AN "ALL-EUROPE" LOUD-SPEAKER SET

ENTER THE BIG COMPETITION *(See p. 48)*

Amateur Wireless And Electrics

Vol. IX. No. 213 SATURDAY, JULY 10, 1926 Price 3d

PRINCIPAL CONTENTS

WELL ILLUSTRATED

Registered at G.P.O. as a Newspaper.

CAPABLE OF RECEIVING ALL EUROPEAN STATIONS!

Constructional details of this fine receiver are given in this issue.

Amateur Wireless and Electrics

The Leading Radio Weekly for the Constructor, Listener and Experimenter

Edited by BERNARD E. JONES

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Chief Contents

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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.

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THE WAVELENGTH RANGES OF POPULAR CIRCUITS

Some reasons why you may not be getting the best results

MANY amateurs who have used one of the popular circuits, such as the Reinartz, Ultraudion, Flewelling, etc., with great success on the broadcast wavelengths are disappointed when they try and receive Daventry with the same circuit.

While the number of valve circuits in popular use has increased greatly each year since broadcasting commenced, it is only natural that particular attention should have been paid to reception on wavelengths between 300 and 500 metres. As there are many circuits which work excellently on the lower wavelengths, but only moderately well—in some cases not at all—on the longer waves, a brief survey of the useful wavelength ranges of some of the more widely-used circuits may be the means of preventing disappointment to a large number of wireless enthusiasts.

Super-regenerative Circuits

Considering the super-regenerative circuits first, it should be noted that these are not worth while on wavelengths above 500 metres. Optimum results are obtained on very short wavelengths indeed, and the efficiency decreases as the wavelength increases, so much so, in fact, that the efficiency is about four times as great on 200 metres as on 400 metres. On 500 metres a super-regenerative circuit is very little better than a straight single-valve circuit with reaction, and above this wavelength it is usually not so good.

Claims have been made by various amateurs that a Flewelling works just as well on 1,600 metres as on the broadcast band, but these people cannot have grasped the principles employed in super-regenerative reception. It may sometimes happen that slightly better results are obtained with a Flewelling on this long wavelength than are given by a straight single-valver, but, if so, it is not due to any super-regenerative action. It has been suspected that a certain amount of L.F. reaction occurs in this circuit, which may account for the effect mentioned. The same remarks apply equally to the Armstrong super-regenerative circuits.

The Reinartz System

The Reinartz tuning system may be employed on any wavelength, but at the same time it is seen to its best advantage when used for the reception of stations working below 500 metres. An essential part of this arrangement is an H.F. choke connected between the plate of the detector valve and H.T. positive. Usually a special H.F. choke coil is used for this purpose, but in those cases where a special coil is omitted the winding of the telephones or the primary winding of an L.F. transformer acts as a choke. As the impedance of any inductive coil decreases as the wavelength is increased, it is more difficult to choke back the oscillations effectively when their wavelength is long.

On broadcast wavelength a 250- or 300-turn coil makes an efficient choke, while on Daventry's wavelength a 1,000-turn coil might be used. However, when working on wavelengths above 1,000 metres, a rejector circuit, tuned to the signals, should be used instead of a choke coil if best results are to be obtained. This introduction of another tuning control takes away from the Reinartz circuit its great advantage of simplicity of operation. Also, as the Reinartz circuit is not a convenient one to use when a very wide band of wavelengths is to be covered, it is advised that this circuit be employed only when the maximum wavelength to be received does not exceed 500 or 600 metres.

The Ultraudion and Long Waves

The Ultraudion circuit, though by no means new, appears to be passing through

(*Concluded at foot of next page*)

BROADCASTING HEAT AND POWER

An article discussing the possibilities of power radiation

By T. THORNE BAKER, F.Inst.P., F.R.P.S.

A FAMOUS university professor suggested recently that the day was approaching when both heat and power would be broadcast and that the universal radiation of heat, power and light by wireless from central power stations would perhaps solve the fuel problems of the future.

Years ago when Tesla promised wireless power, the general public (or, indeed, the then wireless experts) knew so little about wireless that such an announcement was received with ready credence. To-day, with thousands of potential wireless experts and millions of amateurs with some general knowledge, one needs something substantial to go upon before making such a prophecy. Now, what really are the prospects of ever sending power and light and heat by wireless transmission?

Cable v Wireless

We must first consider the matter from a purely common-sense standpoint. Wherever there are existing cables for the supply of electric power it would be folly to think of substituting wireless transmission. The possibilities would occur in countries where water power is abundant and is so often turned into electric power on the spot. The most obvious case is that of the Niagara Falls, where part of the water power is utilised to drive water turbines and generate electricity. Such stations, situated on the spot where the water is available, may be hundreds of miles from the industrial towns where the power is wanted, and here high-tension current at a pressure of perhaps 100,000 volts is transmitted by overhead cables, with their attendant losses and inconvenience. Could such power be transmitted by wireless it might be a great convenience, and would obviate the necessity of the installation and upkeep of the high-tension conduits.

But how is the power to be transmitted? In every case where any power is set in motion by a wireless signal, such as, for example, the control of a ship or train, the received signal after rectification is amplified, and the whole of the amplification is done by means of *local power supplied by the receiving station.* Your loud-speaker is not operated by wireless; it is worked by the power of your own accumulators.

The Beam System

One of the first great feats of wireless radiation was probably that of the Marconi Co., when by means of the beam system they got perfect telephony from Hendon to Birmingham with 18 watts. The amount of current received, however, was sufficient to give, with amplification, perfect telephony. In other words, with the help of the greatest advances that have been made in directive wireless, the loss of energy over a hundred miles can be so minimised that a sufficient percentage of the 18 watts is obtained to actuate, with amplification, one of the most sensitive instruments known to science—the telephone! Yet we talk glibly of transmitting thousands of horse-power with commercial efficiency.

The metallic circuit has another primary advantage—it leads current to each of any number of places just as a big railway line can take passengers to any number of distinct places. This is where one finds, to my mind, an almost insuperable difficulty in the successful transmission of wireless energy.

Suppose a station in central London were radiating energy to factories in a dozen towns in outer London, situated on the circumference of a circle. How could each factory tap the energy unless any intermediate spot on the circumference of the circle could do so too? Obviously it could not. Therefore the central station must radiate energy in *all* directions with practically zero efficiency.

Remote Possibilities

The only alternative would be for one power station to concentrate its radiated energy along a narrow line in one direction, so that any factory in that line, but only in that line, could tap it. It would be interesting to know what power engineers would think of such a scheme.

The weak spot in wireless power transmission is that indispensable difference from wireless telephony. In the latter we amplify what we receive by means of valves and *an abundance of local power;* if we ran our engines or heated our homes by wireless, we should have to receive sufficient energy *off the aerial direct* without any amplification.

No serious-minded student of wireless is foolish enough to say, "It will never be done." But here are sufficient arguments to make us think, and to accept with reserve forecasts which it would perhaps be wiser to modify with care. T. T. B.

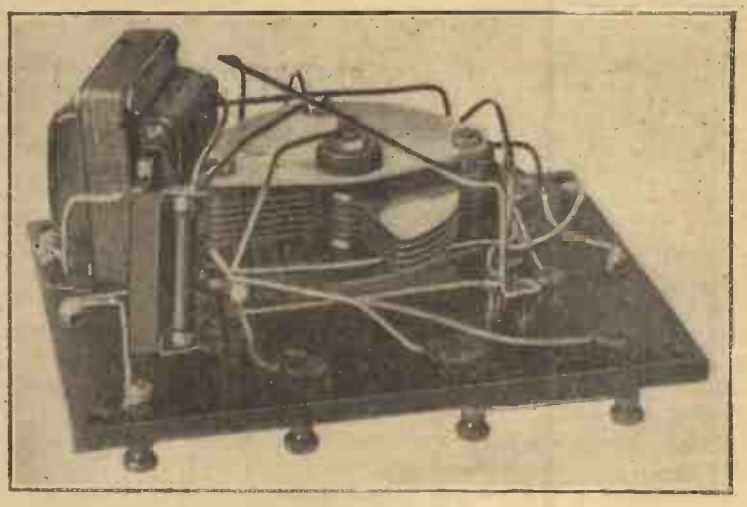
"THE WAVELENGTH RANGES OF POPULAR CIRCUITS" (*continued from preceding page*)

a period of revived popularity at the moment. This is another circuit which performs at its best on short wavelengths. There are several reasons why its performance on long wavelengths cannot allow it to be recommended for general use for the reception of Daventry. In the first place, it is a circuit employing reaction through the capacity between the grid and plate circuits of the valve. This capacity is very small, but will pass sufficient energy to bring the set to the oscillation point when the oscillations concerned have a sufficiently high frequency. When the wavelength is increased much above the broadcast band, however, it becomes necessary to supplement this stray capacity coupling either by introducing magnetic reaction or further capacitative reaction through a variable condenser. In either case the chief feature of the Ultraudion circuit is lost, and it would be better to employ a straight circuit.

Another essential feature of the Ultraudion is the placing of a variable condenser in series with the aerial-tuning coil. This tends to reduce the wavelength to which the set will tune, and therefore abnormally large coils are required for the longer wavelengths. It is bad practice to use a series aerial-tuning condenser for wavelengths above 600 metres when the usual broadcast receiving aerial is employed. The rule about high inductance, small capacity, applies only when the capacity is *in parallel* with the inductance. However, the Ultraudion is a good circuit to use when most reception is done on the broadcast band, and the occasional reception of Daventry can be carried out fairly satisfactorily by using a 250-turn coil.

The Cockaday circuit is another arrangement in which the stray capacities between the grid and plate are utilised to provide the reaction coupling. For the same reason as was mentioned in connection with the Ultraudion, this coupling fails to be sufficient to bring the set to the point of oscillation when the wavelength to which the set is tuned reaches a certain figure, so that this is another arrangement which cannot be advocated for the reception of Daventry. It might also be mentioned that in the Cockaday, as in the Reinartz, it is not convenient to alter greatly the wavelength range of the set above or below that for which it is designed.

Although the actual wavelength up to which any of these circuits will work efficiently will vary according to conditions, it is sufficiently accurate to state that they give the best results only when used for reception below 500 metres. J. J. F.



Two Photographs showing the Complete Receiver and an Under-panel View Respectively.

AN INTERESTING V-I UNIT

Constructional Details of a particularly Compact Two-valver

THE simple receiving set consisting of detector with one stage of low-frequency amplification is universally popular, and can be made in a very compact form. One capable of withstanding very rough use can be built by adopting the ideas explained in this article.

The photographs may give the impression of overcrowding and consequent inefficiency, but a second thought will show that the shielding properties of the metal case will prevent the fields of the tuning coils intercoupling with those of the low-frequency amplifier. Another point of controversy may be the use of so small a variable capacity, but this has been introduced with a view to facilitating sharp tuning.

It is highly probable that the miscellaneous box of the prospective constructor contains most of the parts required, but should they vary from the list here given, measurements must be taken to ensure that they are entirely suitable. Fig. 1 shows the circuit.

The transformer advised for the maximum signal strength is of high ratio, but for slightly better quality with an attendant decrease in volume, a 3-1 of the same make can be substituted.

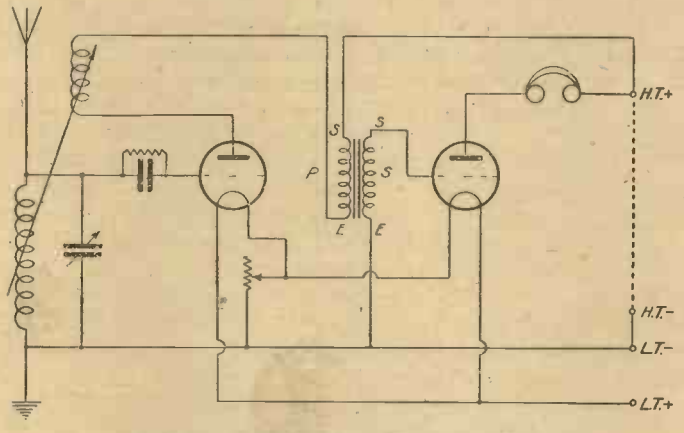


Fig. 1.—The Two-valve Circuit Diagram.

The parts required are: One Radion panel, 5 in. by 7 in.; one Trix L.F. transformer (5-1 or 3-1); one Microstat filament resistance; one Ormond variable condenser, .00025 microfarad; one .00025 fixed condenser and 2-megohm leak; ten terminals complete with nuts and washers; eight Seleezi valve legs; one piece of Fabrikoid cloth, 14 in. by 12 in.; two 4 B.A. countersink screws; eight ½-in. brass countersink wood screws; one sheet tin (xxx), 12 in. by 10 in.; 2 yd. connecting wire.

The panel should be carefully marked off and drilled in accordance with the diagram (Fig. 2), after which the assembling should be commenced, the valve legs, terminals and variable condenser being fixed.

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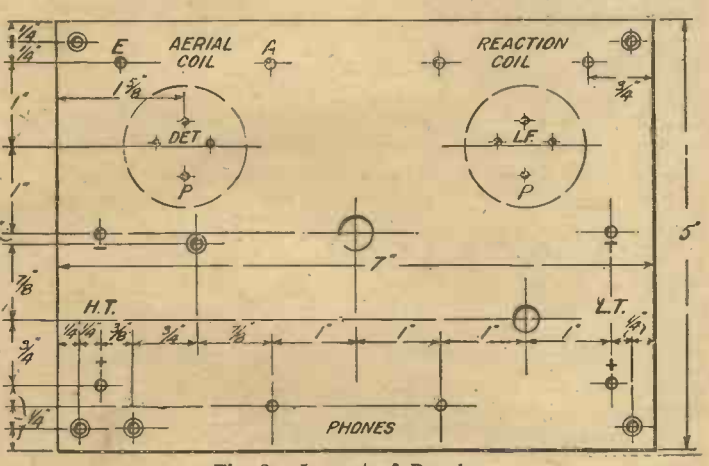


Fig. 2.—Layout of Panel.

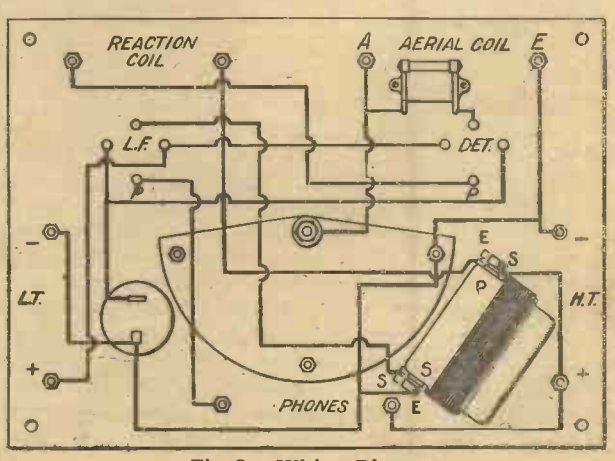


Fig. 3.—Wiring Diagram.

THE ASSEMBLED H.T. BATTERY

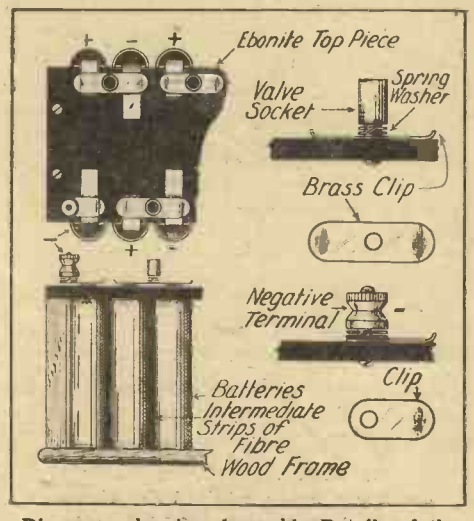
Some Useful Notes on Utilising Flash-lamp Batteries for High-tension Supply

THOSE who use 4½-volt pocket batteries for their H.T. supply will find the suggestion described in this article very useful. It has the advantage of making the assembled batteries neat and compact in appearance, and tappings may easily be taken from any point. Also the existing tags on the battery are not interfered with in any way, nor is it necessary, as is often the case, to bend them over at acute angles, thus bringing about the possibility of tearing them from their connection to the cells inside the battery.

Constructional Details

The diagram shows the main details of construction. The dimensions can easily be found by actually measuring the various distances on the batteries themselves. In the top left-hand corner of the drawing the arrangement is shown from the top, and below is shown the elevation. It will be seen that a wooden frame is first built up having two ends and a base; upon this is screwed the ebonite top piece. The dimensions of this frame and top piece should be in accordance with the number of batteries it is desired to use. Brass clips are placed upon the ebonite top piece so as to secure the negative and positive tags of the adjacent batteries alternatively. These clips are secured by means of a valve socket, as shown in the top right-hand corner of the diagram.

To ensure a good contact between the brass clips and the battery tags, a spring washer is interposed between the clip and



Diagrams showing Assembly Details of the Battery.

the valve socket as shown in each case. The only exception to these details of construction is the negative terminal of the battery board. Here instead of a valve socket is placed a terminal. As this terminal makes contact only with one battery tag, a clip as shown in the bottom right-hand corner will be required. The object of this is to avoid the possibility of misconnection; that is to say, the terminal will take a spade terminal from the negative connection, and for the positive connection a wander-plug will be required. It is advisable to interpose intermediate strips of fibre or waxed paper between each of the batteries to minimise the possibility of leakage. When a battery runs out it is an easy matter to turn the clips round, pull the battery out, slip a new battery in, bend each of the tags over and swing the clips round once more in position.

RADIO.

TERMINAL LEAKAGE

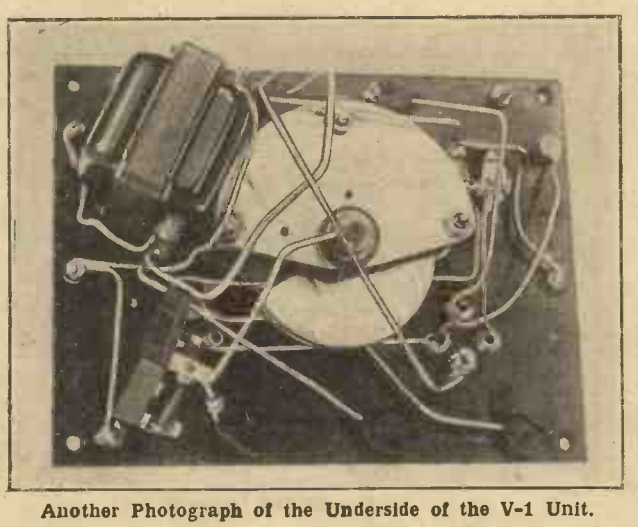
RECEIVERS often give poor results owing to leakage that occurs between the terminals. A fault that is not quite so easy to trace, and yet one that is present in many receivers, is leakage between the terminal shanks and the edges of the wooden cabinet. Care should always be taken when building a set to leave ample space between the components on the panel and the containing cabinet.

P.

"AN INTERESTING V-1 UNIT" (*continued from preceding page*)

The L.F. transformer can then be added. Should the metallic case of the Microstat, when fitted, touch the condenser, it will make no difference to the operation of the set providing the parts in contact are kept at the same potential, that is, both wired to the L.T. negative. For convenience of construction the grid condenser and resistance are suspended by means of the connections.

When the set is being wired (see Fig. 3), the condenser should be occasionally rotated to ensure that sufficient space is allowed for the free movement of the plates. Any form of coil holder or inductance can be used in conjunction with the set, and the method of attaching this is left to the discretion of the constructor.



Another Photograph of the Underside of the V-1 Unit.

For the case, any sheet metal will answer, but a fairly heavy gauge is preferable, as when folded to shape the bottom edges will have a gentle curve. Should the top edges, on completion of the folding, not be in line, they must be levelled off before being covered with cloth. The corners can be soldered if desired. A piece of wood, which comes within a ¼ in. of the top, is screwed in each corner to receive the screws to hold the panel.

After coating the Fabrikoid with adhesive, the case should be placed in the centre, the material pressed against the sides, suitably folded at the corners, and, lastly, pulled tight and turned over the top. Before the final assembly the bottoms of the terminals must be bound with rubber tape to insulate them from the case or its covering. The use of type DE2 valves is recommended.

B. G. C.

WOOD PANELS

GOOD results can be obtained by using wood panels instead of ebonite if attention be paid to the kind of wood used and the method of preparing it. American white wood is very suitable, but it is not easy to obtain in this country. Teak soaked in a suitable wax is found to be very satisfactory.

The writer has made some very good panels by heating Carnauba wax in a big bowl for a fair length of time, to make sure that all moisture is driven off, and then placing seasoned teak (after heating in a warm oven for a few hours) in the bath of melted wax, which is still kept heated. After leaving it for an hour or so, the teak is taken out and dried in a warm dry room.

T. A.

FIVE NOVEL DESIGNS FOR CRYSTAL SETS

Fig. 1.—Set Tuned with a Sliding Spade.

Fig. 5.—Another Variometer Receiver.

IN this article are described and illustrated some crystal sets fitted into the sorts of case which may be found in almost any house, and they are suggestions of what any amateur can do in the way of utilising such knick-knacks.

Spade Tuning

All the illustrations show sets with coils suitable for Daventry only, but it is scarcely necessary to say that smaller coils can be used for lower wavelengths. Fig. 1 shows a small Italian box with a lid of inlaid stone. It measures 7 in. by 5 in. by 2½ in. The aerial and earth terminals are placed at the back and the phone terminals at one side. The crystal detector is inside the box, and a coil of 250 turns or so is screwed down at one end. This is tuned by a copper spade, which consists of a rectangular piece of copper (zinc or aluminium would serve equally well) about the thickness of a postcard, to which a beaded hat-pin has been soldered or riveted to form a handle. The spade slides in the lid of the box, as shown by Fig. 2, and by withdrawing the hat-pin the copper is made to pass over the coil for tuning purposes.

Fig. 3 shows a leather-covered case which once held salt-cellars. It makes a particularly neat-looking wireless case. The aerial and earth terminals are set at each end and the phone terminals in front. This set also is spade-tuned, but in this case the coil is contained in the lid, and the spade (a zinc plate) is fixed permanently in the bottom, from which the bed in which the salt-cellars rested has been removed. The detector—in this case a permanent detector—may be seen close to the phone terminals.

This set is tuned by slightly opening the lid, and thus bringing the coil away from the spade. When once the actual position of the coil has been found a small wedge of wood can be made to fit inside the box to hold the lid in position. Any sort of coil of about 250-300 turns may be used; the one illustrated is a home-made duolateral, made with 3½ oz. of No. 28 d.c.c. wire.

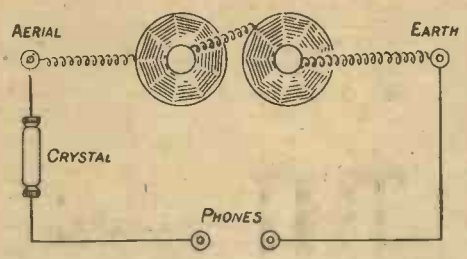


Fig. 6.—The Circuit Diagram for all the Sets.

Fig. 2.—Another Set with Sliding Spade.

Variometer Tuning

Fig. 4 shows a Japanese box of perfumed wood covered with lacquer. In this case two connected coils are used, one in the box and the other in the lid, the outer end of one being joined to the inner end of the other. The crystal detector, of the semi-permanent type, may be seen on the left of the lower coil. This set is tuned variometer-fashion by opening the lid, and so moving the upper coil away from the lower one, until the exact position is found. On the right will be seen a white rod (a piece of bone knitting-needle, in fact), which is pivoted at its lower end on a screw. This serves to hold the lid open at the correct angle.

Fig. 5 shows an old-fashioned work-box, and this was fitted with two coils, the upper one, contained in the lid, sliding across the lower one. The coils are connected together as in the set just described. The detector is inside the box. The upper coil is fixed to a wooden half-moon shaped piece of wood, to which a long handle is attached. By withdrawing the handle the set can be tuned.

The wiring of the sets is shown in Fig. 6.

INDOOR AERIALS

AN excellent indoor aerial, which is capable of working satisfactorily at a distance of a few miles from a broadcasting station, can be rigged up in the following manner.

Paste a piece of tinfoil about 4 in. square on the corner of an ordinary mirror, allowing about ¼ in. space between the tinfoil and the frame of the glass. To the tinfoil attach the aerial lead (the wire may be held between the foil and the glass if desired) and connect the other end of the receiver in the usual manner. Provided the set is reasonably efficient, quite good signal strength should be obtained. The metallic backing of the mirror is capable of picking up the signal impulses, and these are passed to the receiver by the capacity between the backing and the tinfoil; the two surfaces, in fact, act as the plates of a condenser. W.

The Japanese Government proposes to erect a high-power station at Tokio.

Fig. 3.—This Receiver is Tuned by Opening or Closing the Lid.

Fig. 4.—A Variometer-tuned Receiver.

THE FUTURE OF WIRELESS DRAMA?

A Consideration of Possibilities

SOME time ago the authorities at Savoy Hill came to the conclusion that radio drama demanded a short play with a quick *dénouement,* either thrilling or humorous. This conviction led to the production of short plays, admirable in themselves, but all much of the same type. The swing of the pendulum was bound to come, and when it did it was manifest in the recent production of Oscar Wilde's Victorian drama *Lady Windermere's Fan.* One of the points of this play is that, like all Wilde's writings, the dialogue is adequate. Nevertheless, nowadays it is considered too Victorian for modern consumption.

Before the wireless production of this play expressions of doubt were heard at Savoy Hill. Some were convinced that it was too long, others that, as listeners would be unable to see Wilde's characters moving across the stage, piquancy would be lost, with the consequent "deadening" of the dialogue. What was the result? The play was broadcast, and produced a greater number of letters than anything that the B.B.C. has done in recent months. Its success can be compared with *The White Château.*

Another very interesting point can be cited. *Lady Windermere's Fan* was produced in London in its film version almost simultaneously with the radio version. Unhappily for the film, it was screened immediately before the broadcast and not afterwards, and received a lukewarm reception. In this case the characters were seen but the dialogue was absent, which would seem to prove that the success of radio drama depends on the imagination of the listener and the brilliancy of the dialogue. Many listeners were familiar with Wilde's characters and had no need of their ocular portrayal. No complaints were received of the length of the transmission.

The success of this broadcast has seriously disconcerted the advocates of brevity. Wilde's play has proved that it is more essential to work on the imagination of listeners than to produce in fifteen minutes one thrill or one laugh.

Control of Composite Productions

The foregoing remarks deal chiefly with what might be termed straightforward plays. A task of great difficulty is the production of plays which demand natural sounds, either close at hand or in the distance. It is obvious that the speakers or originators of far-off sounds cannot, even given expert control, produce the correct effect if acting in the same studio as those players who are doing the close dialogue. At present Savoy Hill does not possess convenient studios or control. Among last year's successes was the "Radio Tattoo," and for the noises and background singing for this production studio passages and stairways were called into use; but the difficulties of control were stupendous. When the "guns" of the tattoo are stationed down a lift well and "horses" along another passage out of sight of everyone the controlling difficulties can be imagined. One of the dramatic producer's assistants on this occasion was stationed outside the studio and was in touch with the main theatre by means of phones. The duty of this individual was "to cue up" his extraneous noises. As luck would have it, the phones broke down, and but for his skill some humorous pandemonium might have ensued.

These incidents are mentioned as illustrations of the need of facilities under which radio drama labours. The B.B.C. is installed in a building unsuited to many of their activities. Radio drama needs a central theatre with minor theatres grouped around, and the all-essential central electrical control erected in a sound-proof glass-fronted cabinet. In each subsidiary studio connected to this central control silence cabinets would be placed, thereby enabling the producer of the play to broadcast the transmission from the central studio to his assistants, who would "cue in" the artistes or noise effects at the right moment.

"Mixing" Control

A further advance should be made by placing in the central control room the apparatus for "mixing," at the necessary strengths, the transmissions from all the theatres in use. From this control room the complete production would be carried to the engineer's control and so to the aerial.

This system would give both artistic and engineer's control. Such a scheme has been the object of the officials at Savoy Hill, but elaborate methods of this kind are expensive.

It must be remembered that when authors and public realise that radio drama will one day be as powerful as the picture play elaborate studios will be constructed.

ROBERT GLENDINING.

THE DEVELOPMENT OF THE BROADCASTING STUDIO

This is a photograph of the WHT station studio at Chicago, the newest of American studios. Note the corrugated ceiling for the purpose of obtaining the proper sound effects.

The Nijni-Novgorod (Russia) laboratory is making transmissions on wavelengths of 83, 102 and 104 metres.

The new Radiopolis station, installed in the neighbourhood of Santa Cruz (Brazil), has been opened.

In Jugo-Slavia a high-power broadcasting station is being erected by the State in the neighbourhood of Agram (Groatia).

"Cosmos" SHORTPATH S.P. 18 Valves are recommended for use as shown below with alternative H.T. values:—

Stage	Coupling	Recommended Valves H.T. 20-80 v.	80-120 v.
H.F. Amplifier	Tuned Anode (neutrodyne) ..	Green	Blue
	Tuned Anode (not neutrodyne)	Green	—
	Transformer (loose coupled) ..	Red	—
	Transformer (tight coupled) ..	Green	—
Dual or Reflex	All Couplings	Red	Red
Detector (Grid Leak)	Resistance Coupling	—	Blue
	L.F. Transformer or Choke ..	Green	Blue
Detector (Anode Bend)	All Couplings	—	Blue
L.F. Stages ..	Resistance	Green	Blue
	L.F. Transformer or Choke ..	Green	Green
Last Stage ..	All Couplings	Red	Red

Another SHORTPATH Valve

S.P. 18/B (BLUE SPOT)

This new S.P. 18 Valve supplements the well-known S.P. 18 Red Spot and Green Spot Valves. It is designed especially for use in resistance-capacity coupled sets, and for use as a Detector and in H.F. neutrodyne tuned anode stages using 80-120 Volts H.T., so that where this H.T. is employed in the last stage, the difficulty of two H.T. supplies is avoided.

In addition, it gives still more amplification and consumes very little H.T. current.

The S.P./B (Blue Spot) is an excellent valve for anode bend detection. Designed to work in parallel with the S.P. 18 Red Spot and Green Spot Valves, it operates from a 2-volt accumulator and consumes only 0·09 amp. filament current.

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RED SPOT	GREEN SPOT	BLUE SPOT
12/6	12/6	12/6

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Cosmos

RADIO VALVES

R
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On Guard!

There is no leakage with a "Lotus" Buoyancy Valve Holder on guard.

Immediate and lasting connection made when valve pins enter valve sockets. The leg socket expands and automatically locks.

Absorbs shock—protects the valves and eliminates all microphonic noises.

Without Terminals 2/3

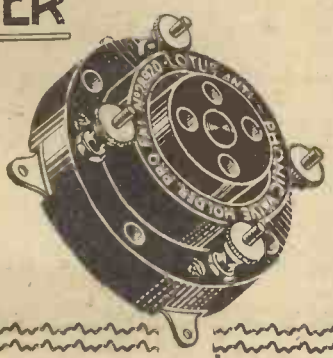
With Terminals 2/6

LOTUS

BUOYANCY

VALVE HOLDER

ANTI-MICROPHONIC



Made from the best bakelite moulding with springs of nickel silver and phosphor bronze valve sockets.

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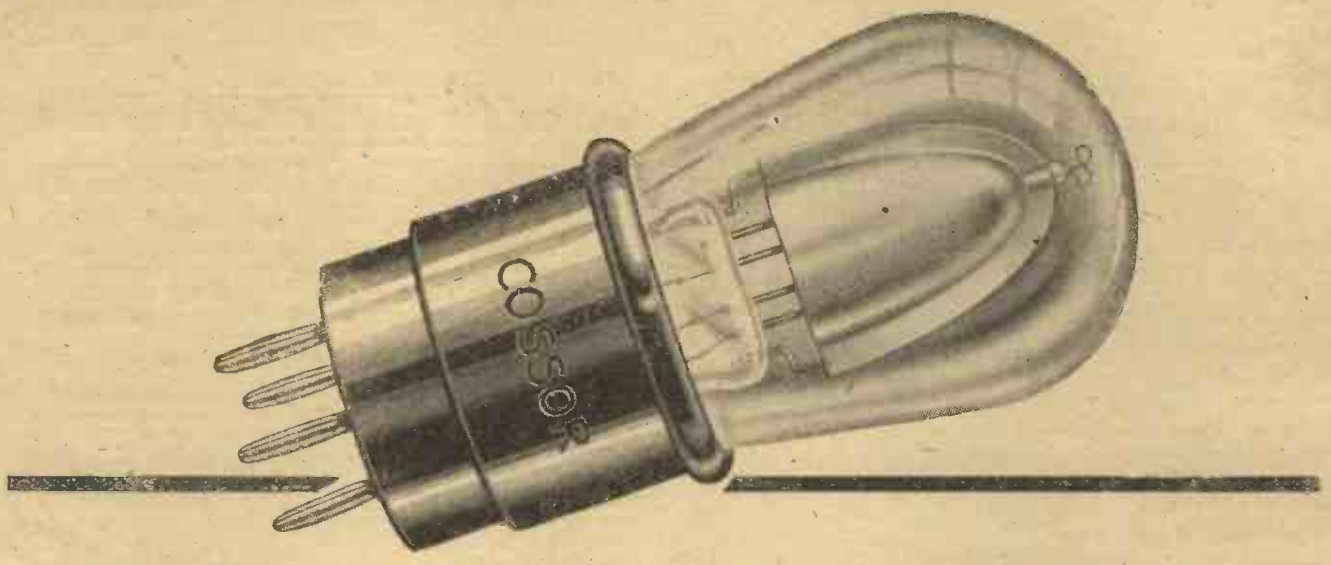


At last the shockproof Valve

THERE is little need to ask "Which is the most vulnerable part of any valve?" Even a man who had never owned a Wireless Set would be able to guess the answer! Ever since Edison ransacked the world for filament material for his first electric lamp, the glowing thread within its crystal globe has been an object of special regard.

The wireless valve is first cousin to the electric lamp—but year by year the relationship is getting more remote. Whereas in the latter, efficiency is measured by the amount of light it gives, the whole resources of Science have been enlisted to obtain in the valve the maximum of efficiency with the minimum of light.

And now that a new Cossor Valve has been evolved with a special filament which operates at a glow almost indiscernible we appear to be within a reasonable distance of a valve which will never wear out.

But filament glow has been only one of the problems which Cossor has faced—and conquered. Another—almost equally as important—has been the perfection of a system of filament suspension which would successfully withstand the thousand and one shocks which every valve must encounter in use.

The Cossor Point One, now being placed on the market, is the first valve in which the new system of Co-axial Mounting has been utilised. For the first time there is available a method which enables the three elements—the Filament, the Grid and the Anode—to be securely united together *at the top* as well as at the bottom.

The new Cossor Point One

—the first Valve in which the filament, grid and anode are secured together at top and bottom in *permanent* alignment.

How this is effected can be readily understood from the illustration above. At the top of the Anode will be seen a seonite insulator which—projecting downward—is firmly secured to the top of the Grid. Through the centre of this seonite tube is threaded a fine wire which acts as the third support to the filament. Thus it has been found possible to evolve a system of construction which will resist without harm the hardest of shocks. Even if the elements in this Cossor Point One should be displaced through an accidental blow they *must* always be in the same relative positions.

Co-axial Mounting is destined to be one of the most important developments of the year. In this brief announcement it is obviously impossible to enlarge in detail upon its many advantages.

Try out this astonishing new Valve now. Remember its current consumption is barely one-tenth of an ampere. One super-heterodyne fitted with seven of them actually takes less current than a single-valve Set using one ordinary valve.

Red Top	Plain Top	Green Top
For H.F. use	For Detector	Power Valve
1·8 volts	1·8 volts	1·8 volts
·1 amp.	·1 amp.	·15 amp.
15/6	**15/6**	**18 6**

—fitted with the new ·1 amp. filament

On Your Wavelength!

A Great Test

ONE of the most interesting tests ever carried out in the history of British broadcasting was that which took place the other night when different programmes were transmitted simultaneously from 2 L O and Marconi House. My own observations were made rather less than thirty miles north-west of London. I used two sets for the purpose, the first being a very simple crystal affair with a single-circuit tuner and the A.T.C. in parallel with the A.T.I. The second set was a rather "extra special" three-valver recently completed. It was designed particularly for selectivity, and it certainly achieves this object. The set consists of one stage of neutralised high-frequency amplification followed by a rectifier, between the grid and plate circuits of which is a tiny variable condenser used for providing reaction effects. The third valve is an ordinary transformer-coupled note magnifier.

With the crystal receiver, 2 L O was audible up to rather more than 400 metres, and the gap between him and the "lower fringe" of Marconi House was very small; still, they could be completely separated without any difficulty. 2 L O was slightly stronger than Marconi House, though the latter was obviously over-modulating in order to compensate to some extent for his smaller power. With the valve set Marconi House vanished completely when the set was tuned 2 metres up or down; 2 L O was entirely inaudible 5 metres above or below.

In London

Reports from several friends in London make rather curious reading. Most of those with anything like efficient valve sets were able to separate the two transmissions even though they might be living quite close to one or other of these stations. In some cases, however, either 2 L O or Marconi House was persistent, coming in as a background to the other's transmission despite all efforts at tuning him out. Owners of crystal sets with single-circuit tuners seem to have found it difficult to hear one station only, though separation could be accomplished, as a rule, where an indoor aerial was employed or if some kind of double-circuit tuner was in use.

There is not the least doubt that alternative programmes are wanted in London, and it is certain that we shall have them before very long, for this would be only a natural development of the present service. The coming of the new era in broadcasting will lead undoubtedly to improvements in the design of crystal sets. Up to the present there has been no need with them to trouble much about selectivity, since the average crystal user can hear only his local station or 5 X X—and it would be a pretty hopeless set if it were unable to separate them! The crystal set can never achieve knife-edge tuning owing to the damping which the detector introduces. It can, however, be so designed that even at short range it will separate two transmissions such as those in the recent test.

A Big Difference

One often sees it stated that American receiving sets are on the average much more selective than our own, and several dwellers in London whose sets were unable to separate 2 L O from Marconi House during the recent test have said to me, "An American receiving set would have done it; just think of what happens in New York when there are often four or five stations transmitting at the same time." On the face of it this seems a fairly sound argument, but when you come to investigate the facts you find, as is so often the case, that there is more in the business than meets the eye. Actually New York possesses seventeen authorised broadcasting stations, though it must not be imagined that all of them are transmitting at the same time. It is when we come to examine the power rating of these stations that we find how different conditions are. Twelve of them have an output of .5 kilowatt or less, and only one is rated at more than 1.5 kilowatts.

Now there is all the difference in the world between separating at short range low-power stations and high. Nor must we forget that 2 L O and Marconi House were working within 95 metres of one another, whilst in New York the stations are spaced out over a waveband extending from a good deal over 500 metres to well under 300. New York, too, is full of places which are blind to transmissions from certain directions owing to the presence of high steel-framed buildings, and in most localities several of the broadcasting stations come in so weakly that they do not require a great deal of tuning out. I am not denying for a moment that the American set with two high-frequency stages is exceedingly selective, but I do believe that our own would give a very good account of themselves in any of the large cities of the States.

Strike Sets

Not a few people that I have met lately have told me that they have been badly bitten over receiving sets purchased in a hurry during the general strike, for they find that they have acquired out-of-date or badly-designed receivers which will not give anything like the results that their friends obtain.

My sympathies in the matter are somewhat divided. Many of those who purchased in a hurry had their eyes wide open at the time and knew that they were not getting the latest and the best, but felt that anything was better than nothing. It is hardly fair for them to lift up their voices in lamentation at this stage of the proceedings. Others, however, bought in all good faith receivers which turned out to be "duds." If these sets were actually sold as efficient and reliable, the purchasers should undoubtedly take up the matter with the makers. Good firms will no doubt be only too glad to set matters right, and the only people who really "got left" are those who have disregarded the warning so frequently given in AMATEUR WIRELESS against purchasing sets or components of unknown or doubtful make. A very great deal, however, can be done to improve even the worst set, and those who can obtain no remedy from the makers may find it worth while to spend a little time and trouble in effecting simple improvements that may make all the difference in the world to the results obtainable.

A Vexed Question

By the time this is in print the Postmaster-General will have answered Mr. Harry Day's parliamentary inquiry as to whether, in view of the oscillation nuisance experienced by listeners, the use of reaction direct on the aerial cannot be officially prohibited.

However much Sir William Mitchell-Thomson may sympathise with those who demand relief from the "condenser swinger," I am afraid that the remedy suggested by Mr. Day is somewhat beside the point. Direct aerial reaction was forbidden in the early days of broadcasting, but it was soon realised that this particular form of circuit was by no means the sole cause of the howling nuisance.

As most of my readers know, an ordinary tuned-anode high-frequency amplifier can easily be made to oscillate, particularly on the lower condenser readings, without the use of any reaction coil, whether coupled to the aerial or the anode circuit. The source of the trouble in this case is the electrostatic coupling set up between the aerial and plate circuits across the internal electrodes of the valve. This difficulty is inherent in practically every valve, so that, to be consistent, valve sets as a whole will have to be abolished, unless they can be fitted with some means for preventing reaction of any sort, whether direct or indirect.

I prefer to think that the real solution

On Your Wavelength! (continued)

will be found automatically, in course of time, as listeners learn to handle their sets with moderation and due regard to their neighbours' comfort. There will, I suppose, always be a few "hogs," but special measures can be taken to discipline the worst of these.

Lightning Risks

In spite of repeated assurances that the risk of lightning with an outside aerial is practically negligible, some people are so nervous on this point that they object even to the presence of an indoor aerial. So far as the outside wire is concerned, even the most timid person would hesitate before refusing to install a telephone on the ground that it would "attract lightning." Yet the network of overhead telephone wires is far more extensive, and therefore presumably more likely to be struck, than the ordinary garden aerial.

Similarly one does not hear of householders objecting to the presence of bell-wiring inside a house, or refusing to use picture wires, on the grounds of increased lightning risk. Why, then, should the innocent indoor aerial be viewed with such suspicion? People should be reasonable and fair-minded in these matters, even if they are a little old-fashioned in their general attitude to wireless.

Telephones and the H.T. Battery

Those building a valve receiver for the first time are sometimes in doubt as to whether the telephones should be inserted between the H.T. positive and the plate of the valves, or between the H.T. negative and the filament battery. In a single-valve set the latter position is to be preferred because the phones are then at earth potential and there is no danger of any leakage to earth should the insulation of the telephone cords be faulty.

However, in the case where more than one valve is used, it is necessary to connect the two batteries together so that all the valves can be supplied by the same H.T. source. Here the telephones are at a high potential, and if long leads are used care should be taken to see that the insulation is good.

A Quick Overhaul

If called in to "doctor" a recalcitrant valve set, the following points are worth keeping in mind. See that the aerial and earth leads, and the two batteries, are correctly connected to the set, that all the valves light up, and that there is an energetic response when the H.T. positive plug is removed and replaced.

Next take a pair of telephones and bridge them across the valve-plate pin and H.T. positive on the battery, trying each valve in turn. Start with the detector, of course, if there is a high-frequency stage. This will enable you to locate the particular valve at fault. If the trouble is on the low-frequency side, test each of the transformers by disconnecting the primary and secondary leads and inserting the telephones in series.

If the trouble is located on the high-frequency side of the set, first remove the H.F. plate coil, and then short the plate and grid pins on that valve so that the signals can get straight through to the detector. This will identify the faulty stage as between the H.F. and detector valves. Always switch off the H.T. when making any circuit alterations.

Shocks from Aerials

I was standing near an 80-ft. wireless mast the other day wondering whether the thunder would spoil my evening's tennis, when a flash to earth excited my attention. There was no lightning at the time, and the flash did not take place from the aerial which was connected to earth, but was from one of the insulated metal guys supporting the mast. These guys are insulated at each end, and also broken in the centre to prevent oscillating and radiating harmonics of the main transmitted wave. The flash undoubtedly occurred through the insulated stay slowly becoming charged by atmospheric electricity until it reached a voltage sufficient to break down the insulation of the air, and it made me wonder how many amateurs have trouble from the same cause through using series aerial condensers.

If condensers be inserted in series with the aerial for tuning purposes, the aerial is isolated and will slowly collect electrical charges from the atmosphere under adverse weather conditions. These charges can, in time, produce very high voltages. Indeed, these voltages become great enough to puncture the insulating bushes in variable condensers or to give a nasty shock if the aerial terminal be touched.

The best and easiest way to avoid such trouble is to connect a high resistance (about a megohm) across the aerial and earth terminals. This resistance should be left permanently in position, and performs the useful task of slowly allowing any static charge on the aerial to leak away. Its presence in no way affects the tuning of the circuits, and it will prevent possible shock or the puncture of a favourite condenser.

THE EDITOR SPEAKING FROM 2LO

On Saturday, July 10th

JUST as we go to press, arrangements have been completed for Mr. BERNARD E. JONES, the Editor of *Amateur Wireless*, to speak from 2LO on Saturday, July 10th, at 7.50 p.m.

His subject will be the International Set Competition, and the object of his short "talk" will be to arouse still further interest in the British Elimination Competition.

(*See page 48 of this issue*)

It is hoped that every home constructor with a really good set on his hands will see fit to take part in this competition.

In view of the Editor's "talk" it has been decided **to extend the closing date for completed entrance forms until Friday, July 16th.**

Another Pat on the Back

In the past wireless has received many hard knocks. It has been held responsible for droughts, floods, heat waves, cold spells and all manner of weather freaks; it has been shown conclusively that the presence of an aerial in an orchard produces barren fruit trees and bumper crops; innumerable carrier-pigeons have been decapitated by flying into aerial wires, and there are those who claim that when 2LO switches on, thousands of feathered songsters fall lifeless to the ground; it was universally accepted until the affair of the Dunmow Flitch that receiving sets broke up the happiest homes by creating wireless widows; headmasters have proved that radio prevents boys from doing their homework, and doctors have shown us that it has terrible effects upon the human frame!

Of late there seems to have been a turn in the tide of feeling, and now I am constantly finding kinder things said about it. Only the other day, for instance, no less a person than Sir William Joynson-Hicks, in inaugurating a receiving set at the Borstal Institution at Hounslow, said that wireless had already had a wonderful effect upon the boys in other Borstal homes. There is not the least doubt that if you can lead the minds of the young to appreciate beauty you are going a long way to suppressing any vicious or criminal tendencies that may be present.

Changes in Talks

During the summer the listener does not desire instructional subjects, but rather those pertaining to summer life and its happenings. To hear the voices of the leaders of the athletic world is an undoubted attraction. To cater for this desire, I learn that the talks which follow the two general news bulletins will remain, but will, where previous commitments allow, be topicalised. The change comes at the 7.40 period, which will be given up to light music. But when some subject becomes the topic of the day, the most prominent person connected with this topic will be obtained to broadcast his or her views for the benefit of listeners.

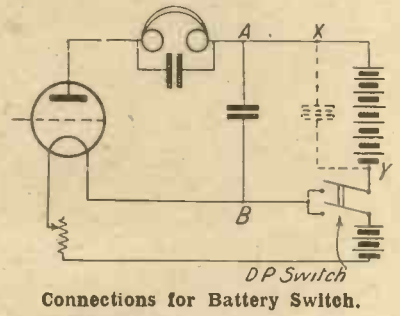
Further, it will be noticed that the 9.40 talk is frequently being curtailed and a short second talk introduced. Listeners will know then that when a 7.40 talk is notified or an extra one introduced after 9.30, they may look forward to hearing one of the great ones of summer activities.

THERMION.

PRACTICAL ODDS AND ENDS

Battery Switching

IT is always advisable to fit a battery switch to the receiver, especially if the valves used require delicate adjustment of the filament potential. When a switch is provided there is no need to touch the rheostat when the best setting has been found. A very convenient method of switching is that shown in the diagram. By arranging the switch as shown, both batteries are automatically cut out when it is opened, and the chances of current leakage when the set is not in use are minimised. Care should be taken to wire the H.T. condenser between the points A and B, as shown in solid lines in the figure. If it is placed as shown by the dotted lines between X and Y its dielectric material is always under the strain of the full high-tension-battery voltage. J. H.



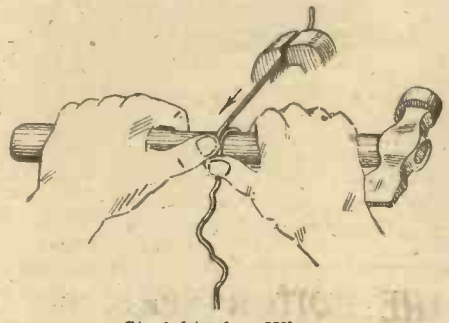
Connections for Battery Switch.

A Drilling Tip

IN order to prevent the drill passing right through a panel when it is desired to tap a hole, the following device may be adopted. Slip the drill through a small brass phone connector (in the form of a tube fitted with two milled-head screws), allowing only just the necessary amount to protrude. The connector, if screwed tightly in position, will prevent the drill going any farther than is desired. P.

Straightening Wire

IN order to get the best results from connecting up the receiver with square-sectioned wire, it is essential that the wire should be absolutely straight. It is not always easy to ensure this being so, for the wire is usually sold in coils, and seems to possess a natural inclination to form kinks and curves. The wire should always be stretched between a vice and the handle of a tool to remove the kinks, and it will also be found that the wire is increased in length by some 10 or 15 per cent. The diagram shows the method of straightening the wire, one end being held in a small vice and the other twisted once or twice round the handle of a hammer so



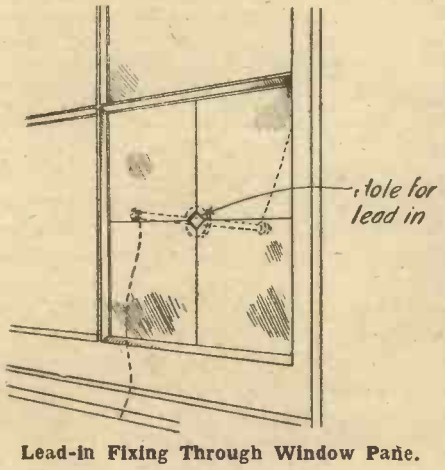
Straightening Wire.

that a strong hold on the wire may be obtained. B. H.

The Lead-in

DIFFICULTY is often experienced, when fixing the lead-in, in drilling a hole through the window pane. Undoubtedly the slight trouble is well worth while, for the wire lead through the glass is much more efficient than a lead-in through the wood surround. Here is a method of cutting the glass which does not necessitate special drills or files, though it is not applicable to large windows.

Remove the entire pane and cut it into four sections. One corner of each should then be cut away as shown in the diagram

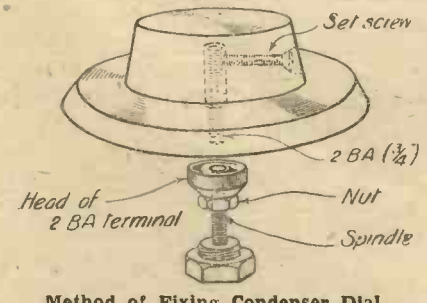


Lead-in Fixing Through Window Pane.

so that a slot will be formed for the leading-in wire when the window is reassembled Finally, an ebonite lead-in tube (of the type incorporating clamps) is fixed in position and the aerial and receiver are connected. G. B.

Fixing Condenser Dials

LARGE-DIAMETER dials, besides improving the appearance of a set, tend to facilitate tuning operations. It sometimes happens, however, that the spindle of a condenser to which it is desired to fix one of these dials is too short to engage the set-screw in the side of the knob. In such a case the head of a 2 B.A. terminal can be screwed on the end of the spindle and locked in position by means of a nut tightened against the terminal head. The latter then acts as a coupler between the spindle and an additional piece of screwed 2 B.A. rod similar to that of the spindle. The length of this rod will, of course, depend on the length of the main spindle and on the distance from the panel at which it is desired to mount the dial. Easiest readings are obtained when the



Method of Fixing Condenser Dial.

dial is close to the panel face, and, generally speaking, the length of the spindle extension is about ¾ in. H. P.

Avoiding Long L.T. Leads

MANY amateurs arrange their accumulators in a corner of the room, bringing the L.T. supply to the receiving set by means of long leads which run to a wall plug. There are two reasons why this method of connecting is unsatisfactory and likely to lead to poor results. First of all, long wires of any kind act as collectors of oscillations and may ruin the selectivity of an otherwise good set. Then the voltage drop when long leads are used, even if the wire is thick, is considerable. It may easily amount to as much as half a volt, an amount which cannot be spared when dull-emitter valves requiring 3.8 volts are worked from a four-volt accumulator. Long L.T. leads should be avoided, and the same applies to very long loud-speaker leads. For outdoor reception it is sometimes necessary to use these, but for normal working in the house they should be kept quite short. H.

The Complete Receiver.

A "ALL-E LOUD-SPE

Details of a five-valve s of all Continental

By J. J. MacKichan

TWO stages of tuned-anode high-frequency amplification, with multiple reaction, one detector, and two stages of low-frequency amplification are employed in the receiver to be described in this article. The receiver is designed expressly for the reception of programmes at any place in this country from any British or Continental broadcasting station at loud-speaker strength, with clarity, freedom from objectionable background, stability, and sufficient selectivity to ensure that all stations, with the exception of those working on wavelengths very close to that of the local station, can be received economically and with ease.

Linked Circuits

In most modern long-range receivers great care is usually taken to dispose the inductances so as to prevent, as far as possible, magnetic and electrostatic coupling between the various tuned circuits associated with high-frequency amplifying valves. In this receiver, on the contrary, all tuned circuits are linked together, magnetically and electrostatically, through the medium of reaction coils, with the following advantages.

(*a*) The application of reaction to each tuned circuit causes a great reduction in the effective resistances of the impedances of the tuned circuits. In consequence, tuning is sharp and selectivity is good.

(*b*) Between the sides of each reaction coil and each coil forming part of a tuned circuit there is electrostatic action, the effect of which is to neutralise the stray capacities of the valves and of the wiring. An auto-neutrodyne effect is thus obtained and the set is perfectly stable.

(*c*) There is remarkable freedom from high-frequency distortion, apparently due to the definite and uniform coupling between all tuned circuits comprised in the receiver.

(*d*) There is no difficulty in constructing the receiver so that it cannot be made to oscillate. In the instructions which follow, the design is such that the receiver cannot be made to oscillate on wavelengths between 250 and 350 metres. It can just be made to oscillate on wavelengths of 350 metres and above; but all stations will normally be tuned-in on the loud-speaker without the slightest necessity for causing the receiver to oscillate.

Special coils of new and original design are employed. They are of the single-layer type, and the wire is wound on a former 4½ in. long by 1 in. wide; the general shape of the coils is rectangular. That coils wound in this rather unusual way are not inefficient as regards their electrical properties and that they are in the "low-loss" category will be seen from the following table, in which particulars are given of measurements taken on coils covering the broadcast waveband.

Coil Number	*True Inductance Microhenries*	*Distributed Capacity Micro-micro-farads*	*Natural Wavelength Metres*	*Maximum wavelength with .0005 microfarad condenser in parallel*
25	56	14	75	310 metres
35	85	13	90	387 ,,
50	102	19	108	430 ,,
75	210	18	130	615 ,,
100	501	22	250	947 ,,

Novel Coupling

In the ordinary way inductance coils are coupled together face to face. These coils, however, are coupled together side to side as illustrated in Fig. 1 (see page 44); three coils are shown coupled together and reacting on each other. In the space E between coils B and C the electromagnetic field is shown, whilst the electrostatic field is shown in space D between coils A and B. Both fields are, of course, present on either side of and around coil B. If it be assumed that B is a tuned coil and that A and C are reaction coils, then A and C would be joined in parallel and so connected in the anode circuit of the detector valve that their electromagnetic fields would assist

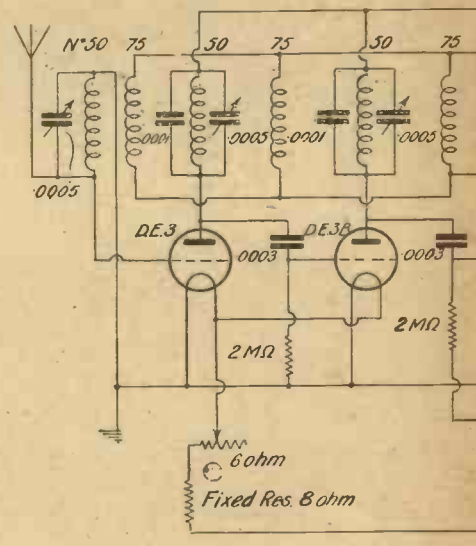
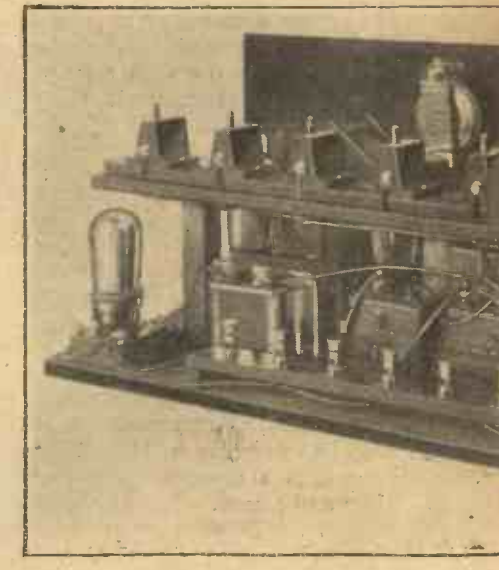


Fig. 2.—The Circuit Diagram of th

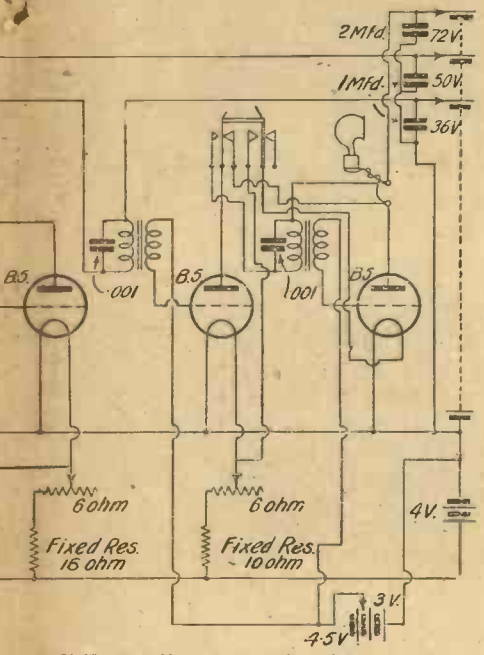


Another Rear View

AN "UROPE" AKER SET

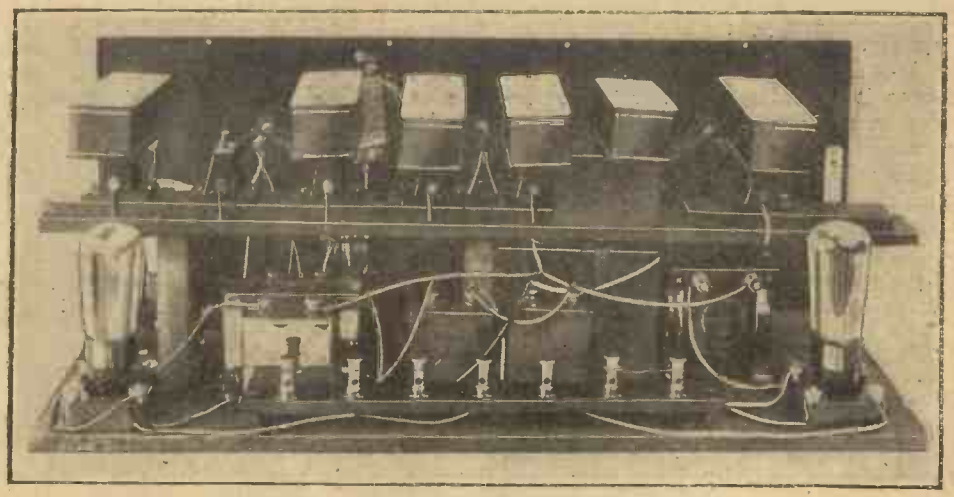
set designed for reception and B.B.C. stations

O.B.E., A.M.I.E.E.



he "All-Europe" Loud-speaker Set.

with Coils Removed.



Rear View (out of case) showing Coils in Position.

the field due to coil B. When this is done it is found that the electrostatic fields due to coils A and C tend to neutralise the interelectrode capacity of the valve whose anode is connected to coil B, provided that the spacing between the coils is such as to suit the type of valve used. In practice it is found that where two stages of high-frequency amplification are used, a fair amount of latitude as regards the type of valve is permissible if the coils are spaced at 2½-in. centres; that is, when the distance between the sides of adjacent coils is 1½ in. The actual measured value of the capacity between the sides of adjacent coils at this spacing is 18 micro-micro-farads.

From an inspection of the direction of the lines of force shown in Fig. 1, it will be apparent that if coil C be brought too close to coil B, the electromagnetic fields will oppose instead of assisting because the coupling will then take place through the interiors of the coils instead of in the space between their sides. This effect is immediately revealed by the flatness of the tuning of the variable condenser connected across coil B, due to the effective resistance of coil B being increased by the opposing fields of coils A and C.

When coils A and C are both assisting coil B and the coupling of the electromagnetic fields is taking place in the space between the coils, the tuning of the condenser connected across coil B is extremely sharp, the whole circuit is perfectly stable, and to cause it to oscillate is a matter of difficulty. In constructing the receiver, no difficulty in connection with the coupling of the coils will be experienced provided that the instructions regarding spacing of coils and other components and the method of wiring the circuit are strictly adhered to.

The Circuit

The circuit of the complete receiver is shown in Fig. 2. The low-frequency amplifier portion of the circuit requires no comment except as regards the method of switching in or out the second low-frequency amplifying valve. This is effected by means of an ordinary telephone switching key so wired as to disconnect the filament circuit of the last valve when the anode of the fourth valve is connected to the loud-speaker. When the key is thrown to the five-valve position, the anode of the fourth valve is transferred to the second transformer and simultaneously the filament circuit of the fifth valve is completed.

Three-volt .06 dull-emitter valves are employed throughout, and the filaments are controlled by three rheostats as shown. A fixed resistance is joined in series with each rheostat to ensure that the specified value of filament current shall not be exceeded.

The H.F. Amplifier

As regards the high-frequency amplifier portion of the receiver, it will be seen that the three reaction coils are joined in parallel in the anode circuit of the detector valve and so spaced as to react on each of the tuned coils. The two anode coils and the three reaction coils are plugged into single-coil holders spaced at 2½-in. centres. The aerial coil is plugged into a movable coil holder which, when in the position of maximum coupling, brings the centre of the aerial coil to within 2½ in. of the centre of the nearest reaction coil. It will thus be seen that the only variation which can be made in the coupling of the coils is that between the aerial coil and one of the reaction coils. In practice this proves to be sufficient.

It is to be carefully noted that the reaction coils are to be so connected in the anode circuit of the detector valve that they assist the rise and fall of the currents in the three tuned coils. This result will be achieved if the coils are connected as shown in the theoretical circuit diagram.

It will be observed that a .0001 fixed condenser is connected in parallel with the variable condensers in the tuned anode circuits (see Fig. 2). Although this is not essential, it is found to be of great benefit, inasmuch as it provides a vernier effect on the condenser tuning, and also causes the dial readings of stations working on wavelengths which are close together to be more widely separated. In ordinary long-range receivers these condensers would be regarded as a source of loss, but in this receiver such losses are more than compensated for by the methods of coupling employed; and the margin of signal strength available from the most distant stations is so great as to enable advantage to be taken of any means whereby the tuning of the receiver may be facilitated irrespective of the minor losses entailed.

A view of the front panel is shown in the photograph, and a dimensioned sketch showing the drilling centres is shown by Fig. 3. The material of the panel is best-quality Mahoganite, and the overall dimensions are 21 in. by 8 in. by $\frac{3}{16}$ in. thick.

The cabinet is of ½-in. mahogany and baseboard and having completed the wiring, to slide the complete assembly into the cabinet. The baseboard should be made from any suitable wood ½ in. thick, 20¾ in. long and 8½ in. wide. This ensures an easy fit.

It will be seen from the photographs that a narrow sub-panel or bridge is employed on which to mount the special coils. This bridge may be of wood ½ in. thick, 1¾ in. wide and 21 in. long, but in the receiver depicted the bridge is formed of two pieces of ebonite ⅜ in. thick. The longer piece of ebonite is 21 in. long by

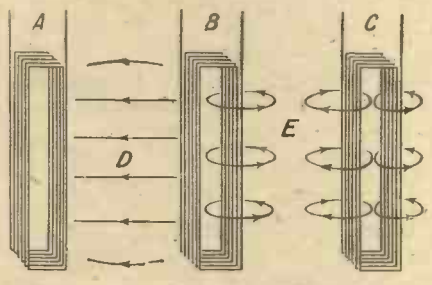


Fig. 1 (above).—Coupling Between Adjacent Coils.

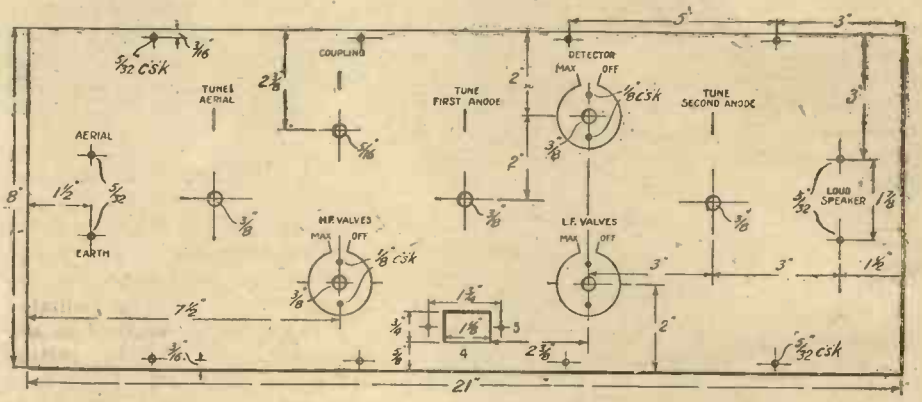


Fig. 3 (right).—Layout of Front Panel.

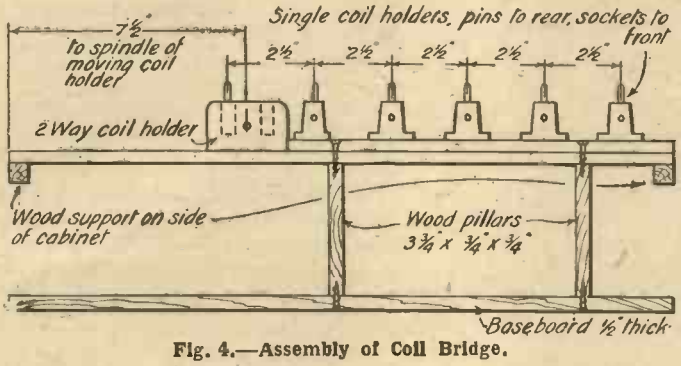


Fig. 4.—Assembly of Coil Bridge.

throughout, and the internal dimensions are as follow: Length, 21 in.; height, 8 in.; width from front to back, 9 in. The method of construction employed is to fit the front panel to a baseboard by means of panel brackets, and after having mounted all components on the panel 1¾ in. wide, and the shorter piece 12½ in. long by 1¼ in. wide. The longer piece extends from side to side of the receiver. The shorter piece is screwed to the top of the longer piece and extends from the extreme right of the long piece to a point 8½ in. from the left end of the long piece. The purpose of this short piece is to raise the tops of the single coil holders to the same level as the moving-coil holder. The assembly of the coil bridge is shown in Fig. 4.

J. J. McK.

(To be concluded)

THE B.B.C.'s THIRD ANNUAL REPORT

THE Third General Meeting of the British Broadcasting Co. is being held at the Hotel Cecil, London, on Thursday, July 8, and in the meantime the Third Annual Report has been issued, according to which the B.B.C.'s income from licences has been limited by the Postmaster-General to £500,000 for the year ending March 31, 1926, but out of this sum it has been possible to set aside the sum of £159,463 to capital and depreciation reserve; in other words, the sum mentioned has gone to the construction and equipment of station and premises, under which heading the total sum of £271,448 has been spent in the history of the company up to March 31. The half-million from licence fees represents all but £9,872 of the entire revenue, the balance consisting of sundry receipts, including net profit on publications. On the true revenue account there is an adverse balance of £4,350, as the expenditure on programmes, operating and administrative expenses and directors' fees have amounted to £514,222. The B.B.C. are, of course, well within their legal rights in giving no analysis of that expenditure, but at the same time we are sorry that they did not realise the extraordinary public interest in the expenditure side of their accounts, and satisfy to some extent a very reasonable curiosity.

The accounts show that an income tax reserve of £14,000, a provision of £4,916 for staff provident fund reserve, a transfer to capital and depreciation reserve of £50,000, together with the adverse balance already mentioned, have been taken from the balance of £79,684 existing on March 31, 1925, leaving of that balance the sum of £6,418, of which £5,307 is absorbed by payment of the maximum allowable dividend of 7½ per cent., the surplus of £1,110 being carried forward. Thus, on the face of them, the B.B.C. accounts show that the Postmaster-General, by restricting their revenue from licences to half a million, has not allowed them sufficient money to carry on with.

TREES AS AERIALS

IT is well to remember when using a portable wireless receiving set out of doors, on picnics, etc., that the nearest tree can sometimes be used in place of an aerial. This dodge was discovered by General Squier years ago. He found that by driving a nail into the trunk of a tree about four or five feet from the ground and connecting the nail to a receiver, very good reception could be obtained. The sap of the tree causes it to be conductive.

AERIALS THAT ARE WRONG

Some pitfalls that should be avoided when erecting aerials

IT is, of course, seldom possible for the amateur to erect an aerial which even approaches the ideal. At the same time, one cannot walk far through the suburbs of any large town without noticing a very large number of aerials which are not only bad, but far worse than they need be.

Now it is not to be supposed that anyone would willingly put up a bad aerial when, by taking little or no extra pains, a much better one could be erected. It must therefore be assumed that these aerials are poor simply and solely because

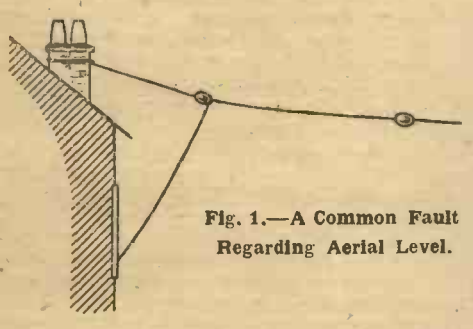


Fig. 1.—A Common Fault Regarding Aerial Level.

the erectors of them are not acquainted with the fundamentals of efficient aerial design.

The first principle that should be grasped is that the ideal aerial would consist of a perfectly straight vertical wire. As, however, the length of such a wire would be very short in the case of most aerials intended for broadcast reception, a "flat top" must usually be added in order to give the aerial the necessary capacity to earth.

Nearly Ideal

At the same time the ideal should be approached as nearly as possible even in the case of the inverted **L** aerial. That is to say, the down-lead should be taken from the lower end of the "flat top." Fig. 1 illustrates a common fault in aerials of this type, in which the down-lead end is higher than the free end. The higher above the surface of the earth that a point in the face of a wireless wave is situated, the greater will be the potential difference between this point and earth. Therefore in Fig. 1 the highest potential produced in the aerial circuit will be at the point where the down-lead joins the flat top. The free end of the aerial and the bottom of the down-lead will both have lower potentials, and therefore current will tend to flow from the point of attachment of the down-lead towards the free end of the aerial and towards the bottom end of the down-lead, or in the reverse directions according to whether the highest point of the aerial is at a positive or negative potential at the moment. In either case the currents in the two portions of the aerial will tend to neutralise each other.

Another mistake often made by amateurs is shown in Fig. 2. Here the down-lead is taken from the end of the flat top farthest from the receiving set. Although in this case the down-lead is attached to the lower end of the aerial, the whole arrangement is nevertheless bad.

How Waves Travel

A wireless wave may be regarded as a succession of positive and negative strains travelling through the ether. In the case of Fig. 2 (an extreme case) the bottom end of the down-lead is situated immediately below the free end of the aerial, so that if the wave front were perfectly vertical they would be at potentials of the same polarity at certain instants. This would result in the induced currents flowing either along both down-lead and flat top towards the point of attachment of the two, or away from this point, and thus again tending to counteract one another. Although in practice the wave front is not always quite vertical, the arrangement shown in Fig. 2 is decidedly bad practice.

We have now arrived at the following conclusions: The down-lead should be taken from the lower end of the flat top

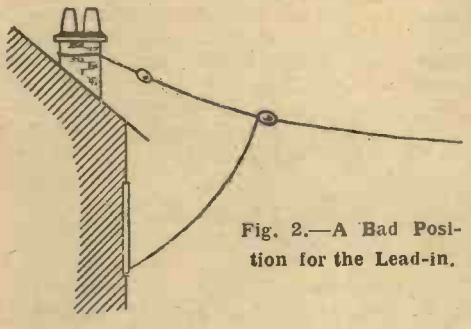


Fig. 2.—A Bad Position for the Lead-in.

portion of an inverted **L** aerial, and this end should also be the end nearer to the receiving instruments.

The error illustrated in Fig. 2 is often committed in an attempt to utilise the directional properties of the aerial. It should be understood that these are so little marked in the case of amateur aerials that they should only be considered after due attention has been paid to the points outlined above. That is to say, if the choice lies between a good aerial which will not be directional towards the desired station and a directional aerial which would be otherwise poor, it will always pay to erect the better aerial and to disregard what little directional properties it may possess.

Electrical Balance

Besides the inverted **L**, the only other type of aerial used by amateurs to any great extent is the **T**. As a matter of fact, only in very few cases can this method of construction be employed with advantage, as for best results it is essential that both arms of the **T** should be exactly balanced in an *electrical sense*.

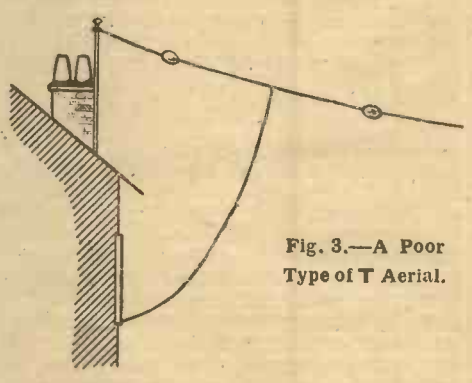


Fig. 3.—A Poor Type of T Aerial.

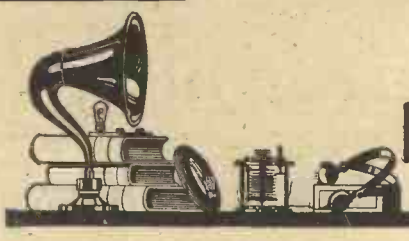
It is quite easy to balance them mechanically, that is, to ensure that they are of the same length, the same height above the surface of the ground, etc., but this is not sufficient. They should each have the same inductance and capacity, and the capacity will be affected by the presence of any conducting or semi-conducting bodies, such as buildings, situated beneath them.

Frequently, however, no attempt is made to balance the arms of the **T** beyond seeing that the down-lead is attached to the exact centre of the flat top. Aerials such as that in Fig. 3 are all too common. That this is not a good aerial will be at once appreciated by those who have read the remarks concerning inverted **L** aerials when it is realised that the **T** consists, to all intents and purposes, of two **L** aerials connected in parallel. In the case of the aerial illustrated both halves are bad. One of the component **L**'s corresponds to that shown in Fig. 1, while the other is like Fig. 2.

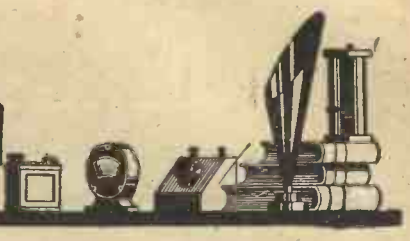
J. J. W.

The wireless club of Strassburg (Alsace-Lorraine) has installed a small telephony transmitter in that city; concerts, news, bulletins and lectures are broadcast twice weekly between 9.15 and 11 p.m. on Tuesdays and Thursdays.

That the wireless licence fee be increased to £1 a year, and that the B.B.C. should spend the extra revenue in paying star artistes adequate fees, is a suggestion made by Dame Clara Butt.



OUR INFORMATION BUREAU



RULES.—Please write distinctly and keep to the point. We reply promptly by post. Please give all necessary details. Ask one question at a time to ensure a prompt reply, and please put sketches, layouts, diagrams, etc., on separate sheets containing your name and address. Always send stamped, addressed envelope and attach Coupon (p. 56).

Polarity of Mains

Q.—*How can the polarity of D.C. mains be easily determined ?—S. B. (Cheshire).*

A.—Immerse the ends of leads connected to each side of the source of supply in acidulated water, keeping them a few inches apart. Owing to what is known as electrolysis the water will be decomposed and bubbles of hydrogen will be evolved at the negative lead. As each molecule of water contains two atoms of hydrogen to one of oxygen, twice as many bubbles will be given off at the negative lead as appear at the positive lead.—B.

Winding Variometer

Q.—*When winding the stator and rotor of a variometer is it correct to put half the total number of turns required on each former ?—L. C. (Belfast).*

A.—Your aim should be rather to have half the total inductance on each former. As the inductance of a coil, other things being equal, increases with the diameter of the turns, it will be necessary to put a few more turns on the smaller winding than are wound on the larger former. This means that the number of turns put on the rotor should slightly exceed those on the stator.—J. F. J.

Charging Accumulators

Q.—*I have started to charge my accumulators from the lighting mains. How can I tell when a battery is fully charged ?—S. R. (Southampton).*

A.—There are three indications. First, the voltage, read with the charging current still passing, should be about 2.6 volts per cell. This will drop to about 2.2 volts per cell after the battery has been disconnected for a little while. Secondly, the density of the acid, taken with a hydrometer, should be about 1.2 or a little higher when the cells are fully charged. This is the most reliable indication as to when the battery is fully charged but, of course, presupposes that the gravity of the acid was correct to commence with. Thirdly, the cells will "gas" freely when fully charged. This means that the acid will present an almost milky appearance owing to the formation of numerous bubbles of gas.—B.

Range of Morse and Telephony

Q.—*Why is the range of any receiving set much greater for morse signals than for telephony, supposing the transmitting station to be using the same power in either case ?—H. P. (Woolwich).*

A.—In the case of telegraphy the whole of the radiated energy is available for the transmission of the message. That is to say, the whole energy-flow from the transmitting aerial is completely interrupted between each element of the morse characters. As long as the energy received from the station is of an appreciable amount, therefore, the message can be deciphered by anyone acquainted with the morse code. With telephony it is different. A continual stream of energy is emitted by the transmitting station, the amount of which, however, varies in accordance with the sounds being transmitted. As the loudest sounds must not be allowed to interrupt the emission of energy altogether, the average amount of variation (or modulation) will be much less than the total emission and that corresponding to the weaker sounds will be but a small proportion of it. It is necessary, for the reception of intelligible speech, to hear all the sounds, loud, medium, and weak, and the distance at which this can be done will be much less than that at which the mere emission of energy could be detected. In the case of a valve set the difference between telegraphic and telephonic range will be even more marked than when an unaided crystal is used. The fact that the receiver may be oscillating is no bar to successful morse reception and even increases the sensitivity of the receiver.—J. F. J.

OUR WEEKLY NOTE

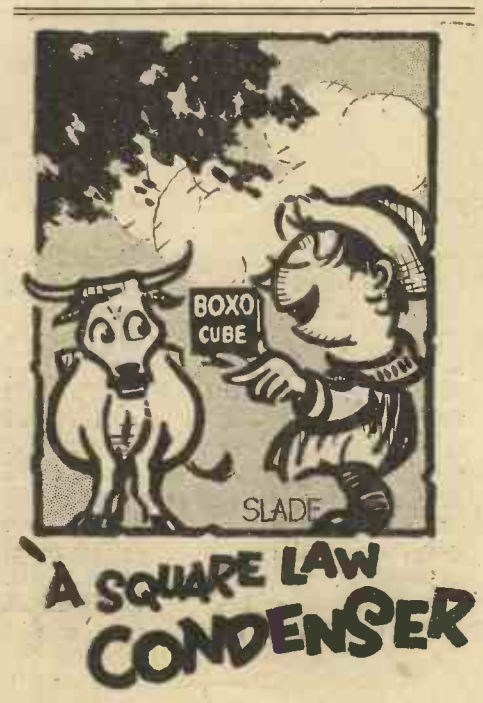
FAILING EMISSION

One seldom fails to recognise the symptoms that indicate it is time to have the L.T. battery recharged. Even if the interior of the valves is so coated with deposit that the brilliancy of the filaments cannot readily be ascertained, the falling off in signal strength and impossibility of obtaining a proper reaction effect soon lead one to suspect the accumulator.

When dull-emitter valves are employed, however, all the usual indications of a failing battery may appear, though the accumulator in fact proves to be in perfect condition and fully charged. When the battery runs down the result is, of course, that the filaments are not raised to the correct temperature and consequently the intensity of the electron stream passing from filament to plate is insufficient.

This reduction of the electronic emission will occur if the emitting properties of filaments deteriorate, even though the normal heating current is flowing through the filaments. The deterioration may be due to the valves having been run at too high a temperature, but in any case will inevitably occur after the valve has been working for a certain considerable length of time, presuming that the filament does not actually break before this point is reached.

THE BUREAU.



QSL

Q.—*What do the letters QSL, sent by a morse station after the transmitting of a message, mean ?—M. R. (Liverpool).*

A.—This is one of a number of internationally-recognised abbreviations and means "Please give a receipt." or "Please acknowledge receipt of the message just transmitted."—R. W.

Condenser Across Loud-speaker

Q.—*Why does the connection of a fixed condenser across the loud-speaker terminals alter the tone of the instrument ?—T. P. (Dublin).*

A.—Varying currents, such as those which operate the loud-speaker diaphragm, can pass through a condenser, but the ease with which they do so depends upon the "impedance" of the condenser with regard to them. This impedance depends not only upon the size of the condenser but also upon the frequency of the current concerned. The higher the frequency the greater will be the impedance. Therefore while the condenser acts as a by-pass across the loud-speaker for varying currents of any frequency the low frequency impulses will be diverted from the loud-speaker to a greater extent than will be the higher frequency impulses. It is to the proportion of the energy at different frequencies being altered that the change of tone mentioned by you is due.—J. F. J.

Using Voltmeter

Q.—*Why is it that when I connect a voltmeter across the filament sockets of an empty valve holder I get a reading nearly equal to the voltage of the L.T. battery while when a valve is inserted the reading is much lower ? Which shows the true voltage across the filament ?—H. R. T. (Eastbourne).*

A.—If you desire to ascertain the exact voltage applied across the ends of the filament, the former method is quite useless. The latter method will give the result required with more or less accuracy depending upon the construction of the meter employed. The actual voltage will be greater than that shown by the meter used as mentioned in the second case, but the difference will be infinitesimal in the case of a really suitable instrument. In order to understand why such different readings are obtained by using the voltmeter in the two ways mentioned it is necessary to remember that the filament circuit comprises a number of resistances in series and that the voltage drop across any one of them will be proportional to the value of this resistance compared with that of the others. The resistances comprise the internal resistance of the L.T. battery, the resistance of the leads to the set and the internal wiring of the latter, the resistance of the used portion of the filament rheostat, and the resistance of the filament wire itself. When placing the meter across the empty valve socket you have substituted the resistance of the meter winding for that of the valve filament. As the resistance of this winding is high the reading shown will be considerably higher than the voltage drop across the resistance of the filament, and to get this the valve must be inserted in the socket.—B.

THE VALVE IN GRAMOPHONE RECORDING

The valve has many uses apart from wireless; this article describes an application to gramophone recording.

DURING the past year or so considerable attention has been paid to the improvement in quality of speech and music as reproduced from loud-speakers. This condition has brought about considerable change in the design of loud-speakers and amplifying devices, the deficiencies of which in the latter are more easily recognised than in the former.

Type of Amplifier

It is, of course, generally recognised that the resistance amplifier predominates where quality is desirable. This statement holds good both as to the frequency characteristic produced by a resistance amplifier and also the wave shape. A well-designed resistance amplifier should have not more than a five per cent. drop in amplification at the lowest frequency on the audible scale, which we might regard as being 60 cycles per second. On the other hand, loud-speakers which reproduce low notes usually fail on the high, and *vice versa*.

With a well-designed amplifier, together with an equally well-designed loud-speaker, wonderful reproduction can be obtained from a receiver, provided the transformer is equally as good. One fact to be borne in mind when receiving broadcast telephony is that the voice or music when being transmitted is amplified many times before being put into the aerial. This distortion encountered during the process of amplification, together with the distortion produced in the receiver, is not at all conducive to perfect reproduction, but considering the tonal quality which can be obtained if sufficient care is exercised in the construction of the amplifier, we may consider that the acoustical problem of broadcasting is nearly settled.

How Wireless Principles are Adopted

Let us now see how wireless principles can be applied to gramophone reproduction. The ordinary gramophone utilising a mica diaphragm actuated by a stylus bar has an exceedingly limited range of reproduction, the range on the low end being limited to about 200 cycles per second. It becomes obvious from this that the low notes of the organ, bassoon, 'cello and other instruments producing low notes would not register on the record. Percussion instruments, such as the cymbals, sleigh bells, drums, etc., usually produced the most raucous noises or did not register at all. With a well-designed amplifier it has been found that, used in conjunction with a microphone of high quality or, better still, a condenser transmitter, all the notes on the audible scale down to about 50 cycles per second would register quite clearly and with a perfectly good wave shape.

Filtering Apparatus

It might occur to the reader that an ordinary resistance amplifier would be suitable for such a purpose. This may be so in many respects, but the other details of the amplifier must not be overlooked.

The instrument designed by the writer for electrical recording of gramophone records possesses many advantages heretofore not met in electrical-recording apparatus and amplifiers. The instrument in question has a network of filters which permits the accentuation or suppression of high, medium or low notes. Any particular band of notes or frequencies can be entirely suppressed, while others can be boosted to an astounding degree.

To the engineer the advantages of such apparatus become apparent immediately upon analysing the output of a record in an oscillograph. A further advantage of electrical recording is that a much greater magnitude of sound can be impressed upon the disc, thereby allowing a greater latitude to the recording engineer so far as cutting is concerned. The instrument in the accompanying photograph will also play the record under the same conditions as it was recorded. By this means any discrepancies in the recording can be immediately checked and rectified.

The apparatus required for electrical recording consists merely of a well-designed speech amplifier utilising a broadcast microphone of high efficiency, together with a suitable recording instrument which may conveniently follow the principles of the reed telephone. Such a unit can be used so as to actuate a crystal or needle to obtain the desired cut on the record. The accompanying photograph depicts an electrical instrument developed by the writer which has achieved success in the United States.

Operation

A row of four keys will be seen at the bottom of the panel. When the left-hand key is pressed down, together with a combined setting of the other keys, the apparatus is ready to record. The switch arm seen on the right of the panel serves to boost the low notes or suppress the high, or *vice versa*. When actuating this control, the effect is almost uncanny, as the high notes or low notes are boosted or suppressed as the operator desires. While a record is being made, the wave shape of the output may be watched continually in an oscillograph. Aural monitoring is also accomplished by switching the second key from the right, which monitors into the first or second stage of amplification. In such an instrument particular care must be paid to detail in design, and the valve must be regarded as a distortion device unless the source and load impedances are suited. At present, for obvious reasons, details of the construction of this instrument cannot be described, but it is hoped in the near future that details will be available so that the experimenter may conduct tests along such lines himself. W. H. F.

The Writer (standing) with his Electrical Gramophone-recording Apparatus.

Memo. to the Reader: I have personally arranged with American authorities for amateur British-built sets to be sent over the Atlantic to compete against American sets.

THE EDITOR, *Amateur Wireless.*

The Editor to The Reader

A Great International Set Competition

When I was in America in April and May, a most interesting challenge was thrown out to me. I was discussing matters with the Secretary of the Radio Manufacturers' Show Association and we were commenting upon the essential differences between American and British sets. He suggested that the American public would like to see a number of representative British receivers, as to which there was much curiosity but little knowledge. Suddenly we alighted upon the idea that there might be very active support for an international competition in which American and most certainly British amateur set-builders would take part, and in which it was hoped that French and German constructors might also be represented.

The upshot was that I expressed my willingness to take the responsibility of organising a British Elimination Competition for the purpose of finding 25 sets to send to New York to represent this country, and I now have pleasure in inviting every skilled home-constructor to take part in such an Elimination Competition.

I want valve sets of every kind, as long as they are well-designed, well-made and representative of thoroughly up-to-date practice. I do not mind what the origin of the set is, whether the design first appeared in the pages of AMATEUR WIRELESS, WIRELESS MAGAZINE or any other periodical, or whether the design has never been published at all. That is quite immaterial. Certainly, I do want readers of this paper to support the competition in great strength, and I want the designs published in this paper and in the WIRELESS MAGAZINE to be well represented too. But I want *every* home-constructor who has produced a set of outstanding quality to enter it for the Elimination Competition.

WHERE AND WHEN

I wish to send the 25 sets to the United States during the first week of August, that is, in not more than four weeks' time. There is, therefore, not a moment to lose. I propose to hold the Elimination Competition just as quickly as it can be organised. I have had prepared a printed entrance form and set of rules (there is nothing irksome in the rules), and what I want qualified readers to do is to send me straightaway an application for the entrance form and rules. These I shall send in duplicate—one entrance form to be returned completed with as little delay as possible, and the other to be retained for the competitor's reference.

Not until I have received the completed entrance form shall I be in a position to send the necessary printed labels, inasmuch as before I can decide where the sets are to be sent I must first form some idea, however approximate, of the number of sets there will be.

I want all the sets entered for the Elimination Competition to be on public view for a short time.

I repeat then: Let the qualified reader write me immediately for entrance form and rules. In due course I will send to him all the necessary information.

PRIZES

Twenty-five sets will be selected to go to the United States. The owner of each will be awarded by us a BRONZE MEDAL. The American organisers will distribute three prizes among the British Competitors, in addition to a certificate to each, and will award

AN INTERNATIONAL CUP OR MEDAL

for the best amateur-built set exhibited; whether by American, British or other nationals.

Should the International Prize be awarded for a British-built set that has passed through our Elimination Competition and been sent by us to the United States, then, in addition to the International Prize, we ourselves will award

A GOLD MEDAL SPECIALLY STRUCK FOR THE PURPOSE

So you see that the prizes are worth having and anybody may be well proud of them. I have great hopes that my readers will seize upon this opportunity of taking part in the first international competition of this sort that has ever been organised.

The rules which will be sent to every applicant will be found to cover, it is hoped, almost every possible contingency, and in themselves they are simple and encouraging, but perhaps there are a few points upon which I may make a public note.

AMATEUR WIRELESS and the WIRELESS MAGAZINE are responsible for the Elimination Competition only. The American authorities are responsible for the organisation and judging of the International Competition in the U.S.A.

No wireless manufacturer or salesman, no employee of any wireless manufacturer or salesman, and no other member of the wireless industry may compete; neither may any employee of the proprietors of AMATEUR WIRELESS and the WIRELESS MAGAZINE.

Do not send me the set until the proper formalities have been complied with; in other words, first apply for the entrance form, upon receiving it complete it, return it to me and await the supply of labels which I will send you.

The 25 sets selected to go to the U.S.A. will be sent and returned free of all expense to the competitors, and will be insured from the moment they leave London until they are returned to the competitors.

No crystal set is eligible.

Please post me immediately the application for entrance form and rules. Address your application to:

INTERNATIONAL COMPETITION,

THE EDITOR,
"Amateur Wireless,"
La Belle Sauvage,
Ludgate Hill, London, E.C.4.

"A.W." TESTS OF APPARATUS

Conducted in the "Amateur Wireless" Research and Test Department

Polarity Indicator

WE have received a very neat polarity indicator from Myers (London), Ltd., of 74 and 75, Fore Street, London, E.C.2. The indicator consists of a glass U tube, hermetically sealed at each end, and partly filled with a liquid which, we believe, consists of a solution of phenolpthalein and sodium sulphate. A terminal is mounted at each end of the tube and is connected to an electrode which dips into the solution.

One lead from the electric source, the polarity of which it is desired to find, is connected to one terminal, and the other lead from the source is applied to the second terminal just long enough until a red coloration appears at one of the immersed electrodes in the indicator.

If the voltage of the source is low a considerable time may elapse before the red coloration appears, but with a high-voltage source the coloration quickly forms. It is essential with a high-voltage source to apply only a brushing contact to the terminal of the indicator. The red coloration takes place at the *negative* electrode.

If the indicator is connected up to an alternating-current source both electrodes will show a red coloration.

Many uses may be found in wireless for this little instrument, among which may be mentioned the determination of the polarity of the output terminals to the phones or loud-speaker, or the polarity of the output terminals of battery-charging devices.

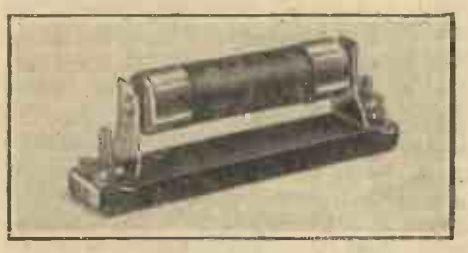
Igranic Tone Control.

Igranic Tone Control

THE IGRANIC ELECTRIC CO., LTD., of 147, Queen Victoria Street, London, E.C., are producing a variable resistance which may be used not only as a tone control, but for a variety of other purposes. In outward appearance the instrument resembles the variable grid leak manufactured by the same firm, the resistance in this case being variable from 0 to 1 megohm.

For use as a tone control the resistance is connected across the secondary of the low-frequency transformer, while for use as a damping resistance to stabilise an H.F. receiver, the resistance is placed across the tuned-anode coil. The conducting parts of the tone control are well separated from the control knob, thus eliminating hand-capacity effects. A single-pole fixing device is incorporated.

On test the variation in resistance was found to be exceptionally smooth between the minimum and maximum values and, when once set in any particular position, the resistance in circuit is very constant in operation.



Amperite Automatic Filament Control.

Amperites

WHERE controls are to be reduced to a minimum the rheostats of amplifying valves will be the first components to be eliminated. Some sort of automatic filament control, however, must be given to these valves if efficiency and economy are to be considered. For this purpose Amperites, obtainable from The Rothermel Radio Corporation of Great Britain, Ltd., of 24 to 26, Maddox Sreet, Regent Street, London, W.1, are to be recommended.

The Amperite works on the thermo-electric principle. In outward appearance the component resembles a fixed grid leak or anode resistance, and is mounted in clips. Each cartridge contains a specially treated filament hermetically sealed in a glass tube and surrounded by an inert gas. This filament possesses the unique property of automatically changing its resistance as the L.T. battery voltage changes, so that a practically constant current passes through the valve filaments. The valves are thus constantly operated at maximum efficiency.

Several types are made, Nos. 1A, 4V199, and 6V199. Type No. 1A is suitable for all 5-volt valves working off a 6-volt accumulator, also for 1.1-volt valves working off a 2-volt accumulator. Type No. 4V199 should be used for all 3-volt .06-ampere valves working off a 4-volt accumulator or 4½-volt dry cells, whilst type No. 6V199 is recommended for 3-volt .06-ampere valves on a 6-volt accumulator.

We have tested these self-adjusting resistances and have found them to be remarkably efficient. Not only are they efficient in themselves, but they also prolong the life of a valve by preventing the filament of the valve from being overrun.

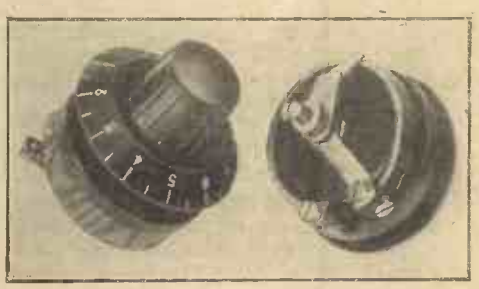
As each amperite is mounted in clips it is an easy matter to change the type should it be subsequently desired to use valves of a different filament voltage and current.

Penton Rheostats

THE Penton filament rheostat, illustrated in the accompanying photograph, is supplied with a very attractive knob and dial moulded in one piece and engraved from 0 to 10 over 300 degrees of the scale. To the dial is attached a spindle which passes through the one-hole fixing screw and operates the contact arm to which it is attached by a grub screw. The contact arm, which is laminated, can be so adjusted that the pressure gives a smooth motion and, at the same time, ensures a positive contact at all settings.

The resistance wire is carefully wound on a heat-proof composition which protects the panel from the heat dissipated by the resistance. Connections to the contact arm and to the resistance wire are brought out to screw terminals mounted on the side of the component. The rheostats are supplied in two resistances, 7 ohms and 30 ohms, and with each type a central one-hole fixing device is employed.

The 7-ohm rheostat is not only suitable for valves taking a heavy filament current, but will act admirably as a master rheostat to control simultaneously the filaments of several valves. The finish of the component is excellent and its sturdy construction is a guarantee of consistent functioning. We can thoroughly recommend the rheostats to our readers.



Penton Filament Rheostat.

On test we have found these rheostats capable of carrying heavy currents without overheating and damaging the insulation. They give a filament current control that is smooth and free from sudden jumps, whilst the maximum resistance of each of the samples submitted for test was well over the rated maximum value. The Penton Engineering Co., of 15, Cromer St., London, W.C.1, are the manufacturers.

Norman Notley

NEXT WEEK AT 2LO

By "THE LISTENER"

In the Programmes

ON Sunday at 3.30 p.m. the Band of H.M. 1st Battalion King's Own Yorkshire Light Infantry is to be relayed from the Granville Gardens Pavilion, Dover. The studio intervals will be provided by Dorothy Bennett and Dale Smith. There are few composers more popular than Liza Lehmann, and Sunday being her birthday anniversary, opportunity will be taken to perform her less familiar song cycle "The Daisy Chain," a cycle of twelve songs of childhood. The artistes are the Vocal Quartet, comprising Dorothy Bennett, Esther Coleman, Eric Green and Dale Smith. Chamber music will be given in the evening by John Barbirolli and his Chenil Players.

A lighter atmosphere prevails on Monday evening, when Mr. T. Sterndale Bennett will sing limericks to his own music. Later follows a short programme by the New Verrey's Orchestra, the soloists being Winifred Davis, soprano, and Arthur Salisbury, violinist. At 10 o'clock Mr. R. E. Jeffrey presents, by arrangement with Sir George Dance, a radio version of the famous old musical comedy *The Chinese Honeymoon*. It is a pity that one or two of the original cast could not have been persuaded to lend their aid.

A brilliant string combination, known as the Geoffrey Goodhart Sextet, under the direction of Alfred Cave, will be heard on Tuesday, supported by Sydney Coltham (tenor) and Leonard Hubbard (baritone). The 10 o'clock feature is a short recital by Salzedo, the famous harpist. Salzedo has written many works for his own instrument, and three will be included.

Another outside relay from the Pavilion, Buxton, is promised for Wednesday, where a big charity concert is taking place. The Manchester Augmented Station Orchestra will be conducted by Mr. T. H. Morrison, the soloists being those two well-known Manchester artistes, Lily Allen and Lee Thistlethwaite. Later follows a variety programme, which includes the vaudeville star Tex McLeod, spinner of ropes and yarns, and Philip Buchel's Trio in syncopated and dance numbers, the combination being saxophone, piano and drum. "Elsa the Wonder" is said to possess two voices, soprano and baritone. Other artistes include Edward Avis, an American bird imitator, Doris Bleach and partner from the Victoria Palace, and Clapham and Dwyer, cross-talk comedians.

Every listener remembers Edward Knoblock's famous play, *Milestones*. Since its first production by Dennis Eadie at the Royalty Theatre it has been revived and filmed, and now on Thursday Mr. R. E. Jeffrey will give a condensed radio version.

Variety turns fill the main bill on Friday, when recitations will be given by Ettie Persy French, syncopated numbers by the Two Bobs, and Datas, the Man of Memory, who was prevented from appearing previously by the strike, will teach us not to "forget to remember," while clever Ray Wallace will be heard again. Later Edward Clark, the musical director of the Newcastle station, will conduct the Wireless Symphony Orchestra.

Another appearance will be made by the new Radio Follies concert party on Saturday night, the artistes being Mamie Watson, Florence Oldham, Reg Palmer, Lawrence Anderson and Harold Kimberley. Later follows a relay from the Dome, Brighton, for the closing festival concert of the Brighton Competitive Musical Festival. The pianist of the week is again Niedzielski, the famous exponent of Chopin, who will continue the nocturnes and mazurkas.

Esther Coleman

WHA WIRELESS HAPPENINGS ABROAD

WITH reference to my recent remarks concerning French wit and German sensibility, Herr Ludwig Kapeller, editor of the well-known Berlin radio magazine *Funk*, has sent me an interesting letter, in which he says (translation): "You are perfectly right in wishing to guard against any over-sensitive national feelings in radio transmissions, nevertheless you must not forget that the word 'Boches,' which is hurled at Germans from France, upsets German feelings even to-day, and the word is still being used at the Parisian stations; as to the anecdote of the goat and the German having been broadcast, it is only to be expected that it would create painful feelings over here, for there is a boundary over which even the best wits should not transgress in radio transmissions, in recognition of international politeness, or, so far as we can see, closer association of the people and the furthering of a common world friendship will not be served." Of course, the Berlin editor's objections are reasonable enough; nevertheless, a joke is its own defence, especially if it is a good one, and, even if it does hit a little bit hard, can usually be taken philosophically. Good humour is an essential component in our natures; it is like a grid leak for the overflow of human passions!

Despite Teutonic admonitions, Radio-Paris continues to fire off smart anecdotes, certainly not all aimed at Germany! The other night a neat little one came over concerning New Yorkers and whisky which even made the imperturbable Parisian announcer laugh himself. Moreover, Georges Delamare in the "Journal Parlé" at the Eiffel Tower station is always "slipping in" to everybody, and certainly the Parisians themselves do not escape from his humorous attacks. After all, are we not often too dull and serious at our English stations? Why not make the people laugh and enjoy themselves?

Between twelve and one o'clock at night the Spanish stations, under good conditions, are simply splendid. What a classical old chime that clock has which sends out the midnight hour under the stars at Madrid! I was one of the lonely nocturnals who sat up to one o'clock the other night to tune-in the special international transmission from Radio-Catalana. It is only a 1-kilowatt station at Barcelona, but the English spoken was quite understandable, and the orchestral music came over very well; the Morse battle from the Spanish Armada in the Bay of Biscay was truly terrific. Very often at a late hour you can pick up some splendid, really romantic opera stuff from the Spanish stations.

(Concluded in third column of next page)

Measurement of Signal Strength

SIR,—I notice that Mr. P. D. TYERS in his article on the measurement of signal strength in No. 208 does not mention an expression which may be used to give a value for signal strength in terms of the shunt resistance and the impedance of the phones. The formula is that the signal strength $S = \frac{Rp + Rs}{Rs}$, where Rp = the resistance of the phones and Rs = the shunt resistance just necessary to eliminate the signal. For strict accuracy Rp should be the impedance of the phones at the average audio-frequency. Since, however, anything like the exact determination of Rs is very difficult owing to external noises, etc., the error in taking Rp as the direct-current resistance may be neglected.

On this scale moderate crystal reception gives a strength of about 30. A phone strength of 1,000 will provide comfortable volume on a loud-speaker in a small room.

It would certainly be found that the arbitrary values of signal strength found by the above formula would differ with different persons and different phones. For instance, if an inefficient pair of phones were used it might very well be found that a strength of 250 in these would give perfectly satisfactory volume on an efficient loud-speaker. The method is thus purely relative for a given operator and pair of phones.—P. R. B. (London, W.).

Crystal Purity

SIR,—May I be permitted to criticise your correspondent's observations on "Crystal Purity" in No. 210?

I think P. M. H. is wrong when he says that purity of reception on a crystal is no better than that with a valve, the former appearing better because signals are so much weaker.

Leaving theoretical considerations alone, may I ask P. M. H. if he has ever used a crystal in conjunction with a three- or four-stage amplifier correctly designed for the purpose? I think if he had, his conclusions would be reversed. Using such a receiver, telephony is as loud as on the best three-valve set (this refers to local reception up to twenty-five miles) and purity is unexcelled. I admit that excellent reproduction may be obtained with a valve detector, but not quite so good as with the crystal combination mentioned. Of course, what P. M. H. means by "a detector valve used under suitable conditions" is rather a debatable point, but if he means a high-impedance valve using anode rectification and no reaction, the purity of reproduction falls little below that of the crystal; but the valve is then less sensitive, and the only point in its favour is its constancy.—F. P. (Keighley).

Wireless Tele-duets

SIR,—There is a novel form of wireless entertainment which should, I think, be considered by broadcasting stations.

Vocal or instrumental duets might be sung or played at home or in a concert hall, one performer being at the broadcasting studio, while the other is at the receiving hall or private house.

A youthful violinist might be very glad to be able to say "I have played a duet with Albert Sammons, and a vocalist might take great pains to make himself or herself worthy of joining voices with a great singer.

The other listeners would, of course, hear only one of the parts, but they might be willing to put up with that for the sake of the stimulus given to domestic performances.

Incidentally, it would free broadcasting from the objection that it is reducing the spirit of private devotion to the musical art.—E. E. FOURNIER D'ALBE.

A Novel Catwhisker

SIR,—It is a source of much difficulty to locate the most sensitive part of a crystal with many of the ordinary catwhiskers, as they so easily slip when least expected. I have recently experimented with a piece of electric fuse wire with utmost satisfaction, as it bends easily and once resting on the crystal does not spring away, being very pliable and a first-class conductor.—ANCIENT ONE (Walthamstow).

Transformer Couplings

SIR,—I notice that C. W. S. in No. 211 states that the ideal method of coupling L.F. valves is one transformer stage followed by a number of resistance-capacity stages. I should like to point out that this is incorrect for the following reasons:

(1) Assuming the transformer to distort very slightly and the resistance capacity to be practically perfect, by putting the transformer first the distortion caused by this is being amplified.

(2) A transformer stage following the detector is not so sensitive to weak signals as a resistance-capacity stage.

(3) Smooth control of reaction is found to be easier with a high resistance in the anode circuit of the detector.

The best arrangement is one or more resistance stages followed by one good transformer stage. This has the additional advantage that a sensitive (high impedance) detector valve may be used without distortion.—R. S. (Clapham).

"W H A" (*continued from preceding page*)

Berlin, too, seems to be going in for plenty of opera, some of which is really quite classical and enjoyable. For example, a short while back they gave *Die Verkaüfte Braut,* or *The Bride who was Sold.* The Bohemian composer, Friedrich Smetana, full of the melody of his country, was born at Leitomischl in 1824; he studied at Prague with Liszt, and founded a school of music in that city. In 1856 he was a conductor at Gothenburg, and went on a musical tour through Scandinavia, returning to Prague in 1861, where a year or so later he obtained the position of bandmaster at the National Theatre. But in 1874 poor Smetana became deaf, a terrible thing for a genuine musician, and he died in a madhouse in 1884.

It seems that listeners in the south of France do not get the Paris stations so well as we do in England. A correspondent from Marseilles, writing in the *Haut-Parleur,* says: "I know of nobody in Marseilles who gets either the Petit Parisien or P T T stations. On the other hand, Radio-Paris is received very well. The Eiffel Tower is very difficult to get. I have only got it once very weakly on the phones and with three valves! The stations we hear best are Rome, Spain, Radio-Toulouse, Berne and London. I got Warsaw once, and have got Vienna many times." And he goes on to say it is practically impossible to cut out their local station, and that distant stations have only got a chance on two days a week when the local station is not transmitting. LYONS.

"Camera Work that Pays" is the title of an article appearing in the current issue of "The Amateur Mechanic and Work" (3d.), and gives hints to the amateur photographer so that he can make his hobby show a margin of profit. Other articles appearing in the same number are: "Making a Kitchen Coal-cabinet," "Six Kinks for the Metalworker," "Charging Accumulators from the Mains," "A Use for Sawdust as Fuel," "A Cigar-box Crystal Set," "A Safety Switch for Valve," "An Easy Way of Fixing Wires to Earth Switch," "A Novel Fire-screen," "Sound and Neat Soldering," "The Reflecting Telescope, and How to Use It," "Making Drawers Slide Easy," "Sharpening Scissors with a File," "Further Hints on Pillion-riding."

Datas, the "Memory Man," whose appearance before the microphone was postponed owing to the strike, has been booked for July 16.

THE oscillation evil is growing in the west of Scotland, and it is felt that drastic steps will have to be taken sooner or later by the authorities to check the nuisance.

A specially constructed wireless receiving set has been installed in the hospital at Hamilton (Lanarkshire) Poorhouse. The cost of the installation was over £100.

A microphone has now been installed in the tower of Glasgow University, and the bell is being relayed as an alternative time-signal to the chimes of Big Ben or Greenwich.

Dominion Day programme at Glasgow included a short sketch by Captain R. W. Campbell dealing with Canadian emigration, and a personal message from Sir George McLaren Brown, European general manager of the C.P.R.

The Prussian High School for Physical Development has erected a small transmitter at Spandau, in the neighbourhood of Berlin. It is to be used for scientific experiments in connection with the transmission of heart beats and other biological studies. For the present, transmissions are being effected on every Tuesday evening from 10.30 p.m. onwards on a wavelength of 300 metres.

It is stated that rapid progress is being made with the new high-power experimental station at Daventry. This station, as has been previously explained, is the prelude to the establishment of high-power stations by which it is hoped to provide listeners with a real opportunity of choosing alternative programmes.

The Neuchâtel Observatory daily broadcasts time-signals (through the Berne station) at 13.00, 16.00 and 20.00 B.S.T. The transmissions are made on a wavelength of 434 metres.

The Prague station now concludes its programme at 10 p.m. with a time-signal consisting of a long dash and six dots at one second interval.

Crystal control of the wavelength of transmitting stations is at present in use at six broadcasting stations in Chicago.

A wireless-controlled fog signal has now been permanently established on Rosneath Beacon, a light which marks a dangerous sandbank at the mouth of the Clyde.

The U.S.A. short-wave station 2XAF, which transmits on 32.79 metres, will continue to relay the WGY (Schenectady) programmes on every Tuesday and Saturday evening throughout the summer.

The U.S.A. Interior Department recently recommended that a wavelength of 1,034 metres should be allotted to aviation direction-finding stations, and that the entire band from 983 to 1,052 metres be exclusively set aside for the use of both shipping and aircraft.

On July 10, from 4 to 5.30 p.m., the B.B.C. will relay a programme by the band of the 2nd Bat. North Staffordshire Regiment from the Pavilion, Clacton-on-Sea.

For the "condensed" broadcast version of *Milestones* on July 15, Mr. R. E. Jeffrey has secured the assistance of the author, Mr. Edward Knoblock.

For the eleventh of the series of "Shakespeare's Heroines," to be given at the London studio on July 11, Miss Lilian Braithwaite will take the part of Hermione.

In an Elizabethan programme which was transmitted from the Glasgow station on July 6 was a 'cello solo, entitled "Heart's Ease," by an unknown composer, to which reference is made in Shakespeare's *Romeo and Juliet*.

The oboe d'amore was broadcast for the first time on June 30 from Glasgow. This instrument is now practically obsolete (there being only one known example in Scotland), but was frequently used by Bach and Handel. It was only recently discovered that Bach wrote a concerto for the oboe d'amore, and this work was played in the programme from the Glasgow station.

A novel broadcast from Glasgow took the form of a relay from the assembling point for many hundred children, who took part in a flower procession, headed by massed bands, to a large hospital in the city.

Highgate School is to give a school concert which will be broadcast on July 26.

It has been resolved by the committee for the Halifax appeal for the wireless equipment in local hospitals to aim at getting £2,000, that sum having been deemed necessary. The total received or promised so far is £1,409.

The Japanese Government are concluding arrangements for the erection of a high-power transmitter in the neighbourhood of Tokio.

Lady Forbes-Robertson will play "Katharine of Aragon," from *Henry VIII.*, at the London studio on July 18. This will be relayed by several stations.

Information regarding tests on reception made during the time when the phenomenon of the Aurora Borealis was active has been issued by the American Department of Commerce. In the north-western States a considerable falling off in strength was noticed. On wavelengths below 350 metres, in addition to the reception being weakened, marked interference was caused by prolonged hissing noises.

Over a hundred wireless sets are now in use in the New York wireless police scheme, which should be successful in reducing the number of law-breakers who successfully evade the law. Police reports will be broadcast from the station WNYC, and all police posts will thus be informed simultaneously of crimes, so that the arrest of fugitives will be expedited.

Train telephony is being considerably developed in Germany, and apart from expresses running between Berlin and Hamburg, international trains on the Berlin-Flushing and Berlin-Paris route are being equipped with apparatus for the benefit of travellers.

The eighteenth International Esperanto Congress will take place at Edinburgh between July 31 and August 7, when the members will discuss various ways and means by which the auxiliary language can be utilised for broadcasting.

Admirers of Mr. Albert Sammons will welcome him in a popular violin recital at the London studio on July 22.

The use of wavelength-governing crystals is being seriously considered by German broadcasting authorities, and tests are to be carried out extensively next month to determine whether it is possible by their use to reduce the number of wavelengths in Germany from the present twenty to some nine or ten.

The new Salamanca (Spain) broadcasting station EAJ22 has now resumed transmissions on a wavelength of 405 metres. Concerts are given from 17.00 to 18.00 and 21.00 to 23.00 B.S.T. daily.

Experimental transmissions on a wavelength of 395.8 metres are being made by the Prague station.

WOODEN LOUD-SPEAKER HORNS

THE many advantages in the way of purity of reproduction that are obtained by fitting wooden horns to loud-speakers in place of thin spun-metal horns are described in a free booklet issued by H. Maddison, of 2A, Ronalds Road, Holloway Road, Highbury, N.5. In it are illustrated and described hand-made oak and mahogany bells, flares and horns for loud-speakers. The horns are made in all sizes to fit all standard types of loud-speakers. The table grand Allwoodorn, a concealed-horn model to which any gramophone attachment can be fixed, is worthy of special attention.

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

GREAT BRITAIN

The times given are according to British Summer Time.

London (2LO), 364 m. 1-2 p.m., con.; 3.15-4 p.m., transmission to schools; 3.30-5.45, con. (Sun.); 4.15 p.m., con.; 5.15-5.55, children; 6 p.m., dance music; 7-8 p.m., time sig., news, music, talk; 8-10 p.m., music; 9.0, news (Sun.); 9.30 p.m., time sig., news, talk; 10 p.m., special feature (Mon., Wed., Fri.). Dance music on Thurs. and Sat. until midnight.

Aberdeen (2BD), 495 m. **Belfast** (2BE), 440 m. **Birmingham** (5IT), 479 m. **Bournemouth** (6BM), 386 m. **Cardiff** (5WA), 353 m. **Glasgow** (5SC), 422 m. **Manchester** (2ZY), 378 m. **Newcastle** (5NO), 404 m. Much the same as London times.

Bradford (2LS), 310 m. **Dundee** (2DE), 315 m. **Edinburgh** (2EH), 328 m. **Hull** (6KH), 335 m. **Leeds** (2LS), 321.5 m. **Liverpool** (6LV), 331 m. **Nottingham** (5NG), 326 m. **Plymouth** (5PY), 338 m. **Sheffield** (6FL), 306 m. **Stoke-on-Trent** (6ST), 301 m. **Swansea** (5SX), 482 m. **Daventry** (25 kw.), high-power station, 1,600 m. Special weather report 10.30 a.m. and 10.25 p.m. (weekdays), 9.10 p.m. (Sun.); 11.0 a.m., light music (exc. Sat. and Sun.); relays 2LO from 4 p.m. onwards, own con. on Mon. Dance music daily (exc. Sun. and Tues.) till midnight; on first Friday in each month until 2 a.m.

IRISH FREE STATE.

Dublin (2RN), 397 m. Daily, 7.30 p.m. Sundays, 8.30 p.m. until 10.30 p.m.

CONTINENT

The Times are according to the Continental system; for example, 16.30 is 4.30 p.m., and 08.00 is 8 a.m. B.S.T.

AUSTRIA.

Vienna (Radio Wien), 582.5 m. and 531 m. (temp.) (10 kw.). 11.00, con. (almost daily); 15.30, con.; 19.25, news, weather, time sig.; con., lec., news; 20.00, con.; 22.00, dance (Wed., Sat.).

Graz, 402 m. (1 kw.). Relay from Vienna. Also own con. (Tues., Wed., Fri.), 20.10.

BELGIUM.

Brussels, 487 m. (1½ kw.). 17.00, orch. (Tues., Thurs., Sat. only), news; 20.00, lec., con., news. Relay: Antwerp, 265 m. (100 w.).

DENMARK.

Copenhagen (Radioraadet), 347.5 m. (2 kw.). Sundays: 15.30, lec.; 17.30, children; 20.00, play; 21.15, news, con.; 21.15, news, Esperanto. Weekdays: 20.00, lec., con., news, con.; dance to 24.00 (Thurs., Sat.).

Ryvang, 1,150 m. (1 kw.). Sundays: 09.00, sacred service.

Odense, 810 m. Relays Copenhagen.

Sorö, 1,150 m. (1½ kw.). Relays Copenhagen.

FINLAND.

Helsingfors (Skyddskar), 504 m. (500 w.).

Helsingfors, 440 m. Con., 18.00 (Tues., Thurs., Sat., Sun.).

***Tamafors**, 368 m.

***Jyvaskyla**, 561 m. (200 w.).

***Uleaborg**, 233 m. (200 w.).

* Relay Helsingfors.

GRAND DUCHY OF LUXEMBURG.

Radio Luxemburg (LOAA), 1,200 m. Con.: 14.00 (Sun.), 21.00 (Thurs.).

FRANCE.

Eiffel Tower, 2,650 m. (5 kw.). 06.40, weather (exc. Sun.); 07.15, 08.00, physical exercises; 11.00, markets (exc. Sun. and Mon.); 11.20, time sig., weather; 15.00, 16.45, Stock Ex. (exc. Sun. and Mon.); 18.00, talk, con., news; 19.00 and 23.10, weather; 21.00, con. (daily). Relays PTT, Paris: 07.15, 08.00 (daily).

Radio-Paris (CFR), 1,760 m. (about 3 kw.). Sundays: 12.45, con., news; 16.30, Stock Ex., con.; 20.15, news, con. or dance. Weekdays: 10.40, news; 12.30, con., markets, weather, news; 16.30, markets, con.; 20.15, news, con. or dance.

L'Ecole Sup. des Postes et Télégraphes (PTT), Paris, 458 m. (800 w.). 07.15, 08.00, physical exercises; 14.00 or 15.00, studio con. or outside relay; 20.30, lec. (almost daily); 21.00, con. (daily).

Le Petit Parisien, 333 m. (1 kw.). 21.15, con. (Tues., Thurs., Sat., Sun.).

Radio L.L. (Paris), 350 m. (250 w.). Con. (Mon., Wed., Thurs.), 20.30.

Radio-Toulouse, 431 m. (2 kw.). 12.30, con., time sig. (daily); 17.30, news (exc. Sun.); 20.45, con.; 21.25, dance (daily).

Radio-Lyon, 280 m. (2 kw.). 20.20, con. (daily). Temporarily closed.

Strassburg, 200 m. (120 w.). 21.15, con. (Tues., Thurs.).

Radio Agen, 318 m. (250 w.). 12.40, weather, Stock Ex.; 20.00, weather, Stock Ex.; 20.30, con. (Tues., Fri.).

***Lyon-la-Doua**, 486 m. Own con., 20.00 (Mon., Wed., Sat.).

***Marseilles**, 351 m. (500 w.).

***Toulouse**, 280 m. (2 kw.).

***Bordeaux**, 411 m.

* Relays of PTT Paris.

Montpelier, 220 m. (1 kw.).

Angers (Radio Anjou), 300 m. (500 w.). Daily: 20.30, news, lec., con.

GERMANY.

Berlin, on both 504 and 571.5 m. (4 kw.). 06.30, con. (Sun.); 09.00, sacred con. (Sun.); 11.00, con. and tests; 12.55, time sig., news, weather; 15.00, educ. hour (Sun.), markets, time sig.; 17.30, orch.; 20.30, con., weather, news, time sig., dance music until 24.00 (Sat., Sun., Thurs). Relayed on 1,300 m. by Königswusterhausen (1,300 m.) and Stettin (241 m.).

Königswusterhausen (LP), 1,300 m. (8 kw.). 11.30-12.50, relays Berlin (Sun.); 15.00, lec. (daily); 18.30, relay of Berlin (Vox Haus) con. (daily). 2,525 m. (5 kw.), Wolff's Buro Press Service: 06.45-20.10. 2,880 m., Telegraphen Union: 08.30-19.45, news. 4,000 m. (10 kw.), 07.00-21.00, news.

Breslau, 417 m. (4 kw.). 12.00, con. (daily), Divine service (Sun.); 12.55, time sig. (Sun.), weather, Stock Ex., news; 16.00, children (Sun.); 17.00, con.; 19.00, lec.; 20.30, con., weather, time sig., news, dance (relays Berlin). Relay: Gleiwitz, 251 m.

Frankfort-on-Main, 470 m. (1½ kw.). 08.00, sacred con. (Sun.); 11.55, time sig., news; 12.55, Nauen time sig.; 16.00, con. (Sun.); 16.30, con.; 18.00, markets, lec.; 20.00, lec., con., weather. Dance: relays Berlin. Relay: Cassel, 273.5 m.

Hamburg, 392 m. (4 kw.). Relayed by Bremen (279 m.), Hanover (297 m.), Kiel (230 m.). Sundays: 07.25, time sig., weather, news, lec.; 09.15, sacred con.; 13.15, con.; 18.00, con.; 19.15, sports, weather, con. or opera, dance. Weekdays: 05.45, time sig., weather; 07.00 and 07.30, news, weather; 12.55, Nauen time sig., news; 14.00, weather, con.; 16.15 and 18.00, con.; 19.00, lec.; 19.55, weather and con.; 22.00, dance (Sun., Thurs., Sat.).

Königsberg, 462 m. (1 kw.). 09.00, sacred con. (Sun.); 12.55, time sig., weather, news; 16.30, con.; 17.00, con. (Sun.); 19.30, lec.; 20.00, con. or opera, weather, news, dance (irr.).

Leipzig, 452 m. (3 kw.). Relayed by Dresden (294 m.). 08.30, sacred con. (Sun.); 11.00, educ. hour (Sun.); 12.00, con. (daily); 12.55, Nauen time sig., news; 16.30, con., children (Wed.); 20.15, con. or opera, weather, news, cabaret or dance (not daily).

Munich, 485 m. (3 kw.). Relayed by Nuremberg (340 m.). 11.30, lec., con. (Sun.); 14.00, time sig., news, weather; 16.00, orch. (Sun.); 16.30, con. (weekdays); 18.30, con. (weekdays); 19.15, lec.; 19.30, con. (Sun.).

Munster, 410 m. (1 kw.). Relayed by Elberfeld (259 m.), Dortmund (283 m.). 11.45, radio talk, Divine service; 12.00, news (Sun.); 12.30, news (weekdays); 12.55, Nauen time sig.; 15.30, news, time sig.; 16.00, con.; 17.00, children (Sat.); 19.40, news, weather, time sig., lec., con.

Norddeich (KAV), 1,800 m. 24.00 and 04.00, weather and news.

Stuttgart, 446 m. (1½ kw.). 11.30, con. (Sun.); 16.30, con. (weekdays); 17.00, con. (Sun.); 18.30, time sig., news, lec., con. (daily); 21.15, time sig., late con. or cabaret.

HOLLAND.

Amsterdam (PCFF), 2,125 m. (1 kw.). Daily: 06.35-15.30 (exc. Mon. and Sat., when 12.30-13.30), news, Stock Ex.

Hilversum (HDO), 1,060 m. (5 kw.). 09.00, sacred service (Sun.); 19.10, con.; 21.00, news, etc.

ITALY.

Rome (IRO), 425 m. (3 kw.). 10.30, sacred con.; 13.15, official communique; 17.00, children; 17.30, relay of orch. from Hotel di Russia; 17.55, news, Stock Ex., jazz band; 20.30, news, weather, con.; 22.15, late news.

Milan, 320 m. (2 kw.). 20.00-23.00, con., jazz band.

NORWAY.

Oslo, 382 m. (1.2 kw.). 11.00, Divine service (Sun.), Stock Ex. (weekdays); 19.15, news, time, lec., con.; 22.00, time, weather, news, dance relayed from Hotel Bristol, Oslo (22.30-24.00, Sun., Wed., Sat.).

Bergen, 358 m. (1½ kw.). 19.30, news, con., etc.

SPAIN.

***Madrid** (EAJ6), 392 m. (1½ kw.). Daily: con. (times vary daily). Closes at 24.00 on Sun., Wed., Sat.

***Madrid** (EAJ7), 373 m. (4½ kw.). 17.30-24.00, con. (almost daily).

***Madrid** (EAJ4), 340 m. (3 kw.). 16.00, con.

*The Madrid stations are again working to a rota, varying time of transmissions daily.

Barcelona (EAJ1), 324 m. (1 kw.). 17.00-21.00, news, lec., con. (Sun.); 18.00-23.00 (daily).

Barcelona (Radio Catalana) (EAJ13), 462 m. (1 kw.). 19.00-23.00, con., weather, news.

Bilbao (EAJ9), 415 m. (1 kw.). 19.00, news, weather, con. Close down 22.00.

Bilbao (Radio Vizcaya) (EAJ11), 418 m. (2 kw.). 22.00-24.00, con. (daily).

Cadiz (EAJ3), 357 m. (550 w.). 19.00-21.00, con., news. Tests daily (exc. Sun.), 24.00.

Cartagena (EAJ15), 335 m. (1 kw.). 20.30-22.00, con. (daily).

Seville (EAJ5), 357 m. (1½ kw.). 21.00, con., news, weather. Close down 23.00.

Seville (EAJ17), 300 m. 19.00-22.00, con. (daily).

San Sebastian (EAJ8), 343 m. (500 w.). 17.00-19.00, 21.00-23.00 (daily).

Salamanca (EAJ22), 405 m. (1 kw.). 17.00 and 21.00, con. (daily). Closes down 23.00.

Saragossa, about 325 m. Testing.

SWEDEN.

Stockholm (SASA), 430 m. (1½ kw.). 11.00, sacred service (Sun.); 12.30, weather; 14.00, con. (Sun.); 17.00, children (Sun.); 18.00, sacred service; 19.00, lec.; 21.15, news, con., weather. Dance (Sat., Sun.), 21.45.

SWITZERLAND.

Lausanne (HB2), 850 m. (1½ kw.) (temp.). 20.00, lec., con. (daily).

Geneva (HB1), 760 m. (2 kw.). 20.15, con. (daily).

Berne, 435 m. (2 kw.). 10.30, organ music (exc. Sat.); 16.00, 20.30, con.

Basle, 1000 m. (1½ kw.), con. daily. 20.30

[*Owing to the demands upon our space a few of the less important stations are not given in this issue.*]

HEADPHONES

. All 4,000 ohms.

N. & K. GENUINE. See name in full on outside cases, new Lightweights, 11/6. Extra quality do., 13/6. . . . DR. NESPER, unapproachable value, adjustable, wonderful tone, 12/11. . . . DO. TELEFUNKEN (20/- model), limited number at 14/11, adjustable, genuine. . . . "BRUNET," stood the test of years, need no boosting, 11/9, 12/11, 14/6, 3 models. . . . ERICSSON EV CONTINENTAL, still as good as ever, exquisite tone, sample pair, 8/1.

BRITISH HEADPHONES

BROWN'S FEATHERWEIGHT, 20/-. BROWN'S A TYPE (Reed), 30/-. B.T.H., 20/-. STERLING, 20/-, 22/6. WESTERN ELECTRIC, 20/-. All makes stocked.

SUNDRIES.

Newey 2-way geared coil stand, 6/6. 4 point condenser, 17/6. 15/-. "B.I." New Type Aerial Tuner, 39/6. Gambrell Neutrovernia, 5/6. Seamark Connode, 19/6. U.S. Super, L.F., 18/6. Voltmeters D'ble rdg. 7/3. H.F. Transformers all wavelengths. Magnum, 7/-. Stradia 6/6, Bowyer-Lowe, 7/-, McMichael, 10/- (A. 7, 12 6). Var. grid Leaks, Bretwood, 3/-. Watmel, 2/6. Anodes B., 3/-. W., 3/6. Woodhall L.F., 23/6. Valve Holder, 2(6.

SETS OF PARTS.
(Well-known Circuits).

ST. 100, 84/-. Twin-valve, Loud Speaker, 80/-. One-Valve Reflex, 41/-. Efficient valve set 30/-. All-Concert De Luxe, 118/-. Simplicity 3, 62/-. Less Box Panel and valves.

LISSEN Coils, 50x, 6/-; 60x, 6/4; 75x, 6/4; 250x, 9/9 for super selective and neutrodyne circuits. All Lissen parts stocked.

"ESSANCO" MOUNTED COILS. —Made under Burndept Licence. Patent No. 168249. No. 25, 35, 50, each 2/-; 75, 2/6; 100, 3/-; 150, 3/-; 200, 250, 300, each 4/-.

IGRANIC - PACENT. Potentiometer, 2/6; 6 or 30 ohms Res., 2/6.

LISSENOLA LOUD-SPEAKER UNIT. 13/6.

VARIABLE CONDENSERS.—Polar Standard, 10/6. Junior, 5/6 each. Bowyer-Lowe Popular, 10/6. Igranic, 24/-, 21/-. Collinson's Low Loss, 21/-, 20/-. Utility, 8/6, 10/9. Vernier 2/6 extra. Utility Low Loss, stocked .0003 and .0005. J.B. (Jackson Bros.). Square Law, .001, 9/6; .0005, 8/-; .0003, 7/-; with vernier, 4/- each extra. Geared, .0005, 15/-; .0003, 13/-; Low Loss, 10/6, 9/-.

FIXED CONDENSERS.—Dubilier, .0001, 2, 3, 4, 5, each 2/6. .001, 2, 3, 4, 5, 6, each 3/-. Grid Leak. 2/6. Edison Bell, .001, .0001, 2, 3, 4, 5, 1/-; .002, 3, 4, 5, 6, 1/6. .0003 and grid leak, 2/-. McMichael with clips, .0001 to .0005, 2/6 each; .001 to .006, 3/- each. Watmel, .0003 and grid leak, 2/6.

MARCONIPHONE.—Auto Series Par. Variometer, 16/-. Sterling Non Pong V.H., 3/6. Velvact Potentiometer, 9/-. Ideal L.F. Transformers, 30/-. (2-7-1, 4-1, 5-1, 8-1). Ideal Junior L.F., 21/-. Var. Res. 40,000 ohms, 8/6; H.F. Choke up to 4,000 metres, 10/6. Sterling Baby L.S. 50/-. Sterling Dinkie, 30/-. "Minikon" S.L.V. Condenser, .00025, 21/-, .0005, 24/-; .001, 30/-.

VALVES.—Cleartron C.08 or C.15, 12/6. Power 6v., C.25, 15/-. Cosmos S.P. 18 Red or Green, 12/6. New Blue Spot, 12/6. All Mullard, Ediswan, Osram, Marconi, Cossor stocked. Bright D.E. and Power, 8/-, 14/-, 15/6, 16/6, 18/6, 22/6, 24/6, 30/-, £2. Mullard P.M.4, 22/6. Do. P.M.3, 16/6. 1 burnt-out valve taken in part exchange for any of above. Usable valves exchanged.

L.F. TRANSFORMERS. Ferranti A.F.3, 25/-; A.F.4, 17/6; Eureka Concert, 25/-; 2nd Stage, 21/-; Baby 1st or 2nd, 15/-; Reflex, 15/-. Formo shrouded, 10/6. Success (Black), 21/-. Royal, 20/-. Ormond newest model, 15/6. Wates' Supra, 10/6. Croix 5-1, 3-1, 4/6. Marconi "Ideal," all stages, 30/- each. C.A.V., 15/-. Pye, 22/6. Gambrell 2 stages, 25/6. Ideal Junior, 20/-.

ITEMS OF INTEREST.—Cosmos Blue Spot, 12/6. Dimic Coils, 10/-; Base 2/6 (usual wavelengths). Igranic Pacent .0005, 18/6. Igranic Pacent .0003, 14/6 (new S.L.F. variable). Amplifex Frame Aerials, 70/-.

IN STOCK ALL NEWEST MAKES OF VALVES.

I STOCK EVERYTHING YOU REQUIRE — SPACE LIMITED — MAKE OUT YOUR LISTS AND I WILL QUOTE YOU LOWEST INCLUSIVE PRICES.

WITH VERNIER 1/- each extra. Post 6d.

LOW LOSS SQUARE LAW

This variable Condenser is simply marvellous value. It cannot be equalled in price or quality.

.0005, 4/11 .0003, 4/9

SPECIAL DISTRIBUTOR of

Ormond Products

SQUARE LAW LOW-LOSS, .0005, 9/6; .0003, 8/6 (1/6 each less no vernier). FRICTION GEARED, .0005, 15/-; .0003, 14/6; .00025, 13/6. STRAIGHT LINE FREQUENCY FRICTION GEARED, .0005, 20/-; .00035, 19/6. FILAMENT RHEOSTATS DUAL, 2/6; 6 ohms or 30 ohms, 2/-. POTENTIOMETER, 400 ohms. 2/6. L.F. SHROUDED, latest model, 17/6.

CLUBS AND TRADE SUPPLIED.

KAY-RAY

WONDERFUL VALUE IN STRAIGHT LINE FREQUENCY

CONDENSERS

LATEST MODEL NOW READY

With knob & dial.	Post 6d. set.
·0005 - -	8/11
·0003 - -	8/3

This true Straight Line Frequency Condenser will amazingly improve the selectivity of any set. Sturdily built. Electrically and mechanically right—meeting all requirements of low loss design. Mount this real Straight Line Frequency Condenser in your set NOW and experience the joy of quick, certain tuning.

WILL TAKE ANY SLOW MOTION DIAL. SUPREME SELECTIVITY.

SETS FOR THE MILLION

Sets complete with following accessories—

Long distance 2-valve L.F. and Detector Receiver in handsome polished cabinet; includes set as shown, 1 power, 1.06 D.E. valves, tuning coils, H.T. 60v., L.T. 3, Aerial Equipment, H.T. & L.T. Leads, 2 pairs of 4,000 ohms phones, or LOUD SPEAKER (Marconi Tax Paid).

£4 - 10 - 0

Also new circuit specially adapted for use in flats, etc.

With indoor aerials,

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Carr. and Packing, 5/-

DUAL VARIABLE CONDENSERS FOR ELSTREE SIX

·0005 - 12/11

ALL PARTS SOLD.

CALLERS COLUMN

Post Orders accepted from same over 10/- in value, 9d. post extra.

ACCUMULATORS.—2 v. 40, 7/11; 2 v. 60, 9/6; 2 v. 80, 12/6; 2 v. 100, 14/6; 4 v. 40, 13/11; 4 v. 60, 17/11; 4 v. 80, 23/6; 6 v. 60, 26/6; 6 v. 80, 35/6. ALSO another good make, 1/6 extra on each of above.

Switch Spade Terminals for H.T., L.T., etc., 1/6 pr. Spade tags, 6 a 1d. Spade screws, 2 for 1½d. Red or Black, 3d. pr. Ins. staples, 5 a 1d. Ormond screws and nuts, 2 a 1d. Switch arms and studs, 1/-. Nickel, 1/4. Wander Plugs, 2d., 3d., 4d. pr. Plug and socket, red and black, 3d. to 1/- pr. Twin Flex, red and black, 12 yds., 1/6. Miniature Silk, 6 yds., 6d. Ins. hooks of egg insulators, 2 for 1½d. Aerial wire, 7/22, 100 ft., 1/11. Extra heavy weight, 2/3. Stranded aerial, 100 feet (49 strands), 1/3. Also "Wonder" aerial multiple strands phosphor bronze, 110 feet, 2/11.

D.C.C. wire per ¼ lb., reel 20 g., 9d.; 22 g., 10d.; 24 g., 11d.; 26 g., 1/-; 28 g., 1/1. Tinned copper, 1/16 sq. Bus bar., 12 feet, 6d. Empire tape, 12 yds., 6d. Earth Tubes, Copper, good value, 1/11. Climax, 2/3, 5/-. Sets of 5 Coils (Dickenson Patent), air spaced, 25/30/50/75/100, 1/9 set. Mounted Coils, very efficient, all makes lowest prices.

EVEREADY 66 v., 12/6; 108 v., 21/-. L.T.3 for D.E. Valves, 7/6. SIEMENS H.T. 60 v., 12/6. Hellessen's 60 v., 14/6. Various 1.5 D.E. Batteries, 1/6 to 2/6.

EBONITE.—"Grade A," cut while you wait, 3/16 at halfpenny per sq. inch. ¼ in. at three farthings. Scrap ebonite on sale.

CRYSTAL DETECTORS (enclosed). —High class, 9d., 1/-, 1/3, 1/6, 1/9.

MICROMETER. Nickel, 1/9. Permanent, 2/6. Mic.-Met., 4/6. All well-known makes stocked. Crystals. SHAW'S GENUINE HERTZITE in a sealed box with signature.

RADIO MICRO. .06 Special, 6/11. Power, 8/11. 2 volt, 6/11. Various .06 valves, 4/11, 5/11. Power valves D.E., 7/11, etc. 1 valve L.F. Amplifier in polished box, beautifully made, 18/11. 2 valve do., 31/11. Handsome crystal sets, variometer tuning, 10/11, 12/11.

BARGAIN DEPT.

Huge quantities of window-soiled and goods which have been taken in exchange for sale at ridiculous prices. Bargains not sent by post.

SPECIAL OFFER in Oak, American Type, hinged lid, Cabinets, with baseboard for 12 x 7 panel, 8 in. back to front, 9/6. Also 12 x 9, 10/11; 16 x 8, 16/11.

Portable Aerials, fix up anywhere, copper, with Ebonite insulators (100 ft. total), length 12 ft., 3/11.

H.T. BATTERIES, 60 v., 5/11; 100 v., 11/6. "Adelco" 60 v., 6/11; 100 v., 12/3. "A B" 60 v., 6/3; 100 v., 11/9.

4.5 Flash Lamp Batteries, 6d. line, 6 for 2/9. "A B," 3 for 1/-; 4 for 1/3. Vario s, per dozen, 3/8, 3/9, 3/11, 4/3.

SUNDRIES.—Adhesive Tape, 4d. 8 drills, 1/3. 5 Spanners, 6d. Taps, 0, 2, 4, 6 B.A., 1/11. Screwdrivers, 8d. Breast Drills, 0-¼ chuck, 3/11. Screw Wander Plugs, 3d. pair. Extra quality, 4½d. and 6d. pr. Valve windows nickel, 4½d. and 6d. Basket coil holders, 10½d., 1/-. 6 ft. phone cords, 1/-, 1/3, 1/6. Loud Speaker Cords, 1/6, 1/11. Empire Tape, 12 yds., 6d. Panel brackets, 6 in., 10d. pr. . . .

COILS.—Mounted inductance, 25, 1/-; 35, 1/4; 50, 1/9; 75, 2/-; 100, 2/-; 150, 2/4; 200, 2/8; 250, 2/10; 300, 3/2. MOUNTED AIR-SPACED.—25, 1/2; 35, 1/4; 50, 1/8; 75, 1/11; 100, 2/-; 150, 2/6; 200, 2/10; 250, 3/-; 300, 3/3; 400, 3/6.

ALL PETO SCOTT'S PARTS SOLD HERE

K. RAYMOND

27 & 28a, LISLE ST., Leicester Sq., W.C.2.

Hours 9-8
Sat. 9-9
Sun. 11-1

Back of Daly's Theatre,
Nearest Tube, Leicester Square.
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TWO NEW VALVES

G.P 4 GENERAL PURPOSE AND P.V. 4 POWER VALVES— for use with 4-volt accumulator *(or three dry cells).*

The salient features of these ideal companion DULL EMITTERS are, economy of consumption—a longer lasting accumulator charge and high efficiency—clearer, better reception—with louder volume.

You can identify G.P.4 and P.V.4 by:
(1) The clear glass Inspection "Window."
(2) The Wafer Disc—a hallmark.
(3) The Seal—ensuring the valve being unused after final test in the Ediswan laboratories.

SPECIFICATIONS

EDISWAN G.P. 4	EDISWAN P.V. 4
Volts, 3·5–4	Volts, 3·5–4
Amps., ·15	Amps., ·35
Plate Voltage, 60–120	Plate Voltage, 60–120
Amplification Factor, 12	Amplification Factor, 6
Slope, ·55 Ma/v	Slope, ·65 Ma/v
Imped'ce, 22,000 Ohms	Impedance, 9,500 Ohms
G.P. 4.—General Purpose dull emitter. Low current consumption. Long Life. Powerful amplification. Elimination of objectionable microphonic effects.	P. V. 4.—Ideal power valve, companion to G.P. 4. When used for Loud Speaker work: powerful, distortionless amplification. No microphonic effects.
Price 16/6	Price 22/6

Obtain from your Dealer the Ediswan Folder—"2 New Valves"

EDISWAN VALVES

Will improve any set

THE EDISON SWAN ELECTRIC CO. LTD

N.V. 2

WIRELESS IN PARLIAMENT

From Our Own Correspondent.

MR. DAY asked the Postmaster-General whether, in view of the oscillation annoyance experienced by wireless listeners, he would consider action to prohibit the use of reaction on the aerial?

Viscount Wolmer, the Assistant Postmaster-General, said: "On the recommendation of the Broadcasting Committee of 1923 a condition was inserted in all wireless receiving licences that 'reaction must not be used to such an extent as to energise any neighbouring aerial.'" He did not think it would be in the general interest to prohibit entirely the use of reaction, which was of considerable advantage in increasing the sensitiveness of wireless sets, and only caused interference when improperly used. The authorities were enforcing the regulation very strictly.

Mr. H. Morrison asked the Postmaster-General whether he would arrange that the British Broadcasting Co. should broadcast weather reports every morning during the hay and corn harvest.

Viscount Wolmer said that weather reports prepared by the Meteorological Office were broadcast every morning at 10.30 from the high-power station at Daventry, in addition to two reports every evening from all broadcasting stations.

According to an answer given by Viscount Wolmer to Mr. Day, a wireless receiving licence entitles the licensee to use more than one set of apparatus on premises wholly in his occupation. A separate licence, however, is necessary for apparatus in each tenement or flat in separate occupation.

CHIEF EVENTS OF THE WEEK

SUNDAY, JULY 11

London	The Band of H.M. 1st Bn. The King's Own Yorkshire Light Infantry.
Birmingham	Requested Classics.
Bournemouth	Concertos and Instrumental and Vocal Feature.
Cardiff	Famous Singers in Famous Arias.
Glasgow	All-British Programme.
Manchester	The Irwell Bank Prize Band.
Newcastle	Orchestral Concert.

MONDAY

London	Humour in Music and Verse.
Aberdeen	Ballad and Instrumental Programme.
Bournemouth	The Municipal Military Band.
Cardiff	Gems from Italian Opera.
Leeds-Bradford	Leeds Tercentenary Celebrations.
Newcastle	Trifles.

TUESDAY

London	The Geoffrey Goodhart Sextet.
Aberdeen	Old Favourites in Music and Song.
Birmingham	Operatic Programme.
Cardiff	Cap and Bells.
Glasgow	Light Chamber Concert.
Leeds-Bradford	*I Pagliacci.*
Manchester	Revusical Moments.

WEDNESDAY

London	Concert on behalf of the National Association of Local Government Officers.
Daventry	Daventry Calling France.
Aberdeen	Scottish Dance Music.
Bournemouth	An Evening at Weymouth.
Edinburgh	*Chatelard*, a one-act Play.
Glasgow	Italian Opera.
Manchester	Special Concert relayed from the Pavilion, Buxton.
Newcastle	A French Night.
Stoke-on-Trent	A Programme of Miniatures.
Swansea	The Afan Valley Silver Band

THURSDAY

London	*Milestones.*
Leeds-Bradford	Tercentenary Concert.

FRIDAY

London	Variety Programme.
Birmingham	Mirth and Melody.
Bournemouth	Choral Works and Orchestral Ballads.
Belfast	A Trip to the Isle of Man.
Glasgow	The S.C.W.S. Prize Brass Band.
Manchester	Schubert and Schumann Programme.

SATURDAY

London	Brighton Competitive Musical Festival.
Aberdeen	Scottish Programme.
Cardiff	A Red Indian Night's Entertainment.
Glasgow	Glasgow Fair.
Manchester	Mirth and Melody.
Newcastle	A Favourite Concert.

ADVERTISEMENT INSTRUCTIONS for "Amateur Wireless" are accepted up to first post on Thursday morning for following week's issue, providing space is available.

PREPAID ADVERTISEMENTS.

Advertisements under this head are charged FOURPENCE PER WORD, minimum charge FOUR SHILLINGS.

DEPOSIT SYSTEM.

As the Publishers cannot accept responsibility for the bona fides of Advertisers in this publication they have introduced a system of deposit which it is recommended should be adopted by readers when dealing with persons with whom they are unacquainted. It is here explained.

Intending purchasers should forward to the Publishers the amount of the purchase money of the article advertised. This will be acknowledged to both the Depositor and the Vendor, whose names and addresses must necessarily be given. The Deposit is retained until advice is received of the completion of the purchase, or of the article having been returned to and accepted by the Vendor. In addition to the amount of the Deposit, a Fee of 6d. for sums of £1 and under, and 1s. for amounts in excess of £1, to cover postage, etc., must be remitted at the same time. In cases of persons not resident within the United Kingdom, double fees are charged.

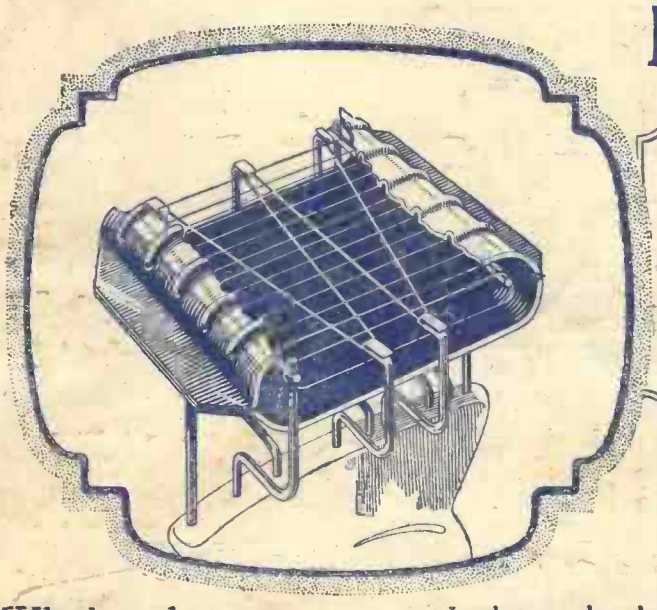
The amount of the Deposit and Fee must be remitted by Postal Order or Registered Letter (Cheques cannot be accepted), addressed to

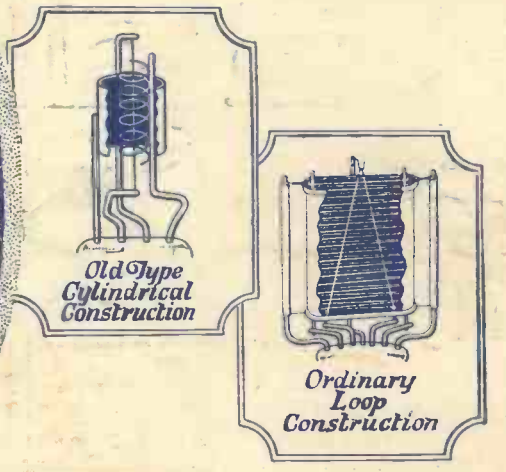
"AMATEUR WIRELESS,"
ADVERTISEMENT DEPARTMENT,
LA BELLE SAUVAGE, LONDON, E.C.4.

WIRELESS.—Capable, trustworthy men with spare time who wish to substantially increase income, required where we are not fully represented. Applicants must have practical knowledge of installation of Set and Aerial, be a Householder or live with parents, and be able to give references. State age and experience.—Address, Dept. 28, General Radio Company, Limited, Radio House, Regent Street, London, W.1.

All Valves

have constructional features but only P.M. Valves have the P.M. Filament—





Which valve construction gives you the most for your money

For 4-volt accumulator or 3 dry cells

THE P.M.3. (General Purpose) 0·1 amp. **16/6**

THE P.M.4 (Power) 0·1 amp. **22/6**

For 6-volt accumulator or 4 dry cells

THE P.M.5 (General Purpose) 0·1 amp. **22/6**

THE P.M.6 (Power) 0·1 amp. **22/6**

For 2-volt accumulator

THE P.M.1 (General Purpose) 0·1 amp. **15/6**

THE P.M.2 (Power) 0·15 amp. **18/6**

These Prices do not apply in the Irish Free State.

Look at the length, thickness and design of the Mullard P.M. Filament and you will appreciate why those who understand valves place its results 33% higher than any other on the market.

This wonderful P.M. Filament

- Is supported by 5 strong but resilient hooks.
- Cannot be broken except by the very roughest handling.
- Has up to 5½ times greater emission surface.
- Requires only one-tenth ampere.
- Has the abundant flow of electrons entirely controlled.
- Remains ductile even after 1,000 hours life.
- Wastes no heat by glowing.
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