THE CRYSTAL SET—AND THINGS THAT COUNT

Amateur Wireless

And Electrics

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PRINCIPAL CONTENTS

WELL ILLUSTRATED

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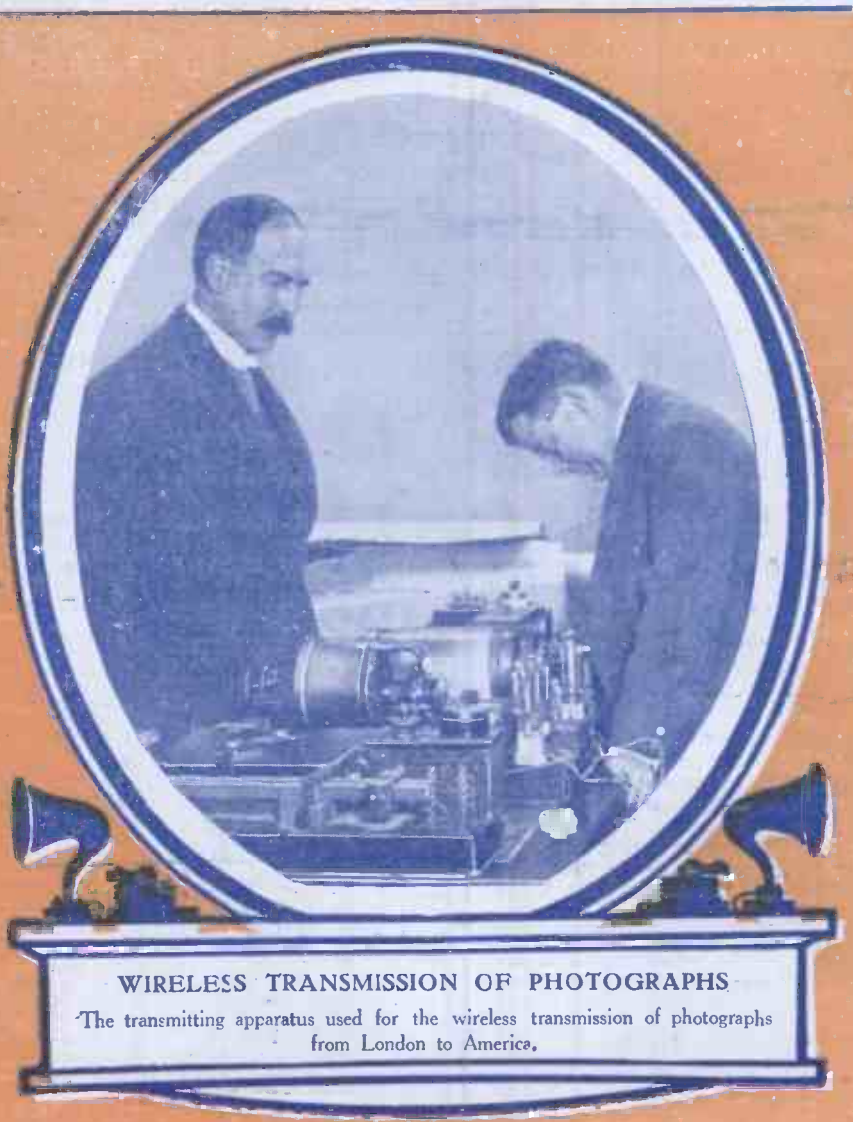

WIRELESS TRANSMISSION OF PHOTOGRAPHS

The transmitting apparatus used for the wireless transmission of photographs from London to America.

SUGGESTIONS FOR D.X. WORK

NO longer can we complain of the lack of variety of the Broadcasting programmes available for us. If those being transmitted from near-by Stations are not to our liking we can readily take a trip to some of the nearer Continental Stations such as Brussels or Paris. Transmissions from these Stations are so good and usually so free from interference that they can be relied upon for a programme that is a welcome change.

Numbers of people would take an interest in Continental transmissions but for the fact that they are handicapped by unsuitable apparatus. Although in the hands of an expert a single valve receiver can be made to give astounding results, yet it is generally recognised that a stage of high-frequency amplification is necessary to make reception a certainty.

A Typical Cossor Valve.

If yours is a single valve set why not convert it at once for long distance work by adding a stage of high frequency—diagrams and instructions have frequently appeared in this Magazine. Until you are in a position to enjoy long distance reception you have not experienced one of the great thrills of Wireless.

If your Receiver is supposed to be capable of receiving over several hundred miles and does not do so in your hands it is very probably because you are using the wrong kind of Valves. No one is foolish enough to put a racehorse between the shafts of a farm cart or to enter a cart horse in a race. Each animal—through generations of breeding—has been reared for its own particular job. And it is the same with wireless valves.

The Right Type of Valve Essential

The valve for long-distance reception must be so sensitive as to pick up signals constantly impinging on the aerial that are much too weak to be rectified by the Detector Valve. And if these oscillating currents are not rectified any number of low-frequency valves will not make the slightest difference.

That is exactly why the Cossor P.1 and the Cossor P.2 are two entirely different valves. The first can only commence to function on signals that are sufficiently strong as to be capable of rectification. It is the purpose of the P.2 (the valve with the red top) to build up the signals so that the P.1 Valve can easily rectify them.

Valves Should Work in Harmony

Working in perfect harmony it is only natural that the Cossor P.1 and the P.2 should be capable of producing exceptional results. Indeed, in the two short years that they have been on the market they have enjoyed a measure of appreciation which has been accorded to no other Valves.

Experimenters first, then the general Wireless public afterwards, were quick to realise that the hood-shaped Grid and Anode in conjunction with the arched filament were responsible for a more efficient use being made of the electron stream.

It is obvious that the ordinary valve with its long straight filament and tubular Anode is most wasteful and permits a serious escape of electrons from each end of the Anode. It has not been difficult to convince a man that if reducing the filament current decreases the electron stream—and consequently the signal strength—then any proportion of the electron stream not being used will have much the same effect.

The Importance of a Rigid Grid

In the same way those enthusiasts who have been keen to obtain pure loud-speaker reception readily appreciate that the ordinary spiral grid is far from rigid. Its weakness permits microphonic noises and distortion which can only be entirely eliminated by a design similar to the Cossor. Here we see a grid that is a magnificent piece of engineering work. Built up on a stout metal grid band, each wire is anchored no less than three times—thus making a network which is wonderfully rigid.

Undoubtedly—as satisfied users seem to be never tired of telling their friends—the P.1 and the P.2 are remarkable valves. If you are in any way dissatisfied with your present Set—if you cannot get far beyond your local stations you should fit Cossor Valves, recognised as the country's most popular Valves.

The new Cossor Sealed Box.

A New Method of Valve Packing

It should be noted that all Cossor Valves are now sold in patented sealed cartons—the only valve in the world that can come direct from factory to user without being used for demonstration or other purposes.

This safeguard is being greatly appreciated by the wireless public, who now know that they can be assured of a full life for every Valve. Distribution arrangements now having been completed, every Dealer should be in possession of an adequate stock of Cossor Valves in these new cartons.

The New Wuncell Valve.

A Dull Emitter for Long Distance Work

One of the chief complaints against Dull Emitters as a class is that up to the present they can hardly be said to match up to their corresponding bright prototypes. Most Dull Emitters possess characteristics of their own which are quite different to any Bright emitter Valves. It is interesting to note, therefore, that the new Wuncell Valve recently released for issue by A. C. Cossor, Limited, is an exact counterpart of the well-known P. series.

D.X. enthusiasts will be glad to know, for instance, that after a Station has been tuned in, the P.2 Valve can be removed from its socket and a W.R.2 inserted and little—if any—correction in tuning will be necessary. This, by the way, is one of the hardest tests to give any Valve, and when successful is definite evidence that the two Valves possess identical characteristics.

The Wuncell Valve is at present available in two types—the W.1 and the W.2 (the latter with its customary red top). Both of these Valves correspond to the P.1 and the P.2 mentioned above.

For the convenience of the man with a multi-valve Receiver who does not want to invest in a complete set of Dull Emitters at once the same model is available with a resistance inbuilt with the base. This will enable anyone to use a Wuncell (normally operating on 2 volts) with a 6-volt accumulator. When all the Valves in the Set have been substituted by Wuncell Valves, these resistances can be short-circuited and the accumulator converted to 2 volts—thereby trebling its amperage. This type is named W.R.1 and W.R.2.

Owing to the tremendous demand for these new Wuncell Valves supplies have been somewhat difficult to obtain, but every Dealer should soon be in a position to supply either of these two types of Valves from stock. The price of the W.1 and W.2 Wuncells has been fixed at 21s. each, and the W.R.1 and W.R.2 Wuncells with resistances in base are 23s. 6d. each.

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THE CRYSTAL SET—
—AND THE THINGS THAT COUNT

WIRELESS seems, from some points of view, so utterly simple nowadays, that most of us are rather inclined to give too little attention to the small points of detail which often make so much difference to the performance of the receiving set. In certain conditions reception is ridiculously easy. If, for example, you live anywhere near a main broadcasting station you will get quite good results with an aerial and an earth of the most elementary type, a tuning inductance wound anyhow, a variable condenser whose capacity is a matter of little importance, and any pair of telephones, whether their resistance is high or low.

Freak Receptions

Even at a distance of 45 miles I can receive 5 X X quite audibly with nothing more complicated than the apparatus shown in Fig. 1. It is possible to go yet one step further by removing the crystal and making contact with the point of the catwhisker and the rim of the cup. 2 L O has been received by a friend who lives within a quarter of a mile of his transmitter with no more extensive apparatus than a pair of telephones. One lead was connected to a radiator, whilst the other was held against an iron mantelpiece in the manner shown in Fig. 2.

If wireless is such a straightforward business as this, then why should we worry ourselves about small points of detail? The answer is that when you are quite near a station, or when the power that reaches your aerial is considerable, you will obtain a good flow of rectified current through the detector in any circumstances, and that as your telephones are sensitive to very tiny currents you can waste a great deal and still obtain signals.

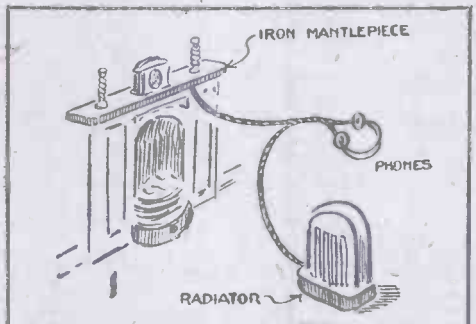

Fig. 2.—A Receiver for 2 L O at a distance of a quarter of a mile.

To those living very near a main station attention to points of detail is not of vital importance, provided that they are satisfied so long as speech and music are audible; but the man who lives at greater distances will probably hear little or nothing unless he ensures that his set is brought up to the highest point of efficiency. And further, those who receive at short range will obtain better reception by attending to the little points that matter.

I am not going to suggest any complicated crystal circuits. I want simply to look at circuits of the most straightforward type, and to point out where the weak spots in them may be. If such weak spots exist in any reader's set, he will find that by following out the suggestions made he will in most cases effect a distinct improvement.

Inductances

Let us take first of all the question of inductances. One of the commonest types of simple crystal set is that shown in Fig. 3a. The inductance in this case is a single-layer coil wound on a tubular former, and it is made variable either by means of a sliding contact or by the provision of tappings and a selector switch. Too often the crystal user is anxious to be able to cover a wide range of wavelengths with one aerial tuning inductance. The broadcast band lies between 300 and 500 metres, but he thinks that it would be rather folly to be able to tune at will to 600 metres in order to hear shipping signals; and would it not be better still to be able to get up to 900 metres, so that the air stations may be tuned in? And if you can reach 900 metres, then surely you might as well make the coil a little larger, so as to be able to receive 5 X X when you want him. This means that the inductance must tune from, say, 280 to 1,800 metres.

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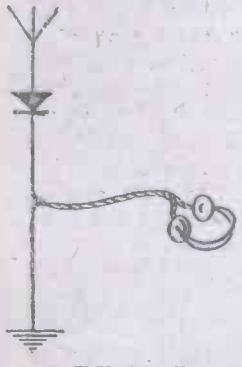
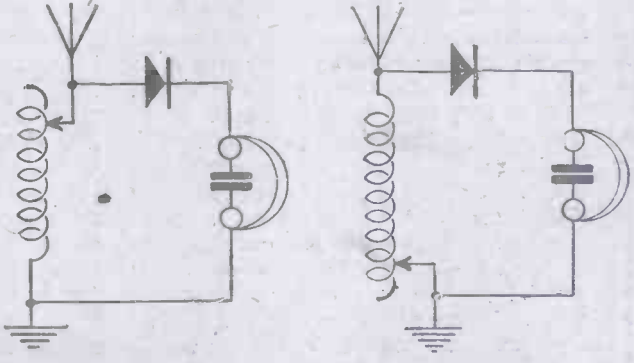


Fig. 1.—5 X X, 45 miles away, can be received with this.



Figs. 3a and 3b.—Two Simple Crystal Circuits.

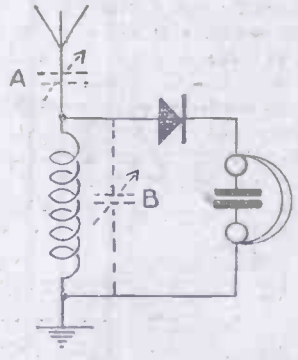


Fig. 4.—The Position of the Condenser.

THE SAGGING FILAMENT

The information given here may save you the cost of a new valve.

OF all the valve difficulties encountered by the amateur wireless enthusiast, probably a sagging filament has perplexed him most. From outward appearances everything is in order, and all connections O.K., and yet no signals. If the valve is removed and examined closely it will be found that the filament has sagged and is touching the grid; as shown in the sketch.

This, of course, would not happen if the filament could be kept in an upright position when in use, but as many receiver panels are at an angle or perpendicular it is often impossible for the filament to be kept in that position.

No doubt many have discarded such valves as useless. There is no need to do so, however, as with a little careful handling they may be restored to service and this very simply. All that is required is the filament battery, two short lengths of wire and a little patience.

Remedying the Sagged Filament.

Round each of the two filament legs of the valve twist a piece of copper wire, the other ends of which are to be joined to the terminals of the filament battery. The valve now being lighted is turned in the opposite direction to the sag (the concave of the sag facing the ground). Still holding the valve in one hand, gently tap it with the other, and the filament will come clear of the grid. The photograph shows the operation.

The writer has dealt with many valves in this way and found them quite satisfactory afterwards.

W. H.

Experiments are now being conducted with the wireless adjustment of clocks. The invention consists of mechanism which is fitted inside a clock, and which will pick up wireless time signals from observatories, and automatically adjust the clock to correct time.

"THE CRYSTAL SET—AND THE THINGS THAT COUNT" (*continued from preceding page*)

From the point of view of convenience the idea is excellent, but this is really all that there is to recommend it. When the slider or the selector switch is set so as to give an inductance suitable for 400 metres, more than half the turns of the coil are out of use; but they are still there, forming a separate coil coupled to the part that is in use and with a wavelength of its own. The more nearly this wavelength approaches that to which the receiving set is tuned, the worse will signal strength be. In any case the dead end will cause serious losses through absorption. Therefore should you be using an inductance of large size you will do well to cut it down to something that is much less ambitious in the waveband which it seeks to cover.

Further, examine the way in which your coil is connected up. Is it wired like A or 3B in Fig. 3? If its connections are those of the first figure you have a very inefficient arrangement, since your dead end is at the high-potential end of the coil. Matters will be improved if you change the wiring over, so as to make the aerial connection fixed and the earth connection variable.

The Best Tuning Arrangement

By far the best arrangement for tuning is that shown in Fig. 4. Here a fixed coil is used, and tuning is done by means of a variable condenser. The coil may conveniently be of the plug-in type, and if you purchase or wind a suitable set of inductances you can tune to any wavelength that you wish by using the appropriate coil. With a fixed inductance there are no dead-end losses, but it is important to see that the coil itself should be efficient. The best rule to observe is that the heaviest wire compatible with reasonable compactness should be used. Speaking generally for wavelengths from 600 metres down to 300 the wire should not be finer than No. 24, whilst No. 16 or 18 should be used for very short wavelengths.

What should be the position of the tuning condenser? Should it be in series, as shown by the dotted lines at A, or in parallel, as at B (Fig. 4)? What we want to do is to obtain the biggest possible potential difference across the tuning coil. The greater they are the larger will be the proportion of current driven through the detector, and the stronger will be our signals in the telephones. By means of the series condenser we obtain the biggest possible differences across the coil. With the condenser in parallel they may be very much less, especially if the capacity in use is big. The larger the parallel capacity the greater will be the reduction in signal strength. This should be remembered in cases where for some reason or other it is found impossible to place the condenser in series. We may find, for example, that we can tune in a certain station either with a certain coil and a parallel condenser of .001 microfarad set at 170 degrees, or with a coil one size larger and a condenser setting of 25 degrees. With the smaller coil there will be a considerable loss in signal strength.

Parallel Condensers

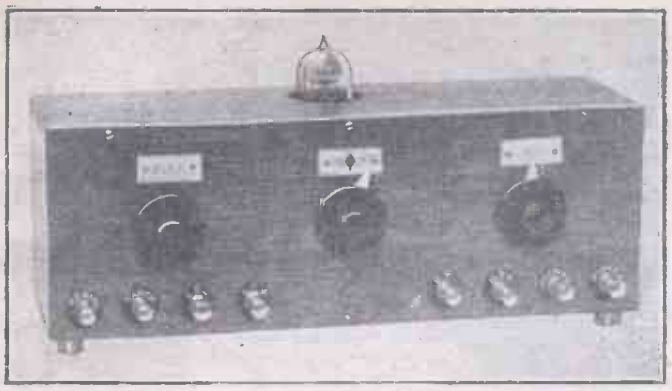
One should always use the largest amount of inductance possible in conjunction with a condenser in parallel. There is a tendency to use variable condensers of large maximum capacity, because they enable one fixed coil to tune over a wide band. Here again there is nothing but its convenience to be said in favour of the plan. The parallel condenser in such a circuit as Fig. 4 should never have a maximum capacity greater than .0005 microfarad.

About the detector itself very little need be said, for the majority of those used nowadays are quite efficient. Care should, however, be taken to see that the crystal is kept clean and that the catwhisker point is sharp.

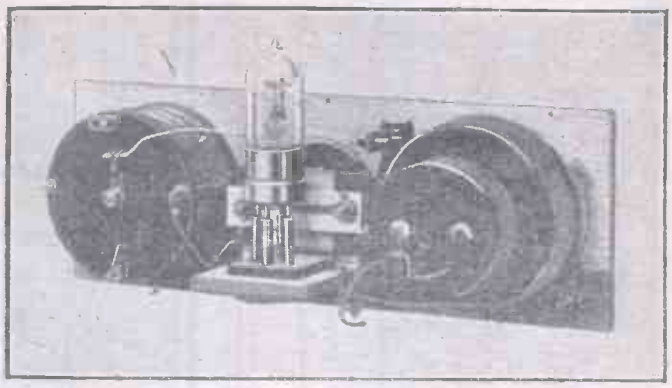
Telephone Condensers

The remaining component of the set is the condenser in shunt with the phones. First of all, is it necessary to use a telephone condenser at all? In theory it is essential to do so, since the windings of the telephones offer such a high impedance to high-frequency currents that there is virtually no path for them to earth. We must remember that an inductance of high value acts as a practical bar to high-frequency currents, whilst they pass with ease through a condenser. In the telephones capacity is provided by the twisted leads, and to some extent by the self-capacity in the windings. The set may, therefore, work quite well without the condenser in shunt at all. It is not, however, wise to rely entirely on these chance capacities, and though on loud signals there may be no perceptible difference in the performances of the set with or without a telephone condenser, it will generally be found that a distinct improvement is effected by its use.

J. H. R.



The Complete Receiver.



View of Back of Panel.

A "REAL" HOME-MADE ONE-VALVER

The author of this article describes how he not only built the set but also made the components.

IT should be understood that in the case of the receiver described below an attempt has been made to produce a set on slightly unorthodox lines without impairing in any way the general efficiency. Except for the variable condenser, practically every component can be made at home from the miscellaneous collection of oddments which are accumulated by the experimenter.

As it is usually a difficult matter to bring in distant stations with one valve without the use of excessive reaction, it was decided to arrange this set to receive only the local station, and to do this efficiently and with the simplest controls. In actual practice it certainly fulfils all that is claimed for it. An ebonite panel is not used—in fact practically the only ebonite used for insulating purposes is the block which carries the four sockets for the valve.

The receiver consists in the main of a wooden cabinet containing a variable condenser, inductance and reaction coils, and the valve and rheostat. A hole is provided in the top of the cabinet for the valve, which projects about 1 in. (see Fig. 1). Fig. 2 shows the circuit diagram and Fig. 3 the lay-out of the parts on the front of the cabinet. The left-hand knob is for the reaction coil, the centre one for the filament resistance and the right-hand one for the variable condenser of .0003 microfarad capacity. All terminals are along the bottom edge. The dials are of stout drawing-paper, and being white show up against the dark woodwork.

For the one station the condenser pointer is arranged in the central position on the dial, and the position of the reaction knob is noted (it is not critical up to a certain point). When once set this resolves the control into the use of the filament resistance only.

Home-made Knobs

The three knobs are home-made and perhaps look a little neater than the unusually large ones sold for control purposes. Each one consists of an ebonite disc 1⅜ in. in diameter and ⅛ in. thick. They were cut from sheet, filed roughly to shape, and then revolved by a breast drill (after securing a piece of 2 B.A. rod through the middle by two nuts) and finished with emery-cloth.

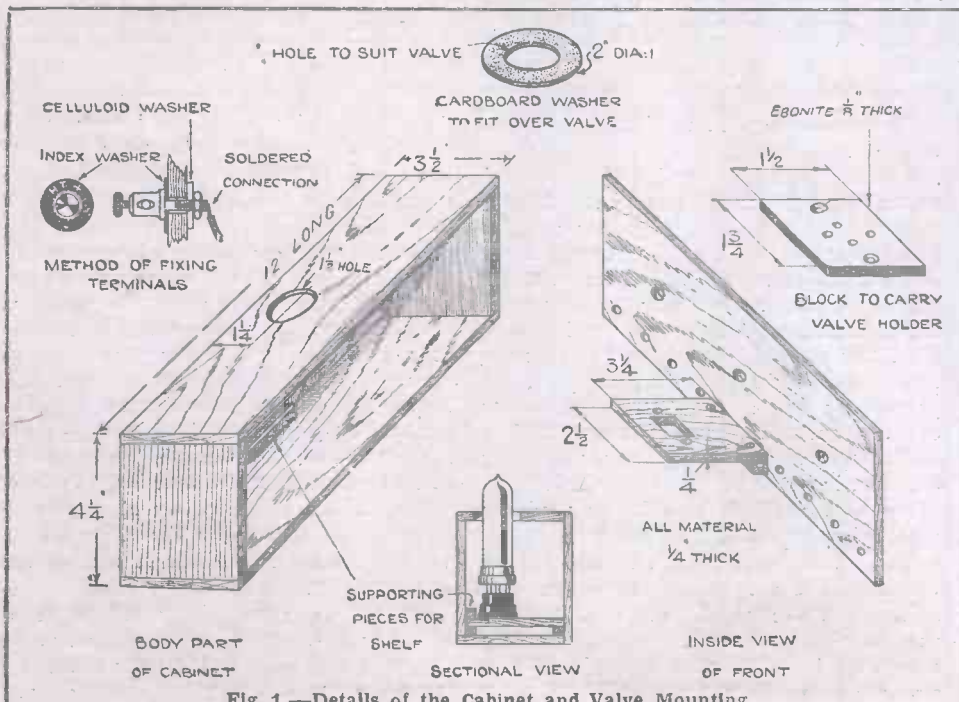


Fig. 1.—Details of the Cabinet and Valve Mounting.

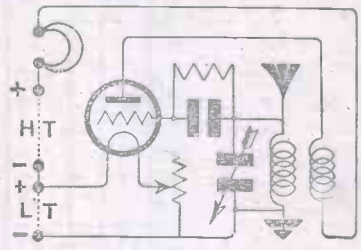


Fig. 2.—Circuit Diagram.

(Fig. 3 is on the next page.)

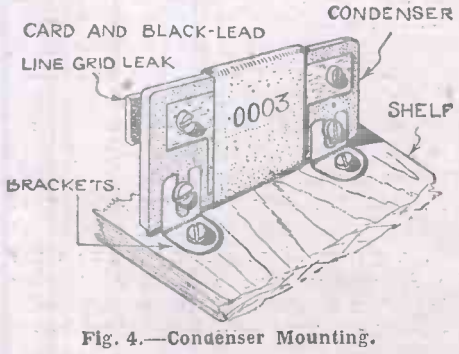


Fig. 4.—Condenser Mounting.

The Cabinet

Fig. 1 shows the details of the cabinet, which is made from ¼-in. mahogany throughout and polished. All parts, including terminals, are fitted to the front and a shelf is provided to carry the valve and holder and grid condenser (the valve, of course, is fitted through the 1½-in. diameter hole in the top after the front is affixed). There is a space of about ¼ in. between the valve and the cabinet, and to prevent the entry of dust, etc., a cardboard disc is cut so that it is a push fit over the projecting part of the valve (see Fig. 1).

One interesting point relates to the fitting of the terminals. The screw of the terminal is passed through a clearance hole in the wood and clamped up with a black index washer on the outside and a celluloid washer on the inside. If the inside of the hole is first given a coat of shellac there is absolutely no risk (for all practical purposes) of any loss of strength due to leakage. In fact when trying out this set the writer secured the terminals direct on to the wood, the index washers being fitted later for the convenience of identifying the terminals.

Grid Condenser

The .0003-microfarad grid condenser is supported on two brackets, which are secured to the shelf (see Fig. 4), and the usual grid leak, consisting of a pencilled line on a strip of card, is held by the terminal screws of the condenser. The vertical limbs of the brackets are forked so as to provide easy assembly and dismantling when necessary.

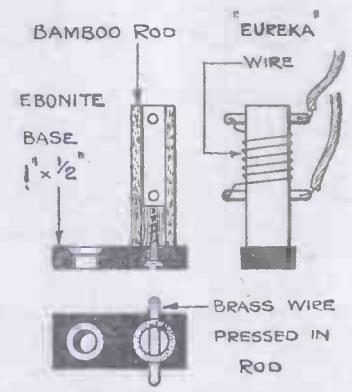


Fig. 6.—Details of Fixed Resistance.

Aerial and Reaction Coils

The tuning coils are of somewhat unusual design (see Fig. 5). The aerial coil is wound on a cardboard tube 3½ in. in diameter by 1¼ in. long; it is wound with 24 turns of No. 26 d.c.c. wire. This coil is secured to the front of the cabinet by three brads.

Reaction is effected by the inner coil, which is 2½ in. in diameter by 1¼ in. long, wound with 50 turns of No. 36 d.c.c. wire; it is made to slide along two ⅜-in. diameter pegs fixed into a base, which in turn is screwed to the front. A 2 B.A. rod is used to operate the reaction coil. This rod is soldered to a brass plate shown in the left-hand side of Fig. 5; the other end passes through a hole in the front and terminates in an ebonite knob described above.

The details of the fixed resistance will be quite clear from the sketch, Fig. 6, and its position will be apparent from a study of the second of the photographs. H. J. T.

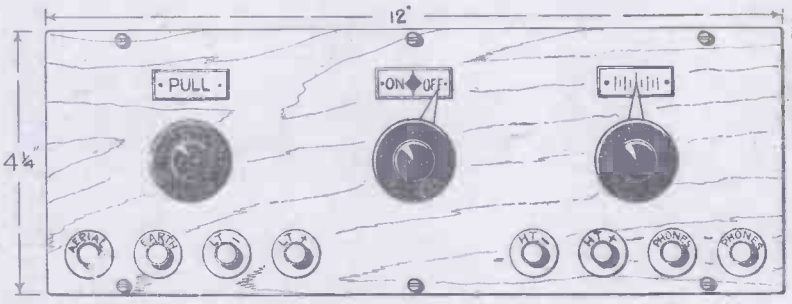


Fig. 3.—Front View of Panel.

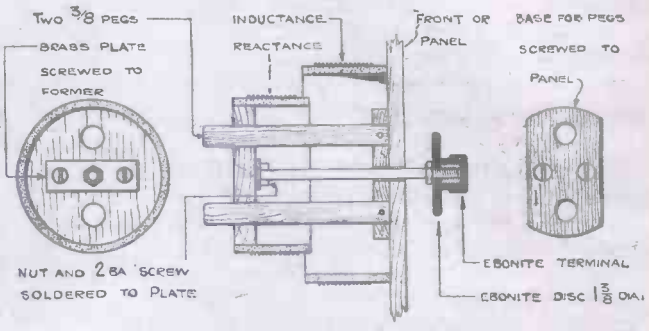


Fig. 5.—Arrangement of Tuning Coils.

WILL THE VALVE BECOME OBSOLETE?

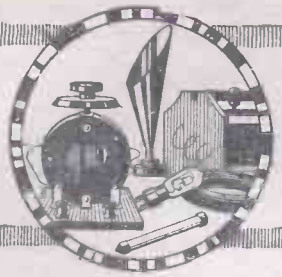
TO-DAY we have the big high-power station 5XX regularly transmitting the B.B.C. programmes at crystal strength over a range of at least 100 miles, and consequently thousands of crystal-set owners in remote districts are able to tap the ether with the minimum of experience, trouble and expense. Perhaps it is because almost everyone is perfectly satisfied that such a splendid thing is not heralded as a boon and a blessing to men—and women. Less than a year ago, however, the mere suggestion of such a thing would have created much comment. And next year? Who can say that the simple crystal set will not become the one and only type of receiver in general use?

Already the Americans are talking of erecting a central broadcasting station with a power of 50 kilowatts, and since the Americans have a habit of "doing things," no doubt this station will materialise. This may mean that almost every British crystal-set owner will eventually be able to pick up American transmissions.

Whether one large and extra powerful central station would be more satisfactory than several smaller high-power stations situated at 100 miles or so apart is, I believe, a problem which is at present under discussion in our own country. Our leading wireless engineers have so far favoured the latter method, but whether this or the former method is eventually adopted, the prospective and existing crystal-set owner can rest assured that the power problem will receive every consideration, this being the most important factor to be dealt with. Many of the valves now being used for amplifying purposes will not then be required. I refer, of course, to the average listening-in outfit with headphones, and although valve amplification is usually necessary for loud-speaker work, even this may soon be supplanted by loud-speaker strength transmission, or the development of a suitable amplifier.

After all, why should the individual enthusiast have to worry about the "power" of his receiving apparatus when the strength of a transmission can be easily modified to operate the most simple form of crystal receiver within a given range? Town residents are not worried with small electrical generating plants to light up their houses; the "juice" is "broadcast" at a standard strength or pressure from the main generating station, so that it only becomes necessary to switch on a simple piece of apparatus—a lamp to wit—which is designed to work on the "wavelength" and power of that transmission. In other words, if the given power of a wireless transmission is *already there*, we do not want to increase it before it will operate our receivers.

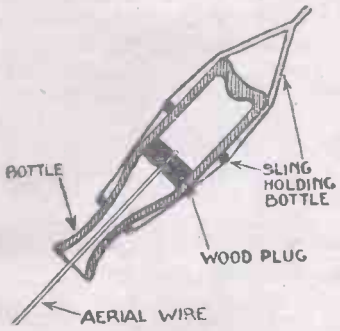
Since this greatly-improved state of affairs is inevitable the valve must naturally take a back seat, and may eventually become quite obsolete for receiving purposes. Who knows? O. J. R.



PRACTICAL ODDS AND ENDS

All-weather Insulator

AN aerial insulator which will be equally efficient in either wet or dry weather can be very easily constructed from a small bottle.



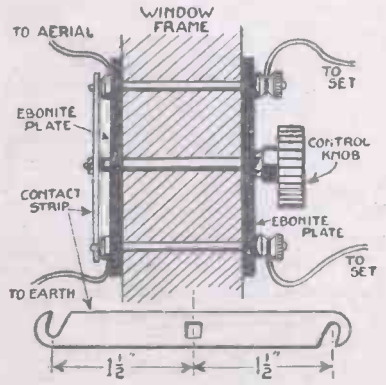
All-weather Insulator.

A sling of cord or wire is made with which to fix the bottle to the mast or wall hook. Next a piece of wood is cut which will pass through the bottle neck and as long as the internal diameter of the bottle. This piece of wood is dropped inside the bottle and a loop is made on the end of the aerial wire, and this also is passed inside.

With a little patience the wood can be "lassoed" by the loop on the end of the wire, which is then drawn taut. S. D.

Aerial-earth Switch

TO be really effective, of course, any aerial-earth switch should be placed outside the building, but this usually gives



Aerial-earth Switch.

rise to the necessity of opening a window to manipulate the switch.

By using a switch like that shown by the diagram such inconveniences are obviated, as connection or disconnection can be quickly made from inside. The arrangement of the switch parts are clear from the diagram and need no further explanation. E. J. H.

Indoor Aerials and Earths

WITH an indoor aerial, especially if the set is in an upstairs room, difficulty frequently arises in obtaining an efficient earth.

In such cases it will probably be found that an adaptation of the counterpoise-earth principle will give best results, the method to be employed consisting merely in putting another wire at the floor level approximately underneath or following the course of the aerial.

The aerial itself must, of course, be kept well away from ceiling and walls. If an indoor aerial is wanted quickly it can easily be erected by slinging the wire from the picture-rail, using hooks made of short pieces of wire on the rail with string loops between the hooks and the aerial wire.

In using indoor aerials it will usually be found that considerably more inductance is required than with an outside aerial, and some of the sets sold for reception of broadcasting may be found to have insufficient wire on their coils for use with indoor aerials. R. B. T.

Solder in Threads

FOR the greatest efficiency when wiring a set all connections should be soldered. Many constructors who would otherwise solder their connections refrain from doing so because if solder runs into the threads of terminal shanks, etc., difficulty is experienced in removing the nuts when altering the set. The following method solves the difficulty.

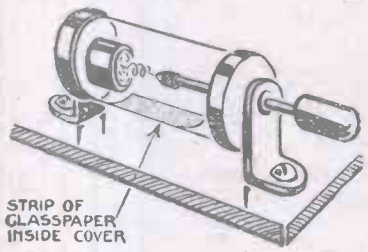
Each terminal shank is first drilled with a $\frac{1}{16}$-in. hole about $\frac{1}{4}$ in. deep (if $\frac{1}{16}$-in. square wire is used for wiring the hole will have to be slightly larger in diameter). When wiring up a little Fluxite is placed in the hole in the terminal shank, which is then nearly filled with solder. While it is still liquid the connecting wire (which should be tinned) is pushed into the hole, and when cool the result is a perfectly soldered joint, with no solder on the threads of the terminal shank.

To remove the wiring, simply place the hot soldering-bit against the shank of the terminal, and when the solder melts withdraw the wire. The terminal is then ready for use again. W. E. M.

Detector Hint

ADJUSTMENT of the catwhisker in a detector is facilitated by fixing a strip of paper inside the glass tube, as shown by the diagram.

If white glasspaper is used the point of the catwhisker can be easily cleaned when necessary.



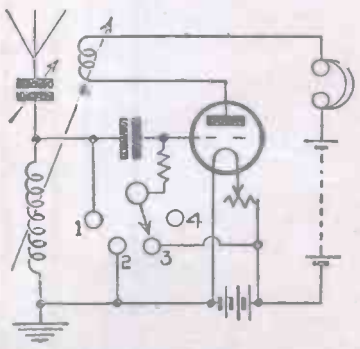
Detector Tube with Paper.

In doing this care must be taken not to exert too great a pressure or the catwhisker will be damaged. T. H

Grid-leak Switch

A USEFUL refinement on the detector panel of a valve set is a switch which will connect the grid leak in any of the following positions: In parallel with the grid condenser, with one end to + L.T., one end to − L. T., or will disconnect it altogether.

The switch is made from four contact studs of the usual pattern and one switch arm which can be bought complete. The studs should be spaced so that the switch arm cannot rest on two at once, which might short-circuit the L.T. battery.



Grid-leak Switch.

The diagram shows the connections. Stud 1 puts the leak in parallel with the condenser, stud 2 puts one end to L.T. −, stud 3 puts one end to L.T. +, and stud 4 cuts the leak out altogether. W. M.

VAGRANTS OF THE ETHER

ETHER disturbance of the kind variously known as atmospherics, strays or X's are, luckily, not very troublesome in this country. Working with a crystal or single-valve set, the only evidence one is likely to get of their existence is an occasional sizzle or slight crackle in the phones. With one or more stages of high-frequency amplification in circuit, however, these etheric "vagrants" are apt to grow more pronounced, so much so, in fact, that D.X. or long-distance work is often sadly hampered by them.

In tropical or semi-tropical climates the ether is usually in a far more turbulent condition than anything normally experienced here. In such districts it is quite impossible during many hours of the day to receive anything in the nature of distant signals, the phones being filled with a practically incessant roar of atmospheric noise, which effectively shuts out everything else.

A Pressing Problem

The problem of dealing with this bugbear of wireless is one of the most pressing and difficult that the wireless engineer has to face. From the commercial point of view, before wireless telegraphy can seriously compete with the older line and cable systems it must be equally capable of maintaining an uninterrupted service between distant stations at all hours through the day as well as at night.

A great number of ingenious methods for combating this nuisance have been put forward from time to time, but up to the present the utmost that has been achieved is only a partial success. It is not too much to say that a fortune awaits the lucky inventor who can devise some means of efficiently clearing the ether, either by trapping the atmospherics so that they do not affect the receiving apparatus or else by selectively filtering out the signals so that they come through to the phones clear of extraneous noise.

Among recent efforts in this direction is one recently protected by the Marconi Co. (Patent No. 220,660), which is based upon an ingenious theory of the essential nature of such casual disturbances, as distinct from the ordinary ether waves which go to form a signal proper.

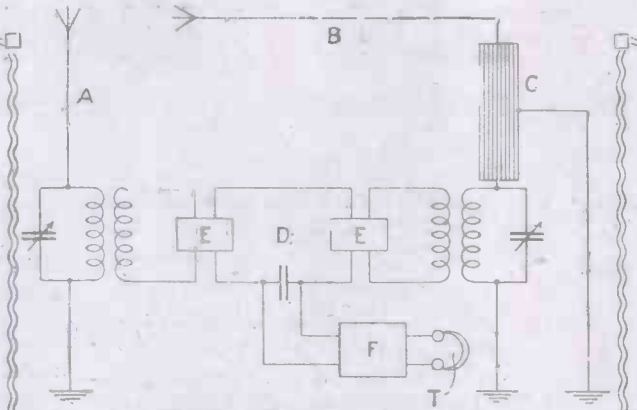


Fig. 1.—A Suggested Method of Eliminating Atmospherics.

The ordinary electromagnetic wave travelling over a good conducting surface is known to consist of a vertical electric field and a horizontal magnetic field, both in phase and both in the plane of the wave front. According to the new theory, *atmospheric disturbances consist of an electric field only*, with no magnetic component. If, therefore, the receiving system as a whole can be arranged to respond only to the magnetic component of the field, it will be unaffected by atmospherics.

An Ingenious System

The energy received on an ordinary vertical aerial A, Fig. 1 (which is affected jointly by the electric and magnetic fields) is combined with the current received on a second aerial B (arranged to respond only to an electric field). The effect due to the received electric fields is then balanced out by using phase-adjusters, whilst that due to the magnetic field is passed on to actuate the phones. The vertical portion of the aerial B is rendered insensitive to magnetic fields by means of an earthed shield C. The horizontal portion needs no such protection, as it is practically unaffected by the magnetic flux, which, as previously explained, travels in a horizontal plane. The aerial, as a whole, therefore only responds to electric fields of force. Both the aerials A and B are coupled, as shown, to an intermediate circuit D through phase-adjusting devices E, by means of which the currents due to the electric fields are mutually opposed and nullified. The "atmospherics" accordingly disappear, whilst the clear signals (carried by the magnetic component) are fed by the amplifier F into the phones T.

Another Method

In another method of tackling the same problem the Marconi engineers have proceeded along entirely different lines (Patent No. 211,512). In this system the received atmospherics are utilised in the first place to produce a continuous noise in the phones, an audio-frequency chopper being coupled to the aerial if necessary to assist in securing this effect.

The impact on the aerial of a train of comparatively *sustained* oscillations, such as constitute the dots and dashes of the Morse code in C.W. working, is then arranged to disconnect the phones from the receiving circuits, and so give rise to corresponding silent intervals. In other words, the signals are, in effect, recorded as silent interludes upon a background of heterogeneous noise.

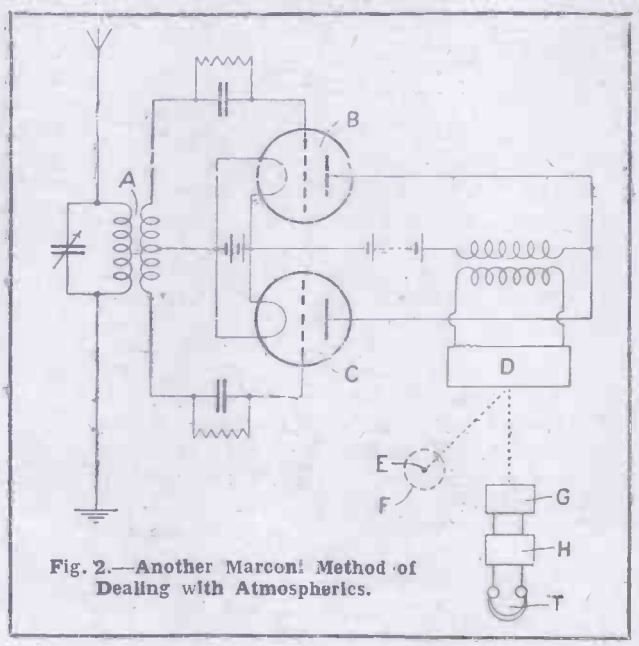


Fig. 2.—Another Marconi Method of Dealing with Atmospherics.

As shown in Fig. 2, the secondary of the input transformer A is coupled to two balanced rectifying valves B C, and the common branch of their output circuit is coupled to a mirror galvanometer D. The mirror reflects light from a source E on to a photo-electric cell G, the light being interrupted at an audible frequency, say 1,000, by a rotating shutter F.

When no energy, either signal or disturbance, is entering the aerial, the galvanometer mirror is at rest, and intermittent light from the source E is reflected on to the cell G, producing an audible note of 1,000 frequency in the tuned amplifier H and phones T. Impulsive static disturbances are reduced by the balanced valves B, C,

(*Concluded on page 1032*)

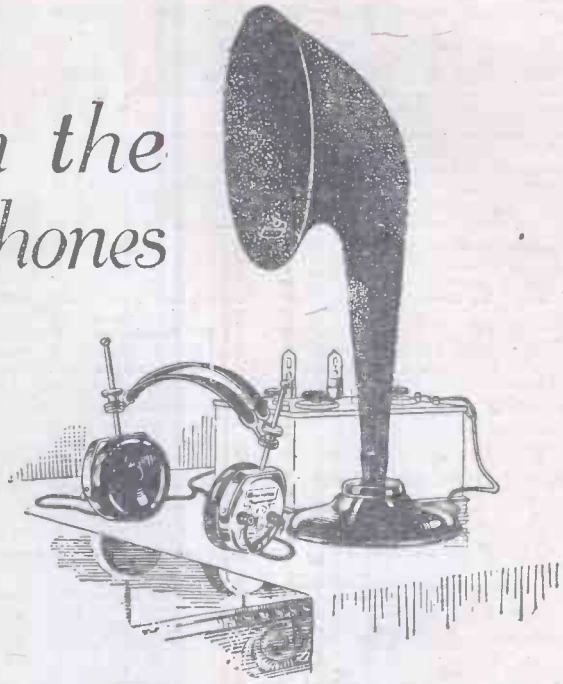
Tune the Table-Talker with the "Matched Tone" Headphones

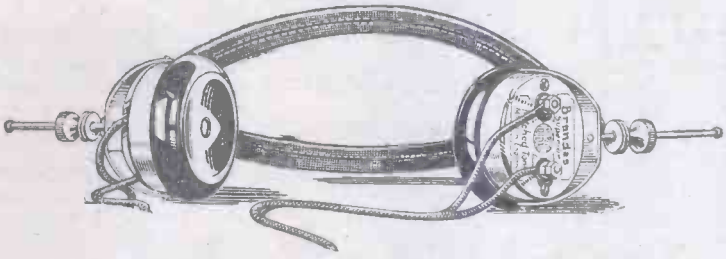
The Brandes Family Series

OH, Boy! What fun you'd get with the *Table Talker*, as well as your *"Matched Tone"* Headphones. Ask Father. Can you really think of a better hobby for 1925? Just real fun—fun for the holidays—fun all the year round. You will hear every blessed word as plain as though your own form-master was speaking—and it's heaps more interesting. You'd hear real music just as loud as you hear that girl thumping on the piano next door—but no false notes. Oh no! And it's so pleasantly natural.

Ask your Dealer for Brandes.

British Manufacture (B.B.C. stamped).





All Brandes products carry our official money-back guarantee, enabling you to return them within 10 days if dissatisfied. This practically constitutes a free trial.

The *"Matched Tone"* feature was embodied as the distinctive characteristic of Brandes Headphones in 1908, and means that both your ears hear exactly the same sound at the same instant—and you learn a new beauty of tone. They are tested and re-tested for just this one vital point, and in addition their strength, long-wearing comfort, and reliable efficiency make them undoubtedly superior.

25/-

The *Table-Talker* is a Brandes quality product at a moderate price. The non-resonant, specially constructed horn is matched to the unit so that the air resistance produced will exactly balance the mechanical power of the diaphragm. This means beautiful sound-balance and remarkable tone qualities. It is twenty-one inches high, and is finished a shade of neutral brown.

42/-

Crown Farm House, Walton-on-Thames, Surrey.

19-11-24.

Dear Sirs,

It may interest you to know that I received Australia on your 'phones. I consider that they are the most sensitive 'phones that I have used, and I am much pleased with their general performance.

Yours faithfully,

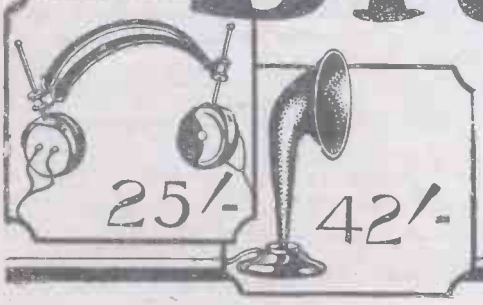
(Syd.) F. WALKER.

For 1925

An excellent family gift to the family. Club together and get yourselves Brandes Products for the receivers. They provide good fun all the year round.

Brandes

Result of 16 Years Experience



The name to know in Radio

On Your Wavelength!

Poor Conditions

I DO not know what it is, but something in the weather or atmosphere of late has made conditions very poor for reception, as many have probably noticed. This is most curious, for as a rule November and December are the two best months of the year. In the last six weeks we have had just a few good patches, but on the whole things have been very bad. What I mean is this. Near-by broadcasting stations come in pretty well, but if you go for anything that is at all distant, either you do not get it at all or you are only able to tune it in so weakly that there is no pleasure in listening to it. Those with very good aerials probably do not notice any vast difference between good and bad reception conditions, but when you have of necessity a very inefficient aerial, as I have, then you do feel the effects of the strange ups and downs.

To make sure that it is a bad night, one should always try for *several* of the far-away stations. If you are content with an attempt to get one of them, you may be misled, for it may happen that he is working on less power than usual on that particular night. But when you try round for two or three, then you have a pretty certain indication of how things are. The stations that I generally use for testing purposes are Aberdeen, Belfast and Radio-Iberica. The first and last I can always get in some kind of way, though there is a very great variation in their signal strength according to the prevailing conditions. Belfast, who requires some separating from stations on near-by wavelengths, comes in only on good nights. When I can pick up all three at good strength, I know that a successful evening is likely, whilst if the reverse is the case it is certainly not worth while to attempt other long-distance work or to sit up into the small hours for America.

U.S.A. Stations

I wonder how readers have fared with the American broadcasting stations lately. Most people that I have spoken to seem to have done very poorly with them during the last few weeks. My own experience has been the tantalising one of being able to get several stations on every occasion that I have tried, but with such poor strength and so much interference that it has been impossible to hear more than an odd word or two of speech or a few bars of any musical transmission. I am talking now of the stations which transmit on the normal broadcast band between 300 and 500 metres. KDKA on the very short waves has, I believe, been coming in fairly well, though I have not tried for him myself since my short-wave set has been in the workshop undergoing alterations.

During the International Radio Week results on this side of the Atlantic were distinctly disappointing. Our stations were heard well enough over there, but the American transmissions were picked up by comparatively few people. When conditions are good, an efficient single-valve set worked from a decent aerial is usually all that is needed to pick up quite a number of the American stations, and if a note magnifier is added the strength is quite respectable. But when things are bad you can do nothing. It is of no use to pile on high-frequency stages, for when you do so you merely bring in heaps of "mush."

An All-night Sitting

Last night's experience was typical of those that have gone before it of late. I did not begin Transatlantic attempts until 1.30 a.m. From that time until 2.30 I struggled, trying station after station with the help of the wavemeter and getting no reward for my pains. Now when things are good I can pick up WJZ straight on to the loud-speaker, and without using the headphones at all, with the set nowhere near the oscillating point. I do not have to search round for his carrier wave and then to resolve it.

Last night, unless the set was oscillating slightly, there was no sound to be heard. By loosening the coupling between primary and secondary and setting the potentiometer well over towards the negative end I was able to get the carrier waves right enough, but nothing on earth would resolve them. I could find the silent point of any one of them in seven different ways—with the A.T.C., the C.C.C., either of the anode-tuning condensers, the potentiometer, the H.F. rheostats, or by altering the degree of coupling between primary and secondary. But the silent point *was* a silent point. In such conditions I do not think that it is possible to hear distant telephony, since the voltage changes due to the modulation are not sufficiently great to actuate even such a sensitive piece of apparatus as the valve. There is some comfort in that thought, but the fact remains that a fruitless late night or all-night sitting is pretty disappointing.

A Grumble

I am going to grouse. I do not like grumbling, but I feel that I must do it to-day, and it is not entirely on my own account, for it represents the feelings of the majority of those—and they are a large number—with whom I discuss wireless week in and week out. There seems to be a pretty general opinion that the B.B.C. programmes have not been up to the mark of late. In the first place, we are having too much simultaneous broadcasting. If a complete programme or a single item is of really outstanding merit, then by all means S.B. it; but there is simply no point at all in sending out from all stations simultaneously things which are likely to interest only a few people. Take, for instance, the Darby and Joan programme, which was of the type that I referred to recently as far-fetched. I have not met anybody yet who appreciated it; we could have done with the music well enough if only the silly padding had been left out. Now if it had been confined to London alone things would not have been so bad; but as it was every station was sending it out to its listeners. This went on from 8.30 until 9.30, and after the news we had the Savoy dance bands.

Dance music again does not please all tastes—at any rate, not if we have too much of it—and I think that we are having too much of it nowadays. On the following night the entertainment given by a concert party was of the feeblest type, whilst some of the jokes were in very questionable taste. Except for half an hour's interval for the news bulletin and a most interesting talk by Sir William Bragg we had that concert party solidly from 7.30 until 10.30, and a little of this kind of thing goes a long way. There is, I know, nothing so useless as destructive criticism. For this reason I would like to set down what, so far as I can ascertain, the majority of people *do* want in the way of broadcasting.

What Is Wanted

It is of no use to try and devise ideal programmes, for it is quite impossible, as one knows, to please everybody. But I will indicate what I believe to be the general feeling in the matter. We want any amount of orchestral music, there being a judicious selection of classical and popular items; we want humour that *is* humour. We want good songs well sung, and we want instrumental solos, preferably on the piano, the violin, the clarinet and other instruments which are well suited to wireless transmission. We want short interesting talks by people who speak well, and not dull papers read in an expressionless monotone which would make even the most interesting subject boring. We want a certain amount of dance music and a certain amount of short plays if they are well done. We want comic operas of the tuneful type, after the manner of *Dogs of Devon*.

On Your Wavelength! (continued)

We want to hear speeches by great men and women relayed upon important occasions. We like occasional novelties, such as the transmissions which took place from Wembley and the Zoo, the broadcasting of the nightingale's song and the relaying of European or Transatlantic stations. We do not want readings of poetry, far-fetched or "sloppy" programmes, dull talks, too much dance music or too much S.B. I hope that these remarks will be taken in the spirit in which they are meant. I do not wish to give offence to those who, I know, are trying their best to provide pleasing programmes. My only wish is to help. Like all enthusiasts, I want to see wireless becoming more and more of a popular hobby, and I am sure that its development is checked by the transmission of programmes which do not please the majority of listeners.

Watch the Lead-in

I came across a curious case recently when a friend called me in to render first-aid to his set, which had developed baffling symptoms. Signal strength had gone right off and anything like long-range work was absolutely out of the question. We tested every single part of the set itself without finding anything amiss. The batteries were well up, the valves were all doing their duty, whilst coils and condensers came through every test with flying colours. The substitution of my telephones for his produced no improvement, which proved that there was nothing wrong with his. An examination of the wiring disclosed that every connection was as it should be.

We took the set down to my den and connected up. Its performances were delightful. The natural deduction, therefore, was that something was wrong with the aerial or earth. As the earth is usually to blame in these cases, we tackled this first. When after much labour we had dug it up we found that there was nothing to criticise. This left the aerial, which was duly hauled down for examination. For some time we could find no fault here, and then I had an inspiration: "Let's try resoldering the lead-in joint," I said. We did so, and the result was perfect reception once more. What had happened was simply this: a corrosive flux had been used in making the original joint, with the result that in course of time proper contact had ceased to exist at this very important point. Not many people would think of suspecting a joint that has once been soldered and that *looks* all right. If you find the symptoms which I have described in your own set and cannot account for them in any other way, have a look at your aerial.

My New Set

It's very early for Christmas presents, I know, but I've just had my first one, and I'm not so certain that I appreciate it at its true value—at least, not yet. It's a valve set of a somewhat complicated kind as regards tuning, but the man who came along with it said it was 'the gr-randest thing in sets he'd ever touched, and would I just let him get Paris as a proof of simplicity. I would, and he started. Well, he didn't catch Paris, though after a lengthy period of knob-turning he asked me to listen-in. Yes, I said, that's all right, but it's Glasgow. That's Captain Brown on ships. Well, wouldn't you have thought that would have flustered my expert? Not a bit. He said: "Of course it is, but I didn't know whether you would understand French, sir." Ah, well, as John Henry says, "I'm sure it is a good set, but I'm not certain I shan't drown it, and keep the tabby one—I mean the other one." What am I using to-night, does someone ask?

A Mystery

I had a most curious experience the other night when I was round at the house of a friend who is a very keen experimenter. We were trying out a new set of his, which gave excellent results so far as range was concerned, it being possible quite easily to run round all our own broadcasting stations and a great many of the Continental stations. But we were not quite satisfied with the quality. There was a little woolliness about it, and the music seemed decidedly harsh when reception was brought up to loud-speaker strength.

Presently my friend asked me if I could suggest anything that was wrong. I told him that I thought that the set was working too near the oscillation point, whereupon he placed a wet finger squarely on the aerial terminal without producing any tell-tale plock. There was merely a slight reduction in signal strength such as one would expect. He then touched the grid leg of each valve in turn, with the same result. I could have sworn that the thing was oscillating or nearly so, and when a little later he asked me to take his place at the controls I made the test myself. A loud clear plock occurred at once. "There you are," I said. Just to verify, *he* touched the aerial terminal; there was no plock. I touched it again; there was a very loud plock. And we got the same result every time. Can you explain it?

I was beginning to wonder whether he was specially endowed with an abnormal high ohmic resistance or whether there was something funny about his capacity or inductance, when suddenly an idea occurred to me. "Do you mind lifting up your foot?" I said. He was rather surprised but complied. I looked at the shoe that he was wearing and said: "Now I understand." Have you got it yet? He was wearing rubber soles of a very thick kind which insulated him from earth! You will produce a plock by touching the aerial terminal of an oscillating set only if your own hand is at earth potential or very nearly so. Owing to his insulation my friend's forefinger was not at earth potential, therefore there were no plocks. You must remember this when testing out a set for oscillation.

The Aerial Question

I don't think that everybody realises the enormously important part that the quality of the aerial plays in reception. It was brought home strikingly to me by some experiments made during the last week. I have always known that my own was a bad one on account of its lack of height—telephone wires cross my garden, leaving me no option in this matter—but I never realised how bad it was until I was able to compare it directly with another.

I should like to say first of all that I made the very best of my own aerial. It is very well insulated at both ends, the lead-in is short and of thick cabled wire, insulating tubes are provided both at its point of entry into the house and also where the earth lead comes in, the earth is an excellent one of low resistance, and all joints in both aerial and earth connections are well soldered. On this aerial 2 L O at less than thirty miles is so faint with an unaided crystal that at least one note magnifier must be used to make him audible in the telephones. A second is required to make telephone strength anything like good, with three a loud-speaker can just be used, and with four loud-speaker strength is fairly good. These are resistance-capacity-coupled note magnifiers, which are not, of course, so efficient as transformer-coupled circuits.

It struck me that I was using rather a lot of valves, and I took the outfit up to the house of a friend who is more fortunately situated than I am from a wireless point of view. He lives up on the hill-side, whilst I am in the lowest part of the valley. Further, he is able to have an unscreened aerial supported at its free end by a 37-ft. mast. You would hardly believe the difference. Without any low-frequency valves at all 2 L O was quite good, and with one, telephone strength was as great as anyone could want. When two were used one could not wear the headphones with comfort, and a small loud-speaker gave respectable results.

I find, then, that my aerial is one high-frequency valve or two note magnifiers worse than his when a crystal rectifier is used. If only I could stick another 15 or 20 ft. on to my mast it would make all the difference in the world. Should you be getting poor results, take these words to heart and see whether you cannot raise your mast by some feet.

THERMION.

SOME OF THOSE WHO ENTERTAIN

Mr. Albert W. Ketelbey.

Miss Gladys Palmer.

Mr. Louis Hertel.

Miss Beatrice Harrison.

Mr. John Perry.

Miss Catherine Aulsebrook.

Miss Bertha Hughes.

Mr. Fred Spencer.

Miss Helena Millais.

MY IDEAL WIRELESS CHRISTMAS

Variety

AN opportunity to don the mantle of the director of programmes comes but rarely, and therefore I hasten to set down what I would arrange for the festive season. My programme would begin at 7 p.m. on Christmas Eve, and I should utilise Big Ben to announce the fact, because I cannot imagine a more suitable medium than his sonorous tones to proclaim to all who may listen that Christmas has come round again. For the next two hours I should suggest the 2LO Military Band, with occasional intervals for pithy little speeches from the staff at the station, impromptu for preference. Interesting little items of news could be wedged in whilst frantic search was made for John Henry, and even the weather forecast sent out (providing those wretched "depressions" were not arranging for wet). Having given John Henry his opportunity, a few tunes from the Savoy Band would be appreciated, followed by a carol party and suitable Christmas music of the old-fashioned type. As midnight approached a short and seasonable address would be appropriate, and at midnight Big Ben would boom again, followed by the bells (St. Martin's, because they come over well) welcoming in the Christmas morning. I'd like then to tune in America, Australia and New Zealand, and generally scout round for seasonable fare.

From a wireless point of view Christmas Day would be quiet. The conscientious staff at the station should have a little respite, and all I would ask is a short religious service, finishing off with a little carol singing. Boxing Day would be a great chance for Wireless Willie, John Henry or the Roosters, to say nothing of the Savoy Bands to give us a real benefit night. For once I would cut out all news (copyright by Reuter's, etc., included), and turn on the staff to send over what they liked; in fact, have a regular beano. A "round the stations" trip would shake up interest, and to finish up the night another cruise round for our friends across the herring pond would be fine.

Altogether my ideal programme would be a kind of *potpourri*, bearing in mind that to give us pleasure many others are working really hard, and sacrificing their own enjoyment for the benefit of countless thousands they will never see.—MR. WALTER MAY (Wakefield).

A Good Programme

My ideal wireless Christmas can perhaps be best expressed in the following programme:

4 to 5.—Convincing talks by Uncles, proving that Santa Claus *does* exist (my children seem to have lost faith since I inadvertently tripped over the L.S. extension leads last Christmas Eve); Miss Milly Amp, recitation, "Dead Beat"; A. N. Tenny, alto, "Stranded."

Here are the remaining letters of our Christmas Competition, in which a prize of three guineas was offered for the best letter on "My Ideal Wireless Christmas." To each of the writers of the letters printed below half a guinea will be forwarded.

5 to 6.—Overture, "Poor Wandering One" (A. Plug); N. O. Resin, solo violin, "Silicon"; A. Guiness, bass, "Drink to Me Only," etc.; talks, Prof. Vernier, "The Panel System," and P. Q. Leafield on "Mush."

6 to 7.—Miss Megger, elocutionist, "An Ode" (Evershed); horticultural talk, "Spade Work," by "Flex"; A. N. Erg, tenor, "Ohm, Sweet Ohm"; dance music by "Tickler" Orchestra.

7 to 7.15.—Captain Eckersley and B.B.C. Director of Effects, "Corks as XXX Stoppers."

7.15 to 8.—Interval.

8 to 8.30.—Mr. Henry Unit, coster study, "Arf a Mho"; technical talk, Re. O. Statt, on "Dimming."

8.30 to 9.—Mr. A. Kleen-Rubber, M.P., "Cabinet Making"; "Matting," Miss Em. Ery.

9 to 10.—The Supersonic Orchestra (conductor, John Henry), "In a Surburban Garden" (S. Preader); Morceau, "A Little Blossom"; "The Old Barrow" (Anon.); selections from "Buzz-Buzz" (Morse); "Before the Mast" (Guy Rope); "Swing High, Swing Low" (A. M. Meter).

10 to 11.—The Acoustic Party, "Watt'll I do"; "Lead in, Lead on"; duet, "Cat-whiskers"; "Hark, Hark the Spark"; "I'm Staggered" (A. Former); "The Pericon Patrol"; "Dear Honeycomb"; "Oh, Lissen!"

11 to 11.30.—Dance music by "Tickler" Orchestra.

11.30 to 11.45.—Talk, "Indigestion."

11.45 to 12.—Grand finale, all Uncles, "The Red Light" (Studio); "The Soldierer's Chorus." Good night.

And the night will be filled with bad dreams;
And the things that amuse have been said.
So we wish you a right merry Christmas,
And stagger off home to our bed.
(Announcer, A. Little Hoarse)

—MR. G. W. E. SKINNER (Leyton).

An Old-time Christmas

SIR,—First, a bright Yuletide service and carols, such as "Good King Wenceslas," suggesting snow, the Yule log, and the glow of giving, to get us into the proper atmosphere. We might, of course, include a short address—five minutes, no longer—which will touch the hearts of rich and poor alike.

Then perhaps a little play of the olden time, stage coach, highwaymen, an eloping couple. The studio of the B.B.C. would know how to create a proper atmosphere. Or, as an alternative, a mummers' play, modernised, with plenty of topical hits.

And, of course, a few Christmas chestnuts by a clever raconteur, to put us in a right good humour with ourselves and everybody else. And a few good songs and instrumental items, not too classical and not too jazzy, by our favourite artistes to help us digest the Christmas pudding.

Then, to open our purse-strings to our poorer brothers who have not the means to get a meal, let alone a wireless set, we could have a chapter or so from the perennial "Christmas Carol" by an able elocutionist, to melt the heart of any old Scrooge still amongst us.

Nor must we forget the kiddies. Yuletide is primarily their festival. "Uncles" must tell their jolliest stories, "Aunties" relate their most beloved fairy-tales, and Father Christmas must himself come to whisper in their phones his latest adventure.

So through the agency of the wireless might Christmas come into its own again and the shade of Dickens rise up and call us blessed.—G. T. S. (Hull).

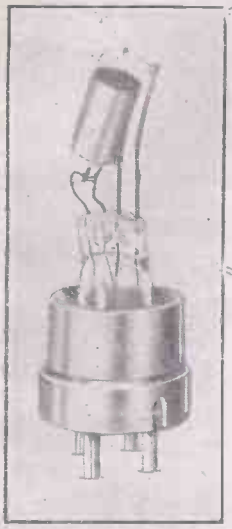
The Premier Concertina Band, under Mr. Percy E. Gayer, will give its second performance on Friday, January 2.

"VAGRANTS OF THE ETHER."—*(Continued from page 1024)*

and merely produce momentary kicks of the mirror D, which only add to the sound already emitted by the phones.

A sustained signal wave, however, throws the mirror over and switches the light-beam right off the photo-electric cell for the duration of the signal, whether dot or dash, so that the phones are entirely cut off from the aerial and remain silent during this period.

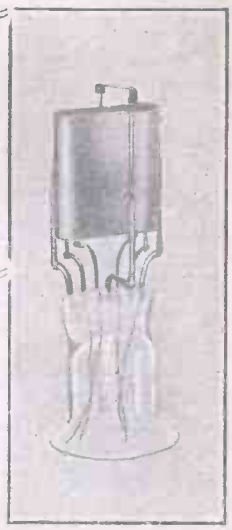
The difficulty of reading such silent signals is overcome by the use of a "back-stroke" transmitting key, the contacts of which are so arranged that the sending and spacing intervals are reversed from their normal sequence. J. KNOX.



Components of Mullard DE Power Valve.

COMPONENTS YOU CAN RELY UPON

SMALL POWER VALVES.—III



Components of Mullard DFA1 Power Valve.

THE dull-emitter power valves are an extremely interesting class on account of their remarkable efficiency. Amongst them are valves which, though consuming about ¼ ampere at less than 4 volts on the filament, will give an output up to 30 or 40 milliamperes in the plate circuit if required. One that I have found extremely satisfactory to use is the M.O. LS5. This is a large valve measuring rather more than 5 in. over all and having a diameter of a little over 2 in. It is rated at a potential of 4.5 volts on the filament, with a consumption of .65 ampere. As a matter of fact, it will work quite well with a filament potential as low as 4 volts, and I have frequently run it off a two-cell accumulator. With 100 volts on the anode and about 4½ volts negative grid bias this valve gives a large volume of undistorted sound. It is robust and has a long life. Its price, however, is rather high.

B.T.H. Valves

A splendid power valve for use with a 6-volt accumulator is the B.T.H. B4, which is rather smaller than the LS5. This valve, which has already been described in "A.W.," works at 6 volts or a little less on the filament and consumes .25 ampere. It is therefore extremely economical in use. The anode potential should be about 100 volts with a grid bias of 4 or 5 volts.

This valve gives excellent reproduction of telephony and will be found most satisfactory as a note magnifier, the volume of sound being very much greater than is obtained with any general-purpose valve. In using the B.T.H. B4 I found that valves of the latest pattern seldom require the full 6 volts on the filament. With these or any other dull-emitter power valve care should be taken to run the filament at the lowest temperature that will give good reception. Should the filament be allowed to become too bright its emission may fall right off. When this happens the emission can generally be restored by letting the filament glow dully for half an hour or so with the high-tension battery disconnected.

Mullard Valves

A very fine range of dull-emitter power valves is the three types made by the Mullard Company. These are the DFA0, DFA1 and DFA2. DFA0 and DFA2 are both designed to work from a 4-volt accumulator, and the latter can if necessary be run off three dry cells.

Both types work with a filament potential of 3.5 volts, DFA0 consuming .35 ampere and DFA2 .25. Their general characteristics are very similar, though the impedance of DFA2 is higher than that of DFA0 and it has not quite so big an amplification factor. DFA2 is eminently suitable for replacing existing general-purpose valves, and it will work satisfactorily with only 50 volts on the plate. With 100 volts results are, of course, very much better, and loud signals can be obtained without a trace of distortion. With 50 volts on the anode the proper grid-biasing voltage is 4, and with 100 volts 9.

DFA0 has a larger output and will be found excellent for use as a second note magnifier where a big volume of sound is required. The grid bias here is 3 volts negative with 50 volts on the plate and 8 volts negative with 100 on the plate.

DFA1 is intended for use with 6-volt batteries, and may in fact be described as a 6-volt edition of DFA0, its characteristics being in every way similar. Its working potential on the filament is 5.5 with a current consumption of only .2 ampere. Dry cells could be used.

To sum up, the amateur has now a large selection of reasonably-priced small-power valves to choose from. Any of those mentioned will be found thoroughly reliable. If you wish to improve your reception and to do away with distortion when using a loud-speaker, you cannot do better than to fit a power valve in place of a general-purpose valve. The results are really surprising, for not only is there a great increase in power, but all harshness and roughness vanish and the tone is immensely improved.

J. H. R.

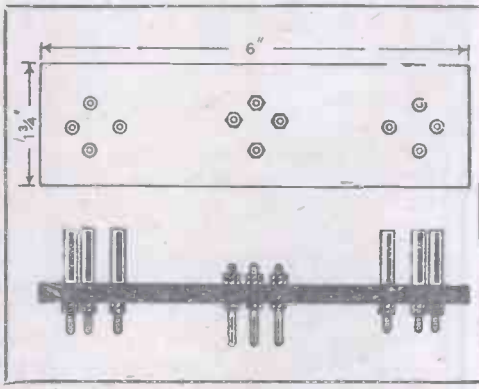
A PARALLEL VALVE ADAPTOR

THE writer has been using a single-valve reflex receiver for some time with unvarying success, but wishing on several occasions to get a little more "punch" for his loud-speaker and bring in distant stations on the headphones more powerfully, he hit upon the idea of working two valves in parallel on the receiver. This arrangement resulted in at least an increase of fifty per cent. in signal strength, while the impedance of the extra valve did not seem to affect the working of the set. As we have the two valves reflexing, it will be apparent that there is an increase in both H.F. and L.F. strength.

It is not claimed that the arrangement is ideal, but it has the advantage of being simple, effective and inexpensive, and can be applied to existing receivers when required without any internal alterations of wiring.

The drawings, Figs. 1 and 2, will make the arrangement quite clear.

R. B.



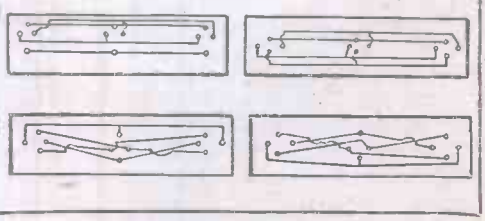


Fig. 1 (left).—Plan and Elevation of Valve Adaptor.

Fig. 2 (below).—Diagrams of Connections.

W H A WIRELESS HAPPENINGS ABROAD

PRESIDENT COOLIDGE has been presented with a five-valve neutrodyne set by an assembly of wireless manufacturers. The panel is engraved with gold and the metal parts are gold-plated.

Dr. von Bredow, of the German Postal Ministry, says that a million Germans listen-in every day.

Excellent results have been obtained by amateurs in South Africa during the International Radio Week.

Two new broadcasting stations are to be erected at Cassel and Dresden. There are three already in operation at Hanover, Bremen and Nurnberg.

Check stamps are being issued by several American broadcasting stations in order to minimise the number of exaggerated claims of long-distance reception.

At 7.30 p.m. on December 29 a popular programme will be broadcast direct from 5 X X, and the band of H.M. Grenadier Guards will give light French and Russian items.

A powerful transmitting station will soon be erected at Bolinas (California) in order to form a new connecting point for the fast service between the west coast, the Orient, Honolulu, and all points in the Pacific.

The Swedish amateur station S M Z S is working Friday and Saturday nights on a wavelength of 120 metres. The owner of this station is Toreten Elmquist, of 23, Jacobsnilgatan, Malmo, Sweden.

A test mobilisation of the 131st Infantry Regiment was carried out in Chicago recently by means of a broadcast call. The entire regiment answered the roll-call within two hours of the wireless message being sent.

A wireless amateur in the Canton of Thurgau has picked up a message from Calgary (Canada) and a reply from Great Britain.

The Radiopol Company has obtained a concession to install a broadcasting station in Poland. Market prices, exchange rates, weather forecasts, political news and musical programmes will be broadcast.

For the benefit of students unable to attend demonstrations at a surgical hospital in France, a microphone was installed a few inches above the operating table, and the students were able to hear the process of cutting flesh and bone.

Since the Danish Meteorological Institute began to issue weather forecasts it has been proposed to erect, at the cost of about 15,000 kroners, a station for the use of the institute alone.

There are at present 120,000 receiving sets in Berlin, and the number is increasing by 2,000 daily.

W H N broadcast cheers recently which were reproduced by loud-speakers to the crowd at a baseball game at Columbus.

Loud-speakers are now being fitted into certain Turkish baths in Boston so that music from W E E I can be heard.

Protests are being made in Nationalistic German circles against the broadcasting of "high-brow" wireless programmes.

President Coolidge, at the third convention of wireless men, urged that measures should be taken to guard against the admission into a broadcast programme of any items that contained malice or slander.

Popular superstition among many inhabitants in Rome considers wireless as the work of the devil, but Mussolini, and even the Pope, listen-in every day.

C K A C, the famous Montreal broadcasting station, is now transmitting concerts in French in the hope of being heard in France as well as in England.

Communication on a wavelength of 71 metres has been established between M. Menars (in France) and Mr. McLurcan (2 C M, in Sydney, Australia). This distance of over 10,000 miles was covered during daylight.

A magazine entitled *Radio-Amator* has been started in Warsaw, and in one of the early numbers an interesting inquiry has been made into the legislation of various countries concerning the use of wireless.

The cable between Germany and Sweden was cut off during the month of October, but communication was re-established at once by wireless between Berlin and Carlsburg.

An "incognito" night was held recently by W L W (Cincinnati). The programme was broadcast for over two hours without any announcement of the call sign or the names of the artistes being made.

A new broadcasting station, K F U O owned by the Concordia Seminary, has recently been opened at St. Louis, Missouri.

Transmissions on a wavelength of 34 centimetres have recently been made in the Kurz Laboratory in Germany.

Two enthusiasts in Spain are rivalling the big station I D O for long-distance transmission. The two amateurs, I H T and I M T, work on a wavelength of 100 metres.

Successful experiments in wired wireless have been carried out by the Syndicate de l'Electricité, of Paris.

The first broadcasting station in Wyoming is being erected, but at present no call sign or wavelength has been assigned by the Government.

The Fiesta de la Praza was broadcast this year for the first time by Radio-Iberica (Madrid).

The Turkish Government has sanctioned the use of wireless receivers in Turkey, but wireless transmitters for private use are strictly forbidden.

An important wireless station is nearing completion in Moscow and will soon broadcast on 1,200 metres with a power of 1 kilowatt.

A postal seaplane travelling from Alicante (Spain) to Oran (Algeria) caught fire recently. No lives, however, were lost, for a wireless S O S message speedily brought help.

The Abbé Moreux, the well-known French professor, has advanced the theory that the recent atmospherics, attributed to Mars, are actually caused by the sun's rays on the earth.

A French expedition, under the command of Marshal Franchet d'Esperey, has recently set out to cross the Sahara. A complete wireless installation on a six-wheeled lorry is being taken with the party.

A Franco-Anglo-American wireless club has been formed at 30, Rue Vineuse, Paris (X V I). The subscription is 250 francs a year, and requests for admission should be made to the secretary at the above address.

Radio-Iberica, the Spanish wireless company which is at present operating the broadcasting station at Madrid, has recently undergone a complete reorganisation, having elected a new president and board of directors.

According to a new French decree, all ships between 500 and 1,600 tons that use French ports will be compelled to carry wireless receiving apparatus, while vessels exceeding this tonnage must have a complete wireless installation.

The Berlin Vox-Haus station is now transmitting all its programmes on 505 metres. The 430-metre wavelength is reserved for tests on gramophone records, which are made between 10 and 12, G.M.T., daily.

The Commonwealth Shipping Line has arranged for twenty-eight vessels to be fitted with direction-finders.

THE BERLIN EXHIBITION

THE official opening of the Berlin Wireless Exhibition took place on December 4. The German Radio Industry Association, supported by the Government postal authorities, has constructed for this purpose a special five-storey building, the main hall of which is nearly 450 ft. long. Most of the exhibitors' stalls have a sound-proof room attached to them, thus allowing demonstrations of receiving sets and loud-speakers without outside interference. A lecture hall capable of seating five hundred people has also been provided and a large series of technical and other "talks" has been prepared by leading authorities and Government officials. It is hoped that transmissions from American stations will be heard on loud-speakers, as well as telephony from ships at sea and moving trains. High-speed transmissions of wireless pictures are also to be a feature of the demonstrations. In an annexe of the hall a small broadcasting plant has been housed in a glass-enclosed studio. Exhibits of considerable interest include a modern saloon railway carriage and an aeroplane, both fitted with wireless transmitting and receiving apparatus for the use of passengers.

The Berlin Exhibition Buildings.

Well over 200 German manufacturers are taking part in the display. A mere casual visit to this exhibition has convinced the writer that a far more impressive and representative show of the progress made in the United Kingdom could have been organised in London this year had there existed amongst our home manufacturers the same spirit of unity and co-operation as that which now appears to prevail abroad, and particularly in Germany.

German competition, on an equal basis of quality of components, is not to be feared in this country, but there is no doubt whatever that foreign visitors to Berlin will be of the general opinion that the Kaiserdamm and Witzieben Exhibition is of a very enterprising nature. J. G. A.

A "DOUBLE-DUAL" OR DUPLEX-REFLEX SET.—III

CONSTRUCTIONAL DETAILS

The Panel

THE first step is to buy a piece of ebonite of the best quality and to mark out on it the positions of the holes to be drilled, adapting Fig. 7 (p. 948, No. 132) to suit the components to be used. The relative positions of the components should, however, not be altered in any way, as the arrangement shown has been arrived at after much experiment. The panel must be thoroughly rubbed down on both sides with fine emery-cloth until no trace of the original surface remains. At this stage any engraving should be done.

When the lettering is finished, the components can be mounted, leaving the heaviest till last in order to make the panel, which is rather large and awkward, easier to handle. Special care should be given to the valve holders; the first two, at any rate, should be the special low-capacity holders now on the market, or alternatively separate valve sockets. If the latter, the thread should be 6 B.A., and not the fat 4 B.A. abominations so commonly used, and for preference they should be tapped into the panel. Failing this, one thin nut only should be used to hold them in place.

Some Constructional Details

Observe that all three valves are arranged so that the grid pin is to the left, filament pins top and bottom. This shortens the wiring below the panel. All this is to avoid unnecessary capacity effects between grid and plate. The switch contacts should be cut down, for as sent out by the makers they are always unnecessarily long, and the extra capacity so caused may make all the difference.

Another point is that the first L.F. transformer, below which the lead to the grid of the first valve runs, should be raised on feet to be as far from this lead as possible. The easiest way of doing this is to secure it to the panel with long bolts, putting three or four "spacer washers," as used for variable condensers, on each bolt between the transformer and the panel. If this is not done there may be serious leakage to earth of the incoming impulses before they get to the grid.

Fixed Condensers

It will be noticed that none of the fixed condensers are bolted to the panel, but are soldered to the stiff wires used for wiring up. This necessitates the use of condensers which have soldering lugs, or the clip-in variety. This saves time, trouble and complication of wires, and reduces the number of bolt heads visible on the front of the panel. There are, in fact, only nine such bolts; eight hold the two transformers, and the ninth forms a convenient point to which to solder the negative filament leads. The positive lead is connected to the H.T. — terminal, and a length of flex is soldered to this and to the bolt, brought through a hole in the side of the box, and finished with spade tags for easy connection to the accumulator. There are thus no L.T. terminals on the panel and no possible chance of mistakenly connecting the H.T. battery where the accumulator ought to be. It is of importance to bring stiff wires that will "stay put" to the edge of the panel, and then solder on the flex, so that they have no chance of straying round inside the box among the other wires

Wiring

As to the wiring up, everything can be summed up in the statement that every wire will have an effect on every other, and that the effect increases rapidly as the space between the wires diminishes, and is greater the longer the wires and the more nearly parallel they are. Strive, then, to keep the wires short, well apart, and to make them cross at right angles, and be particularly careful of those at a considerable high-frequency potential to

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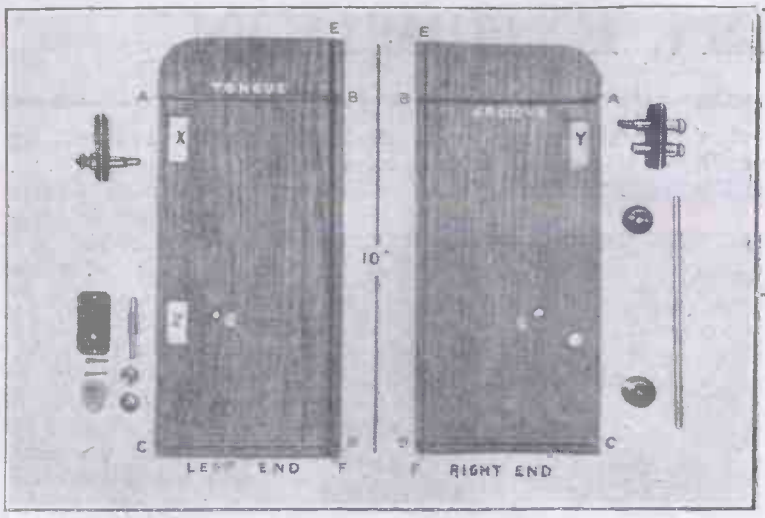


Fig. 1.—Cabinet Ends with Aerial, Earth and Telephone Terminals.

AN EXTENSIB

"ALWAYS COMPLETE

Most unit sets consist of a series of cabinets and do no this series of articles is complete in itself, yet it is of such

IN designing this extensible system of receiving set construction the writer has attempted to cater for the needs of the complete novice as well as the experienced wireless man. Previous methods of unit construction have many advantages and some disadvantages when compared with the complete instrument type of set. In the present set attempt has been made to incorporate only the advantages of both. For instance, instead of a number of entirely separate units connected electrically by more or less unsightly wire strapping, and therefore lacking the portability of a one-unit instrument, this set is so built that at every stage it always has the appearance of a complete cabinet, and so can be moved *en bloc* from place to place, yet any unit can be taken out and the size of the whole reduced inside sixty seconds simply by the unscrewing of two thumb-nuts. Like the celebrated book-case, it is "always complete yet never finished."

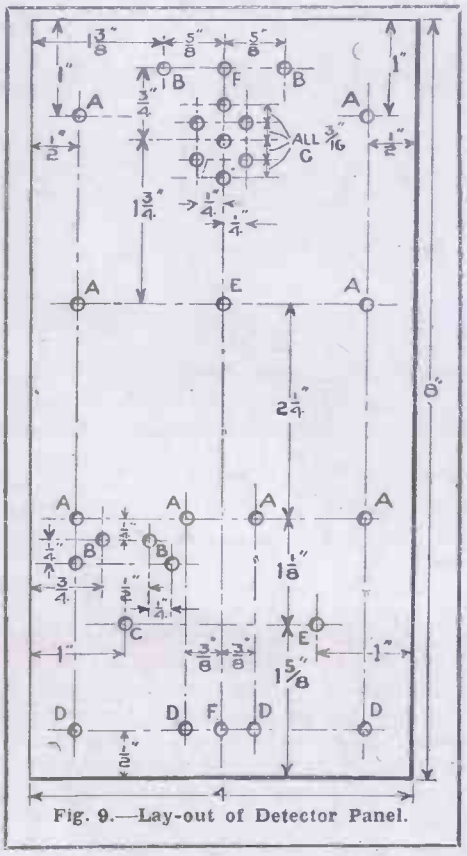


Fig. 9.—Lay-out of Detector Panel.

The Set

The set in its present stage consists of four distinct units: (1) Valve detector, (2) valve dual-amplification unit, (3) simple low-frequency unit, and (4) eliminator and grid-bias control unit.

High-frequency and low-frequency amplification can, of course, be duplicated.

It will be seen that the latest developments in wireless science are incorporated. How the newest circuits may be utilised in the set will be shown later.

In explaining the construction the absolute novice has always been kept in mind, and care has been taken to detail every point where doubt might arise.

Photographs and diagrams have been used wherever they are helpful in explaining constructional and other points, and these cannot be studied too carefully. The number of tools required is kept as small as possible, and those needed are catalogued for the benefit of the beginner. No instrument construction is explained, as all the components may be purchased at any wireless dealer's.

Making the Cabinet

Although many amateurs fight shy of making their own cabinets, preferring to leave them in the skilled hands of the cabinet-maker, there is small chance of failing to make successfully the Crest cabinet if the following instructions are carried out precisely.

The tools required are vice, handsaw, fretsaw, smoothing plane, rabbet plane, screwdriver, hammer, brace and bits, hand drill, tap-wrench, 4 B.A. tap (plug) and file.

The Materials

Oak or other suitable wood, 40 in. by 4½ in. by ½ in. This should be purchased already planed; 4 ft. of hardwood strip, ½ in. by ⅛ in. (as supplied to model-aeroplane builders); three pieces of ebonite, 1½ in. by ¾ in. by ⅛ in.; three coil plugs; one coil socket; six 2-gauge 5/16-in. round-head wood screws; two telephone terminals; two W.D. 4 B.A. terminals; one 2 B.A. screwed rod 5½ in. long; two 2 B.A. milled nuts (from W.D. terminal); four 1-in. countersunk wood screws, and glue.

Fig. 7.—The Co

Construction

First take in hand the two ends (Fig. 1). Two pieces of wood are cut 4½ in. by 10 in., and the ends finished square and true with the smoothing plane. The rabbet plane is now set with a ⅛-in. blade to cut a ¼-in. groove (depth), with centre of cut 1¼ in. from guide. A ¼-in. deep groove is next cut 1¼ in. from one end of each piece (A B, Fig. 1). Mark this "top inside." Reset the plane to cut ¼ in. from the guide, and make grooves C D and E F, care being taken that grooves E F on each piece correspond when the inner faces of the ends are brought together. Glue strips of ½-in. by ⅛-in. wood

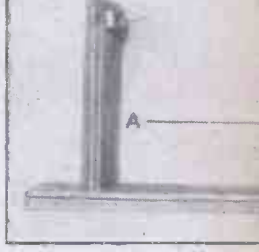


Fig. 6.—End

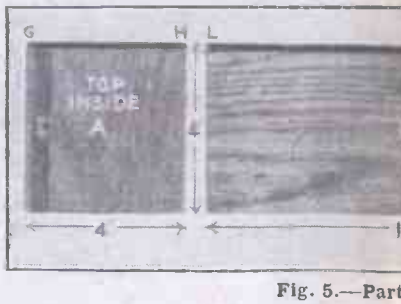


Fig. 5.—Part

BLE UNIT SET

YET NEVER FINISHED"

t present a complete appearance. The receiver described in design that there is no limit to its progressive construction.

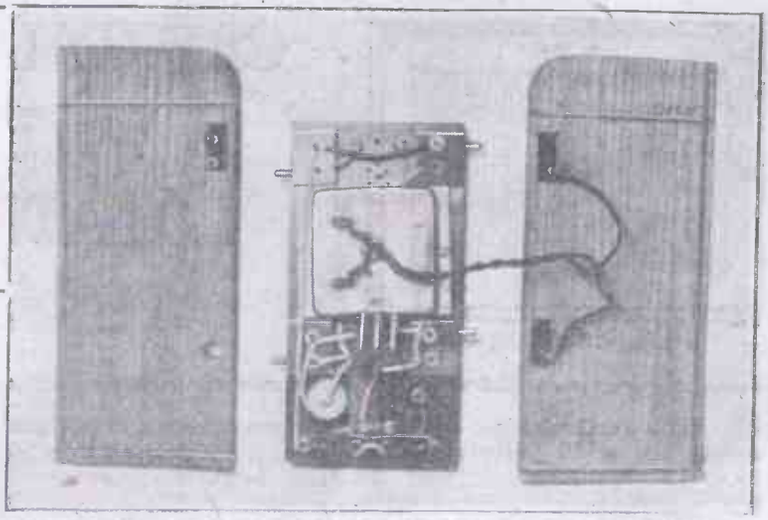


Fig. 8.—Rear of Detector Panel with Connections to Aerial and Earth.

along all the grooves of the left end. When this is done the tongue which protrudes from the left end should fit tightly into the grooves of the right end.

While they are thus together cut with the fretsaw holes X and Y, 1⅛ in. by ½ in.; these are 2 in. from the top end and ¼ in. from the front edge. Also round the corners, as indicated in Fig. 1, and drill G ¼ in. through both.

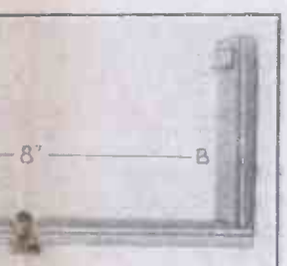
Detector Unit
nplete.

Separate the ends and cut Z, 1⅛ in. by ½ in., 2⅜ in. from the bottom and ¼ in. from the front edge. Drill a ⅛-in. hole 2¾ in. from the bottom and ½ in. from the front edge.

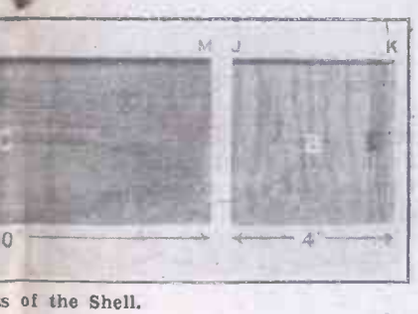
Terminals

Next take the three plugs and one socket, cutting the shoulders of the plugs down to 7/16 in. Drill through the end to a depth of ⅜ in. and tap 4 B.A. Screw in the ¾-in. pillar of a W.D. terminal to a depth of ¼ in. Fig. 2 will make this clear.

The socket must now be cut to a total length of ½ in. outside and 7/16 in. inside, the remaining 1/16 in. being drilled and tapped lengthwise to take a 4 B.A. terminal shank (see Fig. 4), the latter being cut, in the case of the socket, to ⅛ in. to go through the ebonite base (Fig. 3B), and grip the socket on the reverse side.



View of Shell.



s of the Shell.

Drill the three ebonite bases, as shown in Fig. 3, of a size to clear 4 B.A. Two pieces are drilled as A and one as B, with 8 B.A. holes close to each end for fixing to the case ends through X, Y and Z, as shown in the photographs. The plugs on the left end must correspond with the socket on the right at the top and the hole at the bottom of the end piece. Screw the ebonite bases with plugs to ends. Plug the centre ½ in. from the front edge.

The "Shell"

Now inspect Figs. 5 and 6. This shows the case which holds and is duplicated for each unit as it is built; for convenience it may be called the "shell." For this cut one length of wood 4 in. by 10 in. and two pieces 4 in. by 4 in., finishing each to size with the smoothing plane, and taking care to make each edge square and true. Mark each piece on one face "inside." Fix up the 10-in. by 4-in. piece in the vice, and with the rabbet plane, which is already set, cut grooves in each edge, with the grain (see Fig. 6). Do likewise with each 4-in. by 4-in. piece, only in this case cut grooves across the grain along two edges. Then fix up with wood screws through the back, the inside measurement AB (Fig. 6) being 8 in. This must all be done accurately, so it is advisable to fit the left end with tongue to fit into the corresponding grooves in A, B and C (Fig. 5).

When this is done we have a case with removable tongued-and-grooved ends ready to receive a panel 8 in. by 4 in., which rests along two rabbets of wood fixed to the top and bottom of the shell ¼ in. from the front. The panel is secured by two Meccano brackets in the centre, at the top and bottom, as shown in the photographs.

Detector Panel

We can now turn our attention to the detector panel. Fig. 7 shows the complete unit, Fig. 8 the rear of the panel and Fig. 9 the layout.

The unit includes a simple tuning circuit employing honeycomb coils, and is therefore capable of being tuned to any wavelength. The parts required are as follows: One ebonite panel 8 in. by 4 in. by ¼ in.; one Polar condenser; one baseboard-mounting coil holder; one valve-holder bracket; one Lissenstat; four coil holders with contact screws on face; .0002 grid condenser and leak (2 megohms); four Gibson plugs and sockets; one switch and arm; two studs, one with countersunk nut; two stop pins; two telephone terminals; four ½-in. 4 B.A. countersunk-head screws; two Meccano angle brackets; small screws to mount coil holder.

D. G.

(To be continued)

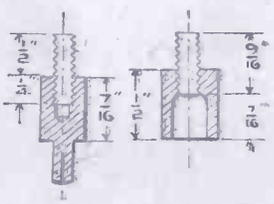


Fig. 2.—Details of Plugs and Sockets.

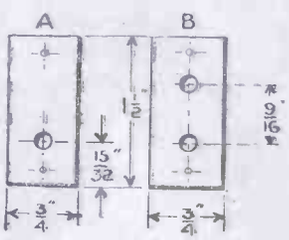


Fig. 3.—Terminal Base.

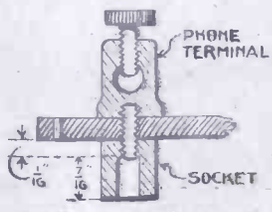


Fig. 4.—Details of Terminal and Socket.

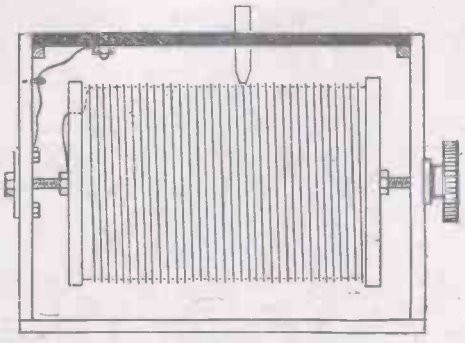


Fig. 1.—The Tuning Coil.

CRYSTAL SET WITH ROTATING TUNER

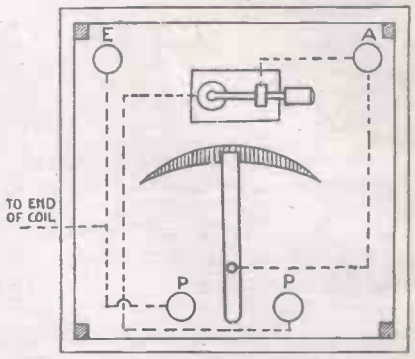


Fig. 2.—Plan of Panel with Wiring.

LIKE most enthusiastic crystal-set owners, the writer has always been searching for "something better," his belief being that any improvement in tuning must inevitably lead in the desired direction. The following are instructions for making a novel receiver which has given excellent results.

Take a former 6 in. long and 4 in. in diameter and wind it with forty turns (about 40 ft.) of No. 16-gauge bare copper wire, first giving the cylinder a good coating of shellac. Begin winding from the right-hand side of the former by pushing the end of the wire through a hole about ½ in. from the edge and hooking it in position. Wind carefully, leaving a little space between each turn of wire, passing the last 6 in. through a hole in the former, but not permanently fastening it.

Now get about 50 ft. of good white string, soak it well in shellac, and wind it around the former between the turns of wire.

Next get a piece of wood about ⅛ in. thick and cut from it two discs to fit in the ends of the former; then two more to cover the ends of the cylinder flush with the outside edge. Fasten the small discs centrally upon the large ones. Find the centres of these discs and bore a small hole to take the ordinary tapped brass rod, 10 in. long, which acts as spindle. Fasten one of the cylinder ends on the spindle about 1 in. from the end by means of nuts and washers on both sides of the disc, put it into position in the former, and then place the other disc on the opposite end of the spindle and fasten by a washer and nut on the right-hand end of the spindle.

Take the 6-in. length of loose coil wire through a couple of holes in the former and fasten between the spindle nut and washer, finally adding a blob of solder for safety. The former should now appear as in Fig. 1.

The Cabinet

For the cabinet, make a box 8 in. by 8 in. by 6 in. deep, leaving the bottom out until the job is completed, and fastening the right-hand side only temporarily. Make a pin-hole in each side of the cabinet, 2¾ in. from the top edge and 4 in. from the side, finally making holes large enough to take two brass bushes, placing the flanged end outside the cabinet. These are for the spindle to revolve in.

Attach a piece of insulated wire, about 1 ft. long, to the inside nut of the bush, the opposite end of the wire being finally connected to the left phone terminal underneath the panel.

The spindle will now protrude an inch on either side of the cabinet. An ebonite knob is screwed on to the right-hand end. The left projection is left until everything is fitted and tested, when a nut is soldered on near the bush and any surplus rod sawn off.

The Panel

There is nothing unusual about the panel except for the switch arm, pillar and crescent-shaped hole through which the end of the arm reaches to the coil. The first job is the switch arm, 5 in. long and ½ in. wide, turned down 1 in. at former end; drill a hole in the arm 1¼ in. from the opposite end large enough to fit the tapped bar pillar easily, file the pointed end of arm to about ⅛ in. and put a tiny nick in it, to fit the coil wire upon which it will finally ride. The pillar consists of about 2 in. of tapped rod; it stands in a position central between the phone terminals but ¾ in. in front of them, and is fastened to the panel by nuts and washers. The aerial lead is connected to the under side of the pillar.

To find the correct position for the switch-arm pillar, mark a line from left to right across the centre of the panel, then another across centre of panel from front to rear, and place the sharp end of the switch arm on the point where the lines cross; this is the centre of the semicircular cut in the panel.

Fix the pillar and put the switch arm on, then by moving the arm the line for the cut in the panel will be indicated.

The wiring is shown in Fig. 2.

R. W.

"A 'DOUBLE-DUAL' OR DUPLEX-REFLEX SET."

(*continued from page* 1035)

earth, such as all wires connected to the plate of a valve and all connected to the grid. If this set is wired up with flexible wires, relying merely on Systoflex to prevent contact between them and with no attempt at proper spacing, it cannot possibly work. Stiff wire is absolutely essential.

It is not easy to fit in satisfactorily all the wires in the tuner (before the first valve is reached), but I recommend a careful study of the photograph to those who find difficulty. The rest of the wiring is simple enough to arrange, although the number of connections to be made is large. Observe particularly that a separate H.T. terminal is provided for the last valve, and two terminals are supplied in the front corner of the panel for grid bias for this valve. Loud-speaker reproduction of good quality is only attainable when the last valve has a high plate voltage of 150 volts or so, together with a suitable grid bias.

Also it should be noticed that the crystal is connected to the coil L6 and the cat-whisker to the bottom of coil L4; if these connections are reversed the act of setting the crystal will introduce serious hand-capacity effects. The moving plates of the condensers, too, are in every case on the earth side, and enamelled metal dials are used in place of the more usual ebonite, with the object of still further avoiding these effects. All these precautions, together with the use of short extension handles, make it possible to tune in even American stations without trouble. The box chosen to support the panel should be not less than 6 in. deep inside, and full advantage of this depth should be taken in wiring up, all the longest connecting wires being carried at the greatest distance from the panel.

With these few hints on wiring the constructor must be content; a full wiring diagram would be so complicated that it would be almost impossible to follow.

The terminals in Figs. 5 and 7 (Nos. 131 and 132) are numbered to correspond, and all switches are arranged alike in the two diagrams, so that the connections shown in Fig. 5 as going to any particular contacts go to the corresponding contacts in Fig. 7.

A. L. M. S.

(*To be concluded*)

AROUND THE SHOWROOMS

Atlas Filament Rheostat

UNTIL the great question "Bright-emitter or dull-emitter?" is finally answered, filament rheostats that are of service with either type of valve will remain in general use.

A particularly neat type of such universal rheostats is the Atlas, made by H. Clarke and Co. (Manchester), Ltd., of Old Trafford, Manchester. The body of this is constructed of porcelain, which is at once neat in appearance, strong, and a good insulator.

Specially prepared disc are used for the resistance element, and these are so arranged as to obviate any risk of packing. One-hole fixing is employed.

Watmel Grid Leak

SCREW adjustments on small instruments sometimes become slack through continual operation, and annoyance is thereby caused to the user. To avoid any such thing happening with their grid leak, I notice that the Watmel people have adopted an ingenious device.

A slot is milled in the bush, through which the adjusting screw passes, and into this is fitted a small D-shaped spring that grips the thread, thus taking up any slackness.

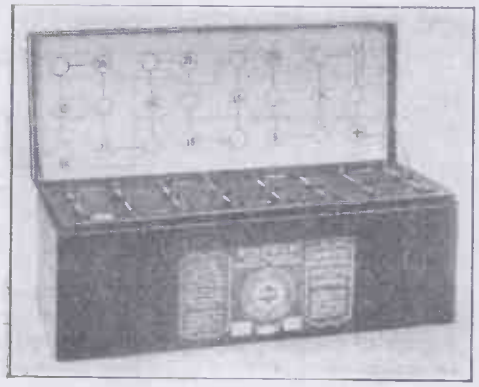
The address of the Watmel Wireless Co. is 332A, Goswell Road, E.C.1.

Ediswan H.T. Batteries

H.T. SUPPLY may be a small or large item on your annual maintenance bill, depending upon whether you use good or bad batteries. And among batteries that must be classed as good—decidedly good, in fact—are those of Ediswan manufacture.

When first one makes acquaintance with Ediswan H.T. batteries one is surprised at their great variety, for there are batteries with 3-volt tappings and 15-volt tappings, with plug-and-socket tappings, with proper terminal tappings, and with no tappings at all.

There are also some special types made,



Ediswan H.T. Battery.

as, for example, the 36-volt tapped battery shown in the photograph.

For several months now I have had a number of Ediswan batteries in use, and although they have been put to some pretty heavy work they show no signs at all of a sudden or premature death. I gauge their useful life to cover many more John Henry soliloquies.

I have only one criticism to make. I should like the "tapping" numbers to read from negative to positive; one naturally taps up from the negative and towards the positive.

Liberty Wander Plug

NO matter how good your H.T. battery is, it is rather *too* good for lighting valve filaments. One can avoid a lot of worry on this score by the simple process of putting a comparatively high resistance in the plate circuit.

Then if you accidentally put the H.T. across your valve filaments, insufficient current will pass to burn them out.

Trouble can be avoided by using a Liberty H.T.B. wander plug, which has a resistance of 500 ohms incorporated in it. This plug is made by the Radio-Arc Electrical Co., Ltd., of Bennett Street, Chiswick, W.4.

Microhm Vernier Condenser

THERE are a number of special uses to which a vernier condenser can be put, as, for instance, in neutrodyne circuits or for balancing two simultaneously tuned anode circuits.

In these cases it is essential that the condenser should have a really small maximum capacity. I have found the Microhm vernier condenser exceptionally useful for very fine adjustments; its maximum capacity is, I believe, .000025 microfarad, and in appearance it resembles a variable grid leak of the tubular type, being about the same size.

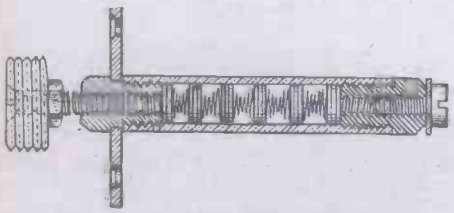
Microhm products are made by the Radio Engineering Co., of College Street, E.9.

VANGUARD.

PROGRESS AND INVENTION

Variable Grid Leak

ALTHOUGH filament rheostats and grid leaks of the compressed carbon type have the advantage that the resistance may be continuously varied from infinity to any



Variable Grid Leak (224,081/24).

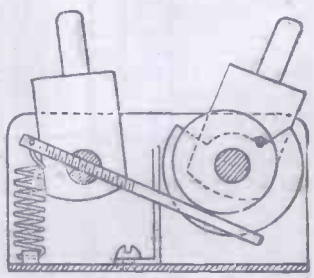
desired value, there is always the possibility that the carbon granules may pack together and considerable vibration may be necessary before they separate.

A method of overcoming this difficulty is the subject of Patent No. 224,061/24 (A. E. Watkins, of Cricklewood, London). The pellets or discs of carbon are separated one from another by springs, and a spring is also inserted between the end pellet and the compressing screw. It is claimed that this interposition of spring devices permits of a very gradual alteration of resistance without the tendency to pack. Various types of spring are described in the specification.

Coil Holder

A NEAT coil holder with a vernier controlling device is described in Patent No. 5,941/24 (Arktiebolaget Baltic, of Stockholm, Sweden). It is interesting to note that in this holder both sockets are adjustable, but are moved by the same controlling arm.

The working of the coil holder is shown in the diagram, and it will be seen that the coarse adjustment is made by the



Coil Holder (224,442/24).

socket attached to the moving arm, while motion is transmitted by means of reducing mechanism to the other socket, which thus has a vernier movement.

EXPERIMENTAL TRANSMISSION.—VI

HOW THE VALVE OSCILLATES

BEFORE describing the numerous possible circuits to be employed for transmission it would perhaps be as well to have a thorough understanding of the action of an oscillating valve.

Action of Valve

When the circuit shown in Fig. 19 is completed, a plate current flows which sets up a magnetic field in the anode coil AB as it passes through it. This current induces a voltage in opposition to itself, so that the plate current does not rise instantaneously to its normal value.

The field in AB induces a voltage in BC in the same direction as that in AB, and thus makes the grid positive with respect to the filament. Now, in accordance with the theory of the hard valve, the grid-circuit current increases, and the negative flow is in the direction shown by the arrow —that is, it is in the same direction as the induced volts in BC, and in the opposite direction to the plate current as far as the coils are concerned. Eventually the result of these two oppositions is that the magnetic field in BC is reduced to zero, and the grid returns to zero potential, causing a fall of plate current.

The decrease of current reduces the magnetic field in the coils and eventually the grid attains a negative potential. The grid current is then very small, BC has no magnetic field of its own, the field in AB has decreased simultaneously with the decrease of plate current, and hence the grid returns to zero potential. The plate current has therefore increased again and the whole sequence of events is repeated.

It will thus be seen that a thermionic valve may be used as a highly convenient

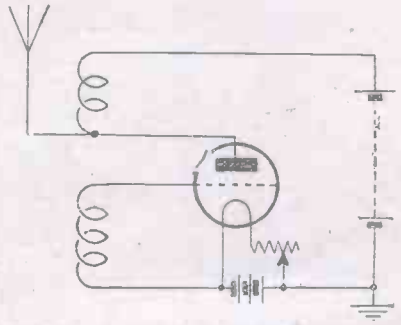


Fig. 20.—Principle of Valve Transmitter.

source of oscillation from the amateur's point of view, since its action is so entirely automatic.

Let us see how the simple circuit shown in Fig. 19 may be converted for C.W. transmission.

It will be obvious that the greatest surges or potential oscillations are set up in the plate coil AB and that if an aerial and earth system is connected across this coil maximum effect will be produced. Such an arrangement is shown in Fig. 20, and this circuit contains all the essentials of a valve transmitter. One more theoretical note before a consideration of practical schemes.

If the inductance included in the anode

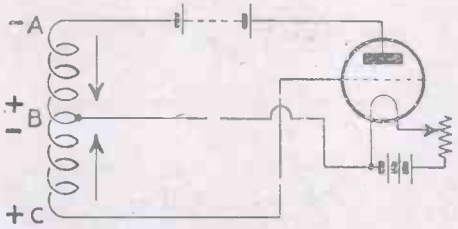


Fig. 19.—A Simple Valve Oscillator.

circuit does not constitute many turns of wire, it may be necessary to increase the degree of coupling of plate and grid coils in order to sustain oscillations of good amplitude—that is, the capacity effect in the grid circuit will be increased.

The capacity effect in the anode inductance may be small, and it may thus arise that the grid coil will control the frequency and wavelength. It may so happen that while an adjustment of plate tapping is made to give a satisfactory aerial current, the wavelength suddenly changes from that of the plate circuit to that of the grid circuit. This consideration must be especially borne in mind when a transmitter is being designed which will work efficiently over a long range of wavelengths.

Methods of Coupling

We are now in a position to note the various methods of grid-to-plate coupling employed in practice in order to know the respective merits of each circuit.

Fig. 21 illustrates a more workable form of the circuit considered in Fig. 20. The aerial circuit, consisting of aerial, L1, and earth connection may be tuned to the wavelength of transmission by means of the tapping A, or a good-quality variable condenser may be connected across aerial and earth terminals to vary the natural total capacity of the system. It is, however, essential that any condenser included in the aerial circuit should have a low resistance to high-frequency currents: it is desirable always to work with a minimum of capacity.

A large capacity condenser of the order of 1 microfarad may be placed in the earth lead if for any reason it is desired to maintain the high-tension supply above earth potential.

The amount of inductance included in the plate circuit may be varied by means of the anode tap B. It will be found that for short wavelengths the amount of wire in the plate circuit is greater than that included in the aerial circuit, since a considerable number of turns are required for the requisite plate-grid coupling, but only a few turns of wire are necessary to bring the aerial circuit to the required wavelength.

A low-resistance small-capacity condenser may be included in series with the aerial to reduce the wavelength, but the aerial current may be seriously reduced; as was previously mentioned, it is not always worth while working near the fundamental in order to obtain a maximum radiation resistance if costly, wasteful condensers are needed to reduce the system to the correct wavelength.

The grid circuit L2 C C1 R1 is coupled to the aerial circuit in any desired manner, but it is essential that the coupling should be continuously variable.

The grid condenser C1 (value .002 microfarad) and leak R1 (value 10,000 to 15,000 ohms) are included in order to give the grid the correct negative potential. Ordinary values are quite unsuitable, and it should here be noted that for efficient working the values for grid leak and condenser in a transmitter should be as high as possible.

In this particular arrangement the grid circuit is shown tuned to the desired frequency.

In actual practice, if the grid circuit is

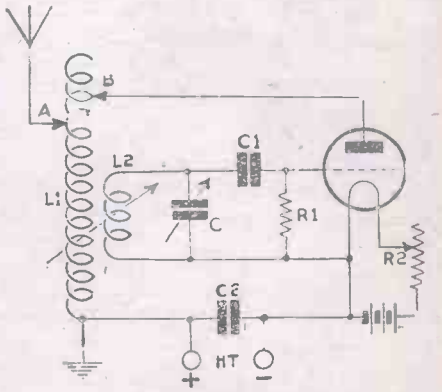


Fig. 21.—Circuit Diagram of Single-valve Transmitter.

exactly in tune with the plate circuit, oscillations will then be sustained through the inter-electrode capacity of the valve. No direct coupling of the coils is then necessary. Such an arrangement will be shown later, where the coil fields may even be at right angles, provided that they are exactly in tune.

KENNETH ULLYETT.

(To be continued)

THE BASIS OF WIRELESS STUDY

CONCERNING UNITS

IN order to define the value of any electrical quantity—for example, 5 ohms, 3 volts, or 6 amperes—we make use of two distinct factors. One factor is a pure number which states "how many," the other is a unit which explains "of what."

There are a great many different kinds of things to be considered in electrical work alone, such as inductance, capacity, magnetic flux, impedance, etc., and each of these must have a suitable unit. When one considers the whole field of physical science this variety becomes immense. It is the object of the physicist always to define the various units with which he has to deal in such a way that there shall be, if possible, some common bond between them. The task of comparing quantities of the same kind, such as the relative frequencies of ultra-violet light and of wireless "waves," is a comparatively easy matter.

Two Systems

Unfortunately, so far as electrical science is concerned, the present system of units is far from satisfactory. In fact, two distinct systems have been evolved which overlap wherever any electromagnetic phenomenon is concerned. One system is derived from the purely electrical point of view, whilst the other is based upon and only recognises magnetic action.

This confusion arises from the fact that in the early stages of the science electricity and magnetism were regarded as two distinct effects, and a separate framework of knowledge grew up around each. Even at the present time we do not know fully and completely the relation between the two, but we are growing more and more convinced that they are merely two different aspects of the same fundamental thing.

Meanwhile, it became necessary to have some workable and consistent means of measuring familiar electrical effects, such as currents, pressures and resistances, and so a third independent system of practical units was prepared, to which we owe the ampere, volt, ohm, etc.

Fundamental Units

The fundamental units, beyond which the human mind does not attempt to probe (the followers of Einstein excepted) are space (or length), time, and mass. So far as we know at present it is impossible to translate any one of these in terms of the other two. The three conceptions are "atomic" in that they cannot be further analysed. Incidentally, it may be remarked that neither of them can be completely realised by the mind.

Accordingly these three "elements" form the fundamental units of all physical knowledge. Conceptions such as velocity, acceleration, momentum, etc. in mechanical science, or capacity, induction, electrostatic charge, magnetic flux, etc. in electrical science, are defined by means of units which are derived from the fundamental trio.

Again, within the comparatively limited field of electrical science there are some conceptions more basic than others. These standard quantities are current and resistance, from which all the rest have in turn been developed. Nevertheless, the units of current and resistance are themselves framed in terms of length, mass and time, and so the structure of electrical units in common with those of the other sciences rests ultimately upon these three supports.

For example, current, as derived from the electrostatic point of view, is the rate of flow of a charge across a dielectric, and is represented in fundamental units by $\sqrt{L^3 M k} \div T^2$, where k is the specific inductive capacity and represents a number only, L represents length, M mass and T time.

As derived from its magnetic attraction or repulsion effects, current becomes in fundamental units: $\sqrt{M L m} \div T$, where m is the magnetic permeability of the surrounding medium, and implies a number only, whilst the other symbols have the same values as before.

It will at once be asked how the same entity, namely, electric current, when reduced to fundamental units, can logically be represented by two different expressions. The answer lies in the original mistake made in separating the electrostatic and magnetic points of view. Until we gain a clearer insight into the ultimate nature of electricity and magnetism, and the mutual relationship between them, this apparent discrepancy in units must be put up with. It is, however, a significant fact that the ratio between the two expressions for a current set out above is of the form L/T (length divided by time), which represents a velocity. When the numerical values of the associated factors k and m are determined for air or a vacuum, they turn out to be identical with the figure representing the velocity with which wireless waves travel through space, that is, the velocity of light. This affords independent evidence of the existence of some intimate connection between electricity, magnetism and light.

Practical Units

The practical unit of resistance, the ohm, is equal to 1,000,000,000 times the corresponding derived electromagnetic unit. By dividing the latter figure by V^2 (V being the velocity of light), we get the corresponding value of the ohm in electrostatic units. It is to be noted that this factor of the velocity of light occurs constantly when comparing the two theoretical units.

The practical unit of current, the ampere, is one-tenth the corresponding magnetic unit, and one-tenth the electrostatic unit divided by V.

It is unnecessary to pursue the comparison further. It should, however, be stated that inductance in the electromagnetic system has the dimensions of a bare length. This corroborates the observed fact that the inductance of a wire increases directly as its length. If, for example, a straight wire is doubled in size all round (in length and thickness) its inductance is doubled. In certain practical calculations the electromagnetic unit of inductance is still employed, and is referred to as a "centimetre" of inductance.

Also capacity, when measured in the electrostatic system, has the dimensions of a mere length. This is perhaps difficult to appreciate at first, until one recalls the fact that the capacity of a condenser varies as its area divided by its thickness, which means $L \times L \div I = L$. A microfarad is equal to 900,000 "centimetres" of capacity. Another "practical" capacity unit frequently used is the "jar." A jar equals 1,000 "centimetres" of capacity, from which it will be seen that there are 900 jars in one microfarad.

D. A. L.

A HOSPITAL RECEIVER

The photograph shows a two-valve Gecophone with Western power amplifier recently installed in the Birkenhead Borough Hospital.

KOP, the station of the Detroit Police Department, is now broadcasting on a wavelength of 286 metres.

Mr. Russell White, of 1AO, New Zealand, has been heard by American amateurs on three different occasions.

If Oliver Twist could visit British workhouses this Christmas he would be surprised to see the inmates in warm dining-halls listening to seasonable songs and greetings by wireless.

The high-power Post Office station at Rugby is gradually nearing completion. Four of the eight 800-ft. masts have so far been erected and the power-house is almost complete.

Capt. H. W. Litt, of the B.B.C. experimental staff, has been appointed engineer-in-chief of the new high-power station to be erected near Daventry.

Mr. G. Marcuse (2NM) has been received at good strength in the Argentine by DA8.

The Queensland Ministry intends to spend a large sum on the installation of wireless sets at the Peel Island (Australia) lazarette for lepers.

The new Marconi station in Dorset will operate on a wavelength of 30 metres, and will therefore cause no interference with local wireless receiving sets.

Sir Robert Donald announced at a general meeting of the Empire Press Union in London that the Empire wireless station at Hillmorton will be opened early next year.

The proposed service to be given by a wireless beam station in India will reduce the cable charges by 30 per cent.

The establishment of a new high-power station at Angora is the latest project of the Turkish Government.

The third annual wireless exhibition, held recently at Chicago, was a great success, and nearly £1,500 has been presented to the fund for the blind as the result of charity sales.

WBZ, KYW and WEAF, three stations well known to British listeners, have now increased their power to 1,500 watts.

KNX, at Hollywood, Los Angeles, now broadcasts educational talks by prominent speakers in California.

It is reported that American wireless enthusiasts will have nothing to do with crystal sets, as long-distance reception is the attraction in the U.S.A.

Complaints have been received of oscillation and interference in the Salisbury district.

A wireless club has been started in Rangoon, and the members are building a transmitting station at their own expense.

Bradford Corporation proposes to issue licences for wireless aerials across streets at a charge of 2s. 6d. each licence.

The latest transmission of photographs by wireless include illustrations of Parisian dress designs sent to Marconi House by express post from Paris for transmission to designers in New York.

The broadcasting of boxing bouts in America is to be banned.

Six broadcasting stations will be erected in Japan by the end of January.

The Basford Rural District Council has abolished the charge of 2s. 6d. which it has been imposing on tenants of its houses who installed wireless sets; it is intended to refund the money already paid.

A receiving set with eighty-two pairs of phones has been presented to the Preston Infirmary, Birmingham.

An appeal is being made by a member of the National Pigeon Association to wireless amateurs to affix small corks to their aerials, and thus prevent pigeons from injuring themselves on the practically invisible wires.

An amateur in the Basses-Pyrenees has heard the Jewa station at Tokyo on a wavelength of 90 metres.

A Sunday Bible class is conducted by the American station WFAA.

Prevention of "mush" from arc and spark transmitters is a problem that the U.S. Navy Department hopes to solve.

An appreciative audience assembled at the Royal Opera House, Covent Garden, on Wednesday, when the B.B.C. gave the first of their series of International Symphony Concerts, S.B. to all stations.

WE REGRET

That, owing to pressure on our space this week, we are compelled to hold over the "Information Bureau" page. All queries addressed to us are answered by post providing a coupon (p. 1056) and stamped addressed envelope are sent us.

In connection with the Empire wireless scheme, it had been arranged to erect stations at different points, each costing £500,000. The use of the beam system will enable stations costing only £60,000 to be erected.

The first press message by wireless to South Africa from England was received by the *Cape Times*.

Wireless sets are to be installed in all the private rooms and wards of the public hospitals in Vienna as a Christmas gift from Herr Schurff, the Minister of Trade.

A Dutch experimental station with the call sign NSF is now conducting tests every night from 7 to 10 p.m. G.M.T.

There is reported to be a number of transmitting stations in Dublin without Government permits. One station regularly transmits a concert every evening on a wavelength of 480 metres.

Complaints have been received of oscillation and interference in the Leeds district.

At the wireless exhibition held in Berlin a section of a postal aeroplane was on view, enabling the public to see the apparatus used for the reception and transmission of messages whilst in the air.

A wireless receiver which can also be used as a transmitter has been constructed by the Russian inventor Lossev.

The Postmaster-General states that the Government will bring forward a Bill in 1925 to amend and improve the law relating to broadcast reception.

Poppy will not be broadcast by the B.B.C. on January 9, as arranged, as provincial managers have threatened to boycott the company when on tour if the play is broadcast.

The first signature to be sent across the Atlantic by wireless is that of Sir Robert Kindersley. The signature was transmitted by photo-wireless on the occasion of a dinner in honour of Mr. Owen Young, the Agent-General for Reparations.

A sentence of imprisonment has been passed on a Breslau "Black Hearer," which is the description applied in Germany to a man who listens-in without a broadcast licence.

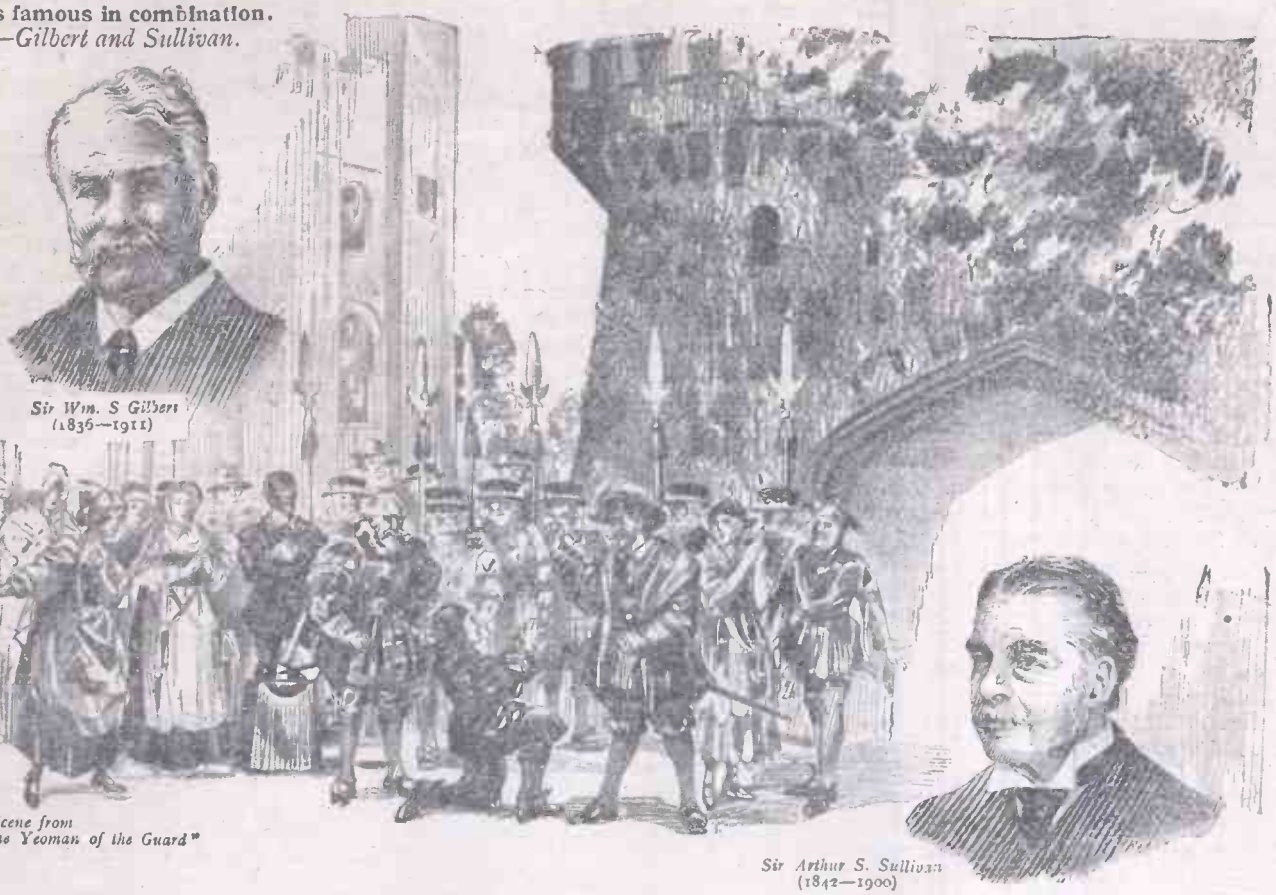
The Dundee U.F. Presbytery has decided to request the B.B.C. not to transmit services on Sundays at a time when services are actually taking place in all churches.

A new dull-emitter valve, invented by Dr. Leonard Levy and Mr. West, employs a molybdenum wire coated with thorium as a filament in place of the usual coated tungsten.

Sir Hall Caine will give a talk on "A Dream of Christmas Day" on December 25.

The band of H.M. Grenadier Guards will provide the instrumental music at 7.30 p.m. on Boxing Day.

Names famous in combination.
No. 1—Gilbert and Sullivan.



Sir Wm. S Gilbert (1836—1911)

A Scene from "The Yeoman of the Guard"

Sir Arthur S. Sullivan (1842—1900)

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THE joint work of Gilbert and Sullivan is one of the most notable instances of successful collaboration. Each won fame individually, but it is in combination that their names are most recalled.

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Purpose.	Type.	Price.
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†G.P.=General Purpose.
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*Can be used with Dry Batteries.
∴For Resistance – capacity Amplification.

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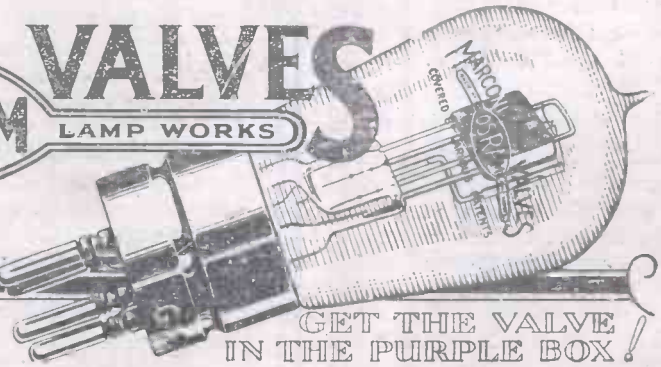
MADE AT THE OSRAM LAMP WORKS



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ANNOUNCEMENT OF THE M.O.VALVE CO, LTD.

GET THE VALVE IN THE PURPLE BOX!

British Broadcasting in Spain

SIR,—Responding to the invitation contained in "On Your Wavelength" in No. 130, I should like to say that I consider we get Bournemouth here in Spain as easily and as clearly as you get Radio-Iberica in England. I am able to compare reception in the two countries. Early this year I installed here on the south coast of Spain a two-valve (regenerative) set and have always received Bournemouth regularly. In July last I fitted up a two-valve set of another make at my home 30 miles north of Liverpool, and soon picked up Madrid on a poor aerial but clearly enough to hear every word of a lecture. Extraneous noises, not noticeable on the nearer stations, are equally troublesome both ways. Any other more reliable comparison is scarcely possible, as it would have to be made with the same instrument and aerial and with the same atmospheric conditions, but my impression is that our reception here of Bournemouth and Manchester, and sometimes other English stations, but especially Bournemouth, is as good as reception of Radio-Iberica in the north of England. As regards 5XX, I may mention that Bournemouth and Chelmsford are received here at equal strength, 5XX being slightly the clearer. Rome comes through very clearly and also sometimes a German station, the name of which I have never been able to identify. I should be glad if you would help me to identify him. His announcer starts with "Hier ist . . ." and his wavelength is about 500 metres. On December 1 the Dvorak symphony was played at 20.5 and a humorous duet at 20.35.

Would it be of interest to you to know that Radio-Iberica have sold large numbers of a simple one-valve receiver, constructed with a lamp resistance to connect up to the house-lighting circuit for both filament and plate current? Why have we not developed this very convenient form of set in England?—G. L. B. (Aquilas, Spain).

Current for Valves

SIR,—I notice a contributor in No. 129 says that he runs his DE3 valve direct from a 3-volt battery. I wonder if he has any idea of what current he is using. I have been using these valves for some months now, running them from a 4-volt accumulator through a suitable resistance. I find that on 2 volts without resistance a DE3 valve takes .056 ampere and on 2½ volts .070 ampere. Although I have never run my DE3 valves on 3 volts without a resistance, as your contributor does, a simple calculation shows that the current which each valve would pass on 3 volts would be .084 ampere.

I should not recommend your readers to run these valves direct without a resistance even on 3 volts, as the makers state that they should be always run at the lowest temperature consistent with satisfactory operation.

I find I get the best results with the current as follows: H.F. .050 ampere, detector and L.F. .070 ampere—that is, just under 2 volts and about 2½ volts respectively.—W. A. M. (Tiverton).

Weather Reports

SIR,—Your contributor "S. W.," whose article on "Weather Reports and How to Read Them" appeared in No. 131, has obviously never himself received or decoded such a report.

In support of the above statement it is only necessary to add that the letter symbols, DD, L, R, etc., to which he refers, *are never inserted in the coded messages*. He distinctly states that they are inserted, and that is contrary to the fact. The letters are used in publications describing the codes merely for purposes of explanation. —A. H. B., for hon. sec. Royal Meteorological Society, London, S.W.

Other Correspondence Summarised

F. L. (Bucks) received telephony from the ss. *Leviathan* at loud-speaker strength.

A. S. (High Wycombe), referring to Mr. J. Hartley Reynolds' letter in No. 130, states that he also received the whole of Mr. Secretary Charles E. Hughes' address from Albany, New York.

A. S. (Manchester) has received W G Y and Radio-Iberica on his single-valve set.

A. H. (Middlesex) has received W B Z and W G Y on his two-valve receiver.

F. W. (Wolverhampton), referring to Mr. J. Hartley Reynolds's letter in No. 130, writes that he received the transmission from Albany, New York, on his home-made dual set.

H. J. H. (Hants) has received K D K A and seven B.B.C. stations on his single-valve set made from instructions given in No. 129.

P. F. H. (Southport), referring to Mr. J. Hartley Reynolds's letter in No. 130, states that he received the transmission from Albany, New York, with exceptional signal strength.

W. G. (Liverpool) writes to say that he has constructed the "Loudest Crystal Set Yet," details of which were given in No. 115, and states that in competition with various other types of crystal sets it was easily the winner for loudness and clarity.

B. D. (Essex) wishes to know if the Königswusterhausen station still transmits calibration signals, for the various German broadcasting stations, on the first Monday and Tuesday of each month between 9.30 and 10.30 a.m. G.M.T.

G. C. (Works) states that he gets all the main B.B.C. stations and several Continental stations on his receiver, which employs a circuit similar to 5 Y M's.

R. H. (Middlesex) has received K D K A, W G Y, W B Z, W H A R and W G Y on his two-valve set, not employing high-frequency amplification.

E. W. L. (Willesden Green) wishes to get in touch with a wireless enthusiast in his district who would co-operate with him in practising morse.

The Greater London Fund for the Blind, 224, Great Portland Street, W.1, wishes to make an appeal to our readers for donations.

S. E. C. (Loughborough) points out the advantage of dealing with a firm of repute and instances the fact that the Edison Swan Electric Co., Ltd., treated him most generously in connection with a valve which he returned.

H. B. (Bristol), referring to Mr. J. Hartley Reynolds's letter in No. 130, states that he received the transmission from Albany, New York, with exceptionally clear signal strength.

EARTHING THE BATTERIES

WHERE direct aerial tuning is used, the batteries are automatically earthed by the connection from the filament accumulator to the lower end of the aerial-tuning inductance. In sets where provision is made for a closed secondary circuit coupled to the aerial, for the purpose of increasing selectivity, it often happens that the batteries are left "floating" when the switch is thrown over from "stand-by" to "tune." This usually results in the battery system being left at a high-frequency potential relative to earth, thus giving rise to disturbing capacity effects with every movement of the operator.

By soldering a lead from the filament end of the secondary inductance to the earth end of the aerial inductance, the batteries will be stabilised at earth potential, the set will become less noisy, and accurate tuning will be facilitated. It is also an advantage to run a connection from the iron cores of each of the L.F. transformers to the common L.T. negative lead. This earths the cores and prevents howling due to magnetic interaction between adjacent transformers. M. A. L.

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AS SHOWN, WITH DIAL, KNOB AND BUSH.

·001	7/3
·0005	5/11
·0003	5/4
·0002	4/11

POST 6d. SET.
UNSURPASSED FOR FINE TUNING.

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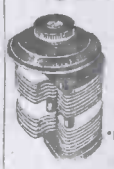

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Equal Parts of—
·00025 or ·0003 12/6
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NEW MODEL WITH VERNIER

With knob and dial.

·001	9/3
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Knob & Dial Free.	Aluminium Ends	Ebonite Ends
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SQUARE LAW		STANDARD	
·001	9/6	·001	8/6
·0005	5/-	·0005	7/-
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·0002	5/6	·0002	5/7

Post 4d. set

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Cheap Fixed..... 6d.

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·001, ·0001 to ·0005..... 10d.
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D.C.C. Wire. per ¼ lb.—
13 g. ... 9d. 20 g. 9d.
22 g. ... 10d. 24 g. 1/-
26 g. ... 1/1 28 g. 1/3
30 g. ... 1/6 etc., etc.

Terminals complete—
Brass Pillar.....1d. 1½d.
W.O. or 'Phone 1d. 1½d.
Fancy Patterns 1d. 1½d.
Extra large..... 2d. 3d.
Valve Sockets 2 for 1½d.
Machine cut Screws Stocked (Best).
Pulleys..... 4½d.
4 Taps and Wrench ... 2/11
Screwdrivers..... 6d.

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Ebonite, D.C.C. and Dial 3/9
Also at 3/11, 4/3, 4/6, up.

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Wonderful Value

60 v..... 7/6
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Ditto.....2/- to 3/-

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2 mfd 3/11

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Switch Arms 8d. to 1/-
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Sorbo ear caps pair... 1/4
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D.P.D.T. SWITCHES

Min Panel..... 1/-
On China base 1/7½
On Ebonite Base 1/11 1/6

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Miniature Panel..... 10½d.
On China Base..... 1/1
On Ebonite ... 1/3 to 1/9
Murray Valve Holder 1/3
Spring Washer ... 4 a 1d.
Coil Plug on Base ... 10d.

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A Wonderful Transformer

DUTCH 6 VALVES 12/6

16g D.D.C USUALLY IN STOCK

PHILLIPS 12/6

4 ELECTRODE VALVE FOR 'UNIDYNE"

"METAL" (FRENCH) ·06 VALVES, 15/11

FIBRE STRIP (for Coils)

3 ft. long, 1 in. wide, 2d.

BREAST DRILLS 0 to ¼ chuck

Cut Bevel and Gear 4/9

Twin Flex, 4 yards. 6d.
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Tape Aerial 100 ft. 2/-
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'Phone Cords 6 ft. 1/- & 1/3
Nugraving ..... 6½d.
Empire Tape, 2 yds. 1d.
Allen Var. Grid Leak 1/3
Best Sleeving 3 yds. 10d.
Rubber Lead-in 10 yds. 1/-
Thick ditto, 1d., 2d., & 3d.
Aerial, 7/22 100 ft. ...1/10½
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De Luxe Crystal Set 7/11
4 Whiskers, 1 Gold ... 2d.
Coil Plugs (ebonite) 4½d.
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Shaped 8½d., 1/-
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Various 1/3, 1/6, 1/9, 1/11
With Dial 1/11
Ormond 1/9
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BROWNIE "IMPROVED" WIRELESS SET..... 7/6

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4 B.A. rod, per ft. ... 2½d.
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Also at 10d., 1/-, 1/3, 1/6
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4·5 Batteries 4½d., 5d.
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Chelmsford D.C.C. 1/-, 1/3 2/6
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Switch Arm, 12 Studs, 12 Nuts, 12 Washers, Lot 10½d.

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6 x 6	...	1/4
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3/16 in.

Cut to size ¼d. sq. in.

WE STOCK ¼-in. EBONITE.

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Variable Grid Leak 2/6
Anode Resistance ... 2/6
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T1 Transformers..... 30/-
T2, 26/-; T3, 16/6; Coils: 25, 4/10; 30, 35, 40, 4/10, 50, 5/-; 60, 5/4; 75, 5/4; 100, 6/9.
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·001, ·002, ·003, ·004, ·005, ·006, Fixed ... 3/-
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Coils: 25, 5/-; 35, 5/-; 50, 5/2; 75, 5/6; 100, 7/-; 150, 7/10; 200, 8/8; 250, 9/-; 300, 9/5; 400, 10/3; 500, 10/6
Fil. Rheostat 4/6
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·001 to ·0005 Fixed ... 1/3
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POLAR VARIABLE CONDENSERS

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Others not Obtainable.

GOSWELL ENGINEERING (QUALITY)

2-way Cam Vernier 9/-
3-way ,, ,, 12/6
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Post 3d. each.

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4000 ohms

Sterling 25/-
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Var. Grid Leak to 10..... Meg. 3/-
Anode Resistance ... 3/-
Anti-capacity Valve Holder 1/9

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Myers, Cossor, Mullard, Ediswan, Marconi, etc. Valves sent by post (purchasers' Risk)

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Latest Model No 3. (3 pole) 17/6
Great for Crystal Sets

TELEFUNKEN HEADPHONES

4000 ohms.....17/11
4000 Patterns 12/6

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(See Trade Mark)
Genuine
4000 ohms..... 13/3
Post 6d. pair.

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Sterling Dinkie..... 30/-
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THORPE K4 FOR UNIDYNE 17/6

(5 Pin valve holder 1/6)

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Shipton 30 or 60 ohms 3/6
Shipton 600 ohm Potentiometer..... 4/6
T.C.B. 6, 13, 30 ohm...4/-
Potentiometer 300 ohms 5/-

STERLING VARIABLE CONDENSERS

Square Law with Vernier ·00025, ·0005 in stock

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WIRELESS AND CRIME

How Wireless Could be Used in Fighting Crime

IT is surprising what little use has been made of wireless by the police in the pursuit and arrest of criminals. There are one or two outstanding instances, it is true, but they are few and far between. Take, for instance, the case of Crippen, whose arrest was due to wireless telegraphy. That was many years ago, and in the interval much has been done towards the improvement of wireless as a useful agent of communication.

In the past the B.B.C. has organised "man hunts," in which wireless broadcasting played the chief part in bringing the "criminals" to book. In all cases the fugitives were stopped within a short time of the transmitting of their descriptions, which were picked up by hundreds of people with receiving sets.

However, there are certain objections to the broadcasting of a criminal's description and the details of his crime throughout the country. One objection would probably be that hundreds and hundreds of false clues would pour into the police stations, and would, no doubt, hamper seriously the police in their investigations, and lead them to investigate false lines of inquiry, thus losing valuable time. On the other hand, there can be few objections to the private use of wireless in the detection of criminals. There is already at Scotland Yard an experimental wireless station, which has been used for experimental communications with police tenders fitted with transmitting and receiving apparatus.

Let us see how wireless could be used as a means of fighting crime.

London could be made the headquarters of the system, and there would be erected powerful plant capable of sending and receiving over long ranges.

At various centres throughout the country there could be erected other installations of a similar nature, all connected to the nearest broadcasting station by land line. Centres could be established at such places as Birmingham, York, Cardiff, Carlisle, Exeter and at other towns of importance. In turn each of these centres would be connected by telephone to the various police headquarters in its area. Certain of the centres could be equipped with motor tenders carrying wireless apparatus, which would be ready to dash to the scene of a big crime at any moment.

Perhaps in future years we may see a police wireless service somewhat on the lines outlined above, and that service may not only be national, but international.

S. W.

SIR HALL CAINE TO BROADCAST ON CHRISTMAS DAY

ON Christmas Day, at 7 o'clock, Sir Hall Caine, C.H., whose novels have been translated into almost every language and who can claim to be the great story-teller of the modern world, will tell anew the Story of Christmas. Listeners-in who remember his remarkable address on Armistice night last year will not miss this opportunity of hearing again the voice which moves the heart almost as much as the story he tells.

As everyone knows, Sir Hall Caine is busily engaged writing a "Life of Christ," which the house of Cassell is to publish at an early date. He has been studying the subject for years, and in this Christmas story he will give the first fruits of his research.

FINDING THE BEST STUDIO

ALTHOUGH it is platitudinous to say that nothing is perfect, it is perhaps permissible to remind listeners of the fact, for few of them realise the constant efforts made by the B.B.C. engineers to effect improvements in the broadcasting service.

Take the matter of the studio. To equip a room with a microphone, piano and seats, etc., is to touch only the fringe of the problem. From the point of view of obtaining the best results, "to echo or not to echo?" is the great question.

The answer, of course, depends upon circumstances. For transmitting the best speech, echo is not desirable, and therefore use is made of a heavily-draped studio.

On the other hand, a slight echo "rounds off" the tones of orchestral instruments, and for transmitting orchestral music a less heavily-draped (or completely undraped) studio can be used.

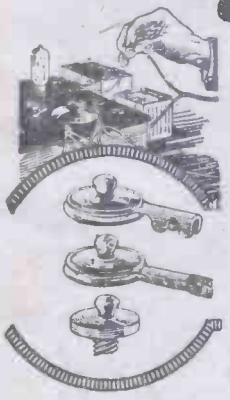
During the last fortnight the B.B.C. engineers have been experimenting with some studios, and many listeners to 2 L O have noticed the difference in the quality of the transmissions. An undraped studio with a linoleum-covered stone floor has been used for orchestral items.

Of criticisms sent to 2 L O about 75 per cent. have been in favour of the new studio, but the engineers think that a good deal of its popularity is due simply to the fact that it gives a fresh "tone" to the transmissions.

To many listeners it has seemed that the echo produced by the undraped studio apparently made the music a good deal louder than usual.

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

Let them all come



THERE is no longer any need to keep people waiting for their share of the broadcast. No need to fumble about with nuts and wire twisting. With the Newey Snap Terminal you can add, at a single movement, as many headphones as your set will stand and be sure of perfect contact every time. Turn your set into a real entertainment for your family and friends.

You can buy these wonderful accessories in boxes at 2/- or any special part you want separately. They can be adapted to any terminal. You will find them splendid time-savers and trouble-savers as well in a hundred-and-one different ways.

They are electrically and mechanically perfect.

Ask your Wireless Dealer to send for leaflet to-day.

EACH BOX CONTAINS:

6 Terminal Studs, 6 Multi Connectors, 4 Coloured Connectors, 9 discs (Black, Red and Blue) printed as follows:

PHONES+
HIGH TENSION+
LOW TENSION+
EARTH—
PHONES=
HIGH TENSION—
AERIAL—

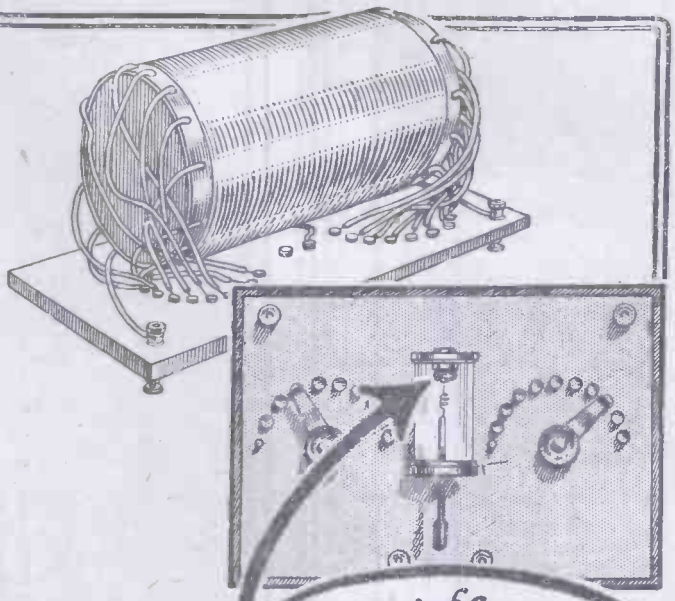
with instructions for use.

2/-

PETTIGREW & MERRIMAN,
124, Tooley Street,
LONDON, S.E.1.

This simple connector can be clipped to the end of any lead with a pair of pliers. When pressed on to the terminals connection is immediate, perfect and permanent. The simple snap movement makes connection.

THE NEWEY SNAP TRADE MARK TERMINAL
FOR WIRELESS PHONE AND BATTERY CONNECTIONS
PATENT APPLIED FOR



The Heart of a Perfect Set - NEUTRON

The one great essential to perfect Crystal or Crystal-valve reception is a really efficient Crystal. A good aerial, heavy-gauge inductances, low capacity, good phones—all these help, but *the one vital point is your Crystal.* And the finest Crystal in the world—Neutron—costs you but 1s. 6d.

An indoor Aerial with Neutron equals an outdoor one with ordinary crystals. Neutron will even compensate for poor phones or inefficient coils; but be sure you get *Neutron,* in the black and yellow tin—the guaranteed and concert-tested wonder crystal.

NEUTRON TRADE MARK

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E.W.B.

CHIEF EVENTS OF THE WEEK

SUNDAY December 28

London	3. 0	Band of H.M. Royal Air Force
London	8. 0	Oratorio, *The Messiah* (Handel).
Birmingham	8.30	Chamber Music Programme.
Manchester	3. 0	Schubert and Schumann
Aberdeen	8.30	Address.
Glasgow	3. 0	Bach Choir.

MONDAY

High-Power Station	7.30	Band of H.M. Grenadier Guards
	9.40	Talk by Keble Howard.
London	7.30	Popular Orchestral Programme.

TUESDAY

London	7.30	"A Mixed Grill."
Bournemouth	7.30	More Musical Comedy.
Manchester	7.30	Chamber Music.
Belfast	7.30	Folk Music and a Play.
Cardiff	7.30	West Country Night.
Glasgow	8. 0	Scottish Orchestra.

WEDNESDAY

London	7.30	New Year's Eve.
Birmingham	7.30	*Maritana* (Wallace).
Bournemouth	8. 0	Municipal Orchestra.
Cardiff	7.30	"The Nubian Programme."
Newcastle	7.30	English Opera
Glasgow	7.30	Hogmanay Night.

THURSDAY

London	8. 0	Chamber Music Evening.

FRIDAY

Cardiff	7.30	From Canada and Wales.
Glasgow	7.30	Musical Comedy Night.
Belfast	7.30	Irish Night.
Manchester	7.30	Night of Solos and Duets.

SATURDAY

Birmingham	7.30	A Programme of Old and New.
Bournemouth	7.30	Light Symphony Concert.
Cardiff	7.30	Light Opera and Musical Comedy.
Newcastle	7.30	Miners' Saturday Night.
Aberdeen	7.30	"Auld Eel Time—Sowens Nicht.

CATALOGUES

FROM the Economic Electric, Ltd., 10, Fitzroy Square, W.1, we have received an illustrated catalogue of wireless sets and components.

A copy of their 1925 calendar has been sent us by Radio Instruments, Ltd., 12, Hyde Street, New Oxford Street, W.C.1.

Polishing Your Cabinet

By means of the C.A.C. Simplex polishing outfit the home-constructor can french polish his own cabinets and give them the professional-looking finish that means so much.

Full directions are enclosed with each outfit, and the method of using it, I find, is simplicity itself. It is a matter of only a few minutes to produce a highly polished surface on any well-made cabinet.

The Simplex outfit is distributed by the City Accumulator Company, of 10, Rangoon Street, E.C.3.

"**Wireless Valve Transmitters**," by W. James, is the title of a useful handbook just published by The Wireless Press, Ltd. (9s.). It is devoted to the needs of the amateur experimenter, the author having dealt with each portion of the complete transmitting equipment under its own heading.

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

GREAT BRITAIN

The times given are according to Greenwich Mean Time.

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

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

Bradford (2LS), 310 m. **Dundee** (2DE), 331 m. **Edinburgh** (2EH), 328 m. **Hull** (6KH), 335 m. **Leeds** (2LS), 346 m. **Liverpool** (6LV), 315 m. **Nottingham** (5NG), 322 m. **Plymouth** (5PY), 335 m. **Sheffield** (6FL), 301 m. **Stoke-on-Trent** (6ST), 306 m. **Swansea** (5SX), 485 m.

CONTINENT

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

AUSTRIA.

Vienna (Ravag), 530 m. (1 kw.). 08.00, markets; 10.00, con.; 12.00, time sig.; 12.20, weather; 14.30, Stock Ex.; 15.00, news, con.; 15.10, children (Tues.); 17.15, lec. (Mon., Thurs., Fri.); 18.30, news, weather; 19.00, time sig., con., news; 20.30, dance.

BELGIUM.

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

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

CZECHO-SLOVAKIA.

Kbely (OKP), 680 m. (1 kw.). Weekdays: 09.00, 10.30, 12.30, 16.00 and 17.00, Stock Ex.; 18.30, lec., news, weather, con. (time sig., 19.00), daily; 10.00, con. (Sun.).

Komarov (OKB), 1,800 m. (1 kw.). Week-days: 13.00, Stock Ex., weather, news; 09.00, con. (Sun.).

DENMARK.

Copenhagen (Kjobenhavns Radiofonistation), 470 m. 19.00, con. (Sun., Wed., Thurs.); also tests on 750 m. other days.

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

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

FRANCE.

Eiffel Tower, 2,650 m. (5 kw.). 06.40, weather (exc. Sun.); 11.00, markets (exc. Sun. and Mon.); 11.15, time sig., weather; 14.45, 15.35, 16.30,* Stock Ex. (exc. Sun and Mon.); 18.00, con.; 19.00, weather; 22.10, weather (exc. Sun.).

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

Radio-Paris (SFR), 1,780 m. (10 kw.). Sundays: 12.45, orch.; 13.45, news; 16.45, con.; 20.30, news, con.; 22.00, dance. 12.30, news, Stock Ex., orch.; 16.30, markets, Stock Ex., con.; 17.45, Stock Ex.. news, women's hour; 20.30, lec., news, con.; 22.00, dance (not daily). Special con. by *Le Matin*, Paris, every 2nd and 4th Sat. in month at 22.00.

L'Ecole Sup. des Postes et Télégraphes (PTT), 450-458 m. (500 w.). 16.00, lec. (Tues. and Thurs.); 20.30, Eng. conv. and con. (Tues.); 20.30, lec. or con. On 3rd Sun. of each month, organ recital, 20.45.

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

Lyons-la-Doua, 550 m. 10.30, news and con.; 11.30-11.45-12.15, 16.15, Stock Ex.; 20.00, news and con.

Lyon (Radio), 290 m. Testing.

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

GERMANY.

Berlin (2), 505 m. (1½ kw). 08.00, sacred con. (Sun.); 09.00, markets, news, weather; 10.00, con. on 430 and 505 m.; 10.30, educat. hour (Sun.); 11.15, Stock Ex.; 12.00, time sig.; 12.30, lec. (Sun.); 13.15, Stock Ex.; 14.30, children (Sun., Wed.); 15.00, Esperanto (Sat.); 15.30, orch.; 17.05, lec., women; 19.00, French (Mon., on Tues. 17.40); 19.30, lec.; 20.30,* con., weather, news, time sig.; 21.30, chess (Mon.), dance (Thurs., Sat.). * If opera relayed, at 18.30.

Berlin (Telefunken Co.), 750 m. (1 kw.). 10.30, 19.00, con., tests (irr.). 3,150 m.: Telegraphen Union, 06.45-18.45, news, con. (Fri., irr.).

Eberswalde, 280 m. 22.15, con. (Mon.).

Königswusterhausen (LP), 2,450 m. (5 kw.). Wolff's Buro. Press Service: 06.00, 20.00. 2,800 m. (5 kw.): 10.30, con. (Sun.). 4,000 m. (10 kw.): Express News Service, 06.00-20.00 (daily); lec. (Tues. and Fri., time irr.).

(*Continued on page* 1054)

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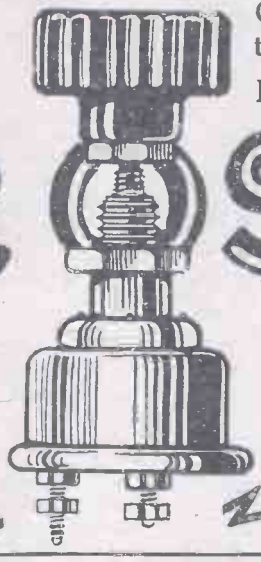

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"BROADCAST TELEPHONY" (cont. from page 1052)

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

Breslau, 418 m. (1½ kw.). 10.15, Stock Ex., weather; 11.00, gramophone con., time sig., weather (Sun.), lec. (other days); 12.30, time sig., weather, Stock Ex.; 14.00, Stock Ex., news; 15.00, children (Sun.); 16.00, lec. (Sun.), orch. (other days); 16.30, children (Sat.); 17.00, orch. (Sun.); 18.30, Esperanto (Mon.), English (Thurs.), lec. (other days); 19.30, con., weather, time sig.; 20.30, dance (Tues.).

Frankfort-on-Main, 470 m. (1½ kw.). 07.00, sacred con. (Sun.); 10.10, Stock Ex.; 10.55, time sig., news; 15.00, con. (Sun.), Stock Ex. (weekdays); 15.30, con., women (Fri.); 16.00, children (Sun., Wed. 17.00); 17.30, lec., opera (irr.); 18.00, lec. (daily), shorthand (Thurs.); 18.30, Esperanto (Fri.); 19.00, lec. (Sun.), English (Mon.); 19.30, con. (daily); 20.30, time sig., weather, news; 21.00, late con. (Mon., Wed., Thurs., Sat.), dance (Fri.).

Hamburg, 395 m. (1½ kw.). Sunday: 07.55, time sig., weather, news, lec., women; 10.15, sacred con.; 11.15, chess; 12.15, con.; 15.00, children; 16.00, con.; 17.45, English conv.; 19.00, sport, weather, news, con. or opera; 21.00 onwards, as weekdays. Weekdays: 06.25, time sig., news; 11.15, markets; 12.10, Spanish lesson; 13.45, markets; 14.15, news, markets, women; 16.05, lec.; 17.00, con., Esperanto (Thurs.); 18.00, lec., English conv. (Wed.); 19.00, weather, con. or opera; 21.00, weather, markets, news; 21.50, news (in English), dance (not daily).

Hanover, 296 m. (1½ kw.). Testing.

Königsberg, 463 m. (1¼ kw.). 08.00, sacred con. (Sun.); 10.15, markets; 11.55, time sig., weather; 13.15, markets; 15.00, orch. (Sun.), markets (weekdays); 15.30, orch., children (Wed.); 18.30, lec.; 19.00, con. or opera; 20.15, orch. or lec.

Leipzig, 454 m. (1¼ kw.). 08.00, sacred con. (Sun.); 10.55, markets, orch., time sig.; 15.00, markets; 15.30, orch.; 17.00, markets, lec.; 18.00, Esperanto (Mon.), chess (Tues.), lec.; 18.30, con. (Sun.); 19.00, English humour (Tues.); 19.30, con., weather, news; 21.00, con. (not daily).

Münich, 485 m. (1½ kw.). 09.30, lec. (Sun.); 10.00, con. (Sun.); 13.00, news, weather, time sig.; 14.00, con., lec. (Sun.); 15.30, orch. (16.00 Sun.); 17.00, agric. talk (Mon.); 17.30, con. (daily); 18.30, English (Mon.), Russian (Sat.); 19.30, con.; 20.30, news, weather, time sig.; 21.00, late con. (Sun.).

Nuremberg, 340 m. Relay from Munich.

Munster, 410 m. (1½ kw.). 06.55, time sig., news; 08.00, sacred con. (Sun.); 11.30, Stock Ex.; 11.55, time sig.; 14.30, markets; 15.00, children (Wed.); 16.00, con.; 18.40, weather, lec., time sig.; 19.20, women, con. or opera, news, dance (Sat.); 21.00, English (Mon., Wed., Fri.), Spanish (Tues., Thurs., Sat.).

Stuttgart, 443 m. (1½ kw.). 10.30, con. (Sun.); 15.00, time sig., orch. (Sun.); 16.30, markets, time sig., weather, orch., children (Wed., Sat.); 18.00, news; 18.30, lec., English humour (Fri.); 19.00, con. or opera, time sig.; 20.15, late con.; 21.15, news, &c.

HOLLAND.

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

Hilversum (NSF), 1,060 m. 17.40, children (Mon.); 20.40, lec. (Fri.); 19.40, con. (Sun.).

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

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

Soesterberg, 1,050 m. 19.26, weather.

HUNGARY.

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

ITALY.

Rome (1RO), 425 m. (1½ kw.). 19.40 to 21.40, con.

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

JUGO-SLAVIA.

Belgrade, 1,650 m. (2 k.w.). 17.45, con. (Tues., Thurs., Sat.).

PORTUGAL.

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

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

RUSSIA.

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

SPAIN.

Madrid (EAJ2), Radio-España, 335 m. 18.00, con.

Madrid (Radio-Iberica), 392 m. 21.00, weather, Stock Ex., time sig., con., news.

Barcelona (EAJ1), 325 m. 17.00 and 21.00, con.

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

SWEDEN.

Stockholm (TV), 440 m. 10.00, service, relayed (Sun.); 11.45, weather, time sig.; 18.10, con., news (exc. Mon.).

Gothenburg, 460 m. 18.10, con. (Tues., Fri. and Sat.). 680 m.: 18.10 (Mon., Wed. and Thurs.).

Boden, 2,500 m. 17.40, con. (Tues. and Fri.); 16.40, con., news (Sun.).

SWITZERLAND.

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

Lausanne (HB2), 780 m. (300 w.). 07.05, weather; 12.30, weather, markets, time sig., news; 16.00, children (Wed.); 17.55, weather, news; 20.15, con. (exc. Wed.), dance (Thurs. and Sat.).

Zurich (Höngg), 515 m. (500 w.). 08.00, con., news; 12.00, weather, news, Stock Ex.; 15.00, con.; 17.15, children (Mon., Wed., Fri.); 18.00, weather, news; 19.15, lec., con., news, weather, dance (Sat.). Sundays: 15.00 and 19.15, con., news, weather.

Dorking and District Radio Society.

Hon. Sec.—A. J. CHILD, High Street P.O., Dorking. At the usual fortnightly meeting on December 1 Mr. W. J. Poole gave a lecture on "Tools and How to Use Them." It has been arranged on members' evenings to devote part of the time to talks on the theory of wireless reception.

Coventry and District Co-operative Radio Society.

Hon. Sec.—A. CURTIS, 35, Berkeley Road, Earlsdon, Coventry.

ON December 3 Mr. Goss, of the Igranic Electric Co., gave a lantern lecture on "Aerial Tuning and High Frequency Coupling Devices."

Croydon Wireless and Physical Society.

Hon. Sec.—H. T. P. GEE, 51, Chancery Lane, W.C.2. THE annual general meeting was held on December 9, when the election of officers for the ensuing year took place.

The Manard Radio Experimental Club for Wimbledon and District

Hon. Sec.—MR. C. H. ORCHARD, 25, Kenwyn Road, W. Wimbledon, S.W.20.

ON November 4 a meeting was held to arrange the next series of lectures. On November 11 Mr. Goldup, of the Mullard Radio Valve Co., Limited, gave a lecture, and on November 27 a discussion on "A.C. as H.T. and L.T. Supply" took place.

"Making a Settee from a Single Bed" is the subject of a well-illustrated and described article in the current issue of "The Amateur Mechanic and Work" (3d.), and gives instructions on converting an ordinary folding iron bedstead so that it can be used for both purposes. Other articles included in the same number are: "New Magic for the Amateur Conjurer," "How to Clean a Muzzle-loading Gun," "Hints for the Motorist," "Making a Loose-coupler Tuner," "Wireless Masts," "Plumbago as a Lubricant," "Making a Model Hot-air Engine," "Securing Table Legs," "Some Novel Hand-made Tops and Spinning Toys," "Fake Juggling and How to Make the Apparatus."

ANNOUNCEMENTS

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

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

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

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

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

She thought he was wonderful

She wanted a three-valve receiver and he hardly knew the first thing about wireless. So when he finished building it and tuned in four of the B.B.C. stations, no wonder she thought he was wonderful. And, being a wise man, who can blame him if he forgot to mention the "EZI-WIRING" Book he'd bought, and the credit due to the author who devised the amazingly simple four-colour wiring diagrams.

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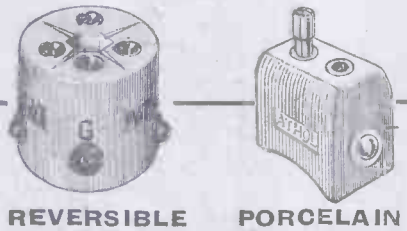

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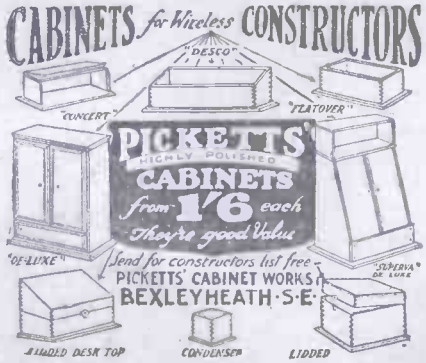

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THE MULTI PLUG TERMINAL ends connection trouble. Agents wanted. Particulars—34, De Montfort Street, Leicester. [4 s

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Complete with flexible connection to fit any Horn or Gramophone. Stalloy Diaphragms. Strictly limited quantity. (Converted Ex-Government). 120 ohms.

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FULL of GOOD POINTS

BUY TESTED PARTS

Ensure the success of the set you make by using Components which are tested and guaranteed accurate before despatch. As used by foremost workers in famous sets.

Complete list free for Postcard containing your name and address. Write at once.

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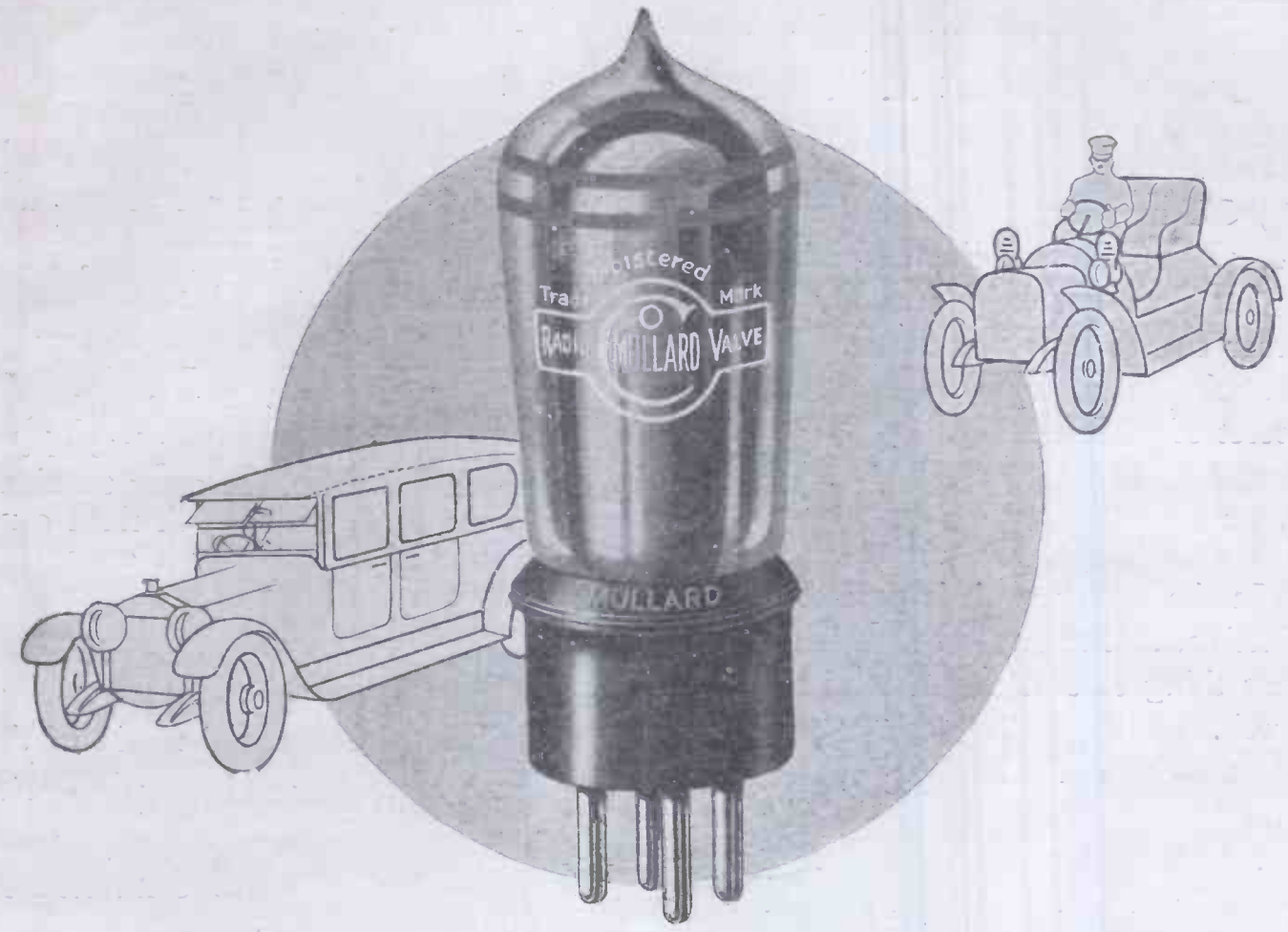
Amateur Wireless | COUPON Available until Saturday, January 3rd, 1925



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The history of mankind and the records of the world's industry are enriched with the wonderful achievements of supreme mastership, and in radio, despite its comparatively short existence, there are many, many incidents and successes that mark the path of the MASTER.

THE VALVE IS THE VERY ESSENCE OF MASTERSHIP IN RADIO.

Have you given this the consideration it deserves? Have you chosen the valves whose progressive master design has won for them outstanding records of successes? Then turn in at your dealer's to-day and ask for

BRIGHT FILAMENT VALVES
Mullard H.F. Red Ring Valves, 12/6 each.
Mullard L.F. Green Ring Valves, 12/6 each.
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Mullard H.F. Double Red Ring Valves
D.3 for accumulators, 21/– each.
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Ask your dealer.

The Mullard Seal on all Double Rinz Valves guarantees you an unused Valve.

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THE · MASTER · VALVE

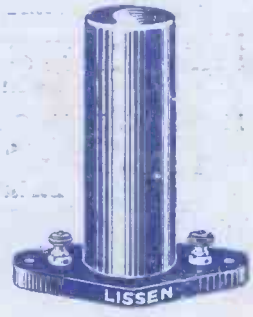
Advt. The Mullard Radio Valve Co., Ltd., Nightingale Works, Balham, S.W.12.

PERFECT ARTICULATION—

YOU may shout through the microphone of a land-line telephone, but it does not help anybody at the other end to hear you better. Perfect articulation of every syllable is the secret of plain talking.

In the same way it is perfect reproduction, and not volume, which is the first thing to aim for in loud speaker work.

Transformer coupling of low frequency valves is very widely used, but the new LISSEN CHOKE is rapidly coming into favour. You sacrifice some volume by using it, but you get absolute purity. Resistance capacity coupling is also very pure, but there is the disadvantage attaching to it that a high H.T. voltage is indispensable. This is not necessary with the LISSEN CHOKE, and for those who wish to try something less conventional than the usual L. F. Transformer, this LISSEN CHOKE can be strongly recommended.



You can quickly build an L.F. amplifier, using the LISSEN CHOKES:—

Connect one terminal of the LISSEN Choke to the plate of the preceding valve, the other terminal to the H.T. battery. A fixed condenser of .01 capacity is connected between the plate of the preceding valve and the grid of the L.F. valve, and a grid leak (preferably use the LISSEN Variable Grid Leak) is connected between the grid of the L.F. valve and the L.T. negative. Grid cells should be introduced if they are found necessary. Each succeeding stage is connected in the same manner.

LISSEN CHOKE ... Price, **10/-**

ALSO TRY ADDING A LISSEN CHOKE TO YOUR LAST TRANSFORMER AS AN EXTRA L.F. STAGE.

PARTS WHICH PULL TOGETHER—

When you know that every vital part in your receiver is pulling strongly with each other, you know that you have a receiver which is the best you can ever get.

BUILD—WITH ALL LISSEN PARTS—

There is one for every vital place.

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

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