued from page 649)

Capt. Eckersley then went on to speak of present troubles, and, in illustration, quoted typical examples of the letters he had to deal with. The first was from a gentleman at Brighton, who said: "Your magnificent concert"—("They are always magnificent if someone can't get them properly," he added)—"was quite spoilt by the dots and dashes of the Morse code." The obvious remedy for Morse interference was for the B.B.C. to shout down the Morse. But, then, there were people with the "wanderlust," who tried to receive other stations, and owing to the increase in power were unable to cut out Uncle Rex at 2 L O. (Laughter.) This had led to the establishment of relay stations.

After explaining the working of the relay stations, he touched briefly on the new scheme for establishing a high-power station thirty to forty miles out of London. This station, he said, would have a power of 25 kilowatts, and would operate on 1,600 metres, giving crystal reception at 100 miles' range, single valve at 200 miles' and two valve at any place in the United Kingdom. He thought that the erection of such a station, which would be quite separate from the others, and would have its own programme, would be the crowning achievement of broadcasting.

When he first put forward the idea he expected that at the least he would receive a crown of laurels, but instead he got quite

a lot of complaints. (Laughter.) A number of people said that it would give them a great deal of trouble to convert their sets to receive signals on the new station's wavelength.

* * * * *

Later, the trouble of the gentleman who came to the conclusion that, after all, there was something in wireless was referred to. This gentleman bought all available literature on the subject, and, after disorganising the whole house—(laughter)—and having driven the last screw home with a hammer—(loud laughter)—arrived at the great night when all was ready for listening in. He would don the phones, and hear nothing. (Laughter.) That would happen again on the next two nights. On the fourth night he might get the concert and would call in the family to participate in the pleasure. Just as he was going to hand over the phones the sounds would diminish to nothing. This was repeated a few times, and at the end of the evening a tangled mass in the corner of the room would be all that was left of the set. (Laughter.) That trouble was known as fading, and for the cause of that it was necessary to study the habits of the electron and the theory of the "Heaviseide" layer!

* * * * *

Continuing, Capt. Eckersley said he did not know if any present had not handled wireless sets, but they would do well to

know that there were times when the receiver might become a transmitter. It was an inspiring thought, and he wondered people did not do it more. (Laughter.) He would like to tell all those who handled their sets unkindly that they were committing a grievous offence against ether manners. (Applause.) For people to create a disturbance in the ether simply because they did not agree with an item in the programme was entirely un-sporting. (Applause.) It might interest such to know that the B.B.C. had managed to compile some really useful information with a view to putting down the nuisance, and he did not think that the wilful disturbers would get much consideration.

* * * * *

Dealing with the future, Capt. Eckersley spoke briefly on the possibilities in the conjunction of wires and wireless, and the linking up of all the continents, the evolution of perfect phones and loud-speakers, which would respond equally well to oscillations of all frequencies. Lastly he touched on the work of radio societies. He said that with the co-operation of the societies the B.B.C. had been able to make many improvements, and they hoped to continue improving in the future. The societies were doing most useful work, and thoroughly deserved the support of the districts in which they were active.

Capt. Eckersley resumed his seat amidst sustained applause.



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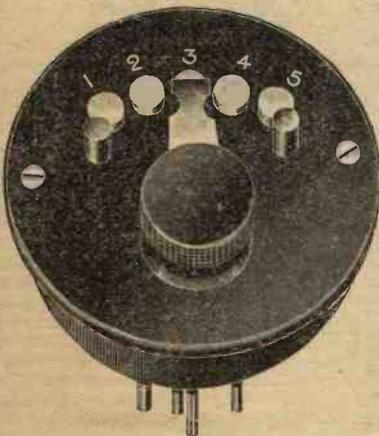
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SINGLE EARPHONES. 120 to 150 ohms, highly suitable for crystal sets as good results are obtained without transformer. Price 2/6 each.

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VOLTMETERS, 0-140, all brand new. Makers, "Everett-Edgecombe," 5" dial very accurate. Price to clear, 30/- each, post 1/6.

FULLER BLOCK ACCUMULATORS, 2-volt 80-amp. capacity, all brand new, designed especially to hold their charge for long periods without sulphating, highly suitable for dull emitter valves. Price each cell, 15/- each, post 1/-. Set of six accumulators in teak carrying case, brass bound, £4 5s.

EBONITE KNOBS. Real ebonite Government knobs, 1/6 per doz., post 3d.

PORCELAIN INSULATORS, BROWN, bobbin type, 1/- per doz., post on 1 doz. 5d.

1,000 OHM CHOKES wound with 47-gauge wire, silk, 1/- each.

LUCAS LONG RANGE LAMPS, ELECTRIC, containing 5" dia. lamp, 4 bulbs, telescope steel earth spike, signalling key, 15' cable, two-pin plug, etc., complete in case with strap. Price 12/6 each.

WORKSHOP FLEX, 40/34, heavy V.I.R., and braided Government flex, 3d. per yard, 220-yard coil £2 10s.

LEADING-IN WIRE, 19/33 V.I.R., 3d. per yd., 2/6 per doz.

500 OHM CHOKE COILS, wound 1 1/2 ozs. 42 gauge wire, silk, 1/- each.

BELL WIRE, 1/22, new, 110 yd. coil, 3/6.

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MARCONI TRANSMITTING GENERATING SETS. Engine and dynamo complete as above, mounted on bedplate, direct coupled, with spare tanks; complete and running. Price £20.

2 M.F. CONDENSERS, 3s. each.



Crystal v. Valve

SIR,—With reference to the letter of "Terminal," in which he says that he is of the opinion that the crystal will replace the valve, I should like to say that I, too, am a crystal user, and I consider that the crystal will replace the valve. I have heard many valve sets, but for purity, clarity and tone, give me the crystal every time. We hear of instances in which crystal users have heard telephony over long distances. This may be due to re-radiation from valve sets, but I think it might be possible that the owner of the set has, unknowingly, hit upon some means of the better rectification and amplification of weak signals.—T. S. (Bury).

Wireless in Germany

SIR,—I note what J. F. A. has to say, in No. 101, about the information I recently supplied. His remarks re the licence for crystal sets are perfectly correct. I obtained the information from a weekly paper, *Radio Umschau*. The edition was published on March 30, and in order to give you the earliest information I wrote on April 4. In the next edition of the *Umschau* the mistake was corrected. Unfortunately I did not see the correction.

Conditions in Germany change very quickly; even the information supplied by J. F. A. (Berlin) is somewhat wrong. The wavelengths of the various stations are now: Königswusterhausen, 680 metres (changed from 475); Frankfurt-on-Main, 467 metres (changed on account of interference); Berlin, 430 metres; Munich, 486 metres; Leipzig, 450 metres. Two more stations are now in operation: Hamburg, 392 metres; Stuttgart, 437 metres.—F. H. S. (Oberschmitten).

Using Phones and Loud-speaker

SIR,—The following might be of interest to your readers.

When listening in to 2 L.O., a detector valve and one L.F. valve give loud and clear results in the phones. To work the loud-speaker, however, at full strength, it is necessary to switch in a second L.F. valve. This, of course, makes it much too loud for the phones. When all phones are in use and other people are in the room, I thought it would be a good idea to be able to have the loud-speaker also working.

I have now altered the wiring of my set so that at the same time I can have two valves on the phones and three on the loud-speaker.

The result exceeded my expectations. Not only does the loud-speaker fill the room (in fact, the house), but the signals in the phones, whilst no louder, are absolutely pure and crystal clear. In addition,

with the phones on the head and the loud-speaker working it gives the effect of the music being actually *in the room itself* and not merely in the phones.

This result was accomplished by first taking the connection from the plate of the first L.F. valve through the primary of the *second* transformer to the phones. Secondly, by fixing two extra terminals for the loud-speaker and connecting one to the plate of the third valve and the other to a separate plug for the H.T.B. This enables one to increase the voltage on the plate of the last valve.

I have also improved the tone of the loud-speaker by connecting a .002 fixed condenser across the *secondary* of the *second* transformer.—H. C. H. (Putney).

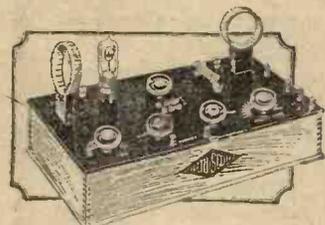
Harmonics

SIR,—A very interesting contribution to the recent discussions on harmonics in wireless is that from an amateur in Stock, Essex, who reports the reception of Bordeaux's time signals on a harmonic while listening to transmissions from 2 L.O.

As one-sixty-fourth of Bordeaux's wavelength (23,450 metres) is approximately 366.4 metres, I think this definitely establishes the fact that wireless harmonics do occur in the order one-half, one-quarter, one-eighth, as originally stated by "Thermion," and not one-third, one-fifth, one-seventh, as amended by him after "correction" by a theoretical expert.—W. J. P. (Leigh-on-Sea).

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THE new high-power station at Chelmsford will use a wavelength between 1,500 and 2,000 metres. Wonderful results are to be expected from this new station. Get ready to tune it in. Peto Concert Coils (all plug-in and interchangeable) H.F. Transformers and Multi-wave Amplifiers will enable you to pick it up anywhere in the country.



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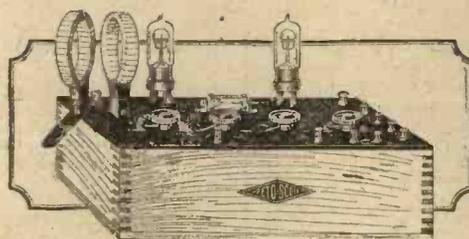
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Permits the usual type of plug-in coil being used as a tuned anode coil in any set designed for use with transformer. H.F. coupling. All connections made internally. **3/6**

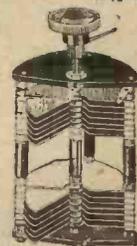
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No. 2. (for second stage of H.F.) **12/6**



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MK. III. 2-VALVE RECEIVING SETS. Range, 200-1,800 metres. These sets contain neat aerial tuner wound on ebonite, with stud tappings, variometer, reaction, Mk. III. variable condenser, intervalve transformer, telephone transformer, grid leak and condenser. Additional fixed condenser and numerous other fittings, such as filament rheostat, etc. In canvas-covered mahogany case, a masterpiece of good workmanship. Tested and perfect. Price, £4. Dispatched by passenger train, 3/6 extra. All tested on 3 broadcasting stations. 80 in stock. Above sets complete with 2 valves, phones, H.T. battery accumulator, £6 16/-. Passenger train, 4/6.

MK. III. R.A.F. 3-VALVE PORTABLE SETS. Containing 2 intervalve transformers, 3 tuning coils, in ebonite cases, 3 filament rheostat valve-holders, grid leak and condenser, transformer condenser. Complete with remote control panel containing 2 variable condensers and filament rheostat, highest-grade workmanship, covering broadcasting wavelength. Contained in waterproof case 12 1/2" x 7" x 4". This set is just the thing for carrying about. Price to clear, 75/- each. All tested. Dispatched by passenger train, 2/6 extra. Above sets complete with 3 valves, accumulators, 66-volt H.T. battery and phones, £7 5/-. Dispatch by passenger train, 3/6 extra. 200 in stock.

R.A.F. "10." 5 valve sets, 2 high frequency, 1 detector and 2 low frequency, case 12 1/2" x 7" x 3". £5 5/-. Dispatched by passenger train, 2/6 extra. 100 in stock. Valves, 30/- extra.

MILLIAMMETERS. 0-50 moving coil. Brand new. 35/- each.
MK. III. STAR CRYSTAL SETS. The finest crystal set used by the Government. Containing Litz wound coils, 2 sets stud tappings, coupling, Perikon detector, carburettum detector, potentiometer, .0015 variable condenser and .0005 variable, fixed condensers, buffer change-over switches, etc. etc. In portable case. This set is well known, and well worth double the price we ask. Price, £5. Passenger train, 3/-.
MK. IV., as above. Range, 2,500-10,500 metres. £5 each.

WESTON SUPER-SENSITIVE RELAYS. Polarised. Brand new. Complete with platinum points, working off .25 of a milliamp. Will record wireless signals off two valves. Cost £10 each. Price to clear, 12/6. Post, 1/-.

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LOW-FREQUENCY AMPLIFIERS. 3 valve. Containing 3 transformers, filament rheostat, etc. £3 each. Post, 1/3. 100 in stock.

HIGH-FREQUENCY AMPLIFIERS. 3 Valve. Containing 3 high-grade transformers, valve-holders, etc. 50/- each. Complete and tested. Post, 1/- 200 in stock.

MK. III. STAR VARIABLE CONDENSER. Capacity, .005. Brand new with ebonite case. An accurate condenser is a big thing. Price, 25/-. Post, 1/- 400 in stock.

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AERIAL AMMETERS. Brand new accurate Sullivan's, 1.5 amp. Nickel-plated panel mounting type, engraved metal dial with on and off switch. 15/- each. Post, 6d.

MORRIS, ETC., AERIAL AMMETERS. 1.5 paper dial. 10/6. Post, 4d.

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1" WIRELESS SPARK COILS. (Sterling.) Ebonite panels, nickel fittings all brand new. Complete with points and condenser. The winding of the coils are highly effective in use as modulation transformers without conversion. Numerous experiments have been carried out with these coils, and proved valuable both to receivers and transmitters. Every one tested. Cost £3. Price to clear, 6/6. Post, 9d. 2,000 in stock.

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DEWAR SWITCHES. D.P.C.O., 12 blades, 3/6; S.P.C.O., 12 blades, 2/6. Post, 3d.

G.P.O. COMBINATION TELEGRAPH SETS. Each set comprises high-grade sensitive galvanometer, makers, Record, Pye and Co., G.E.C., etc. Scale in degrees, high-grade G.P.O. double-coil gounder. Heavy Morse transmitting key having 4 heavy points. Above fittings are mounted on polished teak case, with heavy terminals. Each set has its own case. Cost £8. Price to clear, 15/6 each. Post, 1/3.

MK. III. TUNER CASES. Polished mahogany, size approximately 12" x 12" x 7", with leather carrying handle. 10/- each. Post, 1/- 100 in stock.

TRANSMITTING MORSE KEYS. We have a large quantity of these beautiful finished keys, good movement and heavy points. Cost 25/-. Price to clear, 3/6. Post, 6d.

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AERIAL ROPES. 47 feet long by 1/2-inch diameter, best manilla rope, complete with shackles and eyes, 1/9 each. Post, 6d. Brand new. Cost 5/-. 2,000 in stock.

HAND GENERATORS, 600 volts 30 milliamps. Direct current. £8 each.

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WIRELESS IN PARLIAMENT



From Our Own Correspondent.

QUESTIONS with regard to the profits alleged to have been made by the B.B.C. were put in the House of Commons last week by Mr. Baker, the Labour member for Bristol, East. He asked the Postmaster-General first of all whether he was aware that the proposal to broadcast the speech at the opening of the Empire Exhibition at Wembley led to an enormous increase in the sale of wireless apparatus, as a result of which the Marconiphone firm exhausted their stock; and whether, having regard to the profits which were being made, he was satisfied to leave the control of broadcasting to a private company?

Mr. Hartshorn, in reply, said he had no specific information as to the first part of the question. With regard to the second part, the British Broadcasting Company did not manufacture or sell wireless apparatus, and he saw no reason why increased sales by other firms should affect the arrangement under which the Broadcasting Company was licensed to undertake broadcasting in this country.

This did not content Mr. Baker, who asked: "Are not the profits of the Broad-

casting Company very greatly in excess of what was anticipated when the company was formed?"

Sir H. Brittain: "Is it not owing to the fact that this matter has been left to private enterprise that the profits have been so great, and, so far as Government wireless is concerned, has it not always been carried on at a loss?"

Capt. W. Benn: "Does the Postmaster-General intend to maintain the embargo on the importation of foreign sets?"

Mr. Hartshorn: "I do not think the last question arises. With reference to profits, under the terms of the licence issued to the Broadcasting Company they cannot distribute more than 7½ per cent. to their shareholders. Any additional profits must be used in developing the service."

B.B.C. Programmes

Mr. Oliver asked the Postmaster-General whether there were any terms in the agreement between the Postmaster-General and the British Broadcasting Company which gave to the public any control over the management and choice of programmes.

Mr. Hartshorn said that the licence and agreement of January 18, 1923 (published in Command Paper 1822), and the supplementary agreement of October 1, 1923 (Command Paper 1976), gave the Postmaster-General various powers of control over the constitution and finances of the British Broadcasting Company and the

operation of the broadcasting service. In particular, the company must provide a programme of broadcast matter to his reasonable satisfaction.

Mr. Baker asked the Postmaster-General whether he had received a report from the Broadcasting Board on the measures to be taken to control the broadcasting of speeches and lectures on controversial subjects?

Interference

Mr. Hartshorn replied that the Broadcasting Board had had this matter under consideration, but had not yet reported on it.

Sir Thomas Bramsdon asked the Parliamentary Secretary to the Admiralty if, without detriment to naval wireless signalling, it was possible to curtail wireless exercises and the sending of wireless messages between the hours of 8 p.m. and 10 p.m.; and would he confer a boon on thousands of wireless licence-holders in this country by taking steps to reduce to a minimum the messages sent during these hours.

Mr. Ammon, in reply, said that no wireless exercises were laid down in Admiralty orders to be carried out between the hours mentioned. The attention of the commanders-in-chief concerned was being drawn to the desirability of reducing naval wireless signalling during those hours to a minimum, consistent with service requirements.

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Type A, 6-70 volts.	For general reception,
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Type C 12-300 volts	
Type D 12-500 volts.	For low power transmission.

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Gives greater amplification at greater ranges with entire absence of distortion.
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is of little value if your components are inefficient.

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Every Transformer is carefully tested after being made with the utmost care. No Transformer gives better results and there are few, if any, that give result that approach those obtained by the use of the "Sonola."

For finest possible tuning, and in consequence, maximum volume the "Sonola" (Regd.) Micrometer Coil Holder is unequalled.

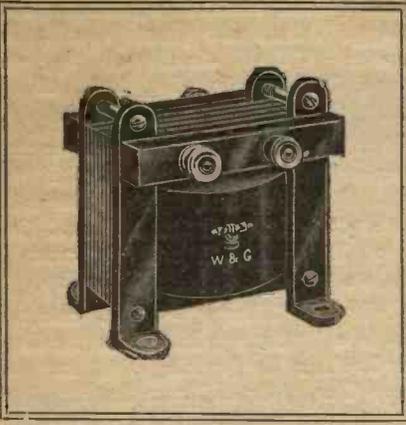
"Sonola" (Regd.) Low Frequency Transformer

Size 3 1/4 by 2 1/4 by 3 3/8 in. deep.

Unsurpassed for Silence, Efficiency and Reliability. Provides remarkable Amplification with freedom from noise and Distortion. Equally suitable for use with the Ordinary, D.E.R., Low Current Consumption and High Power Valves. Terminal Type as illustrated.

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NO MAKE OF TRANSFORMER GIVES BETTER RESULTS



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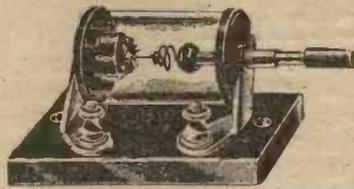
illustrates a wide selection of Complete Receiving Sets, Constructional Sets and Component Parts of every description, free on application. Enclose Business Card or Memo for Special Trade Terms and Discounts.

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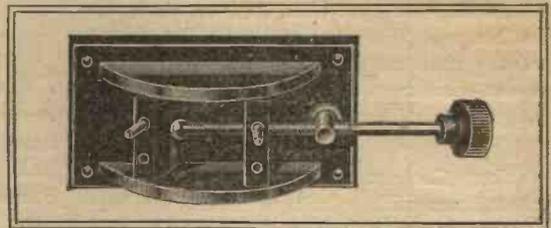
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Stocks also held at GLASGOW DEPOT
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CRYSTAL DETECTORS

Open Type
Mounted on Ebonine Base
No. 380 1/3

Enclosed Type, as illustrated
Fitted with Glass Dust Shield and mounted on Ebonine Base.
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"SONOLA" (Regd.) TWO COIL HOLDER, MICROMETER REGULATING P. Patent

Enables the finest possible tuning and adds considerably to the efficiency and selectivity of the Receiving Set
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Wireless is attracting all men. The Amateur is entering the field in great numbers, and he wants to know all about it. He will require Materials, Parts, Tools. He will also want to sell surplus material.

is out to cater for this class of reader, who will be eager for knowledge and bargains. To meet him, use the Sale and Exchange columns, which he is sure to search. Rate 3d. per word, 3s. minimum, prepaid. Latest date Thursday mornings.

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TRY THE GNEISS AND YOUR SEARCH FOR THE PERFECT CRYSTAL WILL BE REWARDED. NOW AVAILABLE TO THE PUBLIC

It is the only Crystal with a Rectifying Efficiency Approaching 100%

The Gneiss is a Natural Crystal, having its origin in the rich deposits of Mexico, and it SHOULD IMPROVE ANY SET. Scientifically embedded in a Brass Cup, ready for instant use, the Gneiss Crystal may be obtained Price 1/9 each

From **RADIO ACOUSTICS Ltd.**
Electrical Engineers and Manufacturers of Wireless Apparatus
175 a Peckham Park Road, Peckham, LONDON, S.E.15

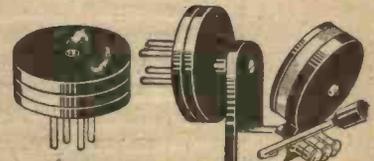
Ask your Dealer to show you Radiax Variable Condensers with Vernier



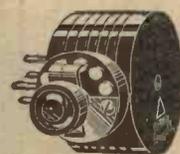
THEY belong to the Radiax series of high quality components which, by reason of their perfection of workmanship and finish, delight the eye while ensuring the best possible results on account of the scientific thought and engineering skill embodied in their production.

Both knobs deeply fluted, ensuring easy control. Vernier indicator shows position and makes the finest tuning simple. Their high overall efficiency enables hitherto impossible stations to be tuned in readily.

Best Quality, with Vernier.		Price.
Capacity.	...	13/-
.001	...	12/-
.0006	...	11/-
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Cheaper Quality, without Vernier.		Price.
Capacity.	...	7/6
.001	...	6/6
.0006	...	5/9
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PLUG-IN TRANSFORMERS OR TUNED ANODE COILS.
350-500, 5/6. 2,600-4,000, 7/6.
Variable Reactance to plug-in to same, 10/-.



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

RADIAX LTD.

20 Radio House, Percy St., Tottenham Court Rd. LONDON, W.1
3 minutes from Tottenham Court Road or Goodge St. Tube Stations.



RADIO SOCIETY OF GREAT BRITAIN

AN ordinary general meeting of the Radio Society of Great Britain was held at the Institution of Electrical Engineers, Savoy Place, W.C.2, at 6 p.m., on Wednesday, May 28, at which Major H. P. T. Lefroy delivered a lecture upon "Wireless in British Military Aircraft up to August, 1914."

Any members of the Radio Society of Great Britain who have changed their addresses and have not notified the change to the secretary at 53, Victoria Street, London, S.W.1, are asked to do so.

Resistance for Dull-emitters.—Mr. T. C. Ball, of 39, Windsor Road, Ealing, informs us that he manufactures and sells a filament rheostat which is practically identical with that described on page 523 in No. 99. We may say that the design of the rheostat described was evolved by a contributor who had no previous knowledge of Mr. Ball's instrument.

Many German air-lines have fitted their aeroplanes with wireless receivers in the passenger compartments. Königswusterhausen now broadcasts special concerts for reception by the air-liners. The broadcast receiver is totally distinct from the ordinary wireless apparatus carried by the 'plane, and it has a separate aerial.

B.B.C. AND THE RADIO SOCIETIES

ON May 7, at the Club House of the Golders Green Radio Society, an enormous crowd of London amateurs, which taxed the capacity of the hall to its utmost, turned up to hear lectures by Mr. Arthur Burrows and Capt. Frost, of the B.B.C. Mr. Burrows spoke on "Behind the Scenes at the B.C.C.," and Capt. Frost dealt with that bugbear, "Oscillation."

Burndept, Ltd., presented an Ethophone V. to the Pope, who has sent a special medal to the firm. On this set, which is similar to that used by the Archbishop of Canterbury, the Pope is able to hear transmissions from London on a loud-speaker, the latter being an Amplion.

CATALOGUES

A NEW poster and leaflet giving details of the "Lynanette," a portable receiver with self-contained loud-speaker, have been sent us by Radio Instruments, Ltd., of 12, Hyde Street, New Oxford Street, W.C.1.

From Burndept, Ltd., of Aldine House, Bedford Street, Strand, W.C.2, we have received a copy of publication No. 241, which gives particulars of the "Ethophone V" broadcast receiver in simple, non-technical language.

Characteristic curves and particulars of DFA-type valves are given in a leaflet (reference V.A.3) distributed by the Mullard Radio Valve Co., Ltd., of 45, Nightingale Lane, Balham, S.W.12.

"Wireless Sets and Accessories," a new and enlarged edition of "Accessories for Private Wireless Installations," has been received from Siemens Brothers and Co., Ltd. of Woolwich, S.E.18. It contains thirty-two pages, and its number is 595.

Details of "Liberty" crystal sets are given in a leaflet received from the Hayward Turbine Engineering Co., Ltd., of Liberty Works, Acton Town Station, W.3.

A new type Amplion gramophone attachment is shortly to be placed on the market. It is constructed on the lines of the already well-known "Concert Gramophone" model, but will cost only £2 2s. Further particulars will be given in a later issue.

Sheffield listeners, it is reported, are greatly pleased with the increase in power.

"Broadcasting House," the new Cardiff broadcasting station, is rapidly approaching completion.

The Marconi Company, in conjunction with La Compagnie Radio-France, have made special arrangements for the rapid transmission of telegrams during the Olympic Games. They will be wirelessly from France to London.

EXPERIMENTAL WIRELESS

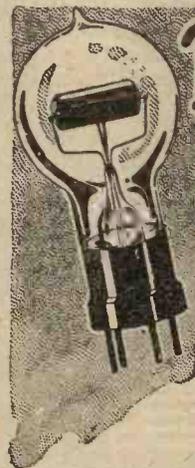
The best Wireless Magazine
:: for all Experimenters ::

Brimful of the latest ideas, apparatus, and circuits. The May issue contains special articles on "A New Microphone," "Low Consumption Valves," "Losses in H.F. Circuits," "Aerial Capacity," "Distortionless Amplification," "Studio Damping," "Direction Finding," and other interesting subjects. All splendidly written and illustrated.

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Complete list of Practical Books on
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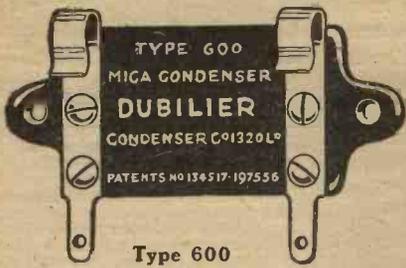
Perfect Valves at Half the Cost!

Burnt-out valves are an expensive item—but here is a way to save money without loss of efficiency.

Send your burnt-out valves to us. We will repair and return them speedily. You will find them equal in every way to new valves and the cost is exactly half. A valve repaired by our patent process (Pat. No. 198247/1922) is hard to distinguish from a new one. It has a new lease of life, an unblemished appearance, and its efficiency is as perfect as when new. Send no money. Take no risks. Valves broken in process are replaced by us whenever possible. Our guarantee of best workmanship goes with every valve we repair. As we repair every kind of valve with the exception of the "Dull Emitter" type thousands of wireless enthusiasts use our service—send those burnt-out valves to-day.

J. W. PICKAVANT & Co., Ltd.,
Quikko Works, Lombard St., Birmingham

Renew valves the
Quikko
way & save money



Type 600

Confidence.

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

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

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

* * * *

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

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

Specify Dubilier.

THE DUBILIER CONDENSER CO.
(1921) Ltd
Goldhawk Road, Shepherd's Bush,
LONDON, W.12.

DUBILIER
CONDENSER CO. (1921) LTD

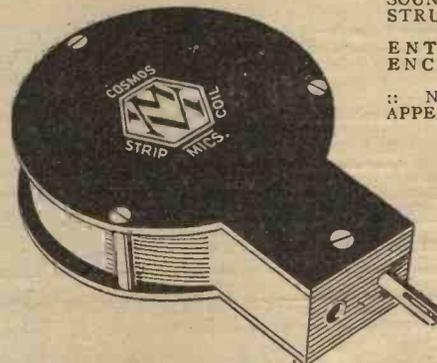
E. P. S. 59.

COSMOS RADIO COMPONENTS

'STRIP' PLUG-IN INDUCTANCE COILS

"COSMOS" Strip Coils are constructed on an entirely new principle, being wound with strip composed of a number of copper wires embedded in prepared paper. The results obtained by this new method of construction are here shown briefly tabulated.

- LOW COST
- LOW SELF-CAPACITY
- MINIMUM RESISTANCE
- LOW H.F. RESISTANCE
- SOUND CONSTRUCTION
- ENTIRELY ENCLOSED
- :: NEAT :: APPEARANCE



The figures given below are the results of tests carried out by the NATIONAL PHYSICAL LABORATORY. Attention is directed to the important fact that the self-capacity is smallest in the coils for short wavelengths.

Coil No.	Inductance Microhenries	Self Capacity m/mfds.	Wavelength (metres) when shunted with capacity shown				Price each s. d.
			.0001 mfds.	.0003 mfds.	.0005 mfds.	.001 mfds.	
25	25	10	100	165	215	300	4 6
35	50	10	145	235	300	425	4 6
40	100	10	200	335	425	600	4 9
50	150	10	245	410	520	735	4 9
75	300	10	340	575	740	1040	5 0
100	700	11	530	880	1130	1590	6 0
150	1000	16	640	1060	1360	1900	6 6
175	1400	18	765	1260	1620	2250	7 0
200	2500	17	1020	1680	2150	3000	7 6
300	5000	24	1490	2410	3060	4260	8 9
400	9000	28	2030	3250	4130	5740	9 9

LOOK FOR THIS MARK →

"Cosmos" Coils and all Radio Components are obtainable from all Wireless Dealers. Send for List A.M. 7117/1. Post Free 1/-.



THE Mark of Efficiency

"Cosmos" Radiophones, Components and "RADIOBRIX" are manufactured by

METROPOLITAN Vickers

ELECTRICAL

CO. LTD

TRAFFORD PARK, MANCHESTER

See our large stand at the British Empire Exhibition—Palace of Engineering, Avenues 8-10, Bays 7-11

R

PO 7

"MAKING YOUR OWN COILS"

IN No. 100, on page 543, an article upon the construction of coils appears under the above heading. We are now informed by the Igranic Electric Co., Ltd., Bedford, that the particular coil described is made upon the same lines as the De Forest coil, of which patent (No. 141,344) the Igranic Co. are the sole licensees. The making of this type of coil for ordinary use or for sale would therefore constitute an infringement of the patent referred to.

"Finding Common Faults in Lighting Circuits" is the title of an article appearing in the current issue of "Work," and this should be of interest to many readers. Other articles in the same number are: "A Hammock Chair for the Garden"; "Making Springs in the Lathe"; "A Pegless Clothes-line"; "Device for Removing Sprockets, etc."; "Repairing an Oval Coal-bucket"; "A Small Occasional Table"; "Simple Bag Repairs"; "Electric Gong Made from Shell Case"; "Side Curtains for Motor Hoods"; "A Simply-made Arc-lamp"; "Making Stringed Instruments for a Boys' Band"; "A Coal Hammer."



Hastings Radio Society

ON April 28 Mr. John L. Baird, the inventor of the Baird system of television, gave a lecture in which he described his experiments. The lecturer described his early experiments, which were based upon a study of the human eye; his early attempts to substitute selenium cells for the visual purple of the eye were made many years ago, but owing to the very minute current available from the selenium cell little progress was made. The development of the thermionic valve, however, gave a means of magnifying the minute currents to almost any extent. Thus removing the first difficulty, the next difficulty was the "time lag," or chemical inertia, of the selenium cell. This was overcome by using light interrupted at a high frequency. By this means the fundamental difficulties were overcome, and in January of this year successful demonstrations of the transmission of moving outline images were made to Press representatives and a number of experts.

Leeds Radio Society

Hon. Sec.—D. E. PETTIGREW, 37, Mexborough Avenue, Leeds.

ON May 2 the secretary described the elementary principle involved in the design and construction of a five-valve receiver, which was further described and demonstrated at the meeting on May 9. The receiver could be used as a simple crystal set or as a single-valve receiver, provision being made for the addition of four further valves, two H.F. and two L.F. if necessary.

Radio Association of Ireland

Hon. Sec.—J. E. MURPHY, 3, Molesworth Street, Dublin.

At the meeting held on May 1 the persistent howling in Dublin and district was discussed, and it was agreed that the secretary should request members of the association to undertake the formation of branches in accordance with the revised rules, with a view to improving the amenities of broadcasting around Dublin. The association is now in a position to give educational wireless demonstrations in Dublin (city and county), having obtained a special licence from the Post Office.

FOUR "AMATEUR WIRELESS" HANDBOOKS—1s. 6d. EACH

WIRELESS TELEPHONY EXPLAINED

SIMPLE CRYSTAL RECEIVING SETS

WIRELESS COMPONENT PARTS

SIMPLE VALVE RECEIVING SETS

CASSELL & CO., LTD., LA BELLE SAUVAGE, E.C.4.

When corresponding with advertiser please mention "Amateur Wireless."

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"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. 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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CRYSTAL RECEIVING SETS.

Carefully constructed to give perfect reception within 25 miles of a Broadcasting Station. Fitted in polished mahogany case, with ebony top and lacquered brass fittings.

Every set fully guaranteed and stamped B.C.C.

Prices 8/9 to 17/6 each.

REVOPHONE CRYSTAL SET at 6/6.

VARIOMETER CRYSTAL SET in Cabinet without lid, dust-proof detector; Each 26/6.

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Write for Price List

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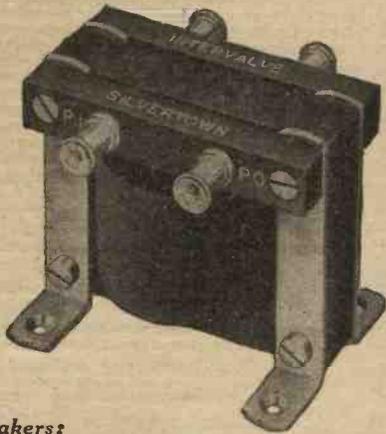
Telephones: HOP 6196 and 1913. Telegrams: STEBRAWARE, SEDIST, LONDON

Silvertown

WIRELESS ACCESSORIES.

Quality Guaranteed by over 50 years' Electrical Manufacturing Experience.

The only Transformer with a 12 months' Guarantee.



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Works - - - SILVERTOWN, E.16.

SILVERTOWN INTERVALVE TRANSFORMERS.

This apparatus is specially recommended, and is giving great satisfaction to users in all parts of the world.

The utmost care has been taken during manufacture to ensure perfect insulation and low self-capacity. This transformer can be used in power amplifiers, with pressures up to 250 volts. It also gives maximum amplification without distortion, and is absolutely noiseless in operation.

Price 21/= each.

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Telephone Headpieces, Crystal Holders and Buzzers, Fixed Mica Condensers, Filament Rheostats, Potentiometers, Insulators, Variable Condensers, etc., etc.,

SAY "SILVERTOWN."

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We have the largest stock of High Grade Apparatus ever offered. Prices—a fraction of cost. Delivery to any part of the World from our Huge Stock. Catalogue Goods are listed and illustrated in our 3d. April Catalogue which should be on every experimenter's table.

RECEIVERS. One, two, three and five-valve sets. Hundreds in stock. We specialise in Portable Sets for all seasons and have purchased the remaining stock of the famous R.A.F. No. 10 Aircraft Telephony Receivers, 5-valve 200/600 metres, 2 H.F., 3 L.F. Cost £50 and sold by others at £10. Complete with diagram, instructions and test sheet at the bargain price of £5 5s. Less valves. An unparalleled Opportunity which should be seized at once.

TUNERS. We have a large stock of the beautifully made Army 60 w Tuners. Those who know this fine set will remember the two variable air 0015 mfd. Condensers in dustproof cover, similar to those in Paul Wavemeters, which are fitted in the ebonite panel of this Tuner. The variable reaction, slow motion coil movement, is the most admirable mechanism ever seen in Radio apparatus, and is most accurately made, giving very fine tuning-coupling to either of the two coils. Having a large number of these we offer them at the cut figure of £4 each.

For those making their own sets we can offer quantities of the famous Short Wave Tuner Coils. Wound stranded Litz wire on 3/8 in. ebonite tubes, at 4/- each.



RECORDERS. For recording Morse Wireless Signals. Enable high speed signals to be received and read at leisure. Magnificent British instrument work, cost £40. R.A.F. surplus, guaranteed working, £6 10s.

MEG. GENERATORS. Hand Generators, 1,000 volts, £13. 1,000/1,200, £11. M.G., 12/1,200 at 75 m/a, £20. 1 K.W. 200 volts, M.G. to 2,000 volts at 500 m/a, £28.

ALTERNATORS. Newton 200 watt 500 cycles, self-exciting Generators, wonderful machines, £3 10s., or with step-up Transformers for 1,000 to 5,000 volts, 500 watt type, £8 10s. All sizes up to 2 K.W.

WAVEMETERS. The Largest and Finest Stock of Selected and Tested W.D. Wavemeters in Great Britain. L.R. Townsend, 120/4,000 metres, £6. Paul's Wave-Testers, 100/3,500 metres, £5 10s. Station Testers, 120/1,400, £5. Townsend Broadcast, £3. Heterodynes, various ranges, 200 metres up, from £4 10s. 0s. Forward, 80/3,000 metres, £6 10s. 80/9,000 metres, £7 10s.

The above articles are only a few of our huge selection of Radio and Electrical apparatus. Send 3d. for our new Illustrated Catalogue and Price List, again enlarged for April. If you can give us a call, kindly note that Colonial Avenue is the first turning on the left in Minorities from Aldgate.

LESLIE DIXON & CO.

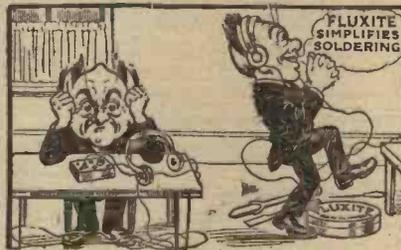
9, Colonial Avenue, Minorities, E.1.

Phone: Avenue 4166.

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Aldgate Station Met. Rly. Buses pass entrance.

Wisdom in a Cigar-box



It is not of what kind of metal a ship is built that keeps it afloat—it's the rivets that hold it that count.

Jones spent a lot of money on building a really first-class receiving set and made quite a rare little masterpiece. Smith, not so well off, knocked together a quaint affair out of a cigar-box and a few other odds and ends. At eight o'clock each evening Jones' troubles commence whilst his friend Smith settles down to enjoy a pleasant hour or two. From a point of cost, Jones should be getting the best of results, but curiously enough, Smith seems to get the most satisfaction from his set. The reason was this—Jones thought expense meant good results and left his set to care for itself, but Smith gave scrupulous care to every minute detail, even to soldering each connection. The moral is obvious. Solder your connections and be satisfied. Soldering is the easiest thing in the world when FLUXITE is at hand to help you.

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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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Buy a Tin To-day.
FLUXITE, LTD. 326, Bevington Street, Bormondsey, England.



For the tool-kit of your car or motor cycle or any soldering jobs about the home.

Amateur Wireless

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Teak cases, polished and fitted with fuses and switch for 5/6 or 4/60, only 5/6 each. Original cost 12/-.
Special Line. Best English Make, 6v. 60 amp-hour, 22/9 each
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The "Varex" Amplifier (prov. patent) fills your room with music by amplifying crystal (or valve) sets 8-8 times, without valves, accumulators, etc. Anyone can cheaply construct this unit from our full-size instructional drawings of amplifier, loud speaker and circuits, 2/6; including "Carbox" contact. Operated by 11-v. dry cell.

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Price: 2 volt 40 10/-	4 volt 20 12/6	6 volt 20 18/3
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Impossible loss of signals. Highest dielectric strength, rigid, thoroughly insulated. Black matt finish. 6" x 6" 1/-; 7" x 5" 1/-; 8" x 5" 1/2; 9" x 5" 1/5; 10" x 9" 2/4; 14" x 12" 4/-; 1/2" thick. Post free. Trade inquiries invited.
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 PLATELESS VALVES
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THE Valve with a silver lining~

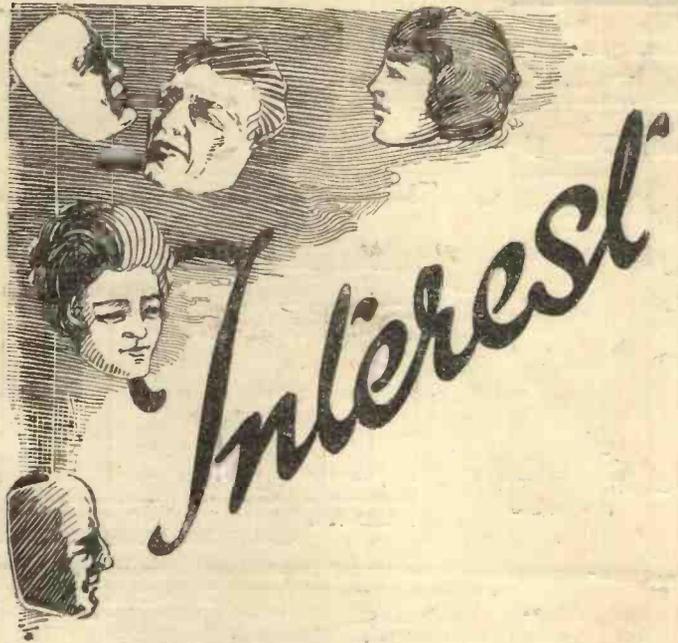
THIS new departure is a decided advance in Wireless Valves. It is the outcome of considerable experiment and research in an endeavour to produce a Valve free from microphonic noises with high signal quality and tone purity. The Anode is formed of a special conducting surface deposited upon the glass container, totally enclosing the Grid and the Filament, giving a large area Anode and definitely ensuring the use of the whole of the Electron stream. The Grid is of special formation, and by this construction an exceedingly high standard of rigidity is obtained. The cap or base fitting is also of novel and original design, and is so arranged that a resilient seating is obtained, no paste or heat is used in the fitting of the cap, yet it is quite impossible for the cap to work loose or come off. The resulting combination is a Valve of high signal quality—great purity of tone—non-microphonic and low self capacity.

Two standard types are now offered. Filament Volts 4 to 6. High efficiency filament.
 Type G.1. General Purposes Valve. Price 12/6
 Type A.1. Special Amplifying Valve. „ 13/6
 The type A.1 is specially made for amplifying with a high magnification factor, and is not recommended as a Detector.

G.W.I. LTD.

THE ORIGINAL VALVE REPAIRERS.
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FRESH interests are the great antidote to boredom.

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

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

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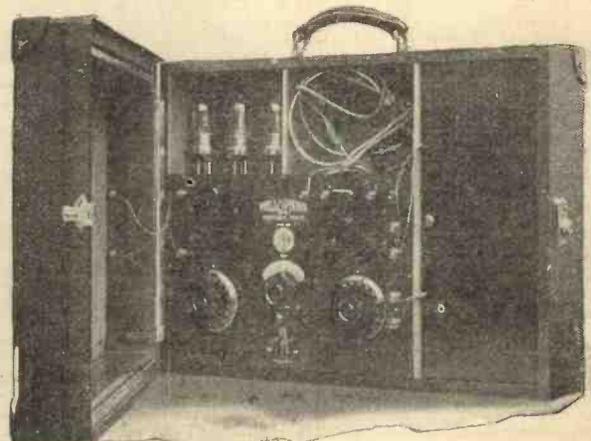
Complete with headphones:

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

FELLOWS MAGNETO Co., Ltd.
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Inductances in Radio Frequency Circuits

The two chief functions of an inductance in radio frequency circuits are, firstly, to give the largest possible E.M.F. across the terminals for any frequency within its range; and, secondly, to transfer this energy without loss by means of its magnetic field to another inductance in another circuit. A coil that has a strong magnetic field, however, may not necessarily be the coil that builds the highest E.M.F. across its terminals. For instance, a coil may have low losses, which means that it would deliver a high E.M.F. at its terminals, and yet its mutual linkage with another inductance may not be strong enough to transfer its full potential to the other circuit, because the shape of the coil and the method of winding may not be the best suited to combine the two essentials of an efficient inductance—namely, a strong magnetic field and a high mutual linkage.



LISSENAAGON TUNING CHART. Note the Intermediate Coils: 30, 40 and 60.

TABLE I. Wavelength range when used as Primary Coils with Standard P.M.G. Aerial and .001 mfd. condenser in parallel.			TABLE II. Wavelength range when used as Secondary Coils with .001 mfd. condenser in parallel.		
No. of coil.	Minimum Wavelength	Maximum Wavelength	Minimum Wavelength	Maximum Wavelength	PRICE
25	185	350	100	325	4/10
30	235	440	130	425	4/10
35	285	530	160	490	4/10
40	360	675	200	635	4/10
50	480	850	250	800	5/-
60	500	950	295	900	5/4
75	600	1,300	360	1,100	5/4
100	820	1,700	500	1,550	6/9
150	965	2,300	700	2,150	7/7
200	1,885	3,200	925	3,000	8/5
250	2,300	3,800	1,100	2,600	8/9
300	2,500	4,600	1,400	4,200	9/2

HOLD A LISSENAAGON COIL UP TO THE LIGHT—SEE THE GREAT AIR SPACE RIGHT THROUGH.

LISSENAAGON coils, however, are large, the low wavelength coils are wound with wire which has a cross-sectional area nearly four times larger than that of wire used in any other coil, the portions of the windings which carry the two extremes of potential are geometrically as far apart as it is possible to get them and the area and intensity of the magnetic field (which is decided by the distance between the two points of potential) is such that there is an extremely strong field between all LISSENAAGON coils, and the two essentials of an efficient inductance are fulfilled in a way not associated with any other make of coil.

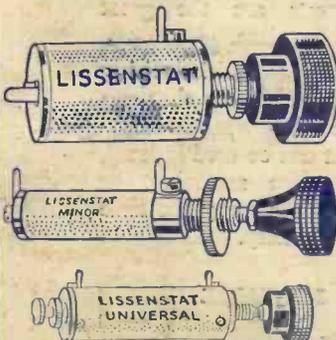
HAVE YOU GOT AN UNRELIABLE GRID LEAK?



If so, the negative charge left on the grid of the valve by each radio frequency oscillation of a radio wave will leak away too quickly, with the result that it would be impossible to regulate the charge that should accumulate on the grid. With the LISSEN Variable Grid Leak (prov. pat.), however, it is possible to select the exact value of leak resistance and to obtain correct grid potential under all conditions of valve and circuit. An interesting alternative use is across the secondary of a transformer or across the Loud Speaker itself, when it will suppress any tendency for the high notes of the musical scale to be amplified disproportionately to the lower notes. LISSEN Variable Grid Leak has positive Stops both ways—continuously variable $\frac{1}{2}$ to 6 megohms—LISSEN ONE HOLE FIXING, OF COURSE, 2/6. LISSEN Variable Anode Resistance, 20,000 to 250,000 ohms continuously variable, same outward appearance as the LISSEN Variable Grid Leak. 2/6.

DON'T BEGRUDGE YOUR RECEIVER A LISSENSTAT

At any rate, let it have one LISSENSTAT—for the detector valve. You will be surprised at the difference it will make to your tuning. When your valve is functioning at the critical point of its characteristic curve you will find yourself able to get fine detection in a way you never could before. And if you fit one LISSENSTAT you will surely fit more.



There are three types—each is suitable for dull emitter and all valves. LISSENSTAT (prov. pat.) This is the super filament control—the difference it makes has to be experienced to be understood. 7/6. LISSENSTAT MINOR (prov. pat.) There must be many hundreds of thousands of inefficient rheostats in use which should be replaced by this perfect little control. Gives something of the beautiful LISSENSTAT control at a popular price. 3/6. LISSENSTAT UNIVERSAL (prov. pat.) Its double adjustment protects expensive dull emitters, and a minimum resistance can be left in circuit, or when it is required, a zero resistance may be obtained so that full battery pressure can be used. 10/6.

TO THOSE WHO THINK LISSENSTAT CONTROL IS THE SAME THING AS AN ORDINARY RHEOSTAT—LET THEM TRY THE DIFFERENCE.

ABOLISHING RE-RADIATION TROUBLE.

The best way to effect this is to use the LISSEN REGENERATIVE REACTANCE in the anode circuit of the first H.F. valve. In this way the receiver will be highly efficient and there will be no re-radiation. Plug-in coils can, if desired, be used for the inductance, or the LISSEN TUNER can be used instead—the latter is very convenient. A receiver fitted with the LISSEN REGENERATIVE REACTANCE becomes extremely sensitive, and so selective that nearby broadcasting stations can be cut out and the others tuned in with full built up strength. It is being widely used in tuned anode circuits instead of plug-in coils. With the latter only one stage of H.F. can be employed conveniently, whereas with the LISSEN REGENERATIVE REACTANCE other stages of H.F. can be added, each stage adding considerably to the range and sensitivity of the receiver. Then again a set of plug-in coils to cover the same wide range as the LISSEN REGENERATIVE REACTANCE would cost more—and with the latter there is no coilholder to buy, either.



ARE RADIO WAVES ABSORBED BY SUNLIGHT?

It is a curious phenomenon how strong light affects the strength of radio reception, particularly in the case of receivers not fitted with proved radio frequency amplification. Amateurs are already finding that their range of reception since the advent of longer days appears in some unexplainable way to be curtailed.

If LISSEN Radio Frequency amplification is employed, however, the range of reception is invariably extended, and those elusive stations again come in despite the absorbing action of sunlight preventing true refraction of ether waves by the "heavenside layer" and so weakening wave energy. LISSEN RADIO FREQUENCY AMPLIFICATION IS THE PROVED METHOD OF BUILDING UP WAVE ENERGY.

FOR SENSITIVITY AND GREAT STABILITY OF CONTROL.

The purpose of the LISSEN H.F. Transformer is to provide a transformer coupling for those who prefer to use it, or where it is indispensable, as in the case of some dual and reflex circuits. As many stages as desired can be used, with great stability of control.

150-4,000 metres ... 19/6
Same outward appearance as the LISSEN REACTANCE, but four connections to make instead of two. Blue print shows how.

FOR HIGH AMPLIFICATION WITH TONE PURITY

For one or two stages H.F. the LISSEN REACTANCE is quite easy to control. Beyond two stages the LISSEN H.F. Transformer should be used. While LISSEN REACTANCE beyond two stages is not easy to control, as the LISSEN H.F. Transformer, used up to two stages it adds extreme sensitivity and amplifies signals to a much greater extent than any H.F. Transformer coupling. Indeed it is almost comparable to a good audio frequency transformer, besides giving absolute purity. Should be used in the anode circuit.



150-10,000 metres ... 19/6
150-600 " ... 17/6
Blue print with each self-tuned.

Note:—Although the LISSEN REACTANCE AND LISSEN H.F. TRANSFORMER are self-tuned, it will oftentimes be an advantage to have available the means for exceedingly fine tuning as provided by the LISSEN Vernier Condenser, which has been specially designed for fine tuning in H.F. circuits, price 12/6.

USE A LISSEN PART FOR EVERY VITAL PLACE OF YOUR RECEIVER, and your receiver will give results which you could never get with mixed parts.

LISSEN PARTS—WELL THOUGHT OUT, THEN WELL MADE

LISSEN LIMITED

16-20, Woodger Road, Goldhawk Road, LONDON, W.12

Telephones: 3380, 3381, 3382, and 1072 Hammersmith.
Telegrams: "Lisennium, London."

We guarantee every LISSEN Part to satisfy you perfectly—we EXPECT to hear from you if you are not satisfied.

CUTTING OUT HEAVY INTERFERENCE.

A LISSENCEPTOR (prov. pat.) can be introduced into a circuit in two ways. With its tuning condenser it can be built into the receiver itself or can easily be used outside any receiver without alteration to the actual wiring being necessary. It will be found perfectly easy to cut out any nearby broadcasting station, and 95 per cent. of morse interference. There is a type of morse interference which calls for more skill, but even this can be so subdued that reception of music is not spoiled. Requires a separate tuning condenser, preferably use the LISSEN Mica Variable Condenser, Mark 2 type at 17/6.

LISSENCEPTOR Mark 1 type, for broadcasting ... 7/6
" " " " 600 metres ... 7/6
" " " " broadcasting and 600 metres combined (with switch for more selective tuning) ... 15/6

THE LISSENCEPTOR ACTS AS A SENTINEL BESIDE YOUR RECEIVER.