PRACTICAL SHORT-WAVE WORK

Amateur Wireless

And Electrics

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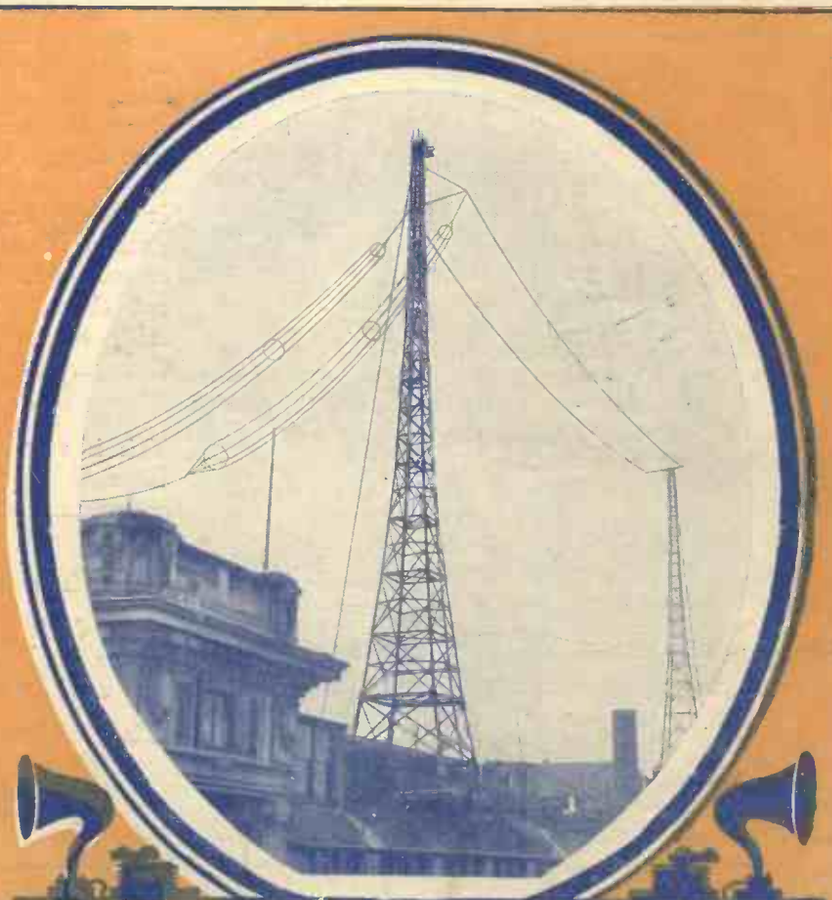

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18/- each

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* *Fitted with internal resistance as above.*

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

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

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

* * * * * *

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

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* * * * * *

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

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

* * * * * *

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

Cossor Wuncell Valves

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Gilbert Ad. 2398

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February 15, 1925.

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Yours faithfully,
C. S. PRINCE.

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COPY.

RECOVERY AGENT,
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Nelson.

January 15th, 1925.

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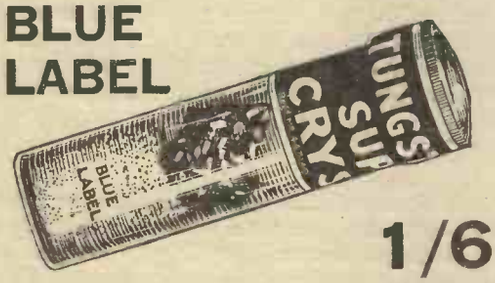

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Amateur Wireless and Electrics

Vol. VI. No. 145 March 14, 1925

GETTING THE BEST FROM A REFLEX

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

Undesirable Conditions

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

Characteristic Curves

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

In the majority of cases the return lead from the grid circuit goes to the L.T. negative terminal, as is the case in Fig. 1. This results in the valve being worked at point C (Fig. 2), or if a rheostat is included in the negative filament lead, at a point slightly to the left of C.

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

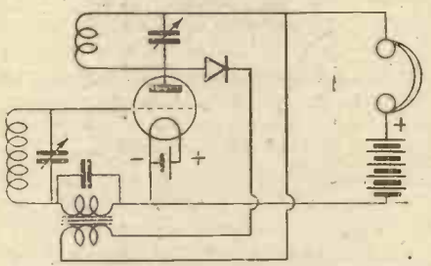


Fig. 1.—Typical Single-valve Reflex Circuit.

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

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

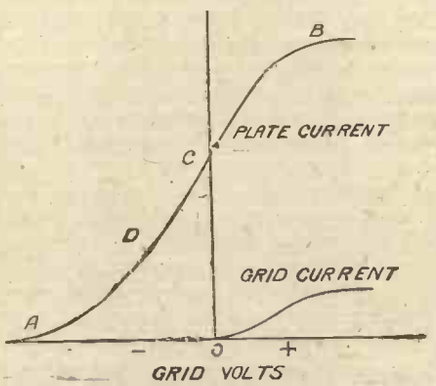


Fig. 2.—Grid-volts-anode Current Curve.

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

Grid Current

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

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

Distortion

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

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

(In the interests of scientific accuracy,

(Continued at bottom of next page)

SPRING-CLEANING THE SET

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

The Dust Fiend

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

Aerial

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

Lead-in

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

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

Components

Dust will lurk in the smallest corner, and it is a good plan to go carefully over every component with a feather. Personally I find a pipe-cleaner very handy for poking out corners. Slip the feather between the condenser plates and into the valve sockets. If you use a crystal, take special pains to clear away any minute particles of the metal which may have been deposited on the panel. This is a constant source of annoyance when the crystal is gripped in a spring fork instead of the ordinary cup.

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

Phones

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

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

G. W. M.

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

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

Double Duty

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

Secret of Success

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

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

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

J. F. JOHNSTON.

Fig. 4.—Low-loss Coil.

TRY THE SHORT WAVES!

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

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

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

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

The Aerial

The first to be considered is naturally the aerial. How can this be improved? Firstly, it should not be longer than about 60 ft. or 70 ft. (This is not essential but preferable.) A single wire is quite sufficient, and particular care must be taken as regards the insulation. As is well known, the frequency of the received signal increases as the wavelength is reduced. Most people know that a capacity has the property of being able to pass a current of an alternating character, whereas it will withstand—within limits—the application of a direct current. Alternatively a high-frequency choke—a coil of wire generally wound single-layer fashion—will do just the opposite. It will pass the direct current but resist or choke back the alternating current.

Now the incoming signal is of the alternating variety. Hence any capacity will not stop this current in any way. Where is there capacity present in the aerial? At the insulators and at the lead-in. Let us set about reducing these sources of loss therefore. Refer to Fig. 1, which shows an average aerial arrangement. It will be observed that losses occur at each end and at the lead-in, due to capacity to earth. This method is therefore not satisfactory.

Fig. 2 shows an improved arrangement. Ebonite tubes or rods about 12 in. long are inserted in series with the insulators already in position, and have the effect of reducing the capacity losses at this point due to the thicknesses of the dielectric. Incidentally this reduces the leakage path, but this is more or less constant for all wavelengths. Observe the lead-in which, instead of coming through a brick wall via a lead-in tube, is passed through a small hole in the window pane. Insulation is again improved here at the same time.

Having attended to the aerial itself we can proceed further. The earth will not need any attention providing it is of low resistance and is made up of thick wire well connected to the water pipe or other object employed as earth.

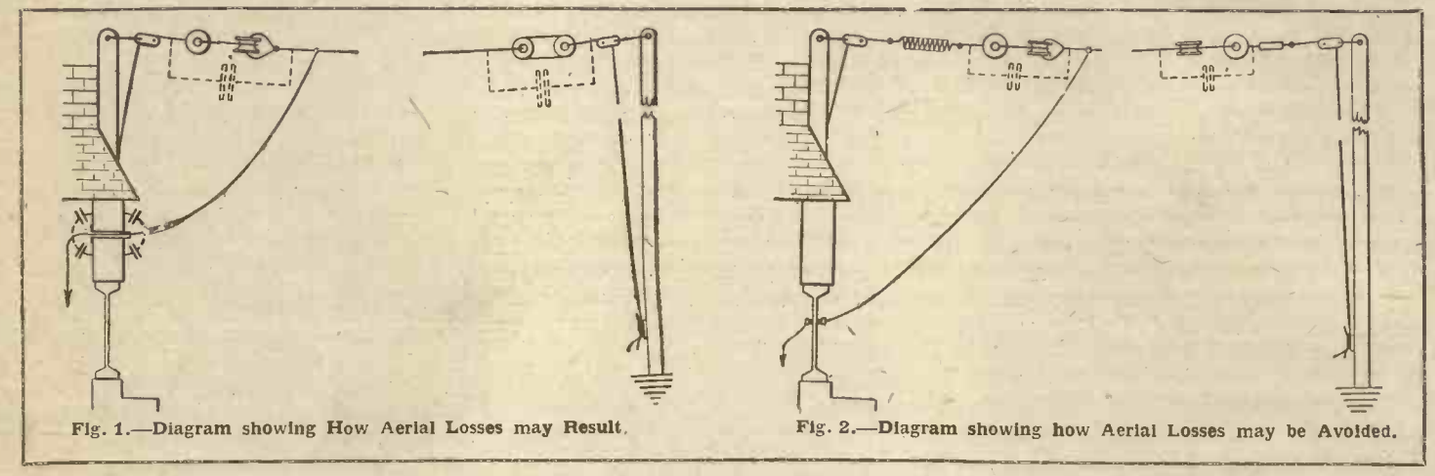


Fig. 1.—Diagram showing How Aerial Losses may Result.

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

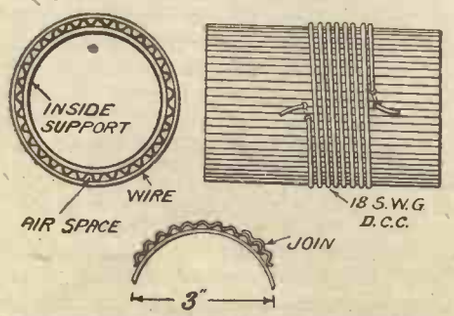


Fig. 3.—Method of Winding Low-loss Coils.

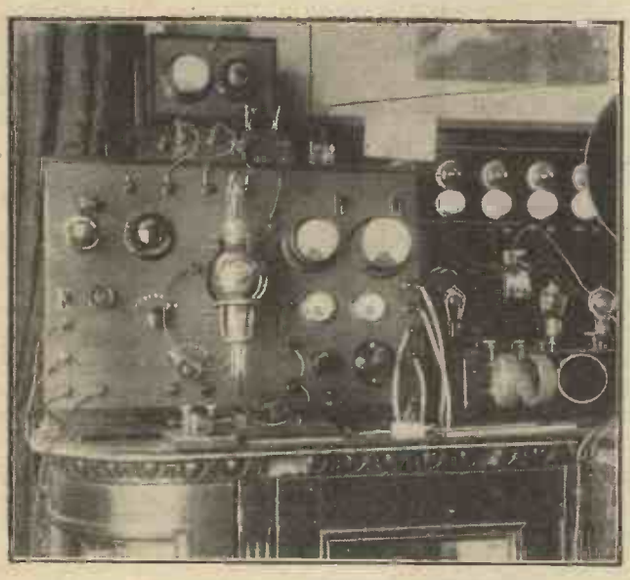
Inductance Coil

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

(*Continued at bottom of first column on next page*)

TRANSMITTING STATION 6 T D

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



6 T D's Present Transmitting Apparatus.

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

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

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

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

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

Long-distance Work

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

This new set has the advantage that when the big o/150 valve is not wanted, a small valve is hung up on a valve holder by the side of it, and the o/150 valve leads replaced by others to a small valve. A switch throws into use the M.L. generator instead of the Mortley machine and another changes over the filament accumulators. Absorption modulation is used for local telephony.

Aerial System

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

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

The Early Transmitter.

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

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

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

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

(*To be continued*)

NON-CORROSIVE FLUX

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

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

PRACTICAL ODDS AND ENDS

A Novel Catwhisker

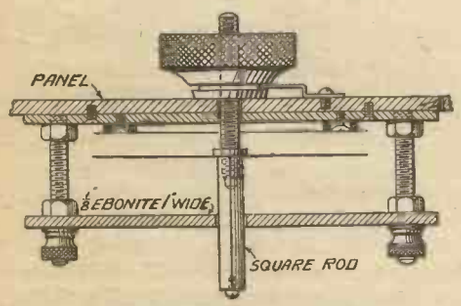
AN original catwhisker can be made from the grid of a burnt-out valve. Grids are usually made of nickel or molybdenum, are springy and, being inoxidisable, make efficient catwhiskers. The extremities of the grid must be cut slantwise in order to form an efficient point contact with the crystal. Any method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

Gramophone Adaptors

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

Mica Variable Condensers

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



Details of Condenser Mounting.

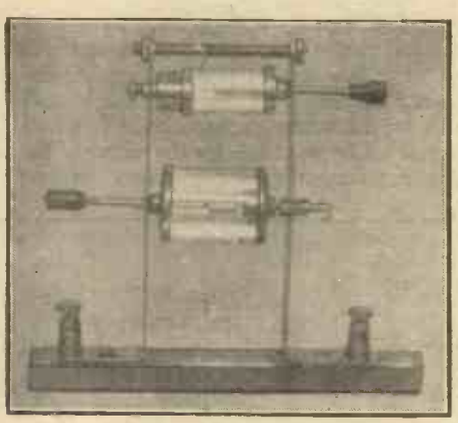
rotation of the knob simply varies the distance between the plates, so that there is no possibility of the dielectric being damaged.

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

Comparing Crystals

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

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



Comparing Crystals.

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

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

A Simple Polarity Indicator

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

The bulb should be held immersed in a pail of warm water and the pip struck off with a file or other light tool. When the pip is removed the water will rush in to fill the globe owing to the vacuum. If the water is very pure a little salt should be added through the hole left by the pip. The bulb should now be dried, and while supported with the hole upwards a piece of paper should be placed over the hole and covered with molten sealing-wax. This sealing-wax cap may now be firmly fixed in position with Seccotine. It now only remains to solder leads to the contact points of the cap.

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

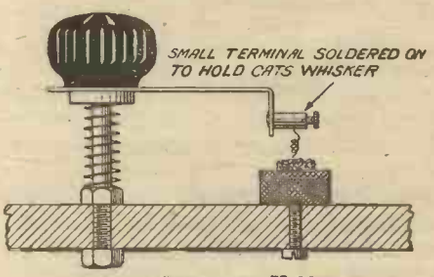
Bubbles will be seen to rise from one of the leads in the water and the wire to this is the negative. E. N. F.

Short-wave Work

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

Mounting the Catwhisker

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



Novel Catwhisker Holder.

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

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

SIDELIGHTS ON THE SUPER CIRCUITS

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

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

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

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

The First Reflex

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

Fig. 1 illustrates the original reflex circuit of April, 1913. In spite of being twelve years old, it is practically identical with most of the reflex circuits now in general use. It will be noticed that the plate circuit is loosely coupled to the crystal detector K through a high-frequency transformer T, the secondary of which is tuned by a condenser C, shunted in turn by the crystal and a by-pass condenser D.

The Reflex Action

Radio-frequency energy from the aerial A is fed to the grid of the valve and sets up amplified currents of the same frequency in the plate circuit. These currents are transferred across the H.F. transformer to be rectified by the crystal, the resultant low-frequency currents flowing through the primary of the iron-cored transformer T2. The secondary of this transformer is inserted in the grid circuit of the valve, and the voltages induced therein by the currents from the crystal are consequently applied across the grid and filament, and reappear as amplified notes in the telephones P.

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

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

The low-frequency voltages set up in the secondary of the feed-back transformer T2 by the rectified currents from the crystal reach the filament direct, and the grid via the grid inductance coil, which opposes very little resistance to their passage. They are not short-circuited across the condenser E because this offers an infinitely large impedance to low-frequency currents, although it readily by-passes the original radio frequencies. No confusion can arise on the grid, which responds simultaneously and independently to both impulses alike.

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

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

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

M. A. L.

(To be concluded)

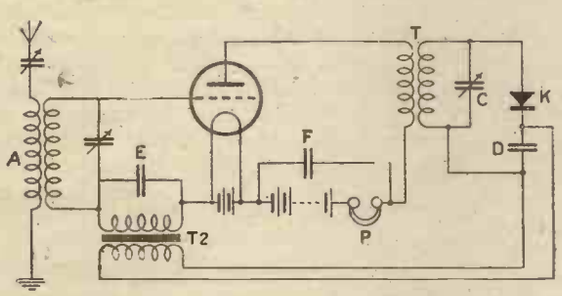


Fig. 1 (left).—The Original Telefunken Reflex Circuit.

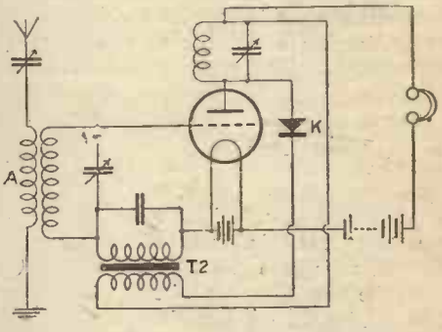


Fig. 2 (right).—The Round Reflex Circuit.

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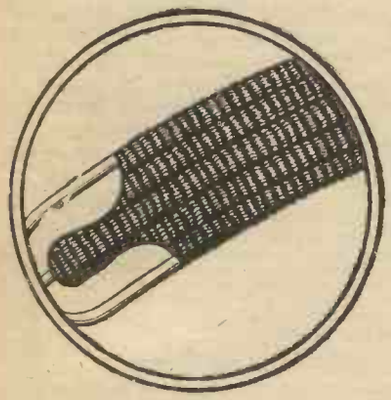

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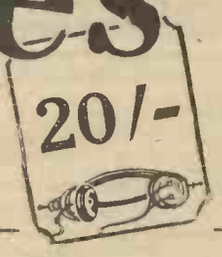

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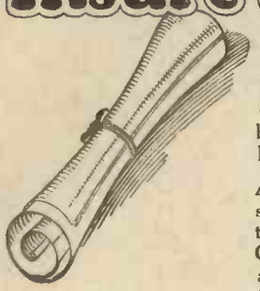

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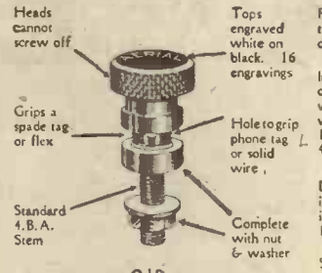

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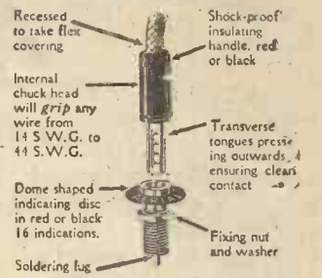

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On Your Wavelength!

Catching It!

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

A Comparison

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

Nearer Home

If you have not heard American stations you have most probably picked up some of those from the Continent, for large numbers of them are within the range of a single-valve set, and some of them may be heard under favourable conditions even on a crystal. How do they compare with our own? Germany is always supposed to be the home of music, and one would naturally expect the programmes transmitted in that country to be something rather startling. But are they? Listen on next Sunday evening to Hamburg, Breslau, or any other easily tuned-in German stations and see for yourself.

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

Paderewski

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

Fresh Fields

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

Wear and Tear

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

The H.T.B. Problem

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

On Your Wavelength! (continued)

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

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

A Problem

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

A Big 'Un

I am in the throes just now of designing my 1925 receiving set. I should say that I am one of those unhappy mortals who are never content for more than a few months on end with any set no matter how good it may be. And the worst of it is that when I make up a new set I never have the heart to scrap the old one. At the present moment there repose on shelves of cupboards, on top of bookcases and on the floor beneath my writing-table no less than six old friends which have given good service in past years. I never use them; they contain pounds' worth of condensers, transformers, rheostats and so on, but somehow I simply cannot pull them to pieces and use their parts for making new editions. The 1925 set will, I think, put all the rest badly in the shade. The new set is to be a super-heterodyne boasting nine valves. If it works as well as I hope and believe that it will I shall be able to get almost everything that is going. The great thing about the "super set" is the few controls that are required. I am proposing to have two only, the condenser which controls the frequency of the oscillator and that which tunes the grid circuit of the first valve. The super-heterodyne, which requires a large number of valves, brings home forcibly the usefulness of the dull-emitter. If I were going to use nine ordinary valves I should have to call in a furniture van to take my accumulator to the charging station, for the filament current required would be rather better (or worse) than six amperes, and the accumulator capable of coping with this for a reasonable time would weigh something! As it is, I am going to use eight ordinary dull-emitters requiring .2 ampere apiece and one-power valve of the same class which takes .25 ampere. The total load will therefore be well under 2 amperes, and my present low-tension battery will have no difficulty in supplying this for about a fortnight at one charge.

Chelmsford and U.S.A.

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

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

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

Reports have come in from British listeners who claim to have heard K D K A on her short wave relaying Chelmsford. I am quite unable to corroborate this. From eleven-fifteen to midnight K D K A regaled me with her dinner-hour concert, and from approximately one-thirty to two-thirty she provided me with a charming programme of studio music. In the interval between midnight and one-thirty, when she was supposed to have been heard relaying Chelmsford, I was entirely unable to pick up even her carrier wave. Whether, in fact, the relay did appear on this short wave will be established later by cable.

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

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

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

To-night's Novelty

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

Youth and Promise

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

THERMION.

CRYSTAL TALKS.—IX

CONCERNING PHONES

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

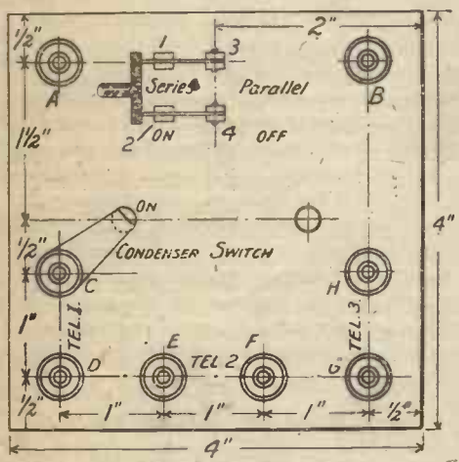


Fig. 2.—Plan of Extension Panel.

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

Resistance

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

Connections

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

Extension Unit

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

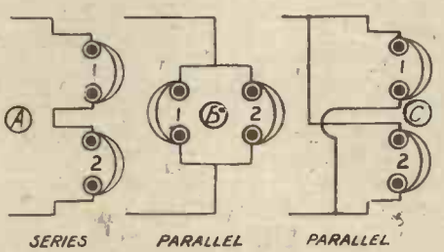
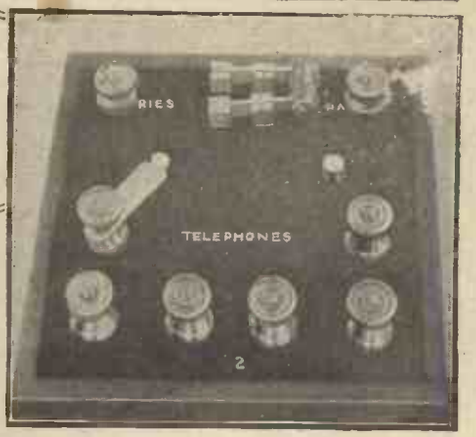


Fig. 1.—Diagram of Phone Connections.

Testing

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



Phone Extension Panel.

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

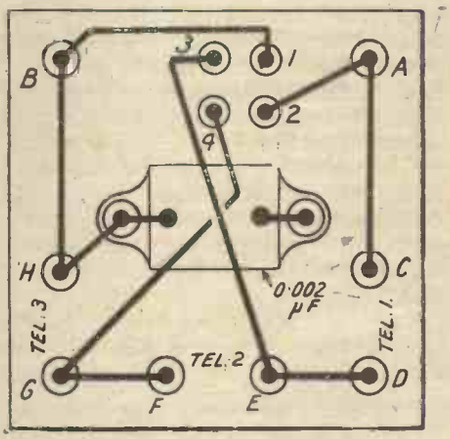


Fig. 3.—Wiring of Panel.

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

Possible Causes of Trouble

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

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

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

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

A SIMPLE INDOOR AERIAL

Fig. 2.—Lamp Connector.

THE idea of utilising the electric-light mains as an aerial is by no means new, but it is not always the newest ideas which prove to be most interesting, and if the reader has not yet tried this type of aerial, then I am sure he will find the experiment worth while. It is well known that high-frequency currents will easily leap across a small condenser and that the same condenser will effectively block low-frequency currents, such as those flowing over the electric-light mains. It follows, therefore, that if we connect two small fixed condensers to an ordinary lamp socket, as shown in Fig. 1, and close the switch to that lamp socket, we collect, on the lead indicated by the arrow, only the high-frequency currents flowing over the mains and in no way interfere with the ordinary low-frequency currents used for lighting. The electric house mains collect high-frequency currents in the same way as an ordinary aerial or other metal conductor insulated from the earth, so by means of this simple condenser arrangement it is not a difficult matter to make the house mains function as an aerial.

To construct the necessary attachment, obtain a burnt-out lamp and break away the glass bulb and all fine filament wires so that the metal top, glass stem, and the two main filament wires remain as indicated in Fig. 2. Make a small loop at the end of each wire and attach one end of a .001-microfarad fixed condenser to each. Take a 3-in. length of fairly stiff bare copper wire, make a loop in the exact centre and firmly clamp the shank of a small telephone terminal into it. Now connect the ends of this wire to the lower ends of the condensers, connect the aerial terminal of the receiver to the small terminals by means of the usual insulated lead-in, close the switch to the lamp socket and all is ready for use.

Fig. 3.—The Complete Arrangement.

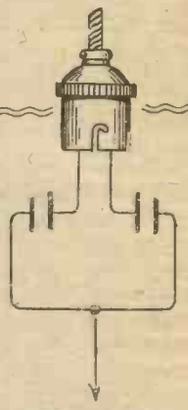


Fig. 1.—Connections of Aerial.

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

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

PADEREWSKI TO BROADCAST

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

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

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

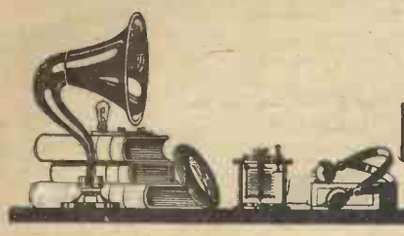
On his first professional tour through Russia at about the age of sixteen he played only his own compositions, and the following year, when barely eighteen, he was appointed professor at the Warsaw Conservatoire. He was not content, however, to spend his life in teaching, and so after six years he resigned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

He has practically captured the imagination of the world by his dramatic vivid renderings of the classical works. His own compositions, in addition to pianoforte works include an opera *Manru*, a suite for orchestra, concertos, sonatas and a symphony. A favourite figure with royalty, he has been the recipient of countless foreign orders and distinctions. In the upheaval of Continental history he became for a time President of Poland, but gladly relinquished this office to return to his beloved piano, and, judging by his performance at the Albert Hall recently, has lost nothing of his powers of interpretation. L. B.

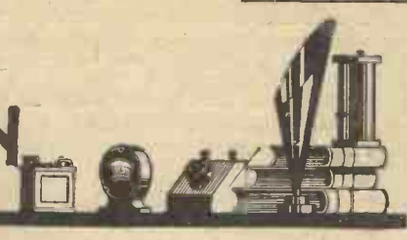
MATTING EBONITE

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

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



OUR INFORMATION BUREAU



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

Crystal Detectors

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

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

Low-loss Crystal Sets

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

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

H.F. Transformers

Q.—I have two slotted ebonite formers, on which I wish to wind the turns of two H.F. transformers. Each former has eight slots 2 in. in diameter, ¼ in. deep and ⅛ in. wide. Could you tell me how many turns I should employ, what gauge of wire is suitable, and what the wavelength range of the finished pair of transformers will be?—D. R. (Bath).

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

Dead-end Switches

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

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

Low-power Transmitter

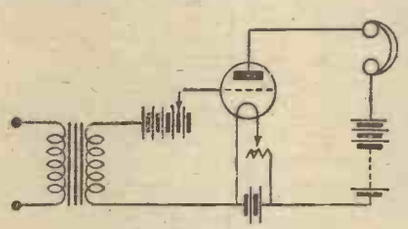
Q.—I have been interested in the articles on transmission in AMATEUR WIRELESS, and intend to build a simple transmitter employing the Colpitt circuit. I should like to know whether the use of a loose-coupled circuit is desirable. It would seem that a second tuned coil would introduce many extra complications.—P.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

A.—The whole point of using loose-coupled circuits is to reduce and minimise the complications in a transmitter. Although extra tuning adjustments are needed, separate adjustment of grid, anode and aerial circuits is possible, and stability of wavelength is obtained. For general work a loose-coupler is recommended. For short-wave work it is a necessity.—U.

Grid Bias

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

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



Addition of Grid Bias.

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

Provided that a hard valve and a high value of H.T. voltage is used the addition of grid bias will improve reception and signal strength. If only one stage of L.F. is employed, a grid-bias voltage of about 1½ volts will probably be suitable.—U.

Valve Voltages

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

A.—

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

—U.

Wavemeters

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

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

Mansbridge Condensers

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

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

Three-coil Tuning

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

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

Anode Voltages

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

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

Induction

Q.—What is induction?—J. T. (Ripon).

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

AROUND THE SHOWROOMS

Valve Unit

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

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

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

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

Grid Leak

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

The appearance of this leak is different from all I have yet seen, the resistance being varied by a plunger which has a 1½-in. throw. One-hole fixing is employed. The range claimed is 10,000 ohms to 20 megohms.

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

Sparta Grid-bias Battery

IN most cases it is desirable to adjust grid bias in steps of 1½ volts, and also to have provision for comparatively high voltages when needed. A number of grid-bias batteries with a total voltage of 12 are adjustable in steps of only 3 volts.

Sparta Battery.

Fuller's have overcome this disadvantage in their Sparta 12-volt W.A. 8 battery, which is tapped at 3, 6, 10½ and 12 volts. Any of the following voltages can be obtained: 1½, 3, 4½, 6, 7½, 10½ and 12.

This battery is certainly a very useful accessory. Measuring only 3½ in. by 1¾ in. by 2¾ in. high, it can be easily accommodated in any set. The makers are Fuller's United Electric Works, Ltd., of Chadwell Heath, Essex.

Anti-vibro Valve Holder

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

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

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

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

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

Tapped Plug-in Coils

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

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

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

VANGUARD.

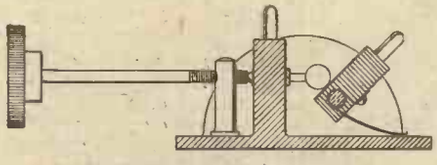
PROGRESS AND INVENTION

Eliminating Atmospherics

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

Coil Holder

PATENT No. 228,357/24 (John Rodger, Pendleton, Manchester, describes a type of Vernier coil holder in which a novel method is used for obtaining the fine adjustment.



Coil Holder No. 228,357/24.

The moving coil holder or holders are under tension by a spring, so that the tendency of the spring is to close up the moving holder in the direction of the fixed coil holder.

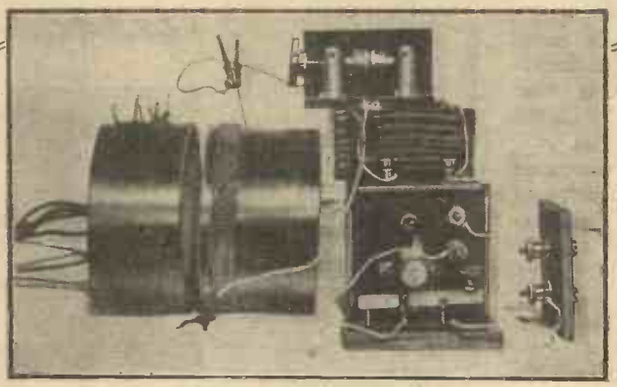
A rod, which may be threaded and which is held in position by a support through which it passes, acts against the direction of the spring on the movable coil holder, and by this method regulates the position of the plugged-in coils.

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

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

TRANSMISSION STEP BY STEP.—II

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



Simple Spark Transmitter.

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

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

Spark Transmitter Circuit

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

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

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

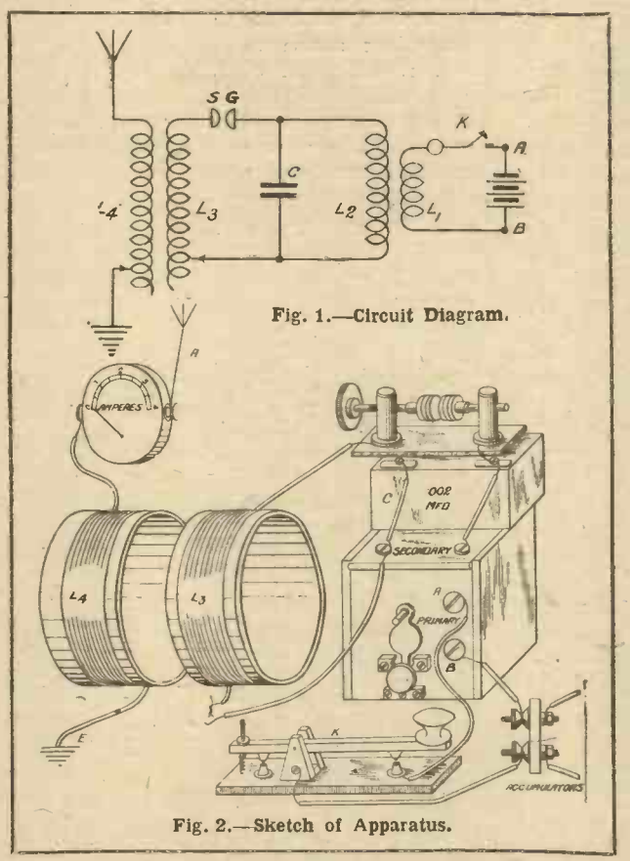
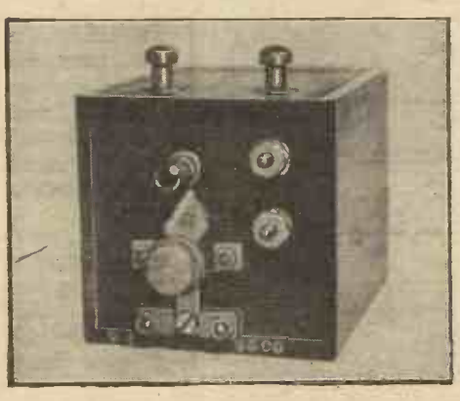


Fig. 1.—Circuit Diagram.

Fig. 2.—Sketch of Apparatus.



Spark Coil

The Ford coil previously referred to works quite well on a 4-volt accumulator. A large amount of high-frequency current flows in the coils L3 and L4, so that the wire used is of heavy gauge. No. 18 d.c.c. wire is used for the secondary coil L3. The cylindrical cardboard former is 5¼ in. in diameter and 2 in. long. Twenty turns of No. 18 wire are used on the former, the last nine being tapped at every turn. Lico clips are used for tuning purposes.

The primary coil L4 is wound with fifty turns of No. 20 d.c.c. wire on a former 5¼ in. in diameter by 4½ in. long. The last twenty turns are tapped every two turns in the same manner as the secondary coil.

Operation

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

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

A. J. C.

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

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

A FOUR-VALVE LO

Constructional Details of Receiver Built f

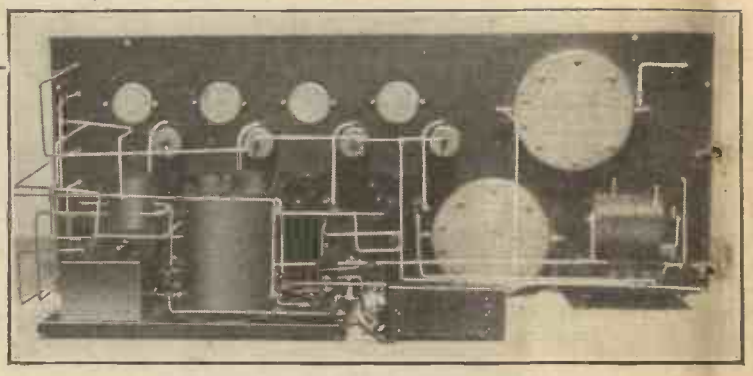
THE receiver described in this article is the result of an attempt to build a loud-speaker set using components almost entirely manufactured by one firm, as it was thought that by so doing the various parts would harmonise. The components in this particular set were mostly made by Lissen, Ltd., but it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

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

Components

The following is a list of the components used:

Two Mark III. mica-dielectric variable condensers; two grid leaks; four coils (broadcasting range for tuned anode, reaction and aerial tuning); one T.I. transformer; four Lissenstats; two chokes; one .0003-microfarad fixed condenser (grid condenser); one .001-microfarad Lissen fixed condenser (transformer by-pass condenser-; one .25 microfarad Mansbridge fixed condenser (valve-choke coupling); four .05-microfarad Mansbridge smoothing condensers; one .25-microfarad Mansbridge smoothing condenser; one grid-biasing cell (1½ volts); one cabinet; one ebonite stage, 7 in. by 7¾ in. by ¼ in.; one ebonite stage, 4 in. by 3⅜ in. by ¼ in.; one ebonite panel, 20 in. by 7⅛ in. (Unique Wireless, 50a, Strand); four Aermonic valve holders; four Aeromonic valve windows; one pair 3-in. iron brackets; one Brown reed phone and parts for the paper loud-speaker; ten terminals.



Back View of Panel showing Wiring.

The Panel

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

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

The Coil Holder and Component Stage

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

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

The Loud-speaker

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

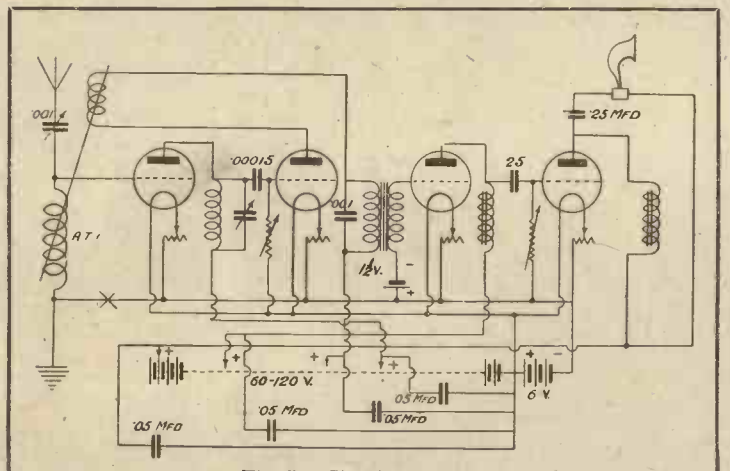


Fig. 5.—Circuit Diagram.

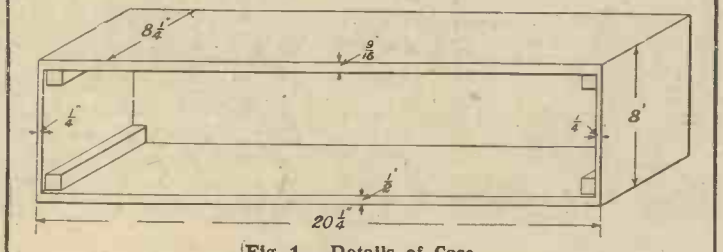
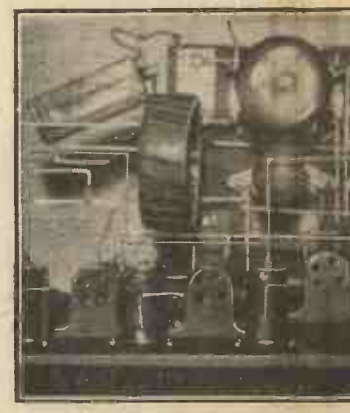
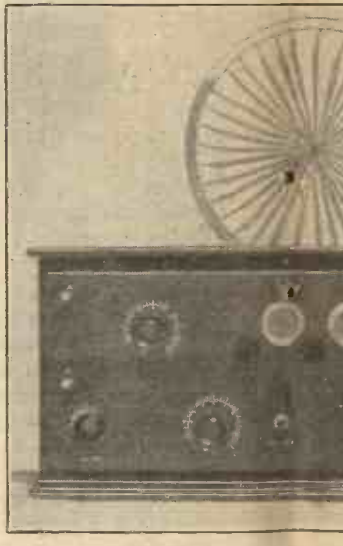


Fig. 1.—Details of Case.



Another Plan View sho

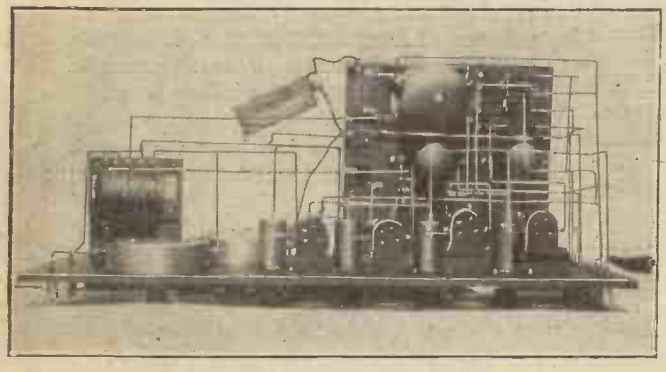
No. 125. This instrument graph), however, differs slight described, as it was made up from Messrs. Unique Wirele



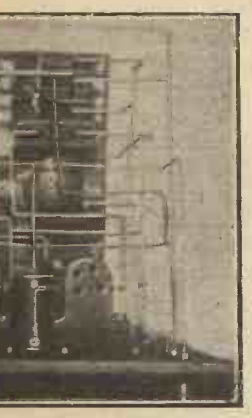
The Complete Four-va

OUD-SPEAKER SET

rom Components of Proved Efficiency



Plan View showing the Stage.



ving the Stage.

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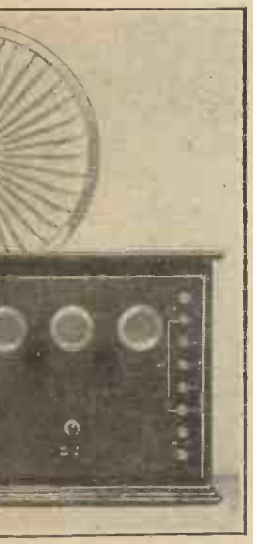


lve Receiver.

of two aluminium rings, a quantity of paper creased ready for folding and a Brown reed earphone. The loud-speaker shown was mounted on a bent brass bracket, which was offset so as to allow the lid of the cabinet to be opened without damaging the diaphragm (Fig. 6). It is suggested that the speaker could equally well be mounted by means of a wooden bracket.

Assembly

When the panel has been engraved the variable condensers, grid leaks, valve holders, valve windows, Lissenstats and terminals may be mounted in position as shown in the photographs and drawings. The only unit which is not mounted on either of the stages is the grid-biasing cell, and this is attached to the floor of the cabinet by means of a fibre or metal strip. With regard to the Aermonic valve holders, the last two intended for the low-frequency amplifying valves are built out from the panel to allow of the insertion of larger valves. This is done by inserting pieces of ¼-in. ebonite sheet between them and the panel before bolting up.

Wiring-up

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

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

Separate values of H.T. potential are available for each valve, together with a bank of smoothing condensers, and the loud-speaker is isolated from the H.T. steady current by means of a suitable blocking condenser and a Lissen choke. The last L.F. amplifier is choke-coupled, so that it may be used as a power amplifier if desired. The use of choke-coupling retains purity of reproduction, often impossible when using transformer coupling for this second stage.

H.F. Amplifier

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

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

In some instances it may be found that the H.F. circuit will persist in oscillating under all conditions of H.T. and filament voltage. If this should happen and the music is distorted (this is generally a sure indication of self-oscillation) it will be necessary to add a little positive potential to the grid of the H.F. amplifying valve. This may be done by placing a 1½-volt grid cell with the negative pole to the negative L.T. lead at the foot of the aerial tuning inductance, the positive pole going to the A.T.I. The position of the cell is shown at X in the circuit diagram. This method, although effective in preventing self-oscillation, is not the most efficient method. It is better to use a

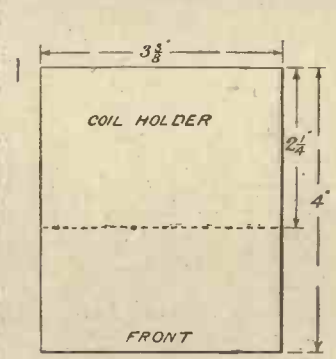


Fig. 3.—Details of Coil-holder Stage.

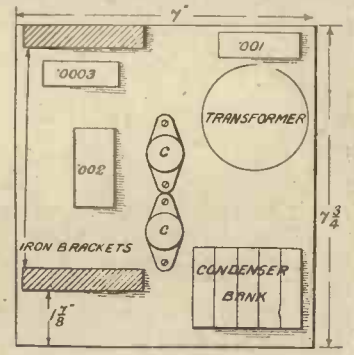


Fig. 4.—Layout of Components Stage.

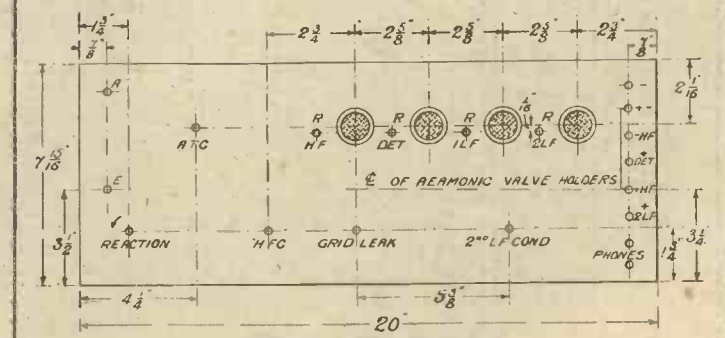


Fig. 2.—Layout of Panel.

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

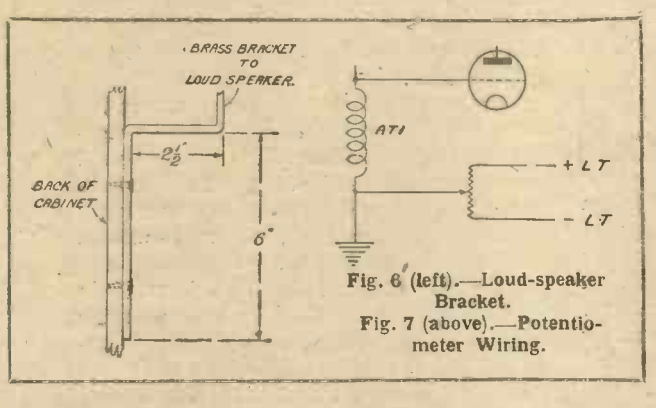


Fig. 6 (left).—Loud-speaker Bracket.
Fig. 7 (above).—Potentiometer Wiring.

As regards tuning, it will be found that the Lissen Mark III. condenser provides a very fine vernier adjustment when rotating the knob over the first range of dial readings. Air dielectric only is used over the range, and there is no need to use the second range (mica dielectric) when tuning the H.F. circuit. It must be remembered that Lissen Mark III. condensers rotate over two revolutions of the scale to get the maximum reading of .001 microfarad, but that the mica does not come into use until the second revolution is commenced.

Results

With the set built as described, exceedingly good results have been obtained. London, Birmingham, Cardiff and Bournemouth have all been received on the loud-speaker at full strength, and all B.B.C. and most of the Continental stations come in at excellent strength on the telephones. A little difficulty was encountered with self-oscillation of the first valve at first, but by suitably adjusting the value of the H.T. and L.T. this difficulty was overcome. These values differ according to the valves in use and can only be found by experiment. The set has also been used for receiving amateurs on wavelengths of 100 metres and upwards with excellent results. A. J. C.

HOW TO EXPERIMENT

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

The Best Receiver

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

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

The components here mentioned are mounted on the baseboard: Two or three valve panels with terminals for grid, plate and filament connections; three good .0005-microfarad variable condensers and two rheostats—preferably of the carbon-compression type; one or two resistances, 2 megohms and 100,000 ohms (these can be either fixed or variable); a selection of fixed condensers (.002, .0002, .0005 and .001) will also be required. A ¼ lb. of each of the following wires will be needed for the construction of tuning coils: No. 16, 20, 24 and 30 double-cotton-covered copper wire. In addition to these a quantity of flex and busbar should be obtained for the necessary connections. The high- and low-tension batteries will in most cases be already in the owner's possession; it is a good idea to buy a dozen or so extra flashlamp batteries (costing about sixpence each) in order to increase the plate voltage in certain cases. These few components, which (excluding the valves and batteries) should not come to much more than thirty shillings, will form a very good beginning for experimental work.

A Line of Experiment

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

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

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

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

Innumerable Opportunities

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

A Fascinating Hobby

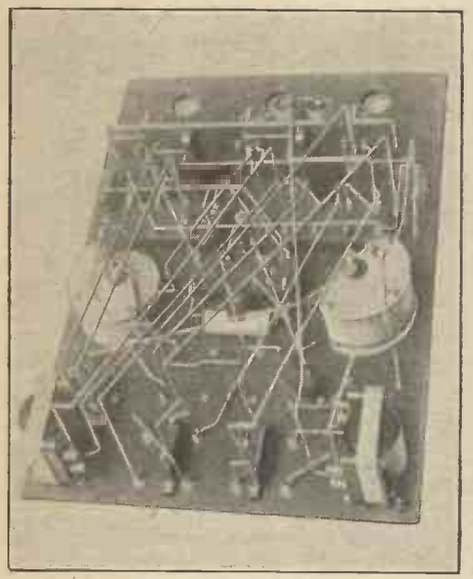
Wireless experimenting is one of the most fascinating of hobbies. It can be indulged in during any spare moment and under practically any conditions. It need not confine the enthusiast to a stuffy indoor atmosphere, since he can easily take a portable set out into the country and perform his experiments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

BROADCASTING IN BULGARIA

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

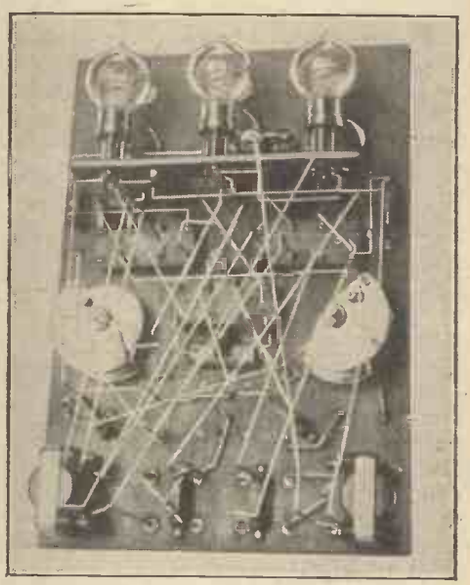
Bulgaria is one of the few European countries which does not suffer from "oscillators," and for the very good reason that to date there are only four licensed wireless sets in the country, each one imported under special authority. J. G. A.

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



View of Back of Panel.

Exterior of Case.



Another View of Back of Panel.

Panel Fittings

THE finished components are fitted on the panel in their respective places as shown in Figs. 2 and 7, care being taken to keep all the screws flush with the surface. The fixed condensers C3, C4, C5, C6 and C7 (Fig. 7) should be fixed in the positions shown by drilling small holes in the panel and tapping them to take 6 B.A. screws. Lastly, the grid batteries require fixing in two places. A single cell B1 (Fig. 7) is enough for the first valve, while two cells B2 are necessary for the last stage of low-frequency amplification. These two cells are fixed by the side of the valve holder on the ebonite shelf carrying the valves. The grid cells can be clamped in position by small ebonite pieces and long brass screws.

Wiring

The panel fitted with all the above components is now ready for wiring. The wiring is shown in Figs. 7 and 8. Two different wiring diagrams have been given to avoid confusion. The wires in Fig. 7 will be close to the panel, while Fig. 8 shows only long connecting wires, which are kept as high as possible.

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

The Cabinet

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

Tuning

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

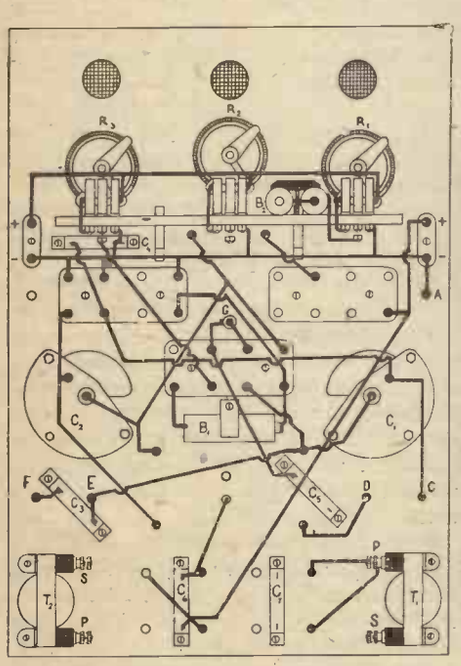
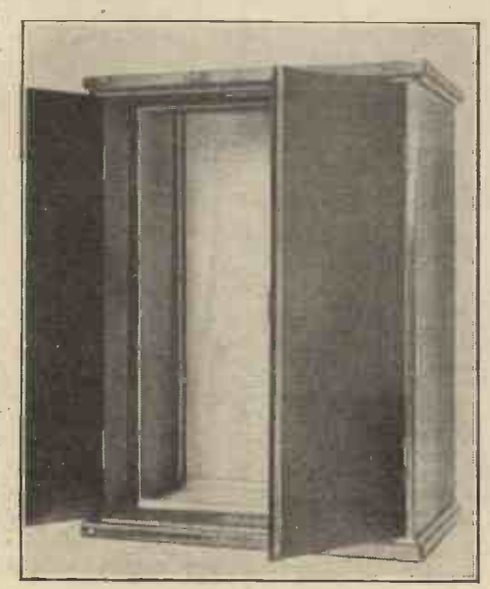


Fig. 7.—Diagram showing Wires Close to Panel.



Case with Doors Open.

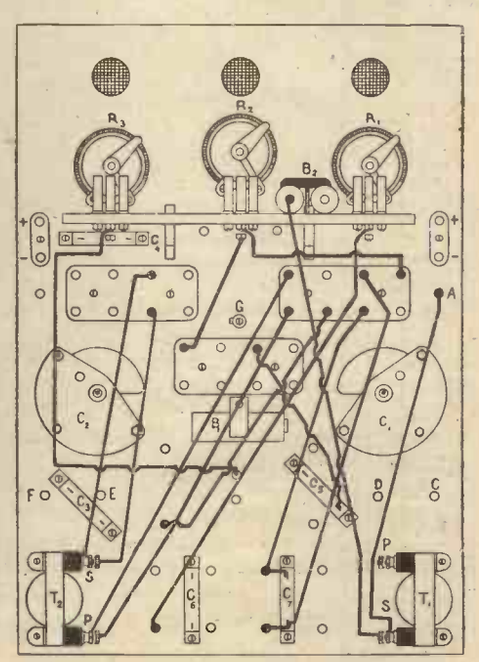


Fig. 8.—Diagram showing Long Wires.

The receiver is then connected to the aerial, earth and the batteries, and the tuning accomplished by turning the aerial condenser dial until the desired signals are heard, keeping the second condenser connections to be made for the corresponding circuits (see Fig. 11).

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

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

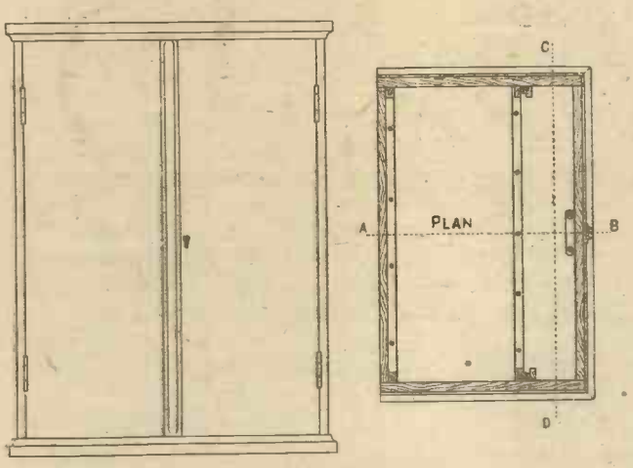


Fig. 9.—Front Elevation and Cross Section of Case.

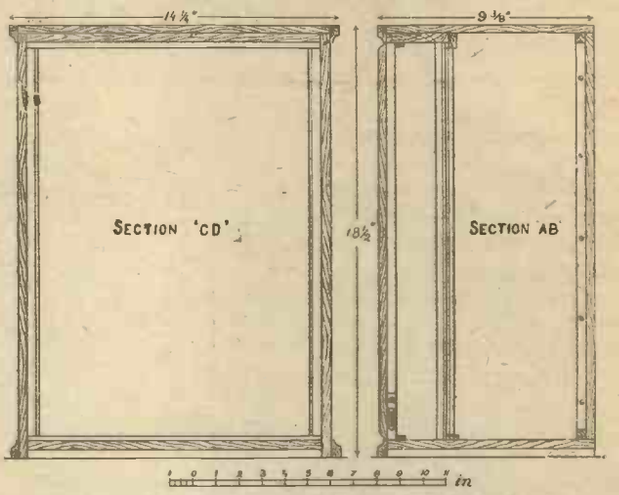


Fig. 10.—Back Elevation and Vertical Section of Case.

at about 10 degrees. The next stage consists of tuning the third coil, which will result in louder signals, but still requiring a finer adjustment of the first condenser. It will be found easier in the initial trials to have tight coupling between L2 and L3 and the coils L1 and L2 kept loosely coupled, although best results will be obtained by keeping L2 and L3 slightly apart.

The following is the table of necessary

Results

Using only one valve in a reflex circuit Cardiff (150 miles) and Birmingham (100 miles) can be very easily tuned-in even when London is working. London at a distance of four miles comes in on the loud-speaker to be comfortably heard all over a room, and if another stage of low-frequency amplification be used the loud-speaker becomes deafening and the receiver has to be detuned to make it

No.	*Circuit*	*Connections to be made*	*Phones*	*Valves Used*	*Remarks*
1	Crystal (*a*)	(10–11), (2–3)	(26–30)	—	L2 removed, and earth connected to c.
	(*b*)	(10–11), (2–3), (17–22), (15–16)	(26–30)	—	L2 and L3 removed and earth connected to c.
One Valve					
2	One-valve reflex	(11–12), (3–4), (14–15), (6–7), (21–22), (23–24)	(27–31)	Third	L2 and L3 closely coupled.
3	Detector	(18–22), (19–23), (7–15)	(27–31)	Third	L3 removed.
4	H.F. and Crystal	(22–23), (7–15), (10–11), (2–3), (27–31)	(26–30)	Third	L2 and L3 closely coupled.
5	Crystal and L.F.	(11–12), (3–4), (13–14), (5–6), (7–15), (9–10), (1–2), (20–24)	(26–30)	Second	L2 removed.
Two Valves					
6	Two-valve reflex	(17–18), (19–20), (1–4), (9–12), (14–15), (6–7), (8–16)	(27–31)	Second and third	L2 and L3 closely coupled.
7	H.F., Crystal and L.F.	(22–23), (7–15), (11–12), (3–4), (13–14), (5–6) (20–24), (9–10), (1–2), (27–31)	(26–30)	Second and third	L2 and L3 closely coupled.
8	H.F. and Detector	(17–18), (19–20), (7–15), (8–16), (9–10), (1–2), (27–31)	(26–30)	Second and third	L2 and L3 closely coupled.
9	Crystal and two L.F.	(11–12), (3–4), (13–14), (5–6), (7–5), (9–10), (1–2), (20–24), (25–26), (29–30)	(28–32)	First and second	L2 removed.
10	Detector and L.F.	(18–22), (19–23), (7–15), (27–25), (29–31)	(28–32)	First and third	L3 removed.
Three Valves					
11	Three-valve reflex	(17–18), (19–20), (1–4), (9–12), (14–15), (6–7), (8–16), (25–27), (29–31)	(28–32)	All	L2 L3 closely coupled.
12	H.F., Crystal and two L.F.	(22–23), (7–15), (11–12), (3–4), (13–14), (5–6), (20–24), (9–10), (1–2), (27–31), (25–26), (29–30)	(28–32)	All	L2 and L3 closely coupled.
13	H.F. Detector and L.F.	(17–18), (19–20), (7–15), (8–16), (9–10), (1–2), (27–31), (25–26), (29–30)	(28–32)	All	L2 and L3 closely coupled.

The loud-speaker can also be operated without any aerial—with two valves, of course—but it is not loud. A piece of cotton-covered wire about 10 ft. long lying in the room when used as an aerial works the loud-speaker satisfactorily.

M. J. C.

CARRIER-FREE BROADCAST

SUCCESSFUL experiments have recently been carried out by the University of Illinois in broadcasting telephony without the use of a carrier wave. Actually both the carrier and one of the side-band frequencies produced by the combination of the high- and low-frequency aerial currents are eliminated, so that the radiated energy is confined to the remaining side-band, which is, of course, fully modulated. A saving of more than one-third in power output is thereby effected at the transmitting end, whilst sharper tuning and an absence of any heterodyne howl is secured in reception. Incidentally, radiation only takes place when and so long as the microphone is actually being spoken into. During the intervals between successive words and sentences the ether is quiescent.

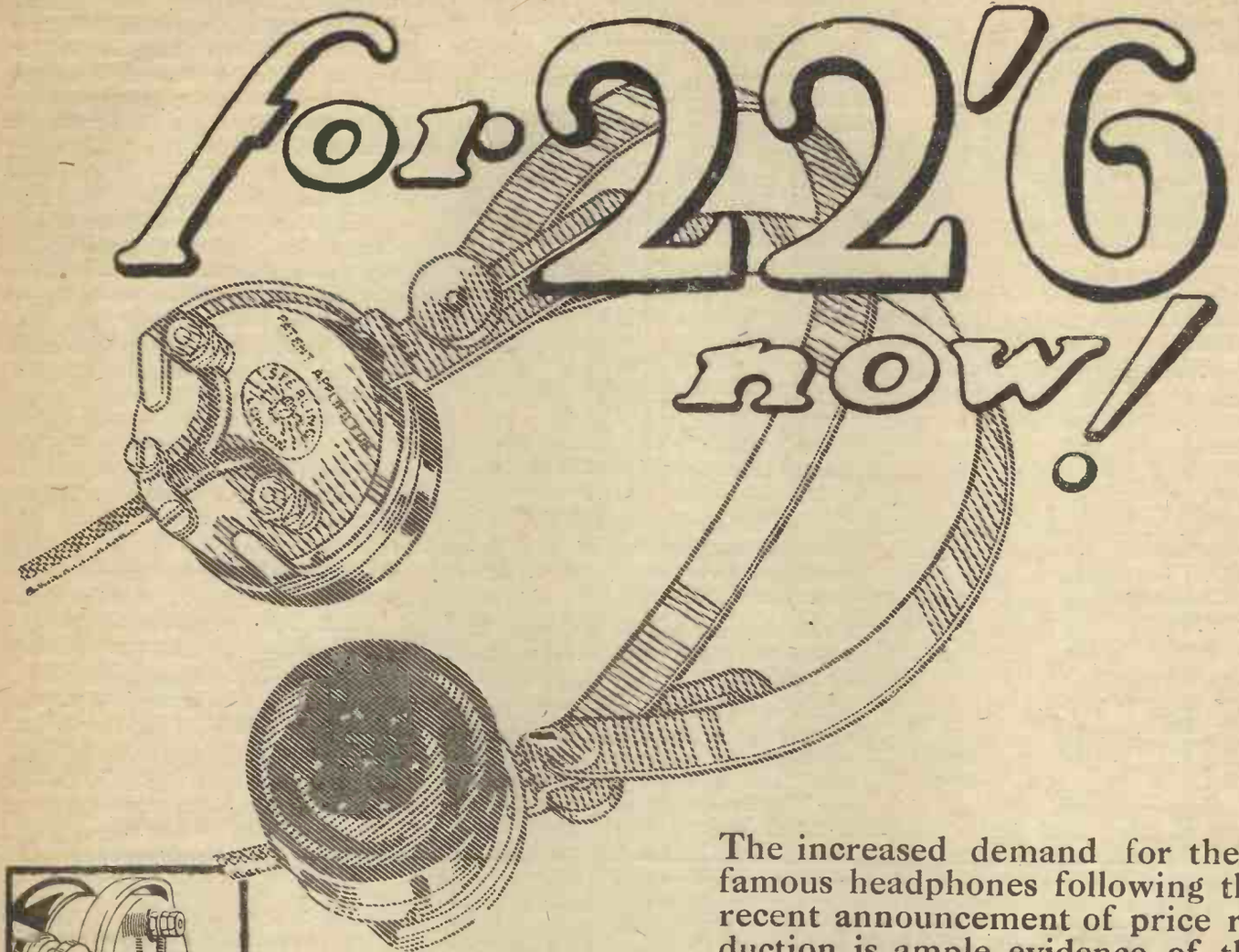
The main drawback to the new system lies in the necessity for the use of a valve oscillator at the receiving end in order to restore the missing carrier wave before detection. A crystal, for instance, would be useless for receiving the new type of transmission, which can only be rendered audible by means of a local oscillator tuned to the frequency of the suppressed carrier wave.

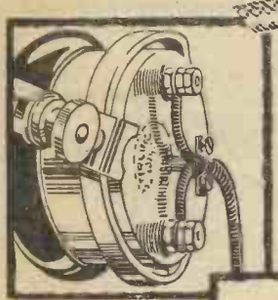
M. A. L.

When you buy your set, let the dealer demonstrate it. If it is what he claims it is, he will gladly do so.

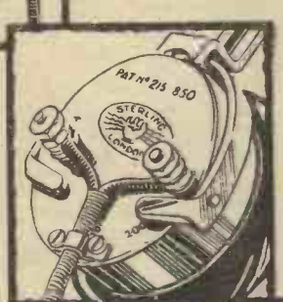
Acid from your accumulator will eat holes in almost anything, so be careful.

for 22'6 now!





I *The swivel and trunnion movement which provides easy adjustment*



II *The back view of one ear-piece — note the difference in construction*

III *The highly efficient electro-magnetic system*

The increased demand for these famous headphones following the recent announcement of price reduction is ample evidence of the keen sense of value possessed by the public.

Sterling Lightweight Headphones at the old price were universally acknowledged as the best value procurable—at the reduced price the value offered remains incomparable.

Comparison with headphones at any price has shown the superiority of Sterling Headphones in efficiency, design, finish and value. In the words of the radio slogan : *"Those who buy Sterling buy best!"*

STERLING
LIGHTWEIGHT
HEADPHONES
At all Radio Dealers

Advt. of **STERLING TELEPHONE AND ELECTRIC CO., LTD.**
Manufacturers of Telephones and Radio Apparatus, etc. Telephone House, 210-212, Tottenham Court Road, London, W.1 Works: Dagenham, Essex

RADIOGRAMS

KDKA dance music, picked up 11,000 miles away by the *Melbourne-Herald*, permitted dancing in the public square at Melbourne.

There are now five hundred and sixty-three broadcasting stations in the United States. Four hundred and fifty-five of them are working with a power of 500 watts or less.

The world's southernmost wireless station will be at South Orkney Island, one of the outposts of the Argentine Republic. The station, to which the call letters L H T have been assigned, will be used principally for Government purposes.

A new principle, which is the basis of a modulation system which renders transmission practically exempt from distortion, is being used in experiments by the Telefunken Laboratory, Berlin. The wavelength is 290 metres and the power 100 watts.

Arrangements are being made for Signora Tetrazzini to sing from the London broadcasting station. This will be the first time she has sung for wireless outside of Italy. It is already decided that her songs will be relayed from London to all British stations, including Chelmsford.

The number of wireless receiving licences in the Southampton area is about five thousand.

It has been suggested that an attempt should be made to broadcast the speeches made by the Prince of Wales during the forthcoming tour.

The Ashton-under-Lyne Concertina Band will give their first broadcast from London on March 21.

Marconi's Wireless Telegraph Co. announces that as an addition to the existing week-end letter service to Bermuda, Turks Island and Jamaica, a similar service has now been arranged to the principal islands of British West Indies.

Latest details of the new measure adopted by certain Glasgow landlords show that tenants are now being offered the alternative of taking down their outdoor aerials or else taking out insurance policies against possible damage to the amount of £1,000.

A musical comedy programme to be broadcast on March 14 will include songs by Miss Grace Gordon and Mr. Frank Cochrane (the original singer of "The Cobbler's Song" in *Chu Chin Chow*), and syncopated songs by Cyril Ramon Newton and Billy Mayerl.

Before the Pacific liner *Orcoma* sailed from Liverpool, the passengers listened-in to a wireless concert provided by a five-valve set which operated loud-speakers in the first-class and second-class saloons.

There are at present fourteen German broadcasting stations which are owned by the Reich Post. A further six stations will be erected this year.

The wireless listener in Germany has to pay 2s. a month, which is collected by the Postal Ministry. The total receipts last year amounted to £271,250.

The Bournemouth station of the B.B.C. has presented a wireless set to the House Beautiful, the N.S.S.U. home for children at Bournemouth.

A loud-speaker is to be placed over the big clock at St. Pancras Station, and an

(*Continued on page* 452)

A Revelation in Transformation

No external aids are required to emphasise the wonder of the R.I. Transformer. It is a real trustworthy British component, with a supreme design of its own that places it before all others on the market. The basis of the R.I. construction is emphatically for the

REPRODUCTION OF BEAUTIFUL MUSIC.

In more technical language the extremely low self-capacity of only 18 micro-microfarads resulting from the sectional method of winding gives—

MINIMUM DISTORTION, MAXIMUM AMPLIFICATION.

Beautiful music must be *perfectly reproduced*
IN RADIO that means an R.I. TRANSFORMER.

PRICE **25/-** EACH.

Ask your dealer. He sells hundreds to satisfied customers.

The R.I. Permanent Mineral Detector, free from the bane of a catwhisker, and giving permanent crystal setting ready to mount on to any panel. 6/- with clips and screws for mounting.

RI LTD

Contractors to the Admiralty and all Government Departments.

Radio Instruments Ltd
12 Hyde Street, Oxford Street
Telephone: REGENT 6214 (3 lines) W.C.1. Telegrams "Instradio London."

RADIOGRAMS (*continued from page 450*)

official, speaking quietly into a microphone in his office, will announce the arrival and departure of trains in tones which will, it is hoped, be heard all over the station.

The Reich Postal Ministry intends to build new broadcasting stations at Kiel, Dortmund, Dorstfeld and Stettin. The cost is estimated at £50,000.

An official of the B.B.C. states that "our twenty-five permanent orchestras, with the artistes, alone cost about £160,000 a year. In addition we have the upkeep of the stations, staff salaries, rents, copyright fees and other expenses."

From June 1 last year to the end of January 265 applicants were granted wireless transmitting licences and 126 were refused.

The building and equipment of a main station costs about £10,000; Daventry, the new high-power station, will cost £50,000.

An international congress of wireless students and amateurs will be held in Paris from April 14 to April 19.

The fourth of the International Symphony concerts will be relayed from the Royal Opera House, Covent Garden, on March 12. The first performance in England of Edgar Stillman Kelley's musical miracle play *The Pilgrim's Progress* will be given. At approximately 10.15 p.m. the Savoy bands will be heard until 11 p.m.

De Groot and the Piccadilly Orchestra will be heard on the evening of March 15, the vocalist being Charles True.

The Basrah port authorities have arranged for Marconi wireless telephone installations to be fitted on their dredgers *Liger* and *Tiger* and also for a shore station with similar equipment. A wireless bell will be included in the installation, thus obviating the necessity for maintaining a continuous watch. This equipment will enable any of the stations to call the others with the facility of an ordinary telephone.

The Royal Air Force band will give its second "request" programme on March 13.

On March 19 the regular chamber music evening of the week will include art songs sung by Miss Anne Thursfield, pianoforte solos by Miss Ethel Bartlett, and string quartets played by the Wynn Reeves String Quartet. The customary fortnightly poetry readings will be included at 8 p.m.

Bournemouth has been heard on a loudspeaker with two valves at Kilmarnock.

Edinburgh Town Council proposes to take drastic measures against those who do not obey the mandate to remove all aerials which cross the streets of the city. Recently it was brought to the notice of the authorities that there were still over two hundred contravening in this way. Anyone failing to comply with the regulations is now threatened with a penalty not exceeding forty shillings for each day during which the offence is continued.

"Our object is, and always has been, to provide the best programmes for the greatest number of people. We believe—and the vast bulk of the letters we receive from listeners support our belief—that we attain that object," states an official of the B.B.C.

The Postmaster-General states that about 1,200,000 wireless receiving licences are at present in force. The Post Office has no material with which to form an estimate of the unlicensed sets in use.

An appropriate programme for St. Patrick's Night will be given at 7.30 p.m. on March 17.

M. Paderewski has consented to play for British broadcast listeners from 9 to 10.30 p.m. on Sunday, March 15.

On Friday, March 6, the Glasgow station of the B.B.C. celebrated its second birthday. The occasion was marked by a special programme, which included a novel burlesque by the 5 S C staff of a wireless programme in 2000 A.D.

Transmitting and receiving apparatus must be installed on French merchant and fishing vessels of 2,000 tons or more gross, or those which carry a crew of fifty, or those having more than twelve passengers, according to a recent Act of the French Chamber which comes into operation on March 15.

Six Sixty

The Best Dull Emitter

SCIENTIFICALLY SUPREME——

The only valve with a Molybdenum Thorium Covered Filament.

The only valve which gives approximately 50% greater volume than a bright emitter.

And it conserves accumulator current over ten times.

BRITISH MADE. B.B.C. STAMPED.

Filament Volts
1·5 to 2
Filament Current
·3 amps.

18/-

If your local dealer cannot supply you with the "SIX SIXTY," communicate with us.

FROM the coherer to the crystal, from the crystal to the valve—and now, to the "Six Sixty," the only valve with a Molybdenum Thorium Covered Filament.

The processes of manufacture of this wonderful new filament are the outcome of recent important scientific discoveries. The emission of electrons from a "Six Sixty" filament is very much greater than that obtainable from a tungsten filament, with the result that the "Six Sixty" gives much greater all-round efficiency and approximately 50% greater volume than standard bright emitters, whilst it consumes only one-tenth of the amount of current they require.

Greatly increased efficiency and largely decreased upkeep costs are certain with the "Six Sixty." *Let it be your next valve purchase.*

DISTRIBUTORS WANTED

Every discerning dealer will want to stock this important valve innovation. Quantities are ready for delivery and dealers are invited to write in AT ONCE. Showcards, posters & leaflets supplied.

The ELECTRON Co. Ltd.

Triumph House, 189 Regent St., London, W.1

Uncle Fellows calling!

Reduction in Price of FELLOWS Headphones

Any reduction in price is welcome, but the reduction in price of Fellows Headphones is more welcome than usual.

It means that your natural desire for economy need no longer interfere with your equally natural desire to buy British Goods.

For 16/6 you can now get the best British Headphones without even having to give a thought to the foreign and inferior article.

Sensitive, comfortable and so light that you can hardly notice them, the Fellows Headphones at their new price bear out more than ever our well-known policy of

"Quality Apparatus at Low Cost"

Uncle Fellows

YEATES, LTD.,
20, Store Street, Tottenham Court Road, London, W.C.1

Well-equipped Sales and Demonstration Offices. Wholesale and Retail.

FELLOWS WIRELESS

The Lightweight Headphones

Highly finished and extremely sensitive they are also very comfortable, and contain only the best workmanship. Fitted with Non-Rusting Duralumin Headbands. Weight with cord 6 oz. Resistance 4,000 ohms.

Only **16/6**

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

E.P.S. 131

WIRELESS IN PARLIAMENT

From Our Own Correspondent.

IN the House of Commons Mr. A. Alexander asked the Postmaster-General what steps he proposed to take in connection with the contemplated amendment of the Wireless Telegraphy Acts to make adequate and specific provision for preserving the right of amateur experiments in wireless communication?

Sir W. Mitchell-Thomson said he hoped to make a full statement on this and other points connected with the Wireless Telegraphy and Signalling Bill on the motion for second reading. Clause 2 (1) of the Wireless Telegraphy Act, 1904, which conferred the right referred to, was reproduced textually in the present Bill. He did not consider that the position of the experimenter was in any way prejudiced under the Bill.

Sir W. Mitchell-Thomson informed Lieutenant-Commander Kenworthy that in two cases in the last two years the Post Office had taken proceedings against possessors of wireless sets for failure or refusal to take out licences.

Asked by Mr. Morris if an applicant for a wireless experimental licence had first to declare the nature of his experiments, Sir W. Mitchell-Thomson said that it was the statutory duty of the Postmaster-General before granting an experimental licence to satisfy himself that the sole object of the applicant was to enable him to conduct experiments in wireless telegraphy. In order to fulfil this duty, an applicant was asked to state what scientific qualifications he possessed and the general nature of the experiments he desired to conduct. If his scientific qualifications were in themselves sufficient to justify the issue of a licence, no detailed information would be insisted on.

Mr. A. M. Samuel, secretary to the Overseas Trade Department, informed Mr. Everard that the value of the wireless apparatus and accessories imported from foreign countries in January, 1925, and in the corresponding month in 1924 were:

Imports Registered in January, 1924.

Wireless instruments	£23,666
Wireless valves	1,214

Imports Registered in January, 1925.

Wireless instruments and apparatus	£100,038
Wireless valves	13,117

Note.—In the year 1924 imports of wireless apparatus were included under the same heading with other telegraph and telephone apparatus. The particulars given above regarding imports of wireless instruments in 1924 were consequently not comparable with those regarding imports of wireless instruments and apparatus in 1925.

REDUCED PRICE

25/-

Carriage Paid, ready for mounting.

Clearer Speech and Music

with the

M-L TWIN-COIL L.F. INTER VALVE TRANSFORMER

ONE amateur enthusiast writes: "Your transformers are definitely superior in quality of production of speech and music." Another says: "The greatly improved reception since fitting these transformers is indeed amazing."

These opinions, arriving daily, confirm our own tests. With the M-L transformer you get both speech and music clearer. There is a complete absence of distortion, greater amplification and a longer range.

Stoutly built and well finished, it is dust and damp-proof. The coils are completely enclosed. Insulation has received special attention, and there is no danger of burning out. Primary to secondary ratio, 1—4.

To get the best from your set use an M-L transformer.

The M-L ANODE CONVERTER

A PERMANENT substitute for the high-tension battery. Ideal for power amplifier work. Worked from the ordinary 6-volt accumulator, the consumption is low — 1.15 amperes. Perfectly smooth reception. Continuous adjustment of H.T. voltage and not by steps.

Supplied in the following standard voltage ranges:

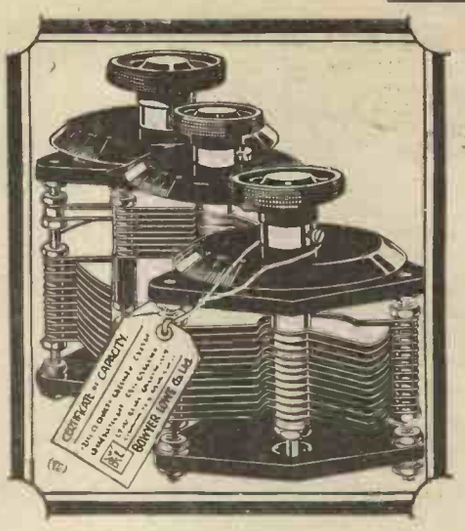
Type B 5-120 volts **£11 5 0**
Type C 12-300 volts **£13 10 0**
} For two stage power amplification

Type D 12-500 volts **£18 0 0** } For low power transmission work.

We invite applications from traders for terms. Write for details.

The M-L Magneto Synd., Ltd., Wireless Dept., Victoria Works, Coventry.

M-L



When you see the Conjurer wave his little wand

You are not less appreciative of the unexpected result because you know it has a simple explanation.

So with Condensers. Every week hundreds of amateurs fit Bowyer-Lowe Square-Law Condensers in their sets and by doing so obtain results more startling than they had imagined possible. Signals gain purity and strength, stations which previously jammed can easily be separated, wavelength range increases so that more stations can be heard.

And these results are not less gratifying because the simple explanation lies in the exclusive design of Bowyer-Lowe Condensers which gives them the lowest losses and highest capacity ratios in wireless.

These Condensers are similar in size and shape to condensers of the non-square-law type. Instal them in your present sets and notice what a surprising difference they make.

Your dealer can supply them from stock, or we can execute your order by return of post. Test these low loss Condensers to-day.

A FEW CURRENT PRICES.

Single		Double (each half)	
.00025	15/-	.00025	28/-
.0003	16/-	.0003	29/-
.0005	17/-	.0005	31/-

Including Dial, Drilling Template and 3 Calibration Charts.

Bowyer-Lowe Tested SQUARE-LAW CONDENSERS

COMPLETE LIST FREE

Send name and address with 1½d. stamp to cover postage for informative new Price List of all our TESTED LOW LOSS PARTS. They make responsive sets.

BOWYER-LOWE CO., LTD., LETCHWORTH

D. X. Work

SIR,—We think some of the following recent D.X. reception may be of great interest to most of your readers. During the last few months we have logged Australia, 3BQ, 3BD and 5BG; Chili, 9TC; Porto Rica, 4SA; New Zealand, 4AG; Mosul, GHH, GHB and M1. All these were on one valve only. On two valves we logged: Australia, 2DS and 2YI; French China, HVA; Mexico, 1AF, 1N and 1K; New Zealand, 4AR.

The set is home-made with straight circuit. Z4AR was heard on Sunday, March 1, calling CQG Z4AR, and Z4AG was heard on the same morning calling Mexico, 1N. HVA is at Hanoi and transmits on a wavelength of 90 metres C.W., using 90 watts.—F. C. and T. A. STUDLEY (Harrow).

"KDKA on a Crystal"

SIR,—There are two things that Mr. Stafford might have made clear: (1) How did he know it was KDKA? He says "apparently a speech *was in progress*," so that there was no opportunity to hear the call-sign given.

(2) *What* did he hear? As it was (by inference) clear enough to be understood, he might have given some particulars (which could easily have been verified).—W. P. (West Ealing).

2LO and 2ZY

SIR,—I notice that THERMION in his notes states that he has difficulty in separating 2LO and 2ZY. I had the same trouble until recently, when I fitted a .0003 variable condenser, a broadcast variometer and a No. 35 honeycomb coil all in series and used reaction on the No. 35. The reaction coil was a No. 75.

When tuning in to 2LO I loosen the coupling of the reaction, put the condenser at 90 degrees, and tune on the variometer, then advance the reaction.

To receive 2ZY or other stations I couple the reaction tight against the A.T.I. and decrease the capacity of the condenser.—A. B. K. (Poplar).

The Super-set and Interference

SIR,—On several occasions recently THERMION has made scathing references to users of super-heterodyne receivers in relation to interference.

I hope you will not mind me telling you that a correctly-designed and constructed "straight" super-heterodyne does not re-radiate, and I have often used two separate receivers at the same time in the same room within six feet of each other with no mutual interference.

A good super should not be used with an outdoor aerial, for the simple reason that signal strength is not increased to the same extent as interference.—5CB (London, S.E.).

Other Correspondence Summarised

T. W. R. (Staffs) thinks that wireless would lose a lot of its charm for amateurs if only one-knob sets were made.

G. E. G. (Chester) found that certain noises which were troubling him in his set were traceable to panel leakage, as he had omitted to matt the latter.

E. R. B. (Staffs) frequently receives KDKA on his one-valve set.

A CHALLENGE TO THE POST OFFICE

MR. R. M. FORD, the wireless amateur who recently challenged the right of the Postmaster-General to enforce the licensing regulations, has now made an application in the High Court for an interim injunction to prevent the Postmaster-General from paying over to the B.B.C. a proportion of the licence fees collected.

The total amount paid over to the British Broadcasting Co., Ltd., is about £500,000, and it is claimed that the Post Office has no right to collect the licence dues from persons having receiving sets.

Mr. Justice Astbury, before whom the application was made, stated that he would not grant an injunction in the absence of the B.B.C. and the Postmaster-General, who were entitled to be heard. The motion was ordered to stand over until Friday, March 6.

TRADE NOTES

A CATALOGUE of Navy-pattern sectional steel wireless masts has been sent us by Hamilton May, Weybridge, Surrey.

An illustrated folder describing the Perfex aerial has been sent us by the Wireless Apparatus, Ltd., 35, Panton Street, Haymarket, S.W.1.

From Malone and Co., Leigh-on-Sea, Essex, we have received a catalogue of wireless sets and components.

CHIEF EVENTS OF THE WEEK

SUNDAY, March 15

London	3.0	Orchestral Programme.
London	9.0	Paderewski. S.B. to all Stations.
Bournemouth	3.0	Band of the 1st Middlesex Regiment.
Aberdeen	9.0	*Parsifal* Choral Selection.

MONDAY

Birmingham	7.30	Music and Drama.
Bournemouth	7.30	Twenty-first Symphony Concert.
Aberdeen	7.30	"Saint Patrick's Eve."
Glasgow	7.30	Chamber Music Programme.
5 X X	7.30	The Catterall Quartet.

TUESDAY

London	7.30	"St. Patrick's Day."
Belfast	10.30	"New Prince's" Frivolities Cabaret.

WEDNESDAY

Birmingham	7.30	Mystery Programme.
Bournemouth	8.0	Winter Gardens Night.

THURSDAY

London	7.35	Chamber Music.
Manchester	8.30	The Hallé Orchestra.
Aberdeen	7.35	Popular Evening.

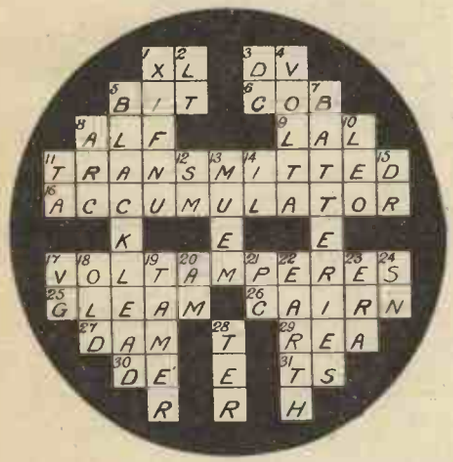
FRIDAY

London	7.30	Popular Concert.
Cardiff	7.30	Women's Night.
Manchester	7.30	An Evening of Variety.
Glasgow	7.30	Clan Campbell Night.

SATURDAY

Cardiff	7.30	Pre-War Reminiscences. (Relayed to 5 X X.)
Newcastle	7.30	Popular Concert.

The Solution of the "Valve" Cross-word Puzzle



This puzzle appeared in the preceding issue.

"A New Treatment for Damp Walls" is described in the current issue of "The Amateur Mechanic and Work" (3d.), and will doubtless prove of interest to many readers. Other articles and features in this number are: "Modelling in Cardboard," "A Novel Form of Hall Table," "In the Metalworker's Shop: Deflection of Tools," "Motor-cycle Practicalities," "A Simple Mounting for a Crystal Set," "Helpful Notes on Keeping the Wireless Set in Good Condition," "The Crystal and Indoor Aerial," "Notes by the Way," "Pip-lamps for Country Dwellers," "How to Set Out a Horizontal Sundial," "Devices for Ornamenting Pastry," "Our Small Car Page," "Fixing a Shelf on Plugs," "Making Money by Inventing."

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), 326 m. **Plymouth** (5PY), 335 m. **Sheffield** (6FL), 301 m. **Stoke-on-Trent** (6ST), 306 m. **Swansea** (5SX), 481 m.

Chelmsford (high-power station), 1,600 m.

CONTINENT

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

AUSTRIA.

Vienna (Radio Wien), 530 m. (1 kw.). Daily: 08.00, markets (exc. Sun.); 10.00, con.; 12.05, time sig.; 12.20, weather; 14.30, Stock Ex. (exc. Sun.); 15.00, news, con.; 15.10, children (Wed.); 17.00, lec. (Tues., Wed., Thurs., Sat.), children (Mon., Fri.); 17.20, women (Tues.); 18.00, news, weather; 19.00, time sig., con., news; 21.00, dance (Wed., Sat.).

Graz (relay), 404 m. Testing.

BELGIUM.

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

Haeren (BAV) (250 w.), 1,100 m. (250 w.). 13.00, 14.00, 16.50, 18.50, weather.

CZECHO-SLOVAKIA.

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

Komarov (OKB), 1,180 m. (1 kw.). Weekdays: 13.00, Stock Ex., weather, news; 17.30, con. (Thurs.); 09.00, con. (Sun.).

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

DENMARK.

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

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

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

FRANCE.

Eiffel Tower, 2,600 m. (6 kw.). 06.40, weather (exc. Sun.); 11.00, markets (exc. Sun. and Mon.); 11.15, time sig., weather; 14.45, 15.35, 16.30,* Stock Ex. (exc. Sun. and Mon.); 18.00, con. (not daily); 18.45, Paris fashions (in English)—temp—(Wed. and Sat.); 19.00, weather; 20.30, con. relayed from PTT (Fri.); 22.10, weather (exc. Sun.). Frequent tests on 1,500 m.

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

Radio-Paris (SFR), 1,780 m. (3-4 kw.). Sundays: 12.45, orch.; 13.45, news; 16.45, con.; 20.30, news, &c.; 21.00, dance music. Weekdays: 12.30, orch., Stock Ex., news; 16.30, markets, Stock Ex., con.; 17.45, Stock Ex., news, women; 20.50, con.; 21.00, time sig.; dance (Thurs.). Tests probable on 1,125 m.

L'Ecole Sup. des Postes et Télégraphes (PTT), Paris, 450 m. (400 w.). 14.00, lec. relayed from Sorbonne University (Thurs.); 15.00, outside relay (Sat., irr.); 15.45 and 17.00, lec. relayed from Sorbonne (Wed.); 16.00, outside relay (irr.); 20.00, Eng. talk (Tues.); 20.30, lec. or con., almost daily, con. relayed by F. L. (Fri.); 20.45, lec. (Sun.), organ recital 3rd Sun. each month; 21.30, con. (Sun.).

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

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

GERMANY.

Berlin (2), 505 m. (1½ kw.). 08.00, sacred con. (Sun.); 09.00, markets, news, weather; 10.00, factory con. and tests; 10.30, educat. hour (Sun.); 11.15, Stock Ex.; 12.00, time sig., news, weather; 13.15, Stock Ex.; 14.00, lec. (Sun.), markets; 14.30, children (Sun., Wed.); 15.00, Esperanto (Sat.); 15.30, orch., French (Tues.); 17.30, lec., women; 18.00, French (Mon.), lec. (Tues.); 18.30, lec., Engl. (Thurs.), theatre news (Tues.); 19.30,* con., weather, news, time sig.; 21.30, chess (Mon.), dance until 23.00 (Thurs., Sat., Sun.). * If opera relayed, at 18.30.

Königswusterhausen (LP), 2,450 m. (5 kw.)

(*Continued on page 460*)

"BROADCAST TELEPHONY" (*cont. from page* 458)

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

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

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

Cassel, 288 m. (1½ kw.). Relay from Frankfort.

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

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

Hamburg, 395 m. (1½ kw.). Sunday: 07.55, time sig., weather, news, lec., women; 10.00, sacred con., chess; 12.00, con., lec.; 16.00, children; 17.00, con.; 18.00, Engl. conv.; 19.00, sport, weather, news, con. or opera; 21.00 onwards, as weekdays. Weekdays: 06.25, time sig., news; 07.30, theatre news; 11.55, time sig.; 12.20, Engl. (Wed.); 14.00, political news, markets; 15.00, women; 15.30, lec., Esperanto; 16.05, orch., 17.00, con., lec.; 18.25, lec., Engl. conv. (Tues. and Fri.), Spanish (Mon. and Thur.); 19.00, weather, con. or opera; 21.00, weather, markets, news; 21.50, news (in English), dance (not daily). Will shortly be increased to 5 kw.

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

Königsberg, 463 m. (1 kw.). 08.00, sacred con. (Sun.); 10.15, markets; 11.55, time sig., weather; 13.15 and 15.00, markets; 15.30, children (Tues., Wed., Sat.), orch.; 18.30, lec., Esperanto (Thurs., Sat.); 19.00, con. or opera; 20.00, orch., lec., weather, news, dance (Thurs., Sun.).

Leipzig, 454 m. (700 w.). 07.30, sacred con. (Sun.); 10.00, educat. hour (Sun.); 11.00, markets, orch., time sig.; 15.00, markets; 15.30, orch., children (Wed.); 16.30, lec. (Tues.); 17.30, lec. (Tues.), experimenters (Wed. and Sat.); 18.00, lec.; 19.00, lec. (irr.); 19.15, con. or opera, weather, news; 21.00, con. (not daily). Will shortly be increased to 5 kw.

München, 485 m. (1 kw.). 10.30, lec., con.; 13.00, news, weather, time sig., snow forecast; 14.00, con., lec. (Sun.); 15.30, orch. (16.00 Sun.), children (Wed.); 17.00, agric. talk (Mon.), con.; 18.00, lec., Engl. (Mon. and Fri.), Italian (Tues.), Russian (Sat.), Esperanto (Thurs.); 19.30, con.; 20.30, news, weather, time sig.; 21.00, late con. (Sun.), lec. (Tues.), dance (Sat.).

Munster, 410 m. (1½ kw.). 11.00, sacred con., news (Sun.); 11.30, news (other days); 11.55, time sig.; 14.30, markets; 15.30, children (Sun.), lec. (weekdays); 18.40, weather, lec., time sig.; 19.20, women, con. or opera, news, dance (Sat.); 21.00, English, Spanish or Esperanto, news, dance (Sat.).

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

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

FINLAND.

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

HOLLAND.

Amsterdam (PCFF), 2,125 m. (1 kw.). Daily: 07.55-16.10 (exc. Mon. and Sat., when 10.10-11.10), news, Stock Ex. (PX9), 1,070 m. (400 w.): con., 20.40 (Mon.). (PA5), 1,050 m. 19.40, con. (Wed.).

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

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

ITALY.

Rome (1RO), 425 m. (3 kw.). Weekdays: 16.00, orch., Stock Ex.; 19.30, time sig., news, con.; 20.15, news, Stock Ex., con.; 21.10, dance, weather. Sundays: 09.30, sacred con.; 15.45, children, Stock Ex.; 16.15, orch; 16.45, jazz band, con., dance.

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

JUGO-SLAVIA.

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

NORWAY.

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

POLAND.

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

RUSSIA.

Moscow (Central Wireless Station), 1,450 m Sundays: 12.45, lec.; 15.30, news and con. Weekdays: 13.00, markets; 15.30, news or con.

(Sokolniki Station), 1,010 m. Sundays: 14.30, con.; 17.00, lec. and con. (Tues, Thurs., Fri.).

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

SPAIN.

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

Barcelona (EAJ1), 325 m. 18.00, lec., Stock Ex. markets, con. or relay of opera; 20.30, news and con.

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

SWEDEN.

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

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

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

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

* Local programmes are also broadcast at times.

Sundsvall (SASD), 680 m. (500 w.). Testing shortly.

SWITZERLAND.

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

Lausanne (HB2), 850 m. (500 w.). 07.05, weather; 12.30, weather, markets, time sig., news; 16.00, children (Wed.); 17.55, weather, news; 20.15, con. (exc. Wed.), dance (Thurs. and Sat.).

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

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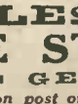

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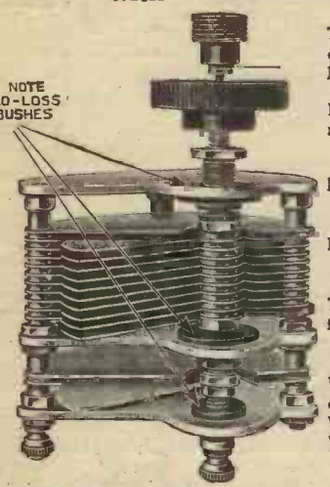

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J.B. Variable Condensers. Complete with Knob and Dial.

SQUARE LAW		STANDARD	
·001	9/6	·001	8/6
·0005	8/-	·0005	7/-
·0003	6/9	·0003	5/9
·0002	5/6	·0002	5/-

Other sizes as advertised by "J.B." Post 4d.

HEADPHONES

ERICSSON E. V. CONTINENTAL

Your favourite 'phones. Entirely NEW MODEL. Most beautifully finished, exquisite tone. Ridiculous Price per pair (4000 ohms).

13/11

POST FREE

POST FREE.

Climax Earth Tube	5/-
Service Detector	2/8
2-v. 40 Accumulator	8/11

R.I. DETECTOR
All orders in rotation 6/-

REACTONE COILS

Set of 5	3/-
1 for Chelmsford	1/9

DULCEVOX LOUD SPEAKER 42/-

TELEFUNKEN TYPE HEADPHONES

so near to originals only an expert can tell the difference (except not adjustable) 10/9 pair

FORMO PORTABLE AERIAL COMPLETE with insulators hooks, etc. 7/6

Eliminates static.

N & K

GENUINE LATEST MODEL, 4000 ohms.

15/11

FEW OLD MODELS

12/11

POST 6d. PAIR U.K.

GENUINE 'BRUNET'

L.F. Transformers.
3—1, Primary 5000, Secondary 15,000
5—1, Primary 5000, Secondary 25,000

13/6

each.

Warning! Note name RAYMOND on windows. You will not be able to buy these goods otherwise. Nearest Tube, Leicester Square. This address is at the back of Daly's Theatre. Open weekdays 9 to 8. Saturdays 9 to 8.45. Sundays 10 to 1.

3 COLUMNS for CALLERS ONLY

ALL POST ORDERS FROM OTHER COLUMNS

Insulated Hooks 2 for	1½d.
Egg Insulators 4 for	3d.
Insulated Staples, 5 a	1d.
Battery Links, 4 for	2½d.
6 ft. 'Phone Cords	1/- 1/3 1/6
Sleeving	yd. 3d.
Empire Tape	12 yds. 6d.
Red and Black flex	12 yds. 1/6
Wander Plugs	1½d
Tape Aerial 100 ft.	1/10
7/22 hard drawn, 100 ft.	1/10
1/16 Bus Bar bank	6d.
Lead-in tubes	6d.
Ormond Rheostat	1/8
C. & S., Good value	1/-
Raymond, with dial	1/11
Twin silk flex 6 yds.	6d.
Baby 2-way coil stand	1/9
do. 3-way coil stand	3/8
2-way ex-handles nickel	2/9
3-way ex-handles, nickel	4/6
H.F. Transformer, B.B.C.	2/6
Ditto, Chelmsford	2/9
D.P.D.T Panel switch	1/-
S.P.D.T. Panel switch	10½d.
D.P.D.T. China base	1/2
S.P.D.T. China base	7½d.
On & off switch	1/-
Legless valve holder	1/-
Solid rod valve holder	1/3
H.T.C. both types.	
Basket holders	7d., 8½d.
Also at 10d., 11d., 1/-	
Spike holders	7d. 9d.
Knobs, 2 B.A.	2d.
Brass coil former	2/3
4.5 batteries	4d., 4½d., 5d.
Dutch detectors	4/3
Fama detectors	4/9
Dutch "R" valves	4/9
Phillips "R"	6/11
French "R"	5/9
Radio Micro .06	10/11
"Metal" .06	10/6
Dr. Nesper phones	11/9
Ericsson E.V. 'phones	10/11
Telefunken Type	8/11
N. & K. Pattern	7/11
Glazite	1/6
Breast drills	4/9
Set of drills	1/2
Screw drivers	3d.
Spanners (5)	4½d.
Pliers	10½d., 1/-
7 waxed coils	1/8
5 waxless coils	1/4
Whiskers	1d., 2d., 3d.
Set of 4	2d.
Copper foil	ft. 2½d
Mansbridge 1 mfd.	3/3
Ditto 2 mfd.	3/9
Ditto .25	2/8
Copper earth tube	3/6

BRUNET

New Model "TYPE D." Hygienic Horn Headbands. Nickel-plated Stirrup. Black and White Cord. Each receiver stamped with trade mark. 4000 ohms. Per pair 16/6

TERMINALS
(Complete)

W.O., Pillar, 'Phone, brass, 1d. each; nickel, 2d. each; stop and valve Pins, ½d.; nuts, various, 6 a 1d.
Valve Sockets ..... 1d., 1½d.
Flush panel do. ..... 1d.
Spade Tags ..... 6 a 1d.
Do. Terminals ...2 for 1½d.
Do. Pins .....2 for 1½d.
Screws and nuts ... 2 a 1d.
Switch arms ..... 7d.
Nickel arms ..... 10½d.
Studs, complete .....2 a 1d.
'Phone connectors ... 1d.
2 B.A. Rod ..... ft. 2½d
4 B.A. Cod ..... ft. 2d.
Valve windows ..... 4d.
Washers ..... 12 a 1d.
Shorting plug and socket 3½d.
Shellac ..... 5d.
Ormond (Neutrodyne) 2/-
Colvern 3/6
Success 3/6
Vernier (Colvern) 2/6

SPECIAL!
60 v. H.T. Batteries, 4/11, 5/11, 6/11

CRYSTAL SETS
5/11, 6/11, 7/11, 8/11 up to 30/-.

H T. BATTERIES

B.B.C. 60 v.	8/11
B.B.C. 36 v.	5/6
Eveready 66 v.	13/6
Eveready 108 v.	22/6
Eveready 36 v.	8/-
Do. 4.5.	6/6 dozen

SHAW'S HERTZITE
with J. J. Shaw facsimile signature. None genuine without. In sealed box. Callers 8d.

D.C.C. WIRE
per ½ lb. Reel.

18 or 20 g.	9d.
22 g.	10d.
24 g.	11d.
26 g.	1/-
28 g.	1/2
16 D.C.C.	2/6 lb

SET OF 5 COILS
Extra air spaced ¼ in. thick 1/8
Duplex Waxless, wavelengths marked No. 25, 35, 50, 75, 100

CHELMSFORD with above specification 10½d., 11d., 1/-

CRITERION COILS
Set of 5 ..... 8/11
25, 35, 50, 75, 100.
Every turn and layer air spaced, perfect for reaction, low self-capacity, mounted on plug.
Also sold separately.

WARNING!
Buy Shaw's Hertzite, only in sealed box, bearing facsimile signature of J. J. Shaw.
Not genuine otherwise.

ACCUMULATORS

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

Hart's Stocked. All High Quality

EBONITE, 3/16 in.
Stock Sizes
Cut to size, ½d. sq. in.

6×6	1/4	12×6	3/-
7×5	1/4	12×9	4/3
8×6	1/10	12×12	5/6
9×6	2/-	14×10	5/6
10×8	3/-		

¼-in. also Stocked.

SWITCH ARM, one-hole fixing. 12 Studs, 12 Nuts, 12 Washers. Lot 10½d.

COIL PLUGS, EBONITE

Fitted Fibre	7d.
Wedge Shape	7d.
Edison Bell	11d.
Plaincoil Plugs	4½d.

Also 5d., 6d., 7d. each
Fibre Strip ..... 2d.
(36 in. by 1 in.)
Empire Tape, doz. yds. 6d.

RAYMOND FIXED CONDENSERS

.001, .0001 to .0005	10d.
.002, .003, .004	1/-
.006, 1/3; .01, 1/9; .02, 1/9	

Ebonite Base Terminals

ENCLOSED DETECTORS

Micrometer	1/6
Half Opal	1/-
Small Brass	8d.
Large Brass	1/-, 1/3
Nickel	10d. to 1/6
Burndept	4/-
Shaw's Genuine Hertzite	10d.
Uralium	1/-
All known makes.	
4 Whiskers (1 gold)	2d.
Gold and Silver do.	2d.
7 Waxed Coils	1/8
5 Waxed Coils	1/3

(For B.B.C.)

SPECIAL!

Vernier 2-way Coil Stands	3/3
Geared do.	5/3

HEADPHONES
Ericsson's Ev. Continental, 4000 ohms ... 11/9

SPECIAL!
Square Law Variable Condensers

·0005	5/-
·0003	4/6

Complete with Knob and Dial
Ebonite ends, 1/- extra

ODDMENTS OF ALL KINDS
all cleared out daily at cheap prices. Not obtainable unless shop bears the name RAYMOND on windows, etc.

RIGHT OPPOSITE
DALY'S
GALLERY DOOR

K. RAYMOND

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

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

CLUB DOINGS

York and District Radio Society

Hon. Sec.—MR. E. S. CANHAM, 3, Fourth Avenue, Heworth, York.

ON February 24 the first meeting of the above society was held, when the usual officers were elected.

Ipswich and District Radio Society

ON February 23 a debate and practical demonstration took place, the subject being "Can a two-valve receiver operate a loud-speaker on the Chelmsford station without energising neighbouring aerials?"

Croydon Wireless and Physical Society

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

AT the last meeting Mr. Camplin delivered an interesting lecture on "The Design of Experimental Wireless Receivers." He dealt with the essentials to be aimed at in designing wireless receivers, and exhibited circuits of one-, two-, and three-valve sets which he found gave most satisfactory reception. A useful discussion followed.

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.

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

PREPAID ADVERTISEMENTS.

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

PATENTS and Trade Marks obtained.—H. T. P. Gee, Patent Agent, Member R.S.G.B., 51, 52, Chancery Lane, London, W.C.2. Phone, Holborn, 1525.

GOLD OR SILVER PLEATED DIAPHRAGMS. Ready for use. Splendid results. 12 in. diam., 1s. 6d.; 16 in. diam., 2s. 6d.—Ernest Murray, 30, Princes Parade, Finchley, N.3. (9 r

FIT YOUR SPEAKER with the "ALLWOODORN."—Maddison, 2a, Ronalds Road, N.5. Manufacturer of wood horns. (29 r

HEADPHONES, Loud Speakers, rewound, remagnetised, adjusted any make. 5s. Remagnetised, adjusted only, 1s. 6d. Postage 6d. Returned in 24 hours.—Magneto Service Co., 4, Newington Causeway, S.E. Hop 2627. [22 r

THE GREAT RADIO MYSTERY. This Combination employs the Great Semi-Transparent South American Crystal which has recently caused such a stir in wireless circles and which gives such remarkable results. This is mounted in a metal cup. Rod Spring Ball Joint and Knob with another appropriate mineral. This can be fitted to your present Detector. No Catswhisker required. Gives Valve Strength with Crystal Purity. Why pay a higher price when you cannot secure greater efficiency. 2s. 3d. Post Free from your Radio Dealer, or direct—Lyons, 119, Clerkenwell Road, E.C.1.

WANTED Freak Wireless Sets and wireless Controlled Models. Particulars to J. Stores, Back East Moor Road, Pallion, Sunderland. (15 s

BEAUTIFUL CRYSTAL SET, large polished Mahogany Case, special Dustproof Crystal Detector, cost 30s., accept 12s. 6d.—A. W. KAY, 8, Craven Walk, N.16. [20 r

PERFECT SQUARE LAW CONDENSERS, ·0005, 5s. 6d. With Vernier, 8s. 3d. Trade samples.—ALLITT'S WIRELESS MANUFACTURERS, 59, Church Hill Rd., Handsworth, Birmingham. [18 r

LISSENIUM

BUILD WITH ALL LISSEN PARTS— THERE IS ONE FOR EVERY VITAL PLACE

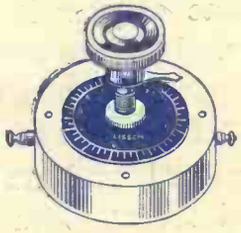
DON'T MIX YOUR PARTS.

With all Lissen Parts your receiver will give Results which would never be possible with Mixed Parts.

RECEIVERS WHICH ARE FITTED WITH LISSENSTAT CONTROL ARE EQUIPPED FOR THE FINEST DETECTION POSSIBLE. Lissenstat Major (pats. pending) gives the most acute tuning possible **7/6**

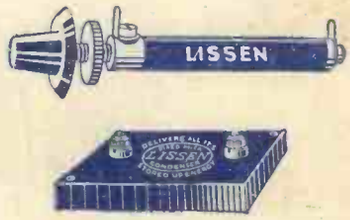
Lissenstat Minor (pats. pending) is replacing many thousands of inefficient rheostats. Provides Lissenstat control at a popular price **3/6**

Ask for LISSENAGON COILS— the Coils which intensify Tuning



On short wave work where tuning is so critical the **LISSEN MICA VARIABLE CONDENSER** with its open scale and delightful tuning characteristics fills a great need.

Negligible minimum, maximum rated at .001. **THIS LISSEN CONDENSER GIVES YOU EVERY CAPACITY YOU WILL EVER NEED—IT SUPERSEDES ALL OTHER CONDENSERS —AND IT IS TOTALLY UNLIKE THEM ... 17/6**



WITH THE LISSEN VARIABLE GRID LEAK YOUR RECEIVER WILL YIELD THE UTMOST SENSITIVITY WHICH CORRECT GRID POTENTIAL UNDER ALL CONDITIONS IMPLIES ... 2/6

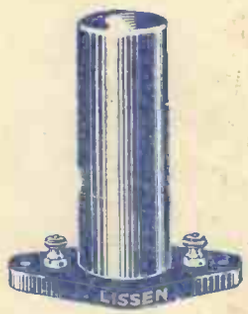
IT IS WORTH WHILE FITTING LISSEN FIXED CONDENSERS, TOO. MADE WITH SCRUPULOUS CARE— ACCURATE TO WITHIN 6%—THEY NEVER VARY — NEVER LEAK. THEY DELIVER ALL THEIR STORED UP ENERGY.

.0001-0009	2/-
.001 -002	2/6
.004 -006	3/-

THE LISSEN T.1 TRANSFORMER WILL AMPLIFY A WHISPER TO A GREAT DEGREE OF LOUDNESS IN A BACKGROUND OF ABSOLUTE SILENCE. It is the Transformer which should be particularly used immediately behind the detector valve. The **LISSEN T.1 TRANSFORMER** is distortionless, for one reason, because the impedance of the transformer is obtained by means of the exceptional coil used and not by the use of a heavy iron core which always tends to distort.

THE LISSEN T.1 TRANSFORMER has a most expensive coil — **IT WOULD AMPLIFY BY ITSELF WITHOUT ANY IRON CORE AT ALL ... 30/-**

Write for Text Book of Lissen Parts. FREE to Readers of "Amateur Wireless"



TO BUILD UP PURE SOUND AND YET RETAIN VOLUME THE LISSEN L.F. CHOKE IS RAPIDLY GAINING FAVOUR. This method of L.F. coupling gives the purity of resistance capacity coupling without the necessity for a large H.T. voltage and is also very suitable for power amplification **10/-**

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Telephones: Riverside 3380, 3381, 3382, 1072.

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