

ELECTION ANNOUNCEMENTS BY WIRELESS

# Amateur Wireless

And Electrics

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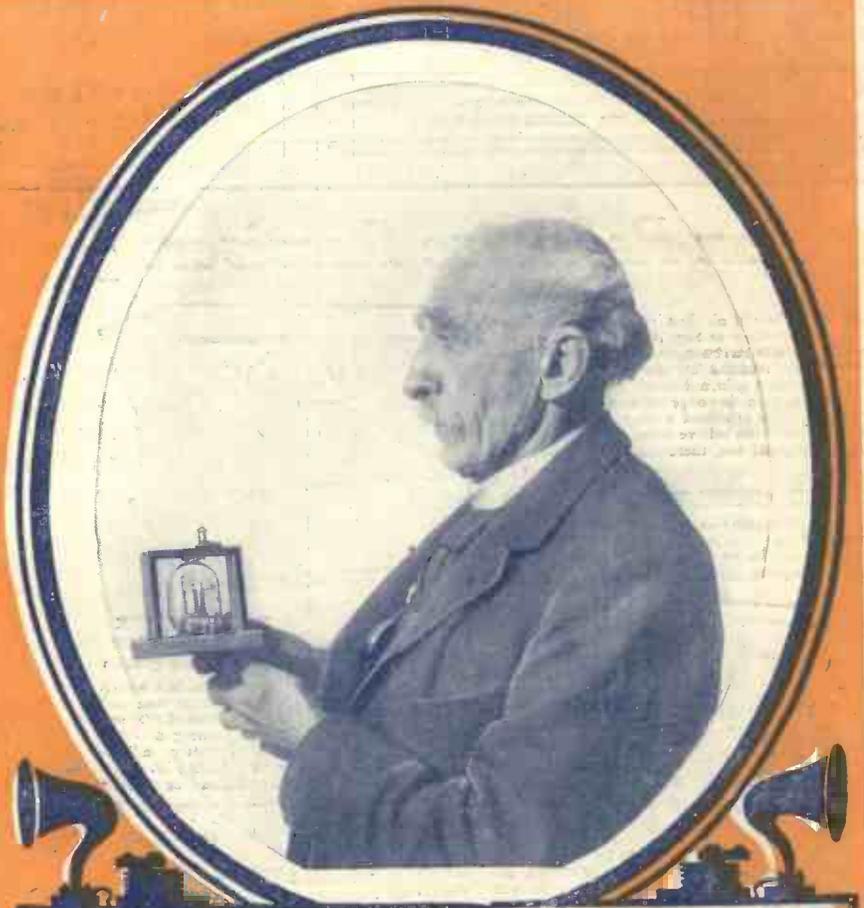
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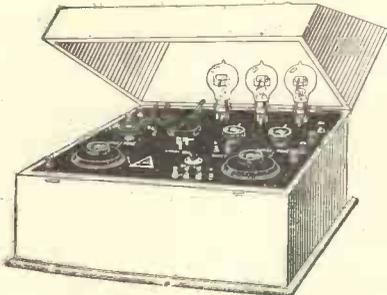
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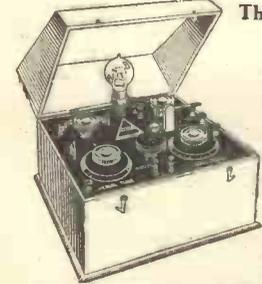
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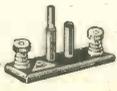
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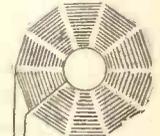
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# Amateur Wireless

## and Electrics

Vol. III, No. 80

December 15, 1923

## A SET AS A CHRISTMAS PRESENT

DO not be misled by the above title into thinking that this is an article only for altruists; you will note that it makes no mention of the person for whom the present is intended! There is no reason so far as I know why a man should not give himself a Christmas present as a small token of appreciation of his herculean labours during the past year. One remembers a useful old saying about charity beginning at home.

### Range

I am not going to talk about the reception ranges of the various types of set. You know, of course, that it is of little use generally to employ a crystal set at more than thirty miles from a broadcasting station, and that if the recipient of your gift lives within two or three miles of a station to use a five-valver would be rather overdoing things. You will already have decided whether your gift is to be a valve or crystal set, so that there is nothing to be gained by discussing that question.

### Crystal Sets

Let us consider the good and bad points to be looked for in crystal sets first of all. Generally speaking, the crystal circuit is so simple that any kind of set if reasonably well made will give results of a kind. It is to the attention which its maker pays to little points of detail that the really good crystal set chiefly owes the extra sensitiveness that will make so much difference to the user. Look first of all at the panel on which the set is mounted. If this is of fibre, ask to see something else, for this material, though an excellent insulator when perfectly dry, loses a very large portion of its good qualities when it is at all damp. Fibre is strongly hygroscopic; that is, it has a peculiar affinity for moisture, collecting it from the air and soaking it in. Hence in damp weather a receiver in which either the complete set or various component parts are fibre-mounted cannot be looked to for first-rate results.

Next see to the tuning gear. The best for crystals may be set down in the order of merit as the loose-coupler, the variometer, the stand employing loosely-coupled basket coils, and the double-slide single-layer inductance. A tuner employing honeycomb coils is not as a rule satisfactory. As the loose-coupler occupies a

good deal of space, the compact variometer is probably the most suitable of all. But whatever the type of tuning gear, make sure that it covers a band of wavelengths large enough for the broadcasting stations at any rate, remembering that their wavelengths will very shortly occupy most of the region between 300 and 500 metres. If possible have it tested with a wavemeter, but if this is not available get the salesman to tune in some station of known wavelength and notice the position of the variometer or condenser pointer. If the inductance is of the right size 2 L O on his present (363-metre) wavelength should come in fairly close to the bottom of the scale, whilst Birmingham or Glasgow should be some distance up its upper limit.

### Detectors

Next examine the detector in order to make sure that it does allow proper adjustment to be made. Perhaps the best type for all-round work is that with a ball-and-socket joint, which enables the crystal to be searched thoroughly. Lastly see to the phones, bearing in mind that with bad phones even the best crystal set will work disappointingly. The current available is so tiny that only the most sensitive phones will respond to weak signals. Their combined resistance should not be less than 3,000 ohms, and double that amount is better still. It is also desirable that the set should be provided with a condenser across the phones.

### Valve Receivers

Now for valve sets. What has been said about insulation applies here with still greater force, for the tiniest leak across the panel may upset the working of the whole apparatus. Owing to its greater range the valve set naturally brings in more signals, hence its owner is more concerned about the question of interference by unwanted signals. For this reason the tuner should preferably be of the double-circuit type and so designed that it permits a very loose coupling to be used. A stand with swinging coils of the basket or honeycomb type will be found excellent. The single-circuit variometer, though not quite so selective, has a good deal to recommend it.

Whatever else you do, make sure that if reaction is fitted it is so designed that it cannot cause interference by re-radiation,

otherwise the set will become the cause of many misgivings to the recipient if he has anything of a conscience.

Where high-frequency amplifiers are used potentiometer control is essential unless some other device has been fitted which enables the tendency to oscillation to be checked properly. It is necessary, too, for good results that valves working at radio frequency should have their own rheostats, for as they are doing quite a different kind of work they cannot be controlled properly by those which also regulate a rectifier or note magnifier. The rheostats of all valves should be smooth in their action and should not give rise to a series of loud clicks in the phones as they are rotated.

In the case of note magnifiers, there are two important points to look for if distortion is to be avoided. The first is to see that the low-frequency transformer used is of respectable size and good design. A cheap nasty transformer will ruin reception on any set. Secondly, it is desirable in most cases, and essential if the set is provided with one or more stages of high-frequency amplification, that the note-magnifying valve should be furnished with a grid-biasing battery.

### Valves

Valves should preferably be of a type whose filaments are vertical, or at any rate they should be arranged in the set so that their filaments are in this position. The horizontal filament asks for trouble, since it tends naturally to sag down on to the grid.

Lastly the phones demand attention. These will usually be of the high-resistance type, and it is important that the resistance should not be too great, for this means that very fine wire has been used for their windings; 2,000 ohms total resistance for the pair is quite as much as should ever be used with a valve set. But if they are of the low-resistance type, see that the phone transformer is a good one.

Whatever kind of set you buy, hear it tested. The loud signals of a near-by station are excellent as a means of discovering distortion. But do not be content with this; have the set tuned also, if possible to a weak distant transmission in order to see whether it has really any claims to sensitiveness. J. H. R.



## A NOVELTY IN CRYSTAL SETS

base of the framework and project about  $1\frac{1}{4}$  in. from the winding. Through these supports a length of 2 B.A. screwed-rod is passed, the top end of the latter being provided with a knob, while on the lower end two lock-nuts are placed.

The slider itself consists of a strip of springy brass  $\frac{3}{8}$  in. by  $\frac{1}{2}$  in., approximately  $3\frac{1}{2}$  in. in length; two 2 B.A. nuts are soldered to the centre, and one end of the strip is bent round so as to grip a small piece of wood. The other end is bent into a suitable contact for the wire.

After shaping the ends the slider strip should be bent so that when in position both ends bear with some pressure on the winding where it passes over the wood uprights of the frame, the small piece of wood held in the slider serving to prevent both ends from making contact at once. A small brass handle may be fitted to the control knob and will be found convenient for large movements of the slider. Movements over single turns can be made by turning the knob itself.

If carefully put together this slider will be found easy to adjust, and alterations can be made in tuning without jerking the setting of any type of detector, an important point when long-distance experiments are being carried out or when searching for weak signals. CALCULEX.

**M**OST experimenters agree that the ordinary plunger-type slider is far from perfect. In order to effect an improvement the writer constructed the set shown in the adjoining illustrations. A teak base, hollowed out underneath and measuring  $6\frac{1}{2}$  in. by  $3\frac{1}{2}$  in., has four strips of hardwood fitted one into each corner, the length of each being determined by the maximum wavelength required. The rectangle formed by the corners of the uprights should be about  $5\frac{1}{2}$  in. by  $2\frac{3}{4}$  in. For broadcast reception a 3 in. depth of No. 24 S.W.G. enamelled wire (approximately  $\frac{1}{4}$  lb. by weight) will be found ample. An ebonite or hardwood top, on which is mounted a crystal detector, completes the frame.

The slider consists of two strips of  $\frac{5}{8}$  in. by  $\frac{1}{8}$  in. copper or phosphor-bronze, each  $2\frac{1}{2}$  in. in length and provided with  $\frac{1}{8}$ -in. holes at the ends. These bearing strips are secured one to the top and one to the

experiment, and an extremely fascinating one. Mr. John Hays Hammond, who first proved the possibilities of wireless control for boat steering, was an amateur. Wireless control is the "baby" of the wireless family. We know that the thing can be done and, broadly speaking, we know how to do it; but much has yet to be discovered to perfect it before the science can be accounted as having reached the stage of practical utility. Therein lies the chance of the clever amateur. He may hit upon just the one thing needed to make it a success.

### Short Wavelengths

In most practical systems of control only very short wavelengths are used. It is no great problem to design apparatus for transmitting these; the real difficulty lies in the reception. Crystal reception, not being sensitive enough, is useless; valve reception must be adopted.

Assume that a 20-metre wavelength is being used, it will be readily seen that in order to tune in such a short wavelength very small amounts of inductance and capacity will need to be used. The valve itself has probably a slightly variable capacity, so that there must be no possibility of error. Hence the difficulty in receiving and in establishing satisfactory control. Various methods of obtaining this are open to the investigator. Leaving out of consideration for the moment all question of wavelengths, here is one plan that may be tried with the ordinary receiving circuits.

### An Experimental System

Oscillations are set up in the receiving aerial which cause variations of potential on G. Current through the valve is varied, the supply coming from H.T. battery and flowing through transformer primary of T. These variations are applied through the secondary on to G<sub>1</sub>, and finally rectified on the last valve of the series. With suitable arrangements one can have currents across the points X X' of the order of milliamperes, and very sensitive, high-resistance relays can be fitted in place of telephones and can be made to operate quite big currents. Really the system is a series of relays.

### Practicable Systems

Considering now the method of establishing control, the system of having a different wavelength for each piece of apparatus is good enough in theory but not in practice, because of the number of instruments that would be required in receiving. The alternative is to use a series of impulses. That means fitting relay switches, each of which has a definite time lag. The system would then be such that each switch would be closed by a specific number of impulses. For example, No. 1 switch would close by one impulse, No. 2 switch by two impulses, and so on. The switches could be operated speedily, and as each one would manipulate a particular instrument in the "control" installation you would be able to

(Continued in third column of next page.)

## WIRELESS CONTROL

**T**HE many demonstrations of wireless control that have been given lately have aroused a good deal of wondering comment. As a matter of fact, there is no more magic in wireless control than in

wireless telegraphy or telephony. All are related, for the essential factor in each is the same. In the latter cases wireless waves are employed for sending messages; in the former they are used for "power" purposes.

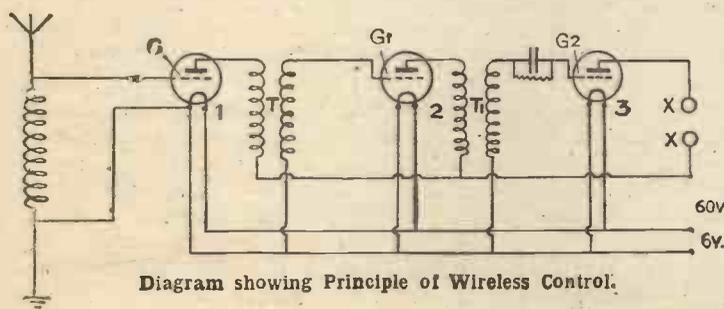


Diagram showing Principle of Wireless Control.

### Possibilities

Apart from its aspect as a scientific achievement, the interest which wireless control holds for the student of wireless lies in the fact that it opens to him another line of

# THE SUPER CIRCUITS.—IV

## REFLEX AMPLIFICATION

(Concluded)

### Making a Valve Do Double Duty

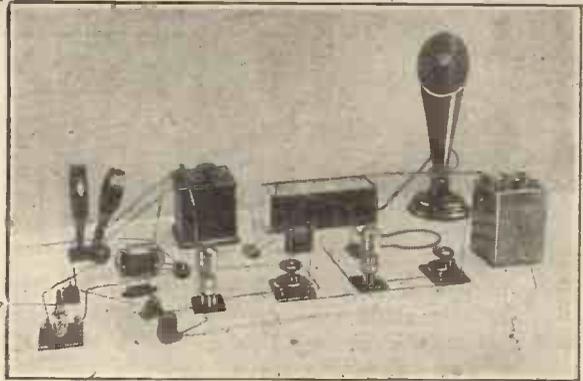


FIG. 8 shows a more recent arrangement due to Mr. Scott-Taggart. Here the grid of the valve is fed with high-frequency energy from the aerial through the coil  $L_1$ , which is coupled to the A.T.I., whilst low-frequency currents are simultaneously applied through a transformer  $T_1$  to the grid from a crystal connected directly across the aerial as shown.

The plate circuit of the valve is tapped on to the A.T.I. at the point  $P$  so that the amplified radio and audio currents are forced back into the aerial. This gives rise not only to the ordinary high-frequency reaction effect due to coupling the plate output at  $L_2$  with the input coil  $L_1$  in the grid circuit, but also to a re-amplification of the rectified components which are fed to the valve a second time through the crystal  $K$  and transformer  $T_1$ .

#### Two-valve Circuit

Fig. 9 represents a simplified diagram of a two-valve dual-amplification circuit due to the same author. The second valve  $V_2$  serves as a note magnifier giving two stages of low-frequency amplification,

A feature of this circuit is the provision of a stabilising resistance  $R_1$  across the grid and filament of the first valve. This helps to prevent self-oscillation, and consequent howling, when ordinary reaction is introduced by coupling the coils  $L_1, L_2$  together.

#### Cascade Working

There is, of course, no reason why double magnification should not be applied in cascade to each valve of a multivalve set. In such cases as the output increases with successive stages of amplification there is a natural tendency for the later valves to become choked up with excess currents, whereas the first valves carry only a comparatively small load.

In order to adjust matters the load may be spread equally over the valves in the following way. Suppose there are three valves before the rectifying crystal. The low-frequency currents from the crystal, instead of being led directly back to the grid of the first valve, are first fed to the third valve. From here they are passed back to the second, and finally reach the

“WIRELESS CONTROL” (continued from preceding page)

make the instruments function as you wished. Exact time intervals could be produced electro-mechanically, and in place of different wavelengths the system would operate by varying lengths of impulse.

#### The Crucial Secret

Experimentally control has been established up to a distance of eighteen miles and maintained with fair certainty and continuity.

The principle of the “leader” cable, now being used for guiding ships and aircraft, was known for many years, but no progress could be made with it until the invention of the valve amplifier supplied the only thing needed to enable “leader” cables to be installed on a practical working basis. It is quite within the range of possibility that an amateur in building a miniature set of control apparatus will happen upon the crucial secret that will

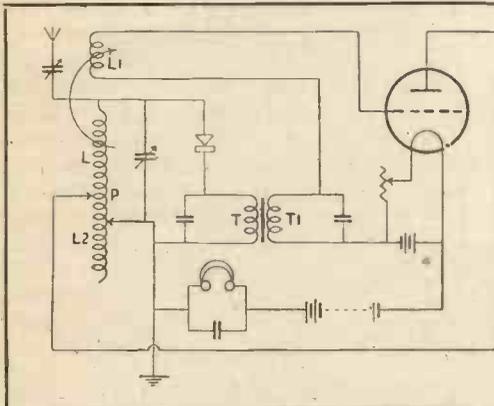


Fig. 8 (left).—Scott-Taggart Dual-amplification Circuit.

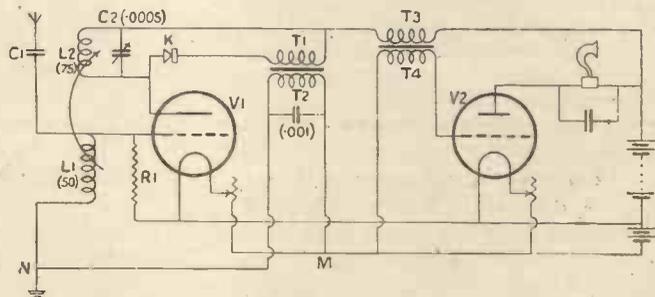


Fig. 9 (right).—Two-valve Dual-amplification Circuit.

sufficient to enable the set to work a loud-speaker. The first valve is of the tuned-anode type with a crystal  $K$  and transformer primary  $T_1$  shunted across the condenser  $C_2$  as in Fig. 9. Low-frequency currents flowing through the primary  $T_1$  are transferred via the secondary  $T_2$  to the points  $M, N$ , which are in effect across the grid and filament of the valve  $V_1$ . The resulting plate output of the valve  $V_1$  flows through the low-frequency transformer  $T_3$ , the secondary of which is in the grid circuit of the valve  $V_2$ . The loud-speaker is inserted in the output circuit of the latter as shown in the diagram and photograph.

first valve, which carries the phones. Valve number one then passes a small amount of high-frequency mixed with a large proportion of low-frequency energy. The middle valve carries half and half, whilst in the third valve a large bulk of high-frequency is combined with a small proportion of low-frequency energy. Each valve is in this way made to carry a total current of approximately the same value.

M. A. L.

give to the system the final touch of efficiency.

J. J. B

### SHELLAC VARNISH

IT sometimes happens that when finishing some work one suddenly realises that all the shellac varnish has been used up on a previous job. More can quickly be prepared by putting some shellac and methylated spirits in a bottle and placing this in a saucepan of boiling water. The shellac dissolves in a few minutes. This method saves leaving it for twenty-four hours to dissolve in the ordinary way. S.

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# AMATEUR TRANSMISSION

## TRANSMITTING VALVES



THE type of transmitting valve used in amateur stations is, constructionally, very similar to the average receiving valve with the exception that, as a rule, the electrodes are slightly larger. In actual operation, however, there is one important difference. A receiving valve utilises the minute oscillations which are collected by the aerial to alter slightly the voltage of the grid. This small change of grid voltage, by virtue of the control the grid has over the emission from the filament, varies to a greater or less amount the steady current flowing in the plate circuit. Now if in this plate circuit we insert a pair of telephone receivers in series we shall produce an audible reproduction of the incoming signals. Since the ratio of the change of plate current to the alteration of the grid voltage necessary to produce that change is in comparison large, the receiving valve is to all intents and purposes acting as a very sensitive relay having practically no time lag.

### Operation

The transmitting valve, on the other hand, operates, so to speak, in the reverse way. Let us try and see what exactly does happen in this case. The diagram shows a very simple circuit in which *V* is the transmitting valve, and we shall also see that the grid is connected through the grid-tuning circuit *GTC* to the negative end of the filament, and another coil *PC* is inserted in series with the plate to the positive terminal of the H.T. generator.

We will now imagine that we have switched on both the filament-heating battery and the H.T. generator. What happens? Owing to the emission of electrons from the heated filament a flow of current takes place between the positive terminal of the H.T. generator and the plate of the valve via the plate coil *PC*. Now this flow of current sets up magnetic lines of force surrounding *PC*, and if this coil is brought near, that is, "coupled" to the grid coil, these magnetic lines of force will set up a similar current in the grid coil, thus varying the voltage of the grid of the valve and by this variation of grid voltage controlling the actual current in the plate circuit.

At first sight one would be inclined to think that as long as the filament was alight and the H.T. generator running the transference of electrical energy from the plate coil to the grid would simply result in the grid being maintained at a certain positive potential depending on the initial current in the plate circuit, thus giving us a greater steady plate current than

would be obtained if the grid merely remained at the potential of the negative end of the filament.

### Natural Frequency

As a matter of fact, due to various reasons, this is not the case. To take just one of these reasons—the others we shall come to later—we shall notice that a condenser is placed in parallel to the grid-tuning coil, thus making the grid a part of an oscillatory circuit, that is to say, a

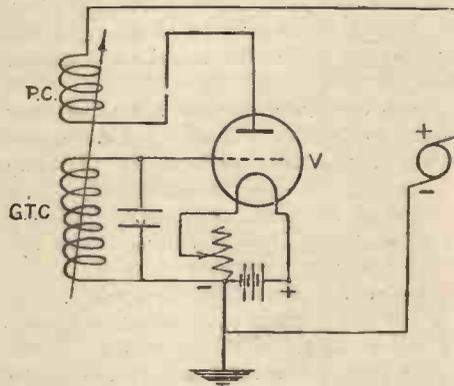


Diagram of Simple Transmitting Circuit.

circuit containing inductance and capacity. This circuit will therefore have a natural frequency of its own depending on the dimensions of the inductance and condenser, and any current set up in it will be of an oscillating nature. To put it in a slightly simpler manner, the voltage and current components of this current will swing a certain amount either side of a mean value.

Going a step further with our investigations, we shall see that the current in the grid circuit is induced into it by the initial current flowing in the plate circuit, and since the resultant current in the grid circuit is oscillatory in nature, the voltage of the grid will also oscillate round a mean value; in other words, the grid will alternately be made a certain amount more negative and more positive than its mean value.

This fluctuation of grid voltage will, since the grid is the controlling element in the valve, cause a corresponding fluctuation of the plate current, and thus an oscillating current will be set up in the plate circuit, and the final result is that the two circuits, plate and grid, will (if the design of the valve, plate inductance and grid inductance and condenser are correct) pull in step one with the other, and continuous oscillation will ensue as long

as the filament battery and H.T. generator are switched on.

We thus see that, fundamentally, the operation of a simple transmitter and our old friend the single-valve reaction circuit are the same, except that the former uses the initial plate current to set up oscillation and the latter the incoming oscillations set up by the signals across grid and filament.

### Valve Design

Mention has been made above to the effect of the design of the valve on the oscillation of the circuit. If our transmitting valve has its grid so designed that with a certain value of high-tension volts—let us suppose 500—and with the grid connected to the negative end of the filament, the curve, which we obtain by plotting the plate current against the grid volts, is such that the lower bend falls right across zero-grid-volts line. From this it will therefore be seen that the rate of change of plate current when the grid is negative to its mean value will not be the same as when the grid is more positive or *vice versa*, and we shall fail to get a true oscillating current set up. We must always arrange things in such a way that the line of zero-grid-volts will cut the straight portion of the curve, which should also be straight for a sufficient distance on both sides of this mean point to allow us to use a considerable amount of oscillation without coming off this straight portion.

If we had to use a valve whose curve gave a bend just on the line of zero-grid-volts, we could get over this difficulty in either of the two following ways. First, by increasing the plate volts; this has the effect of moving the curve bodily to the left, and we could so increase the voltage until the straight portion fell on the right point. Or we could obtain the same result by making the grid positive with respect to the negative limb of the filament. This latter method, however, is not used in practice because certain grid currents are set up when the grid is made positive which have the effect of causing very bad distortion of the transmitted speech.

Since we may not be able to vary the voltage of our H.T. generator sufficiently to move the curve far enough to the left, it is better to use a valve which is designed to give distortionless speech with the grid connected to the negative end of the filament with a certain value of H.T. volts. Such a valve can be obtained from any of our valve manufacturers, who are always glad to advise what particular type should

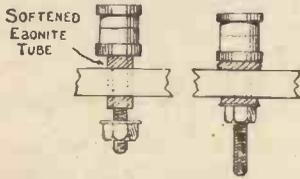
(Concluded at foot of page 665)



# PRACTICAL ODDS AND ENDS

## Bushing Wooden Panels

MANY people, in the interests of economy, are now using wooden panels, and a good method of bushing them is as follows: Cut pieces of ebonite tube of a suitable diameter  $\frac{1}{4}$  in. longer than the thickness of the panel and soak them for a short time in boiling water. On removing them from the water, quickly



Method of Bushing Wooden Panels.

dry and slip over the terminal screws. Holding the tube so that  $\frac{1}{8}$  in. protrudes both above and below the panel, tighten the nut, when the insulation will flatten out and form a neat and secure bushing as shown in the right-hand diagram.

E. J. H.

## Before the Halyard Breaks

SOME amateurs must have wondered how they are going to manage when the halyard breaks, as it eventually must do, even when treated rope is used. To avoid undoing all the hard work connected with the erection of a substantial mast, a good plan is to fix an endless length of single-strand galvanised-iron wire round the pulley, long enough to reach down to within a convenient distance when the mast is erected. Should the halyard break a new piece of rope can be fixed to the aerial line and the end of this rope attached to the endless wire, which can then be pulled up and over the pulley.

G. C. B.

## Cheap Vernier Condensers

FOR the most efficient reception vernier condensers are nearly always required. A cheap type can be easily made from straight lamp glasses. Two of these should be obtained, of such a size that one slides within the other, leaving only a small air gap between them. If the air gap is very large some thick paper can be wrapped round the smaller glass. On the outside of both glasses should be stuck pieces of tinfoil half-way round the circumference; these strips act as the plates of the condenser. For adjusting it two movements are possible. One is simply to rotate one tube and the other is to pull the inner one out. Ordinary chemical test-tubes can also be used.

S.

## Valve-set Connections

WHEN the construction of a receiver employing valves, either as detectors or amplifiers, is complete the filament accumulator should first be connected-up to be certain that all the connections to the valves and filament resistances are correct. The high-tension battery should always be connected last so as to eliminate the possibility of having the valves burnt-out through improper connection of the high-tension battery to the filament leads.

R.

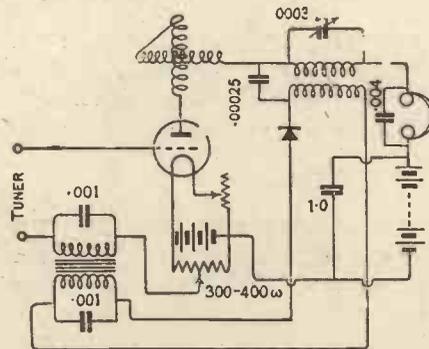
## Crystal Combinations

SOME ambitious experimenters may find it an interesting and instructive pastime to test crystals of different kinds for sensitivity. While thousands of crystals and combinations of crystals have been tried, a new combination may accidentally be discovered that will give results better than any yet obtained.

R.

## Efficient Reflex Circuit

NOW that reflex circuits are becoming increasingly popular we are all trying to find the most efficient circuit. The one shown below is of American origin and is claimed to be very efficient. It differs from the usual reflex circuit in that a high-frequency transformer is used as well as a low-frequency transformer. Points to note are as follow: By-pass condensers must be placed across both L.F. transformer windings, phones and H.T. battery. A tuned-anode circuit is used and



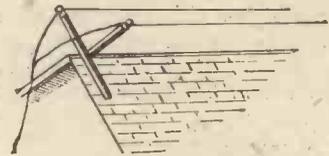
Circuit Diagram of Reflex Circuit.

the primary of the H.F. transformer should also be tuned. The coupling condenser between the windings of the H.F. transformer can be of about .0003 microfarad capacity and may with advantage be variable. The best connections for the transformers and the crystal detector will be found by experiment.

D.

## Aerial on Span Roof

WHERE amateurs have sloping roofs the method shown in the diagram can be successfully used for the erection of an aerial. Two pieces of wood, preferably of square section, should be jointed together with a nut and bolt and placed on the roof as shown. The parts resting on the roof should be clamped to the



Fixing Aerial on Span Roof.

rafters in order to keep them rigid. This system does not allow of the wires being kept very far from the roof, but in cases where no other aerial can be erected this suggested aerial is better than none at all. Reel-type insulators may be fixed at the ends of the supports. Care should be taken to keep the wires as taut as possible, otherwise they may touch the roof.

D.

"AMATEUR TRANSMISSION" (continued from page 564)

be used to give best results on the particular circuit the experimenter proposes to use.

In conclusion, for those who only wish to use small powers of, say, 5 watts, certain of the valves now on the market for loud-speaker use will serve excellently, and have the advantage that in many cases the plate voltage need not exceed 300. Whatever type of valve is used, however, great care should be taken that the makers' figures for filament and H.T. volts are not exceeded.

Increasing the filament volts above the figure stated will probably increase the power the valve will handle, but in so doing the life of the valve will be very greatly decreased. Similarly if the H.T. voltage is increased the vacuum of the valve may suffer and it will, perhaps, become "soft."

Remember that if a valve is rated at 15 watts, this is the figure obtained by multiplying the plate current by the plate volts at a particular value of grid volts, usually zero. It does not mean that you will obtain 15 watts in the aerial, because the watts in the aerial depend on the efficiency (or otherwise) of the actual transmitting circuit.

G. L. M.

# ANNOUNCING ELECTION RESULTS



The "Sunday Times" staff receiving the election results by wireless and tape machine. An ordinary indoor aerial was used instead of the frame which is in the background.



"Marconiphone" and "Amateur Wireless" technical experts testing the quality of reception. Note the power amplifier on the right. In the centre is, Mr. L. E. Wilson, the "Marconiphone" publicity manager.

**E**LECTION results were broadcast for the first time in Great Britain on Thursday last (Dec. 6) simultaneously from all stations. The first result came through at 9.53 p.m. and the last at 1.30 a.m. on Friday. For a week before polling day amateur enthusiasts all over the country took special precautions to ensure that their receivers would be in good working order to receive the results. Many who did not then possess sets spent large sums—in some cases a hundred guineas or more—on receivers of all kinds. One large firm was overwhelmed with orders for elaborate cabinet sets, for which prospective purchasers were prepared to pay almost any sum—provided they could have them for election night.

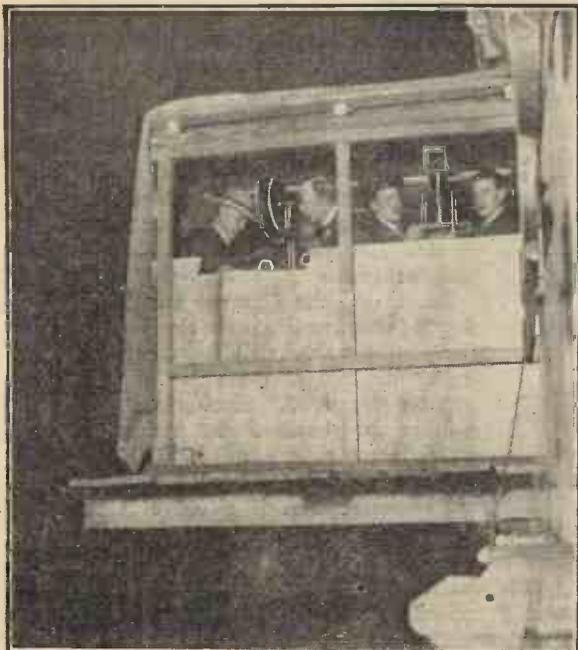
Thousands of people in London were informed of the results through the medium of two large loud-speakers erected in the Strand by the *Daily Graphic* and the *Sunday Times* in conjunction with the "Marconiphone" department of Marconi's Wireless Telegraph Co., Ltd. From 7 p.m. until early Friday morning a huge crowd was kept together outside the offices of the *Sunday Times*. All the items broadcast from 2LO were reproduced with great clarity and were clearly audible over a large area.

The loud-speakers were fixed up in the balcony of the *Sunday Times* offices, which are situated in the Strand just opposite Australia House. Both music and speech could be heard as far away as the Air Ministry

in Kingsway and King's College in the Strand—this with traffic running and above the miscellaneous sounds that are caused by a crowd. In the opposite direction broadcasting could be heard past the Law courts. Everybody present was interested in the reception of the opera *Maritana*, relayed by wireless from the Old Vic and then broadcast from 2LO. Both Acts 1 and 2 were very well received.

Although great interest was taken in all items of the ordinary broadcasting programme, the excitement became great when the election results began to come through. By this time a huge crowd had collected, and the great space outside the *Sunday Times* offices and Australia House was

(Continued on page 678)



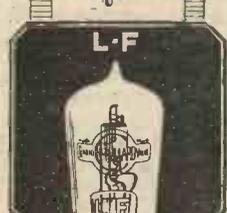
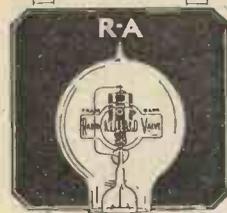
Election results were shown on a screen by the "Daily Graphic" from this platform built out from the side of the "Sunday Times" offices, in Arundel Street, Strand.



Until Friday morning (Dec. 7) there was a large crowd outside the "Sunday Times" offices to hear the "Marconiphone" demonstration, and to watch the "Daily Graphic" screen (top left corner). Note the loud-speakers on the balcony.

# A Valve for every wireless circuit

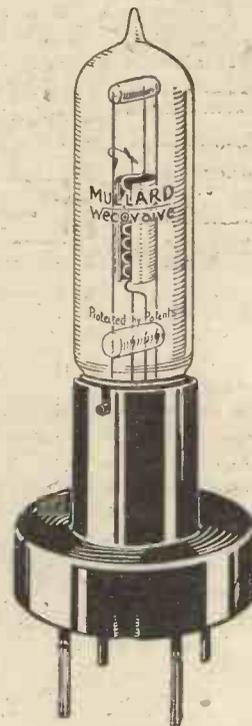
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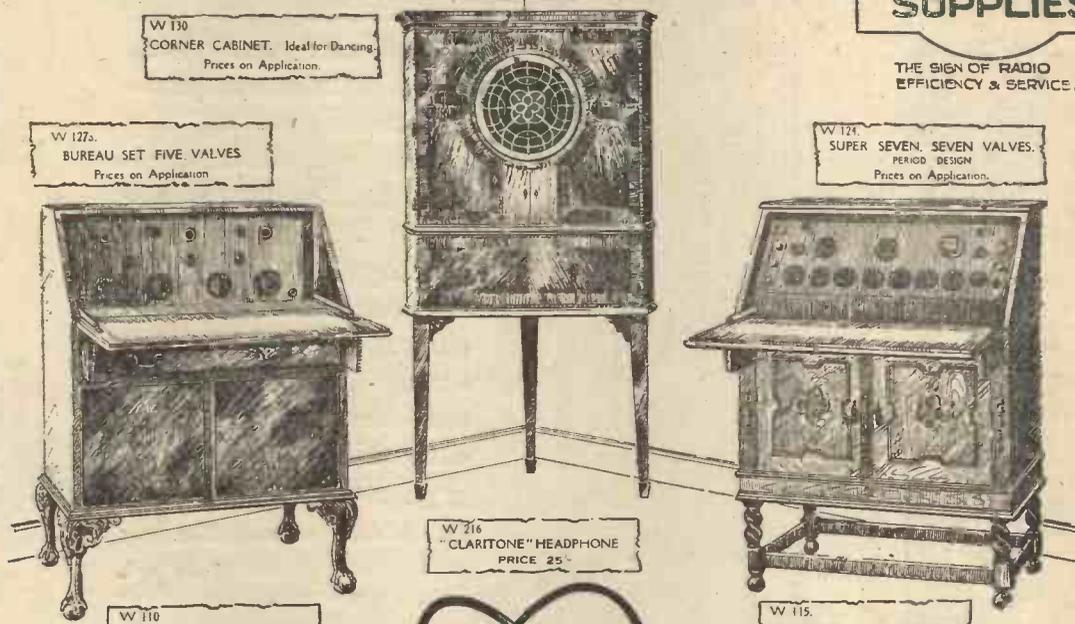
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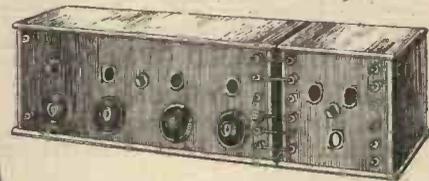
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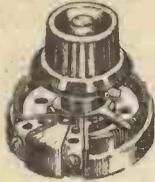


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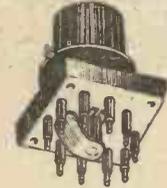
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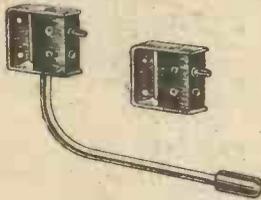
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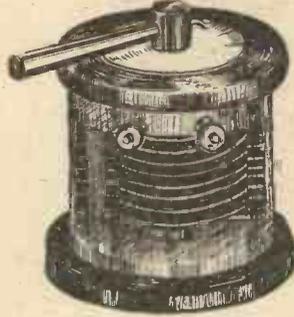
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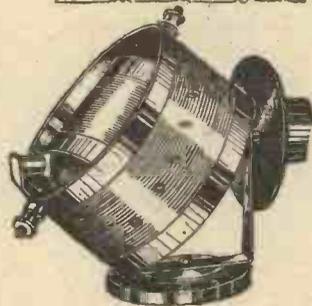
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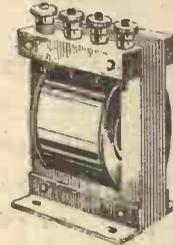
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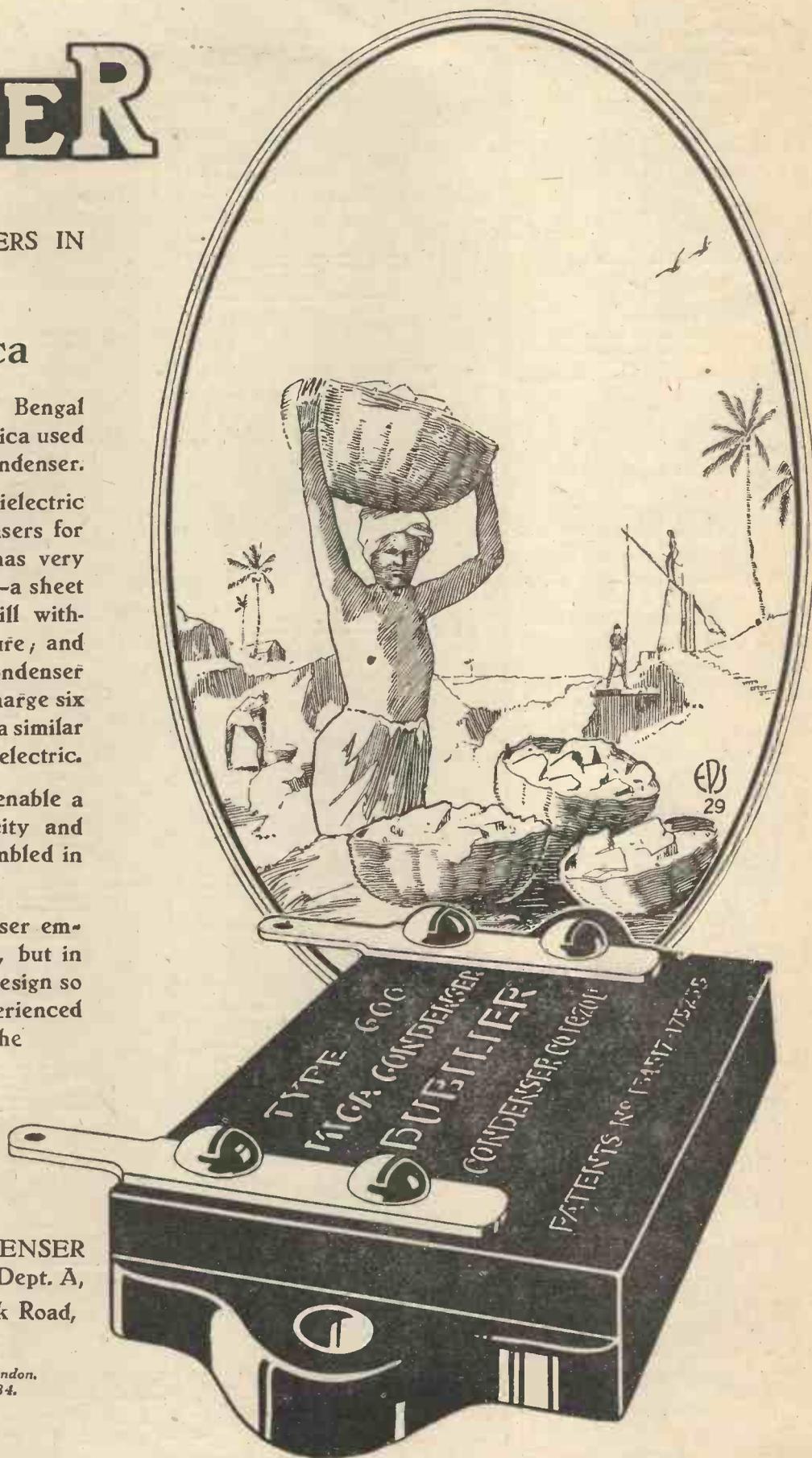
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# On Your Wavelength!

## A Ruined Test

[T was a thousand pities that the attempt to secure telephonic communication with the States, made in the early hours of Sunday, December 2, turned out to be a failure. Fired by a noble enthusiasm, I duly sat through it from three o'clock until five hoping against hope, for, like the angler, the wireless man never despairs of catching something, even if it is only a cold. On this occasion everything that could go wrong did go wrong. To begin with, weather conditions were very poor, that is to say, Irish though it may sound, it was a beautiful night. What one wants for reception of Uncle Sam's wireless telephony is a night that is a regular brute. The more it blows and pelts, the more utterly beastly the weather is, the better your chance of hearing things, though I don't pretend to be able to explain why. Anyhow, I have noticed it again and again, and so, no doubt, have you.

The second disturbing factor was that the Ecole Supérieure had unfortunately chosen the same evening or, rather, early morning to carry out a Transatlantic test on their own account; hence, to begin with, his 450-metre transmission caused rather serious jamming. This was bad enough, but it was nothing compared with the combined efforts of every Ham-handed Henry and Oscillating Oswald who lives and squeals in or near London.

## Unsporting

The B.B.C. made a mistake, I think, in announcing during Saturday evening's programme that the test would take place, for the result of this was that hundreds of owners of valve sets sat up determined to succeed in using the last ounce of reaction or die in the attempt. Living as I do thirty miles out of London, I was not greatly bothered by this, for no one else seemed to be awake in my peaceful townlet. I was, however, worried considerably at times by "mush" from, I think, Northolt. But those at 2.L.O. and at other B.B.C. stations had a terrible time of it. Appeals to listeners to cease oscillating were sent out many times from 3.16 onwards, but they produced little or no effect. It was explained quite clearly, but without avail, that re-radiation was spoiling the test. At 4.25 the owners of small sets who had not an earthly chance of hearing were begged to close down, though few of them apparently did so. At 4.35 a further SOS was sent to all amateur listeners to switch off until 4.40, the speaker promising that he would broadcast any results obtained. You would think that this might have produced the desired

effect, but when one switched on again at 4.40 one heard 2.L.O. announcing sadly that very few had responded.

Now this was thoroughly unsporting. The test was an important one, and much as all of us would have liked to hear American stations on that particular evening, people whose sets were oscillating should surely have been willing to close down, at any rate at intervals, in order to give the thing a chance.

## The Results of the Test

The results of the test were very poor indeed for the reasons mentioned. At 3.16 2.L.O. reported hearing a carrier wave, probably that of WGY. At 3.26 WGY was heard to say, "We await your reply." At 3.36 the carrier wave was again picked up, and it was just possible to detect that it was being modulated. Succeeding five-minute attempts at reception gave much the same result. WGY's carrier was heard during most of them, and once KDKA's wave came in.

I was a little more fortunate than London, probably because I had no oscillators to contend with. At 3.51 and 4.42 I was able to tune in WGY sufficiently well to be able to recognise that speech was being transmitted. The modulation was, however, so feeble that no actual words were audible. The test, then, was practically a failure in one way. But the others made during the previous week have shown that it is possible both for us to hear the States and for them to hear us with a fair amount of certainty on favourable nights. With a little more power and with good weather conditions conversations across the Atlantic should very shortly become quite a common occurrence. In fact soon we may have American transmissions picked up by our own broadcasting stations and relayed on to use as a regular thing.

## The American Stations

Eight American stations took part in the test, and as these are the ones that are generally picked up by amateurs in this country their call signs and present wavelengths may be found useful. Here they are: WGY (Schenectady, N.Y.), 380 metres; WHAZ (Troy, N.Y.), 380 metres; WOR (Newark, N.J.), 405 metres; WOC (Davenport, Iowa), 484 metres; WJAZ (Chicago, Ill.), 448 metres; KSD (St. Louis, M.O.), 446 metres; WGR (Buffalo, N.Y.), 319 metres; KDKA (Pittsburg, Pa.), 326 metres.

Of these WGY and WHAZ come in very well indeed, and they are perhaps the easiest for British listeners to pick up,

since their wavelength, 380 metres, is identical with that of Bournemouth. One can thus tune one's set early in the evening to 6 BM and have a very good chance of picking up either of these American transmissions in the small hours by varying the coupling but without altering the setting of the condensers.

## The Soft Valve Circuit

Several correspondents have written to ask what particular circuit I used to get the really amazing results with a single valve that I mentioned a week or two ago. As a matter of fact, there is nothing very particular about it at all. It was simply a plain "straight" circuit with a loose-coupled tuner and a .001 microfarad variable condenser in series with the aerial. The secondary was tuned with a .003 microfarad condenser. Most of the credit is due to the valve itself. Still there are one or two points in operating such a circuit that not everyone knows. You are always told that for reception below 600 metres the A.T.C. should be in series. This is quite right, but those who tell us frequently omit to add that the old rule about using the smallest possible amount of capacity and the biggest inductance does not apply here. Impulses from the aerial must pass through the series condenser. If, therefore, you make its value small you offer them a very poor path. Hence with this kind of circuit the rule is almost reversed. The condenser's value should never drop below .003 microfarad, and one should make a rule to use an inductance small enough to allow the condenser's setting to be on the second half of its scale, that is, between 90 and 180 degrees.

Again the coupling should be kept as loose as possible. Basket coils wound with rather heavy wire are ideal for this, since they can often be worked 4 or 5 in. apart. When you have picked up your station, loosen the coupling still more. Signals will decrease in strength, but by adjusting the A.T.C. and C.C.C. they can be brought up to the biggest possible volume.

## Where Soft Valves Excel

The soft valve owes its excellence, particularly when used alone, to the fact that the electron stream from filament to plate is very much greater than in the hard valve. An electron leaving the filament at terrific speed collides in the partial vacuum with a gas molecule. Owing to the force of the collision two or more electrons may be knocked out of the molecule and travel towards the plate. The electron, as it were, collects companions on its journey, with the result that there is a

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

bigger flow of current. Whilst excellent as a rectifier, the soft valve is of little or no use as a high- or low-frequency amplifier.

#### **Election Night**

Election night gave listeners an opportunity to hear an opera as artistically performed as is possible. Relayed from the Old Vic., *Maritana* proved once more its attractive force when perfectly sung and acted, and that the audience appreciated it was only too evident as the old familiar airs "Let Me Like a Soldier Fall" and "There is a Flower That Bloometh" were repeated again and again. There is a quality about the singing when transmitted from this theatre that differs from all other attempts to transmit opera. The hollow echoes seem to be obviated, the voices are sweet and wonderfully balanced. Whether this is due to the company, the transmission, or the effect of careful rehearsals is an open question.

When once the election results commenced to "trickle through" all else was forgotten but the cheering. But for the next election, however near or far it may be, I might suggest that the state of the polls might be given at regular and stated intervals, thereby saving much time and likely attacks of "jazz-itis." A jazz band, even as good a one as the Savoy Orpheans, is apt to pall after listening-in from ten o'clock p.m. to one-fifteen a.m., and some of us did it!

#### **A Parlous Experiment**

There is one subject that most people seek to avoid, or at least agree to differ upon, and that is the question of religion. A wise man once said that England was a nation of one sauce and fifty religions, and he was not far wrong. There are, at any rate, enough different sects to make any attempt to enforce the entire service of any one a possible source of irritation, and the announcement that such an experiment is to be tried by the B.B.C. will come as a surprise to many people. Most Christian and Catholic sabbatarians have enjoyed their own particular service previous to the hours of broadcasting, and to return to their homes to listen to another one is not likely to conduce to increasing the popularity of these transmissions.

#### **Russian Night**

In the early days of classical music Russian compositions were eyed with gravest suspicion. They were deemed "the worship of the morbid." The early Victorians liked the cheerful music of Handel, the florid passages of Mozart, and the ponderous brain-storms of Beethoven. With the introduction of Chopin and

Tchaikowsky musicians might be said to "have shied" violently. Russian music certainly is written for the most part in the minor, though not necessarily in the morbid, key, and possibly much of it is based on the Russian folk songs. It is no wonder that the people of the Steppes, little more than serfs and slaves of their nobles, could not sing very cheerful strains. The cold and dark climatic conditions seem to have woven themselves into the very warp and woof of their music. The Russian night, therefore, at 2 LO presented many interesting points. The works were chosen from the giants of Russian music, Tchaikowsky, Moussorgsky, Rachmaninoff, Gretchaninov and Rimsky-korsakov.

Perhaps the most familiar was Tchaikowsky's fairy ballet, "The Casse-Noisette, or the Nutcracker Suite."

From an executive point of view, however, the noteworthy feature of the programme was the great B flat minor piano-forte concerto. This concerto, deemed a failure by Rubinstein, to whom it was first dedicated, has since become the hallmark of a great artist's success, and there are few who have not played it. Bauer, Lamond, Rubinstein, Cortot, Hambourg, De Greef, Pouishnoff and Nikisch, to quote but a few, all have given it a different rendering, yet each one has been a source of pure enjoyment to the listener.

#### **2 LO's Christmas Arrangements**

The Christmas programmes are to be of an elaborate nature, and the whole week is bound to be of interest. On Sunday the band of H.M. Irish Guards will provide the musical fare. On Christmas Eve we shall have carols and waits—possibly of both kinds, as usual—and a special Christmas treat for the 25th is "John Henry." On Boxing Day comes a special children's treat with "Punch and Judy." On Thursday comes a nautical "Rover's" night from Cardiff, with a rest cure on Saturday from Bournemouth. On Saturday there is *The Magic Flute* from the Old Vic.

#### **Short Waves**

I have been wallowing in the short waves again. It's like "Alice's Adventures in Wonderland"; you don't know what you are coming to next. It is becoming apparent to me that there is a necessity to make up an aerial tuning coil with one turn of wire and use a condenser of minute capacity in series with it. I refer to what I believe should be called shorter-wave work. The truth is, 150 to 200 metres is no longer short-wave working. I found 5 WR working 2 X Don recently between 50 and 60 metres. The speech was really excellent for such short-wave working, and considering that a few months ago it was considered impractic-

able efficiently to transmit speech on 60 metres or so, his attempt was very praiseworthy. This, by the way, happened before 2 LO used the wireless link between the Old Vic. and Marconi House. As Captain Eckersley recently stated, it is difficult to get down there, but I know of one station (which for the moment will be nameless) which is carrying out successful tests on 30 metres! The merits of working on this short wave are apparent. The tuning being exceptionally sharp, a greater number of stations are able to work on a given band of wavelengths without mutual interference. Woebetide the aspirant to short-wave working if his lead-in swings, his coils are wound on hygroscopic cardboard, or his tappings loose or liable to vibration. He will surely be undone! Why is it that the B.B.C. does not want you to get down there?

#### **The Amateurs**

2 MK has now budded out into a "thumping" station. He comes in at my place (distance about 30 miles) R6. There is some slight fading, however, and a little generator noise.

2 J X has been heard again recently. He was using one of Evershed and Vignoll's new generators. The smoothness with which these generators work on their normal rating is remarkable. His speech appeared to be slightly on the tinny side and is badly interfered with by noise from his generator getting into the microphone. I was rather interested in the fact that he has got a Mackie generator, which he says will not work efficiently on short waves! I do not quite see why this should be, but it's clear that it does make a noise on 230 metres which is not so apparent on 440 metres.

5 V R has been in prominence again. A few nights back he transmitted some music which has not been excelled by 2 LO.

5 D T, 2 L Z and 2 N M now seem to be properly tuned up to concert pitch for the forthcoming Transatlantic tests. These three stations and 2 O M at present appear to be the most powerful ones in the London area.

Writing of the Transatlantic tests reminds me that there was a dearth of amateur transmitters in the ether on Sunday, December 1. It is strange how this synchronised with 2 LO's efforts to chat with America the night previously. Can it be that they were making up for their midnight or, rather, all-night watch with that station? I imagined them all nicely tucked in bed with their pet microphones wrapped in cotton wool beside them, sleeping a well-deserved sleep! THERMION:

The announcer at 2 LO now says: "Hullo, England—and America, too, if you can hear me!"

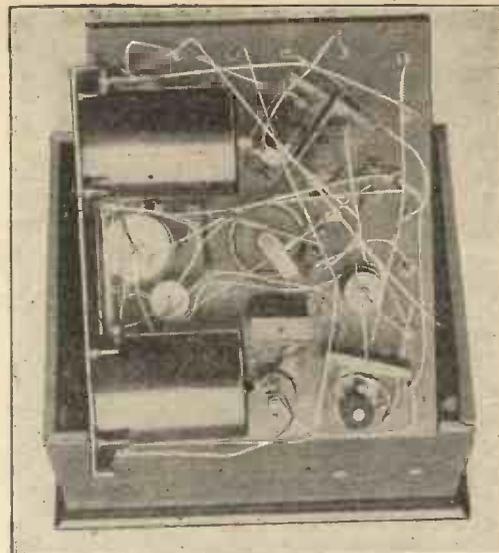


The Note-magnifier Unit.

# An All-purpose Receiver.—IV

[CONCLUSION]

## More About the Note-magnifier Unit



Under Side of Note-magnifier Panel.

THE circuit diagram (Fig. 1) shows all the connections and the method of including the switches. Provision is made for cutting out both valves, leaving a connection right through from detector valve to phones. Another switch is provided for transferring from phones to loud-speaker. No telephone transformer is included in the unit, but there is space between the two intervalve transformers if one is required. A small "lighting switch" is interposed in the positive lead from the filament-heating supply and serves to switch on or off the accumulator current. No provision is made for cutting off the H.T. supply, as this is best dealt with by means of plugs in the battery or battery-box.

### Potentiometer Control

The only particularly novel item in the circuit is the potentiometer control of the grid potentials of the valves. As will be seen, the potentiometer is not connected across the positive and negative low-tension supply as it is in the H.F. detector unit, but it is connected between the two negative leads. The plate current flows through the resistance, and as a consequence there is a drop in potential (voltage) and the negative H.T. is negative with respect to the negative L.T. by the amount of this voltage drop. Those who are acquainted with Ohm's law will appreciate this.

The grids of the valves are connected with the resistance through the secondary transformer windings by means of the moving arm of the potentiometer, and a suitable potential may be tapped off. Only one potentiometer is necessary. The voltage drop is proportional to the anode current, and if the anode voltage is increased the current increases with it. Thus if the anode voltage to the last valve is increased it still works on the most favourable portion of its characteristic curve,

The components necessary for the construction of this unit are: One piece of ¼-in. ebonite sheet 9½ in. by 7¾ in.; two intervalve transformers; two filament resistances; one potentiometer of a resistance of 300 ohms or over; three double-pole switches; one small lamp switch; two valve holders; two fixed condensers of .002 microfarad capacity; two Mansbridge condensers of 2 microfarad capacity; sixteen terminals of good design and proportions; quantity of 16-gauge tinned-copper wire for connections; one telephone trans-

former, which bridges the output, is a "mushroom"-shaped type by Ashley Radio, Ltd. The filament controls are "Lissenstat." All other components are of standard dimensions and can easily be obtained from any of the advertisers in this paper. Particular care should be taken in the selection of valve holders. They should be turned and not moulded. The transformers are very important. They should be the best that can be afforded.

### Construction

The method of construction advised in the first two articles dealing with this receiver should be followed in building the note-magnifier unit. The components should first of all be laid out on a piece of card of the exact dimensions of the ebonite panel and the best positions fixed. Then the card can be marked and used as a guide in drilling the holes to take the various components. The large holes may be cut out by means of a fret-saw.

### Wiring

The wiring diagram (Fig. 2) shows the lay-out of the components. The thick black switch-connections show the upper contacts of the switches. It will be noticed that the transformers are not fixed to the panel. They are on a bridge or frame, and can be clearly seen in the photographs on pages 644 and 645 of last issue. The base of the frame, the sides and the two feet are of ¾-in. angle brass. The top stay, or bottom when the panel is in its box, is of ordinary ¾-in. brass strip ⅛ in. thick. Alternatively the transformers might be fastened to the sides of the box and flexible leads taken to them, so that the panel can be lifted a few inches from the box for examination if required.

The transformers being mounted straight on to the brass of the frame the two cores are connected together. This will probably produce a loud humming noise when the second valve is switched on, which can be eradicated if the cores are earthed by soldering a short lead from the L.T.

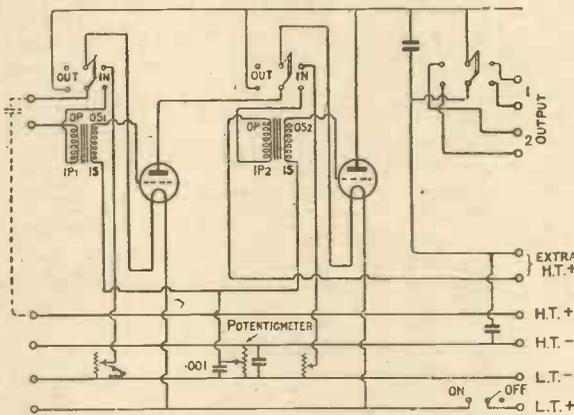


Fig. 1.—Circuit Diagram of Note-magnifier Unit.

former if low-resistance phones are to be used.

### Intervalve Transformers

The intervalve transformers are Lissen T1. The three double-pole switches are "Utility" barrel switches, similar to those used in the tuner unit. If Dewar keys are preferred they can be used in this unit without loss of efficiency. The potentiometer is one of Lissen manufacture of 320 ohms resistance. The resistance could be greater with some advantage. The big-capacity fixed condensers are of Mansbridge type made by the Telephone Manufacturing Company, Ltd. One fixed .002-microfarad condenser is a Dubilier, and the

negative terminal to the frame, as shown in the wiring diagram.

The wiring diagram calls for little comment. It will be noticed that an extra resistance is shown in series with the potentiometer. This is an ex-W.D. resistance of about 380 ohms, and was put in in order to get a bigger voltage drop and consequently greater certainty that the valves would be working on the best part of the characteristic curves. When boosting up the amplification there is always a danger that the valves will work round the bends of their curves, which gives very bad distortion. Unless a potentiometer of convenient size for panel mounting can be obtained of something over 500 ohms resistance this extra resistance is worth including. It should be put in on the L.T. negative side of the potentiometer.

The wiring is the most difficult job. The switching arrangements multiply the leads, and it is necessary to so arrange them that grid and plate leads are well apart and do not run parallel. It is well to keep careful watch as the wiring proceeds so that all the bottom connections are made first. All the main wiring can be done before the transformer frame is fixed.

And now a word as to the actual working of the completed set. With the three units coupled together, all adjacent terminals being connected together, both L.T. and H.T. supply can be taken right through to all four valves. As a start it will be well to bridge the three H.T. positive connections at the back of the amplifier unit and take the battery lead from one only. The writer is using the set with four dull-emitters, and can get sufficient undistorted volume to fill a large room comfortably. This is with 45 volts on the anodes of the first two valves, 60 on the first L.F. valve, and 75 on the second. Separate H.T. is used for the two panels to enable the grid control potentiometer in the note magnifier panel to operate.

Until the working of the set is understood it simplifies matters if all tuning is done on the aerial coil, with the switch in the stand-by position. Afterwards it should be found possible not only to get a slight boost-up effect by the use of the secondary coil, but to tune stations on adjacent wavelengths in and out on the secondary and anode-tuning condensers alone. The writer usually gets 5 W A,

2 L O (his nearest station, just over thirty miles), and 6 B M in this fashion. 5 I T and 5 S C can frequently be similarly separated without tuning in on the aerial coil first. The secondary coil, and also the reaction coil, should be as loosely coupled as possible. A slight tightening of the coupling of the reaction coil will increase the selectivity of the set, making the tuning more critical. The reaction-tuning condenser can sometimes be used with advantage on distant stations.

Tuning for distant stations is very greatly helped by the filament control, particularly when dull-emitter valves are used. The writer finds that the H.F. valve needs the most critical handling, but the filaments of all valves can usually be made to function more efficiently by applying just

stations are regularly received in the phones on two or three valves, and many of them give quite respectable loud-speaker volume. F L and Radiola are excellent. Glace Bay, Newfoundland, has been identified coming in very strongly, and all the Continental time signals are received. The wavelength range of the set is only limited by the coils provided.

5 Y M.

## OVERHAULING PHONES

THERE are few components of the average receiving set which receive less attention, as regards periodic examination and adjustment, than the telephones. Good phones combine a remarkable degree of stability and permanency with extreme sensitiveness, but there must come a time when their original delicacy begins to decline. More often than not either the set or the weather conditions are blamed for impaired signal strength or lack of clarity, but in many cases a little attention given to the phones would be well repaid. Some phones, on the other hand, show a lack of sensitiveness from the start. In these circumstances one may feel somewhat at a loss; the remedy is not always obvious, and phones are too costly to risk experimenting with. However, much can be done to improve them, and the processes recommended later have the merit of simplicity and direct removal of the cause of trouble.

### Testing Sensitiveness

A good idea can be obtained as to whether the phones are in good condition by the following simple tests. Press one of the pins on a chip of silicon or galena, and move the other over various parts of the crystal, applying firm pressure and light contact alternately. A distinct scratching sound should be heard in the earpieces. This is rather an exacting test, and perhaps there will be no response.

Next hold one of the pins on the tongue and tap the latter several times with the other pin. A distinct "toc" should be heard every time contact is made. Lastly, hold one pin firmly between the thumb and forefinger, moistened. Take any small metal object (such as a pen-nib or piece of wire), damp it, and, holding it firmly in the other hand, run it along the other pin several times. With this arrangement loud scratching sounds should be heard in both earpieces. Test each separately. If either should fail to respond to this test or if the sound is weak, the earpiece concerned certainly needs attention.

### Common Faults and Remedies

1. It sometimes happens that the diaphragm is too far away from the pole

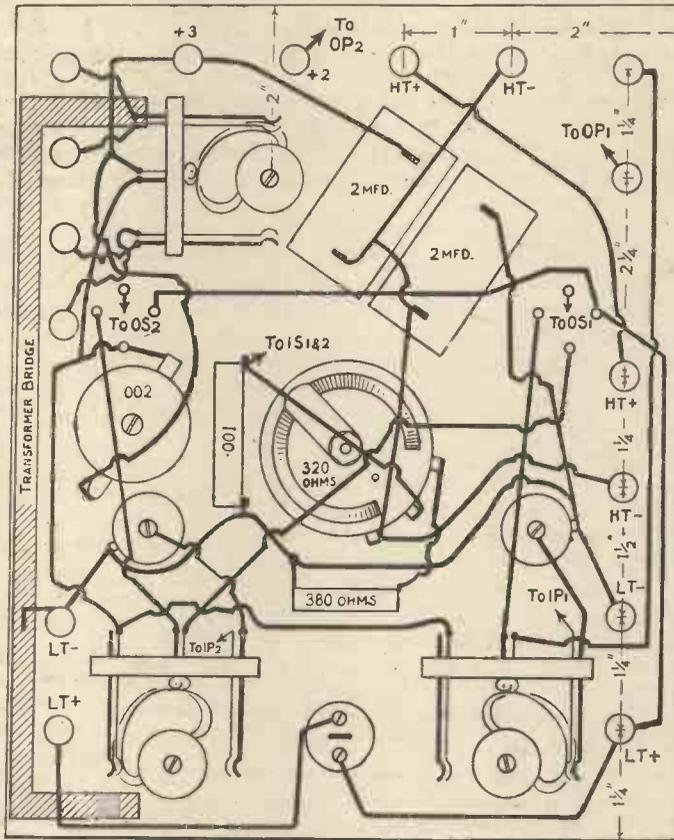


Fig. 2.—Wiring Diagram of Note-magnifier Unit.

the right amount of heating current. The potentiometer on the H.F. and detector panel will be found one of the most useful controls in the whole circuit. To start with, it should be set with the pointer in the middle of the scale, and therefore with the moving arm equally dividing the resistance. If the set shows any tendency to self-oscillation, or if there is distortion in speech or music, a slight movement of the pointer towards the negative end of the resistance will put things right at once.

On an ordinary and very average sort of aerial all the B.B.C. stations can be tuned in quite well, most of them requiring not more than two valves for phone reception. Most of them come in quite well on a low-resistance Amplion loud-speaker. Almost all the Continental

# AROUND THE SHOWROOMS

pieces. This may be corrected as follows: Remove the cap and diaphragm and disconnect the cords from the earpiece. Take a strip of fine emery-cloth (about 3 in. by 6 in.) and fasten to a fairly thick block of wood having a smooth, level surface. Apply a thin coat of oil to the emery, and press the rim of the case flat and evenly on to it. Work the case to and fro, maintaining a firm and even pressure, and move it round a little from time to time. By this means just sufficient metal can be removed from the rim to allow the diaphragm to approach the pole-pieces closer when screwed up. The risk of grinding the rim unevenly or removing too much metal is reduced to a minimum.

2. A diaphragm which is too thick may result in lack of sensitiveness. Such a disc may be carefully thinned by the same process as in the previous case. A great improvement frequently follows this treatment, but care must be taken to clean it thoroughly before replacement.

3. Another frequent source of trouble which may cause much fruitless search unless one is prepared for it is curvature of the diaphragm. Owing to the constant strong pull of the magnets the diaphragm may assume a convex form (considered from the under side) and its centre lie in actual contact with one or both of the pole pieces. This, of course, damps its vibration very considerably, and the earpiece so affected may cease to respond altogether. All that is necessary in this event is to unscrew the cap, turn the diaphragm over, so that it is now either pulled flat again by the magnets or is slightly convex outwards.

It is clear that the fault just described may result in total failure of the phones to respond to signals. It is therefore very necessary to make certain that this is not the cause of the trouble before looking for more serious mishaps, such as burning out of the windings.

Lastly, when phones fail, look first to the cords. The writer was once saved a long and tedious search for a fault in a pair of phones which suddenly ceased to respond to signals of any sort. The cords were replaced by reliable flex and the phones were found to be in perfect order.

ION.

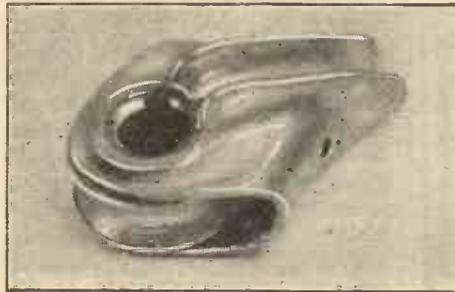
## THICK WIRE FOR TUNERS

BEGINNERS soon learn that high-frequency currents travel along the surface of a wire and not actually through it. They therefore realise that only thick wire should be used for winding tuners; this fact is brought well home by some recently-published American statistics. It is stated that No. 25 S.W.G. wire has more than 60 per cent. greater H.F. resistance at 200 metres than has No. 21, and that No. 28 has more than 100 per cent. greater resistance. There is no reason to doubt these figures; all amateurs, therefore, should take care to use thick wire for their tuners.

S.

### An Aerial Pulley

THE little pulley seen in the photograph is light but strong. It is just the thing to improve your aerial system, but if you use one you will have no excuse for not letting down the wires occasionally to clean the insulators, which in many

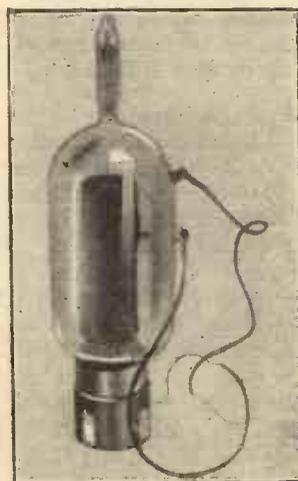


A Peto-Scott Aerial Pulley.

localities soon become covered with soot and grime. These pulleys are made of aluminium, and are supplied in two sizes by the Peto-Scott Company, Ltd., of 64, High Holborn, W.C.1.

### A Round Valve

WITH regard to the original Round valves, such as that shown by the photograph, there is some difference of opinion as to the way in which they work. (These valves, by the way, are not new, being some of the first that were ever made). They were soft, and when in use the tip, which contained asbestos, had to be periodically heated if one wanted to receive signals. From many operators I

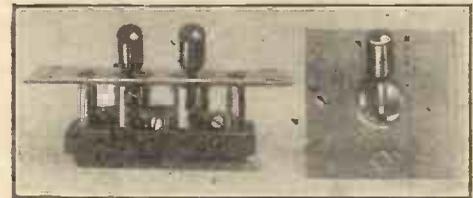


The Round Valve.

have heard glowing tales of the floors of D.F. stations being covered inches thick with matchsticks! That was in the early days of the war. Some of these interesting valves are still to be obtained cheaply from the City Accumulator Company, of 79, Mark Lane, E.C.3.

### Useful Switches

SOME neat and useful switches for panel mounting are shown in the photograph. These can be used for many purposes, such as switching on and off the H.T. and L.T. supply. The switches are made up on nickel-plated panels; that shown on the right measures only 1½ in. square. In the switch on the left the middle leaf contacts are electrically connected. Thus only circuits that are wired



Useful Switches.

in parallel can be connected. Such a switch could be conveniently used, though, for H.T. and L.T., as these have a common pole. These switches can be obtained from the Grafton Electric Company, of 54, Grafton Street, Tottenham Court Road, W.

### Xtraudion Valves

QUITE recently I learnt some interesting facts about Xtraudion valves. First of all they are made in batches of several thousands, and the batch-number of each valve is stamped on the metal base. I believe that the number of the latest batch is VII. Small, but nevertheless important, detail refinements are incorporated in each

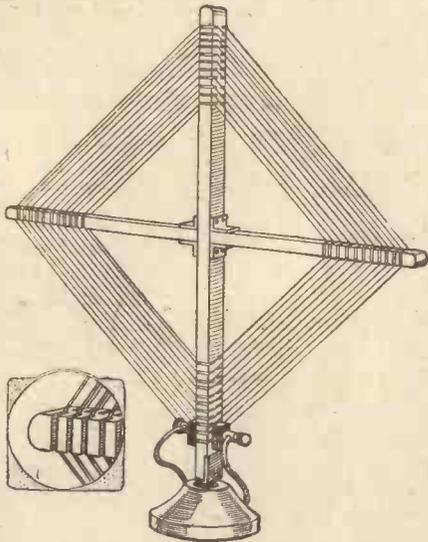


The Xtraudion Valve.

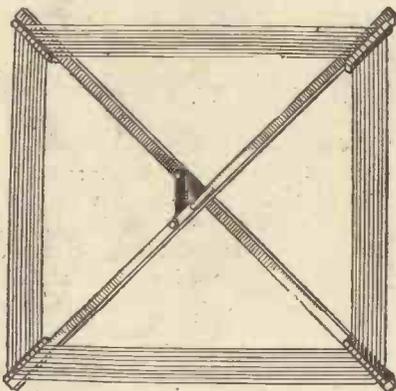
batch. For instance, recently the filament supports have been made to slope outwards; in this way they act to some degree as a spring to keep the filament taut. The metal base has also been turned over the insulating material at the bottom so that the latter cannot work loose. VANGUARD.

# DO YOU USE A

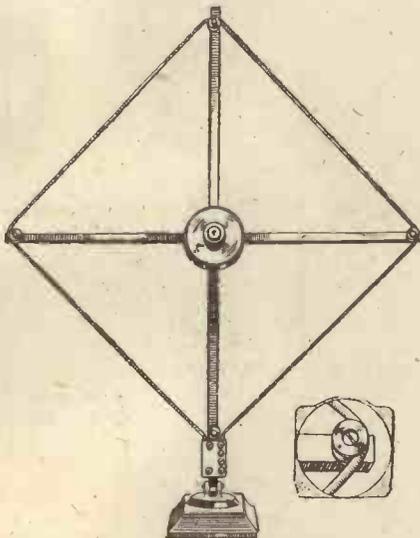
Notes on Its Advantages and Uses ::



Metropolitan-Vickers Frame Aerial and Detail of Wiring.



Radio Acoustics Frame Aerial and Detail of Wiring



McMichael Frame Aerial and Detail of Wiring.

**F**FRAME aerials are always interesting, both to the beginner and the advanced experimenter. The features that recommend them chiefly are portability, adaptability and their directional properties. In the design of frame aerials there are several points that have to be taken into account. First of all the frame should be light and rigid; it should also be arranged so as to permit of circular and sideways motion. The wire with which it is wound should have a low high-frequency resistance, and the area enclosed by the wires should be as large as possible within reasonable limits.

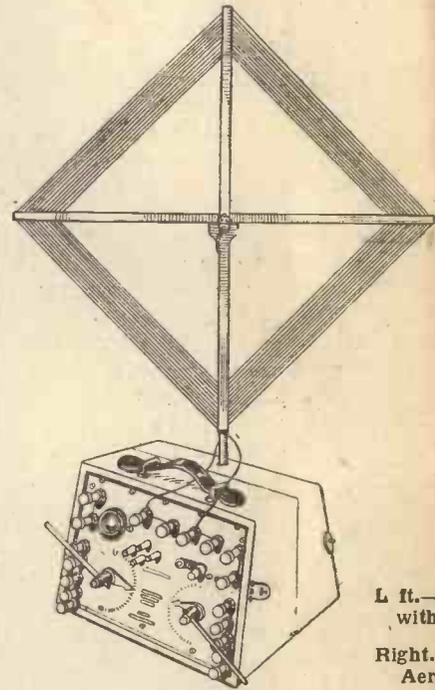
**Efficiency and Design**

Attention to these points helps to produce an efficient frame aerial, but it is almost impossible, and sometimes undesirable, to embody all these features in one model. The degree to which each is carried is determined by the use to which the aerial is to be put; for instance, everybody does not stipulate that his frame must be portable and it therefore need not be very light. Frame aerials are particularly useful to those who live in flats and other places where it is not easy to erect an outside aerial; it is true that they are not as efficient as a standard Post Office aerial, but one must frequently put up with some disadvantages.

Any set that receives broadcasting on an ordinary aerial will usually work with a frame if an extra stage of high-frequency amplification is added.

**Characteristics**

A frame aerial will only receive signals from a station when one side points towards, and the other away from, it; thus it has directional properties. In this way a certain amount of interference is eliminated. Tuning with a frame aerial is fairly sharp, because in a well-designed instrument there is very little self-capacity, and any condenser placed in circuit with the winding produces a comparatively quick change in the wavelength. Sometimes the strain lines in the ether are distorted or bent back; it is then necessary not only to place the sides of the frame in line with the transmitter, but also to move its plane in various positions. Numerous wires do not increase the efficiency of a frame aerial, but only increase the inductance so that it is suitable for use over a larger band of wavelengths. If the required wavelength is sufficiently



L ft.—C with I  
Right.—Aerial of

short, it is desirable to use one turn of wire enclosing a large area rather than more turns enclosing a smaller area.

There are numerous experiments that can be carried out with frame aerials. For instance, they might with advantage be used in making records of the phenomenon of fading.

For ordinary broadcast reception only a very small frame is required. The numbers of turns (approximate) for a frame with 2 ft. 6 in. sides are given in the table on this page. For a frame half the size these numbers should be multiplied by 1.5. If the frame is twice as large the number of

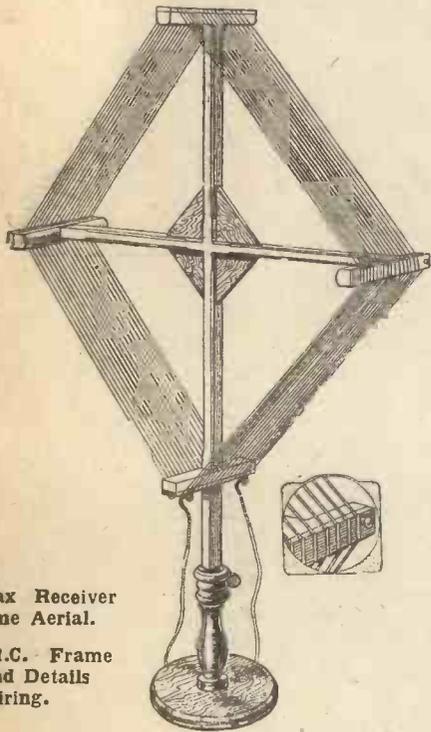
**SUITABLE WINDINGS**

Metres	Turns	Metres
200	Three	900
300	Four	1,200
500	Six	1,500

*These data refer to a frame approximating microfarad condenser in parallel. Wires*

# FRAME AERIAL?

Illustrations of Many Up-to-date Types



Climax Receiver Frame Aerial.

G.R.C. Frame and Details Wiring.

the Metropolitan-Vickers frame aerial (Metropolitan-Vickers Electrical Company, Ltd., of Trafford Park, Manchester). As will be seen from the illustration, the windings are placed in square-cut slots on each side of the arms; thus a large amount of wire is arranged in a small space. This frame is not collapsible; the arms are strengthened by four metal brackets. Phone-type terminals are fitted.

### Radio Acoustics

No base is provided with the Radio Acoustics aerial (Radio Acoustics, Ltd., of 175A, Peckham Park Road, S.E.15), of which each arm is about 4 ft. long. The cross-pieces are connected by a metal strip, which keeps them in position when open. Rubber-covered wire is used, and this is wound on pieces of ebonite fixed at the end of each arm, as seen in the inset.

### Peto-Scott

Folding arms are a feature of the Peto-Scott model (Peto-Scott Company, Ltd., of 64, High Holborn, W.C.1). The horizontal arms let down on hinges at the centre joint and the top arm has a hinge at its middle point. Two of the feet also fold back parallel with the other two. As seen from the inset, the wire is wound in grooves.

### Climax

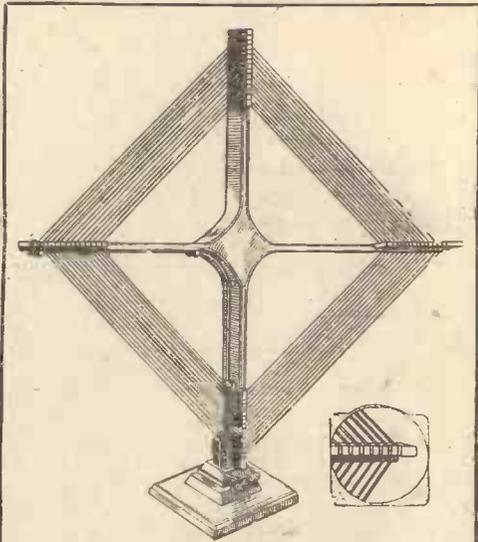
In the frame aerial supplied with the "Monovalve" set (Climax Patents, Ltd., of 188, Church Street, Kensington, W.8) insulated wire is threaded through holes bored in the wooden arms, which are collapsible.

### Rogers, Foster and Howell

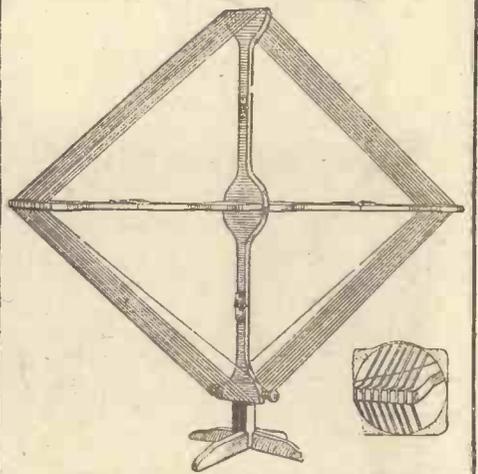
To keep the wires parallel in the Rogers, Foster and Howell aerial (Rogers, Foster and Howell, Ltd., Edward Road, Balsall Heath, Birmingham), which is diamond-shaped, the slots at the ends of the top and bottom arms are not spaced equidistantly. The frame appears to be cut from a solid piece of wood, but it is not really. Triangular strengthening pieces are placed at the centre joint. Ebonite is the material on which the wires are fixed.

### G.R.C.

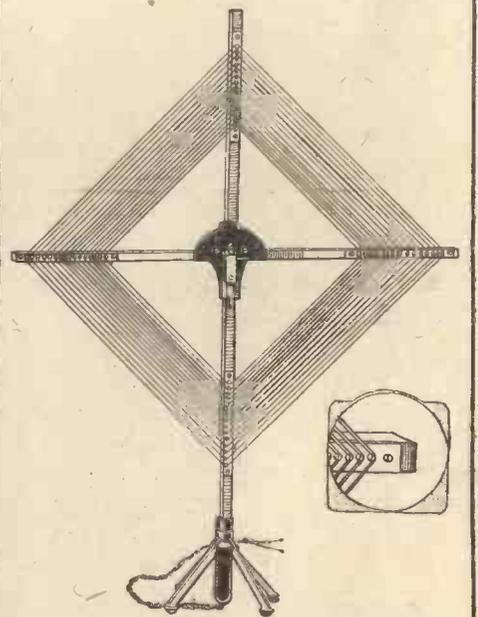
Litzendraht (multi-strand) silk-covered wire, which has a very low H.F. resistance, is used on the G.R.C. frame (General Radio Company, Ltd., of Twyford Abbey Works, Acton Lane, Harlesden, N.W.10).



Rogers, Foster and Howell Frame Aerial and Detail of Wiring



Peto-Scott Frame Aerial and Detail of Wiring.



Sterling Frame Aerial and Detail of Wiring.

turns multiplied by  $\frac{2}{3}$  will be about right. The size of the wire will not affect the wavelength, but is advisable to use the thickest obtainable. Stranded wire can be used with advantage.

There are many frame aerials now on the market that differ greatly in detail, although, of course, they are the same fundamentally. In order to give readers of AMATEUR WIRELESS some idea of the various aerials that can be obtained, it is proposed here to give particulars of fourteen different makes.

### Metropolitan-Vickers

A double winding is the chief feature of

### FOR A FRAME AERIAL

Turns	Metres	Turns
Ten	2,000	Twenty-two
Thirteen	2,500	Twenty-seven
Sixteen	3,000	Thirty-two

approximately 2 ft. 6 in. square, tuned with a .001 spaced  $\frac{1}{8}$  in. or  $\frac{3}{16}$  in. apart.

The length of wire used is 160 ft. This aerial turns in its socket, and can be held in position by means of the set-screw provided.

**Sterling**

Both the arms and the feet of the Sterling frame (Sterling Telephone and Electric Company, Ltd., of 210-212, Tottenham Court Road, W.1) fold up. Normally they are held in position by means of a spring-clip arrangement. A point of interest about this aerial is that the frame, which lifts out of the base, is provided with an ordinary phone plug. A jack is fitted in the base, from which two flexible leads are taken. Thus should it be desired to use an

outside aerial the frame can be taken out of its base and the leads are automatically short-circuited.

**McMichael**

Several wires placed in a flexible covering are used on the McMichael frame aerial (L. McMichael, Ltd., of Hastings House, Norfolk Street, Strand, W.C.2). This aerial takes to pieces entirely. The arms are held in a metal centre-piece and the bottom arm lifts out of a socket in the base in which it rotates. A "junction box" with six terminals is provided. Two windings are used (one for reaction), both of which are tapped in two stages. S. R.

(To be concluded)

the tuner to cut out interference from the arc working the lantern for projecting pictures on to the screen. This tuner was incorporated in an RB 6 model "Marconiphone" receiver, which makes use of six H.F. valves with aperiodic-transformer coupling. Only two stages of H.F. amplification were necessary, however. DEV and DEQ (dull emitter) valves were used in this set.

Even when so close to 2 L O a large current is necessary to get results from demonstration loud-speakers. The necessary "juice" was obtained from a "Marconiphone" special public-hall demonstration set, making use of five LS 5 (dull-emitter)

# PROGRESS AND INVENTION

## Fixing Condenser Vanes

A SPECIAL form of spindle and vane is used in the construction of a condenser described in Patent No. 206,365/23 (G. F. Barrington, of Twickenham).

ing portions fit into the slots in the spindle and the whole are fixed tightly together by the adjusting screw F.

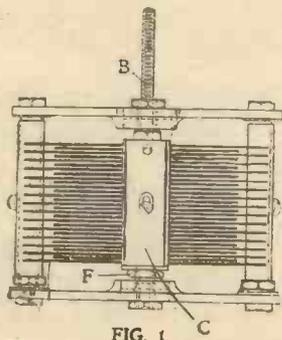


FIG. 1

ANNOUNCING ELECTION RESULTS (Concluded from page 666).

filled with people who had come to hear the results. This crowd would undoubtedly have been far larger except for the fact that a fog began to come up from the river. Nevertheless everyone was in good humour, and as the results came through the announcements were greeted by cheers. Rattles were also used to good effect!

It is not too much to say that this was the first occasion on which an outdoor loud-speaker demonstration has been given in the heart of London. Great developments are possible in this direction in the future.

Further interest was created by the *Daily Graphic* screen, on which were shown amusing films (*Æsop's Fables*) and announcements. Matt, the *Daily Graphic* cartoonist, drew on the screen caricatures of scores of past and present politicians. AMATEUR WIRELESS also found a place in the demonstration, for announcements on the screen reminded the crowd that it is, as it has always been, the best paper for the amateur. More than this, AMATEUR WIRELESS technical experts assisted the "Marconiphone" operators to make the demonstration the success that it undoubtedly was.

Some particulars of the apparatus used will be of interest to our readers. To work the two huge loud-speakers eight valves were used—two high-frequency amplifiers, a detector and five power amplifiers. A special loose coupling had to be used in



Another election scene. The inmates of St. Dunstan's listening to the results.

power valves coupled by the resistance-capacity method. This coupling almost entirely eliminates distortion; still further to clarify signals a special smoothing transformer was used in the anode circuit of the last valve. Grid bias up to 24 volts was supplied to any valve by means of plugs and jacks, from a common battery. A small indoor aerial about 25 ft. long was used. High-tension supply was obtained from an M.-L. anode converter, 280 volts being supplied to the power valves.

Results were shown on the screen by the *Sunday Times* and the *Daily Graphic* as soon as they were received by tape machines and telephones. Thus there was a race between wire and wireless, and as the results were received by the newspapers and 2 L O practically simultaneously little time was lost in broadcasting them. Considering that 2 L O had to alternate results with musical items wireless was not much behind the screen!

Worcestershire elementary schools have been forbidden the teaching of wireless as part of the curriculum. The reason given is that there is the risk of children climbing on to roofs to erect aerials.

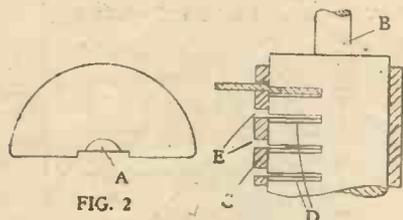


FIG. 3

Fixing Condenser Vanes (No. 206,365/23).

Fig. 1 shows a complete instrument, Fig. 2 a moving vane, and Fig. 3 details of the method of fixing. The moving vanes are made with a projecting portion A and are cut as shown. The spindle B is surrounded by a locking sleeve C; B is formed with slots D and the sleeve C is formed with similar slots E deeper than the slots D. The plates with their project-

## OUR INFORMATION BUREAU

Owing to very great pressure on our space we regret that it has been necessary to hold over the usual page of replies to readers' questions this week. As, in all cases, replies are posted before publication, this omission will not cause any delay. Readers are referred to page 643 of our last issue for rules.



Fig. 1. Map showing Expedition Route.

# HOW WIRELESS ASSISTED ARCTIC EXPLORATION



Fig. 2. Sledging Food Box with Receiving Set.

**A** MOST interesting example of the application of wireless is furnished by the record of the Second Merton College Arctic Expedition to Spitzbergen during the period June 14 to September 15, 1923.

This expedition was a private adventure organised by Mr. George Binney, of Merton College, Oxford, and had for its objects natural history observation, geographical survey and geological research, combined with the pleasures and possibilities of big-game hunting.

**The Venue**

A glance at the map reproduced in Fig. 1 shows the venue of the trip. The first intention was to land a sledge party at some such point as A, in North East Land, and to pick them up again at point B. An alternative route for the sledge

to keep the rendezvous at B, or whether they should branch off on the alternative route, it was decided to install a wireless transmitting set in the parent ship, and to equip the sledge party with a portable receiving apparatus.

The transmitting and receiving apparatus fitted on board was of standard Burndept manufacture.

**The Receiving Set**

The question of a receiving set for the sledge party, however, had to receive special consideration. The sledges were to be operated by man power, and the weight of the apparatus had to be reduced to a minimum. Moreover, no facilities would exist en route for charging accumulators for filament heating. Ultimately a special receiving set was designed and made by Mr. Relf, who was in charge of

will be seen, a very neat little set was produced. Standard "Gecophone" components were used exclusively in making up the set, these being presented to the expedition by the General Electric Company, Ltd.

The question of selecting suitable valves for this set presented difficulties. It was expected that going would be rough during the greater part of the journey, and standard R-type valves seemed to be indicated from the point of view of mechanical strength. These, however, were ruled out on the score of the weight of secondary batteries which would be necessary, and it was ultimately decided to install Marconi DER-type dull-emitter valves.

**Current and Supply**

Careful calculation showed that suffi-



Rough going at Spitzbergen. Such conditions were a severe test for the apparatus.



View showing Aerial with a Member of the Expedition receiving signals from the parent ship.

party was to be from A to C, then across the Hinlopen Strait by means of a boat left at C, and across New Friesland to point D. The area round about D had been previously surveyed on a former expedition in 1921.

To enable the sledge party to learn from the ship whether it would be possible

the surveying. A photograph of this apparatus is shown by Fig. 2, and the following description will be of interest to our readers.

The set was made to fit the standard sledging food-box. A standard three-valve circuit (one H.F., one detector and one L.F. valve) was employed, and, as

cient energy for filament heating could be obtained from two 22-ampere-hour (actual) batteries, and these, of the Fuller "Block" type, were included in the equipment when the sledge party left the ship. Actually they ran the valves whenever necessary during the journey, and were not completely exhausted when the sledge party

Six Marconi DER valves were taken with the party. These were packed in ordinary cotton-wool in a rough wooden case, and this case was carried in one of the sledges. One of the valves came to an untimely end by accident before the party started, but the remaining five survived until the commencement of the last eight miles of the overland journey, when extremely rough going was experienced, which resulted in the loss of two more valves. The three remaining valves, however, did good service until the end of the journey.

The total weight of the receiving apparatus, including the batteries, was only 20 lb. The aerial consisted of three 7-ft. bamboo poles, which could be fitted together, and an 80-ft. length of aerial wire leading from the top to a short pole 6 ft. high. The lead-in was from the higher end. The earth consisted of a similar length of bare copper wire laid along the ice immediately underneath the aerial.

As regards results, during the whole of the journey the ship was received with satisfactory clearness whenever the sledge party listened in. A view of the party picking up messages from the ship is shown.

It will be easily appreciated how valuable this equipment would have been in the case of any mishap which would prevent the ship taking up the party at the appointed place. As it happened, how-

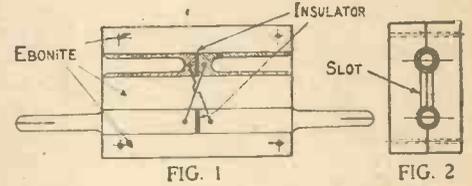
ever, the original programme had to be abandoned, as it was found impossible owing to the condition of the pack ice to bring the ship round to position A in North East Land. Actually the sledge party was landed at point E at the north of New Friesland, and the route traversed was approximately that shown by the dotted line, the party actually being picked up at D in accordance with plan. Although the set was not called upon to take part in any emergency, during the last stage of the journey, when it was finally established by wireless that the party would be picked up safely at the appointed time, it was found possible to abandon certain stores.

We are indebted to Mr. Ernest F. Relf, a member of the expedition, for the information contained in this article and for his permission to reproduce photographs.

**"The Home Constructor's Wireless Guide,"** by W. James (Wireless Press Ltd., Henrietta Street, London, W.C.2). This book, from the pen of a well-known writer on wireless matters, amply fulfils the claims made by its title. It is a comprehensive guide, both in theory and practice, for the amateur who is not content to work entirely by rule of thumb. The book is written in the form of a series of pertinent questions and answers, which have been carefully selected so as to provide all the essential information for the home worker. The price is 3s. 6d.

### A COIL-REVERSING PLUG (Correction)

OWING to an oversight an error occurred in the description of a coil-reversing plug in "Practical Odds and Ends," p. 599, No. 78. This should be amended as follows: Between the pins and



sockets in Fig. 1 (reproduced above) should be placed small insulators. A slot, as shown in Fig. 2, should be cut out of the ebonite so that opposite pins and sockets can be connected together as in Fig. 1.

**An Opening for a Wireless Enthusiast.**  
—We hear that Messrs. Peto-Scott Company, Ltd., 64, High Holborn, London, W.C.1, have a vacancy on their staff for a wireless enthusiast capable of answering technical questions. A live, enthusiastic young man is wanted. Applications—and they are invited only from the right people—should be sent direct to Messrs. Peto-Scott Company, Ltd.

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**Crystal Reception**

SIR,—It may interest some of your readers to know that I can receive the Paris concerts at Nunhead (London, S.E.) on a simple crystal circuit, using hertzite crystal. The reception varies very much; on some evenings it is quite plain, but on others one has to listen very intently. During the last few weeks reception has been quite good.

If I put in one stage of L.F. amplification three pairs of phones can be used and all can hear in comfort.—F. E. McC. (Nunhead).

**Noises in Broadcast Reception**

SIR,—In No. 78, under the heading "Noises in Broadcast Reception," a contributor considers that jamming by spark transmissions experienced by receiving stations situated near to the coast is due to lack of selectivity in the apparatus employed for reception. I am not an expert, and I do not wish in the least to be sarcastic, but I wish that your contributor would show me how to increase the selectivity of our sets so that spark

transmissions would cease to be a serious annoyance.

My own set is sufficiently selective to separate any B.B.C. station pretty thoroughly from any other. I always work with the loosest possible coupling between primary and secondary, and sometimes with and sometimes without reaction on to tuned-anode or H.F. transformer. In spite of this telephony is often badly marred by spark signals. These interfering signals seem to be, since they can be tuned in to maximum strength quite easily, right on the broadcasting band round about 400 metres.

Any hints will be most gratefully received.—J. H. S. F.

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over the Xmas Holidays through H.T. giving out, spare accumulator or valves, etc. Buying sets and accessories from a well known and old established company is your guarantee of courteous treatment and efficient apparatus.

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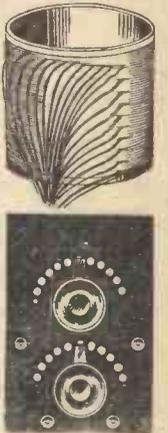
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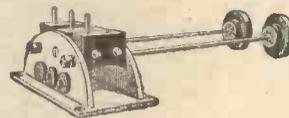
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French D.L., 4,000 ohms ...	11/8	Bushed Ebonite Knobs, best, each	0/3
Aerial Wire, 7/22 copper, 100 ft.	2/2	Lead-in Tubes, any length, per in.	0/1
Lead-in Wire ... per yd., 2d. and 3d.	14/11	Best Ebonite, only in sheets,	
Silk-covered Twin Flex, per yd	0/3	1/2 in., 3/8 in., 1/4 in ... per lb.	4/6
Switch Arms, complete, best only	0/9	Systoflex, best ... .. per yd.	0/5
Filament resistances, best only	2/-	Systoflex, cheap ... .. per yd.	0/3
Fixed Condensers ... ..	1/-	Best quality Coil Holders, 2-way	5/6
Best Condenser Dials ... ..	2/-	Best quality Coil Holders, 3-way	6/6
Basket Coils, 250-2,600 metres set of 7	1/11	Knife Switches for panel mounting	0/8
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H.F. Transformers, any wave-length ... ..	3/6	Instrument Wires.	
Crystal Detectors, in glass ...	1/6	No.	Prices per lb.
Shaw's Genuine Hertzite, large	0/8	D.C.C.	D.S.C.
Herbo Cat's Whisker improves results on any crystal set ...	0/6	18 ... ..	2/8
Phone Cords, best ... per set	1/3	20 ... ..	3/9
Condenser Plates ... per pair	1 1/2d.	22 ... ..	3/11
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# RADIOGRAMS

A QUESTION raised by a London daily is: "Will the broadcasting of speeches and public entertainments develop our critical faculty and make us less easy to please?"

"The law of acceleration seems to be acting very strongly just now in regard to the progress of broadcasting," says the *Glasgow Herald*.

During the recent Transatlantic tests organised by the B.B.C., one Scots amateur, without any thought of remaining up for the occasion, left his set adjusted. "He was actually awakened and somewhat startled," says the *Daily Record*, "by hearing 'Hullo, America!' in no uncertain tones issuing from his receiver."

Senatore Marconi announced recently that successful tests have been carried out between England and St. Vincent (Cape Verde Islands) with a special directional transmitting system.

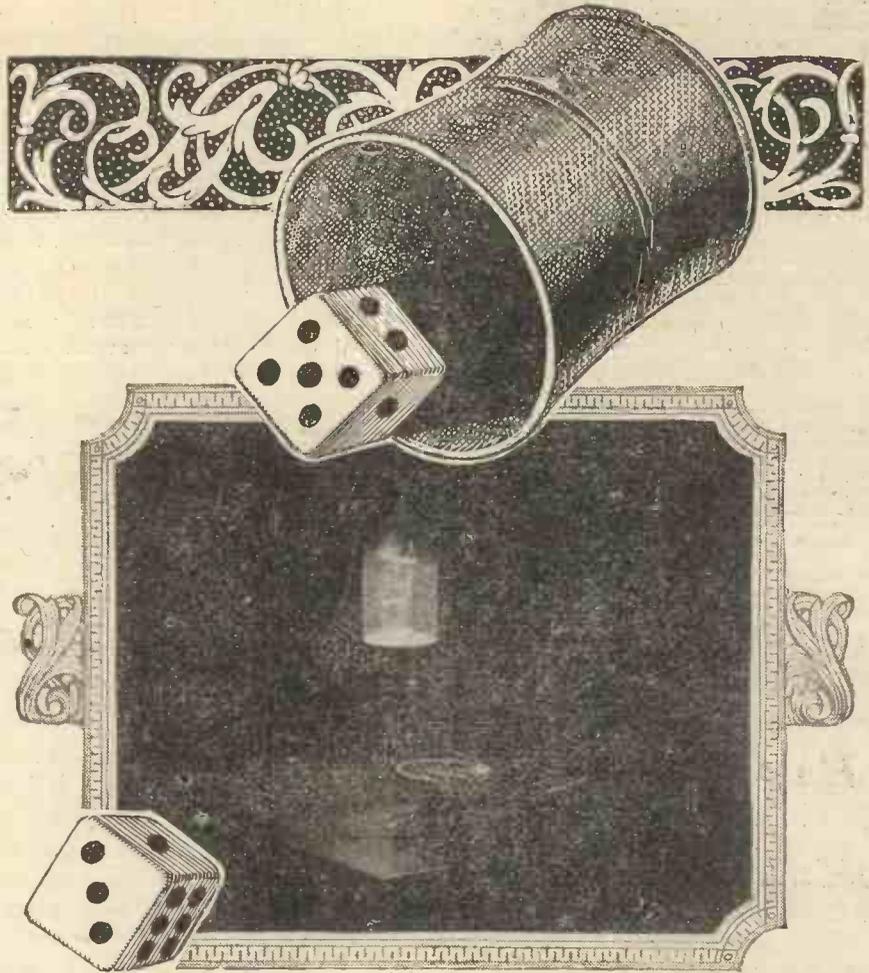
At the Mining Engineering Exhibition, opened at Cardiff recently, wireless apparatus for use in collieries and mines was given a prominent position.

The improved Marconi wireless set for ships' lifeboats, recently demonstrated at Gravesend before the Seafarers' Joint Council, represents great advances in apparatus of this kind. The transmitting power is about four times that which could previously be obtained. The arrangement of masts and aerials is such that they can easily be handled in an open boat at sea. The directional receiver enables the actual direction of a rescuing vessel to be determined.

We learn that the Griffin Wireless Supplies, of 80, Newington Causeway, S.E. 1, has opened a branch at 18, Kingsland Road, E. 2, where a large stock of apparatus can be seen.

(Continued on page 684)

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Ditto, End Plates, 9d. each, drilled. Solid ebonite. Contact Studs, 4d. doz. Stops, 5d. doz. Connecting Wire, tinned copper, 3 yds. 2d. Dewar Switches, 2-way, 3/9.

Crystals. Every make stocked. Zincite, 9d.; Bornite, 6d.; Talite, 9d.; Hertzite, 9d.; Galena, Silicon, Carborundum, 3d.; Copper Pyrites, 6d.; Marvelite, 1/3; Lapisite, 1/6; Midite, 1/-. Gold Seal Plastic Metal for fixing Crystals, 6d. box. Crystal Cups, 4-screw, 1½d. Detector Glasses, 4½d. each. Buzzers, 2/6.

Crystal Detectors. Plain brass, 1/3; Nickel, 1/6; Dustproof, 1/6 and 2/6; Plug-in Type, 3/6; Perikon, 2/3 and 2/9. (Zincite and Bornite.)

Crystal Detector Parts, in envelope, 9d. and 1/3. Nickel, 1/- and 1/6.

Earth Clips, adjustable, 6d. Ebonite, 3/6 lb., any size. Fil. Resist. Dial, 7½d.

Filament Resistances, 1/6, 2/-, 3/-; porcelain base, 4/-. Foll. Copper, 3d. foot. Tin, 4d. Formers, 12 by 2, 2d.; 12 by 4, 4d.; 12 by 5, 5d. H.T. Batteries, 36vt., 7/-; 63vt., 8/6 and 12/-. Headphones. Continental, 11/6; Best, 21/-, 24/-, 25/-; N. and K., 12/9; Brunet, 11/6; Pival, 16/6; Fellows, 18/6.

Amplion Loud Speaker, 42/-. "Ultra," 4,000 ohms, 37/6. Postage, 2/-. Insulated Hooks, 1½d. Tape, 6d. roll. Insulators—Egg, 1½d.; Reel, 1d.; Shell, 2d. Frame Aerials, detachable, 19/6.

Jack and Plug, 2/- and 5/-. Lightning Arresters, 2/- each. Spade Terminals, 2 a 1d. Screwed type, 2d. each. Pin type, 2d.

Knobs, finest, 4½d., 3d. and 2d. Lead-in Tubes, 12 in., 11d.; 9 in., 10d.; 6 in., 8d. Flat Simplex, L pattern, 1/6. Glass Tubes, 9d., 7d., 6d.

Loud-Speaker Aluminium Trumpets, 6/9. Screwed Rod, 12 in. 2 B.A., 2½d.; 4/6 B.A., 2d. Mica, .002, 2d. sheet. Nuts, 2 B.A., 2½d.; 4/5/6/8, 2d. doz.; O.B.A., 4d.

Potentiometers, 200 ohms, 3/6; 400, 5/6; guaranteed. Scales, Ivorine, 0.180, 3d. Set Name Tabs, 6d. Bell Wire, 12 yds., 6d.

Slider Rods, 3½d. Plunger, 2d. Best Ebonite, 6d. Wound Vario-couplers, 5/6. Tapped Coils, 20 and 10 turns, 2/11 and 3/6.

Spacers, large, 2½d. doz.; small, 1½d. doz. Spring Washers, 3d. doz.

Sleeving, all colours, 3 yds., 2 mm., 11d. Shellac, 8d. bottle.

Switches, lacquered brass on ebonite, S.P.S.T., 1/-; S.P.D.T., 1/6; D.P.D.T., 2/-. Panel mounting nickel, S.P.D.T., 1/6; D.P.D.T., 2/-. Switch Arms, 1st qual., 8d. Screws, all B.A.'s—To ½ in., 5d.; to 1 in., 9d. doz. (cheesehead, round-head or countersunk).

Special Oldham Accumulators, 4.40, 21/-; 4.60, 25/-; 6.40, 29/6; 6.60, 35/-. Transformers, H.F. Plug-in, No. 1, 150/450 metres, 3/9; 2, 250/700, 4/-; 3, 450/1,200, 4/3; 4, 900/2,000, 4/6; 5, 1,600/3,200, 4/8; 6, 2,200/5,000, 5/-. Transformers, approx. 5 to 1, L.F., 11/9 and 15/-; all guaranteed. "Powquip," 13/6; best nickel, 14/6. Bobbins, 1/6. H.F. Formers, 2/-. Terminals, W.O., 2d.; telephone, 1½d.; pillar, 2d.; wood screw, 1½d.

Phone Cords, 10½d. and 1/9. Tablets, Earth, Aerial, etc., 1d. Flex (twin), 2d. yd.

Valves, Cossor, Ediswan, Mullard, Marconi. Special purchase, 12/6 each. Ordinary and low temperature in stock.

Variometers, double wound, 2/9; Ebonite miniature, 3/9. Formers, 6d. pair. Wound Coils, 12 by 4, 2/5; 6 by 3, 1/8; 9 by 3, 2/3.

Valve Holders, finest ebonite, 1/3; moulded, 9d. (nut and washer).

Valve Legs, 10d. doz. Valve Pins, 9d. doz. Volt-meters, 5/8 and 8/6.

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### RADIOGRAMS (continued from page 683)

It appears that many people are burning the midnight oil in Newcastle. A correspondent to a local paper says that when he listens to America at 3 a.m. he experiences continual interruptions caused by heterodyning!

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An article in a provincial paper on variometers points out that their use "tightens up the efficiency of the set considerably. . . ." Have you noticed this?

□ □ □

Madame Tetrzzini has announced her intention of broadcasting from 2LO early in the new year.

□ □ □

Low-power wireless apparatus has now been fitted to all lightships in the Mersey estuary for communication with the Harbour Board offices in Liverpool.

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It is likely that an Irish broadcasting company, similar in constitution to the B.B.C., will be formed early in the new year. In a White Paper submitted to the Dail Eireann on December 4 the P.M.G. outlined the proposed scheme. The company would have no official connection with the Government. Thirty thousand pounds is the proposed capital, to be provided by firms in the wireless industry. Seven directors will be nominated by the constituent firms of the company. Receiving sets will be licensed, and the first station would be erected in Dublin.

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The French Society of Physics celebrated its jubilee by opening a scientific exhibition in Paris. The outstanding exhibits consist of wireless apparatus, an exhibit of particular interest being a tank fitted with receiving and transmitting gear.

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Writing in the *Evening Standard* on broadcasting and the theatre, Mr. Basil Macdonald Hastings says that "because broadcasting and the theatre have no more bearing upon each other than the *Saturday Review* and *Comic Cuts*, it is sheer desipience to associate them." Nasty!

Mr. Hastings ends up by saying that, "At the risk of being left out from the next clerical garden party, I am going to remind all concerned that you cannot broadcast legs!"

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On Sunday, December 2, the first afternoon concert was broadcast from the Sheffield station, the concert in question being relayed from Manchester. Over 5,000 letters of appreciation were received.

□ □ □

A correspondent, writing to the B.B.C. in regard to the institution of a relay station in Liverpool, received a reply stating that the question of relay stations in

(Continued on page 688)

## 2LO's Programme

Dec. 13—Dec. 19.

THURSDAY. 5.45 p.m., Musical Talk by "Auntie Hilda" and "Uncle Humpty Dumpty." 7.30 p.m. to 8.20 p.m., Orchestral Music and Dance Music by the Octet and 2LO Dance Bands. 8.20 p.m., Act I. of *Little Nelly Kelly* from New Oxford Theatre. 9.45 p.m., Talk on "Inventors of this Country," by Rt. Hon. Sir William Bull. 10 p.m., Dance Music.

Friday. 5.45 p.m., Two lectures on "Housekeeping," by "Mrs. May." Syncopated Piano Music by Mr. Stanley Holt. 9.40 p.m., Acts II. and III. of *Little Nelly Kelly* from New Oxford Theatre.

Saturday. 7.30 p.m., *Pagliacci* from the Old Vic. 8.50 p.m., The Roosters' Concert Party. 9.45 p.m., "Models and Model Railways," by Mr. W. J. Bassett-Lowke. Dance Music from Savoy Hotel.

Sunday. 3 p.m., Organ Recital from Armitage Hall by Mr. H. C. Warrilow. Songs by Miss D. Bennett, violoncello solos by Miss E. Lake; pianoforte items by Miss M. Snowden. 8.30 p.m., Anthem, "Bethlehem," by "The Church Quartette." 9 p.m., "Royal Air Force Band" from 6BM (Bournemouth).

Monday. 5 p.m., Extract from *Jack Hardy*. Talk on "Music" by Mr. E. Grant. Songs by "Uncle Rex." 9.45 p.m., *The Beggar's Opera* from Lyric Theatre.

Tuesday. 7.30 p.m., Pianoforte Solos by Miss H. Dederick. Two Comedy Sketches by Mr. and Mrs. Riley. 8.45 p.m., Violin Recital by Miss D. Kennedy. Dance Music by the Savoy Orpheans and Savoy Havana Bands from the Savoy Hotel.

Wednesday. 5 p.m., "Uncle" Pol-lard Crowther. The Elocutionist. Miss R. de Perinello. 7.30 p.m., Dance Music by the Wireless Orchestra. "Western Fairy Tales Told in Eastern Fashion," by Rt. Hon. Sir William Bull. *The Prince in Disguise*, recited by Madame L. Ginnett; Songs by Miss Nora Lynn.

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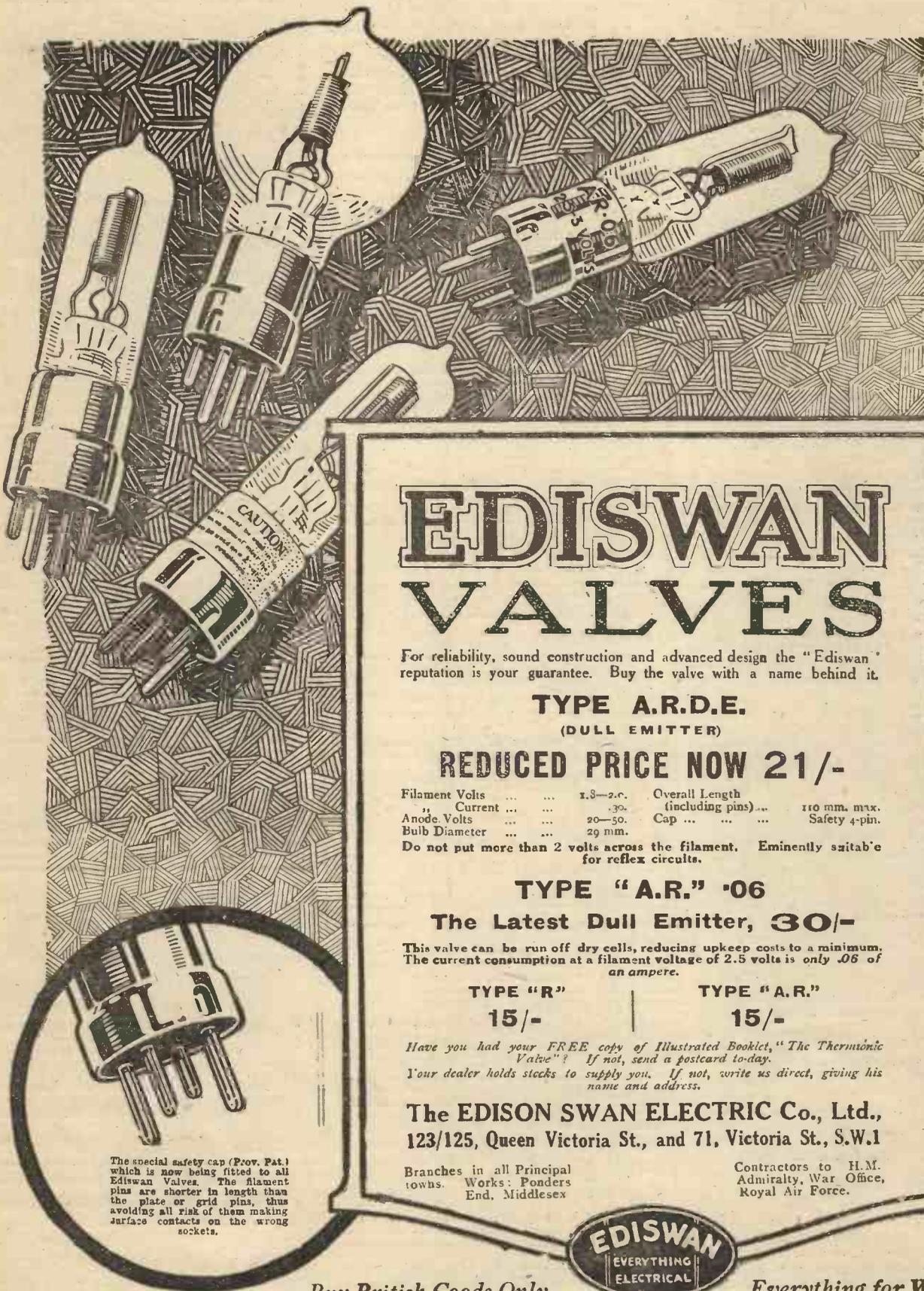
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**Manchester B.B.C. Station (2 Z Y), 400 metres.** Weekdays, 3.30 p.m., concert; 5 p.m., women's half-hour; 5.25 p.m., farmers' weather report; 5.30 p.m., children's hour (Mondays, 6.10 p.m., Boys' Brigade and Boys' Life Brigade news); 6.20 p.m. to 7.15 p.m. and 7.45 p.m. to 10.30 p.m. concert and news. Sundays, 8.30 p.m. to 10.25 p.m., concert and news, etc.

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

**Newcastle B.B.C. Station (5 N O), 370 metres.** Weekdays, 3.45 p.m., concert; 4.45 p.m., women's half-hour; 5.15 p.m., children's hour; 6 p.m., scholars' half-hour (Mondays, 6.30 p.m., Boys' Brigade and Boys' Life Brigade news); 7 p.m. to 10.30 p.m., concert, news. Sundays, 8.30 p.m. to 11 p.m., concert and news, etc.

**Cardiff B.B.C. Station (5 W A), 435 metres.** Weekdays, 3.30 p.m. to 4.30 p.m., concert; 5.30 p.m. to 6 p.m., women's half-hour; 6 p.m. to 6.45 p.m., children's hour (Mondays, 6.45 p.m., Boys' Brigade and Boys' Life Brigade news); 7 p.m. to 10.30 p.m., concert and news. Sundays, 8.10 p.m. to 11 p.m., concert and news.

**Glasgow B.B.C. Station (5 S C), 415 metres.** Weekdays, 3.30 p.m. to 4.30 p.m., concert; 5 p.m. to 5.30 p.m., women's half-hour; 5.30 p.m. to 6 p.m., children's hour (Mondays, 7.15 p.m., Boys' Brigade and Boys' Life Brigade news); 7 p.m. to 10.30 p.m., concert and news. Sundays, 8.30 p.m. to 10.45 p.m., concert and news, etc.

**Bournemouth B.B.C. Station (6 B M), 385 metres.** Weekdays, 3.45 p.m. to 4.30 p.m., concert; 5.15 p.m. to 10.15 p.m., concert and news. Sundays, 8.30 p.m. to 10.15 p.m., concert and news.

**Aberdeen B.B.C. Station (2 B D), 495 metres.** Weekdays, 3.30 p.m. to 4.30 p.m., concert; 5 p.m. to 6 p.m., women's half-hour and children's corner; 7 p.m. to 10.30 p.m., concert and news. Sundays, 8.30 p.m. to 10.30 p.m., concert and news.

**Sheffield (Relay) B.B.C. Station, 303 metres.** Programme relayed from one of the main stations daily.

**Croydon (G E D), 900 metres. Daily.**  
**Eiffel Tower (F L), 2,600 metres. Daily.** 6.40 a.m. to 7 a.m., weather forecast; 11 a.m. to 11.30 a.m., weather forecast; 3.40 p.m., Stock Exchange news; 5.30 p.m. (Saturdays excepted), Bourse closing prices; 6.10 p.m., 7 p.m., and 7.20 p.m. (Sundays only), concert and news; 10 p.m., weather forecast.

**Paris Concerts Radiola (S F R), 1,780 metres. Daily, 12.30 p.m., concert and news; 1.45 p.m., first Bourse report; 4.30 p.m., Bourse closing prices; 4.45 p.m., concert and news; 6.45 p.m., news; 8.30 p.m. to 9.30 p.m.,**

concert; also concert from 2 p.m. to 3 p.m.; 10 to 10.45 p.m. on Sundays.

**Rome (1 C D), 3,200 metres. Daily, 10 a.m. Königswusterhausen (L P), 2,800 metres. Daily, 7 a.m. to 8 a.m., Stock Exchange news; 11 a.m. to 12.30 p.m., news and concert; 4 p.m. to 5.30 p.m., Stock Exchange news.**

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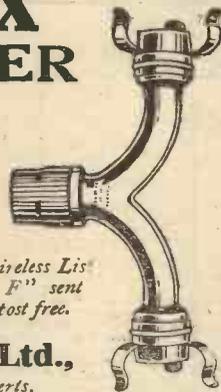
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RADIOGRAMS (continued from page 684)  
 different parts of the country "was receiving early attention." "We expect, however," continues the letter, "that it will be the policy of the Post Office to ask us to establish relay stations in the big industrial centres first." The correspondent only wants to know now if the B.B.C. consider Liverpool "a big industrial centre."

A wireless station has been opened at Cheribon, Java, for communication with shipping.

It is stated that a lady living in Minneapolis, U.S.A., is applying for a divorce on the ground that her husband suffers from "radiomania." Petitioner states that since her husband took to wireless two years ago he has spent all his time with his set, and kept his wife and daughter awake at all hours of the night.

Below are quoted extracts from a radiogram received by the Zenith Radio Corporation, Chicago, from Captain Mac-Millan, who is on an expedition in the Polar regions: "Am very thankful that Arctic exploring ship *Bowdoin* is equipped with complete Zenith radio apparatus. Here at top of world in darkness of Great Arctic night, isolated as we are from even outposts of civilisation, radio has conquered solitude, banished anxiety over

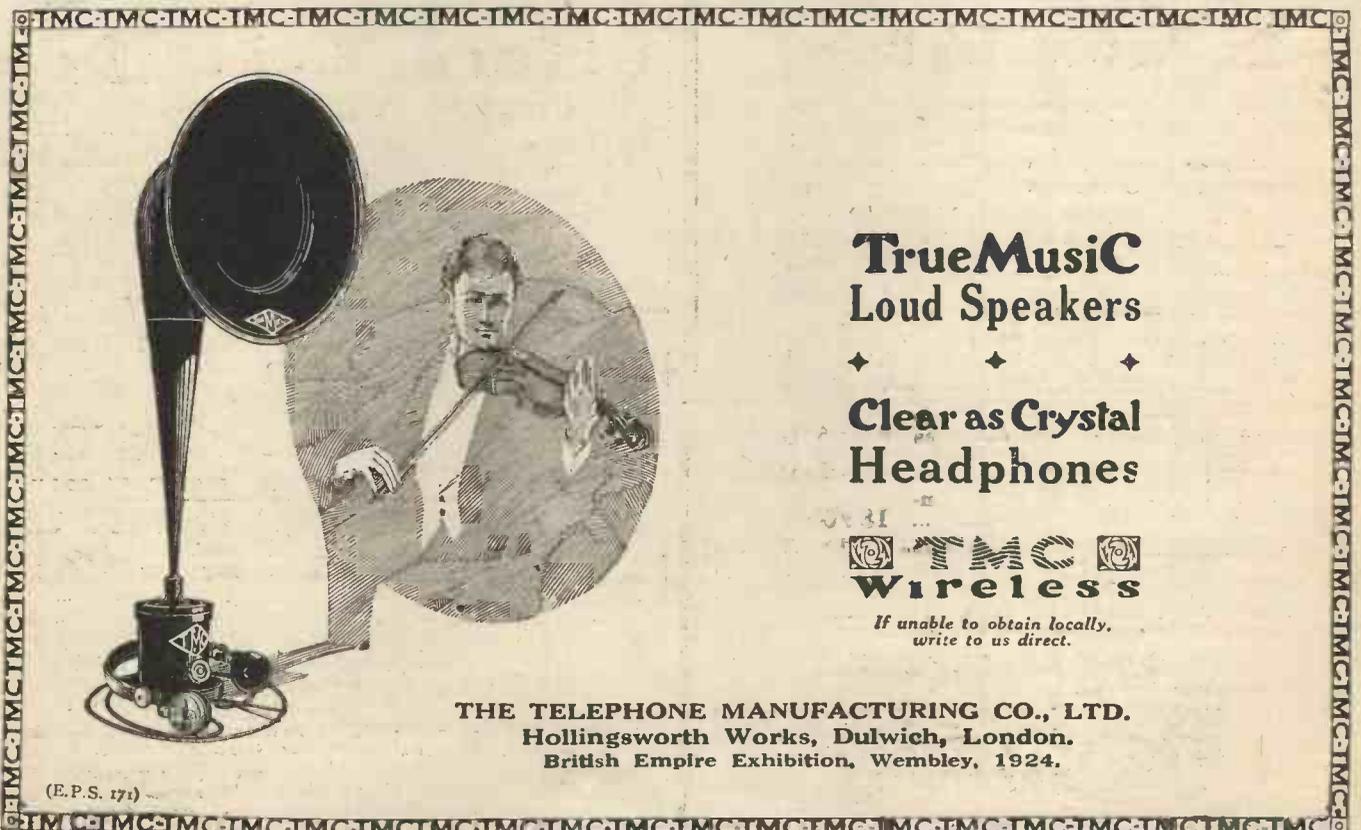
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welfare of friends and relatives at home. We have already listened to stations practically all over the United States, from Europe, and even from far-away Honolulu—music, vocal and instrumental, speeches, prayers, sermons are penetrating the Auroral belt and reaching little *Bowdoin* fast-frozen in ice eleven degrees and a half from the North Pole. We are almost as incredulous as Eskimos that this can be so. Radio has united the ends of the earth."

At a general meeting of the Western Telegraph Company, Ltd., a shareholder stated that he thought it would be an advantage if they (the company) "went in for a little propaganda in which it would be clearly shown how futile was wireless in comparison with the cable." Sir J. D. Pender replied that he did not want it to be said that the cable companies were against wireless, and he thought it was probable that the two interests would have to come together in the future.

Presiding at the annual dinner of the Metropolitan Police Courts' Officials Benevolent Society, Mr. C. K. Francis, the Westminster magistrate, said that: "It has happened to me many times when I have finished the arduous work at Westminster that I have been told there is no magistrate at the South-Western Court, or that the magistrate at Lambeth has lost his voice, and I have been told to go to one of those Courts. Why should I go? Why not put the wireless on at Westminster? I could then hear applications by wireless, fine 'drunks,' and if there was a very disorderly 'drunk' I could give him fourteen days. The wireless would be a good thing for such a man," Mr. Francis observed amid laughter, "for if I saw him I might possibly give him a month."

Spectacle-frames often become bent and distorted so that the user has difficulty in keeping the lenses in correct position before the eyes. How this may be corrected and other simple repairs are dealt with in an illustrated article appearing in the current issue of "Work" (3d.). Other articles appearing in this number are: "Living Marionettes Up to Date"; "A Magical Cabinet"; "Sharpening and Setting a Plane"; "Sound-wave Toys"; "More Novel Tricks for Christmas"; "An Arc Lamp for the Magic-lantern"; "The White Magic of Chemistry"; "The Six Dice—A New Game"; "Home-made Gas Blowpipe."



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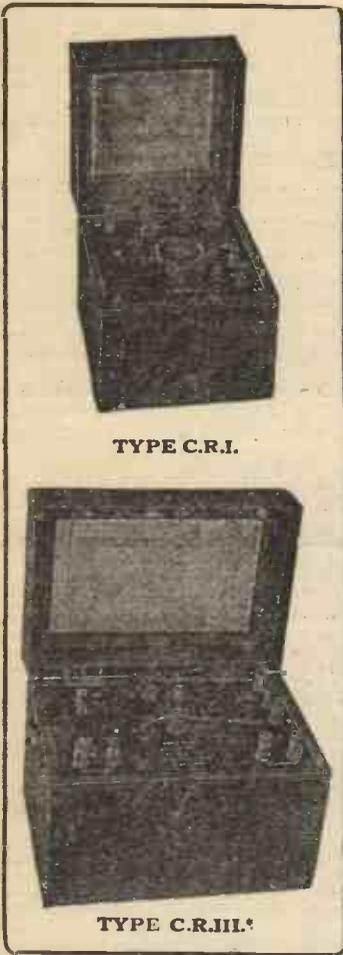
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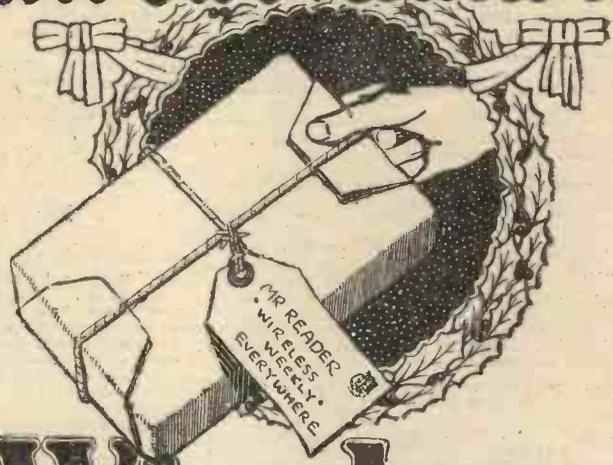
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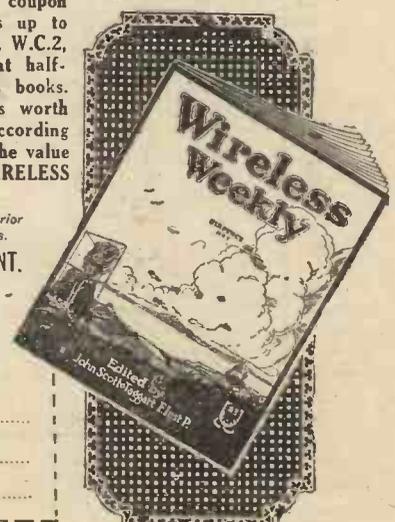
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Wireless Department,  
292-3, High Holborn, London, W.C.1

R.H.

**Honor Oak Park Radio Society**

*Hon. Sec.*—G. J. PRICE, 22, Honor Oak Park.  
An interesting lecture and demonstration on "Dual Amplification" was given on Nov. 30 by Mr. Voigt, the well-known authority in this branch of wireless research.

At the last weekly meeting Dr. J. Russell Higson gave a lecture on "Sound Distortion." He explained the principles of energy and motion in relation to sound, and then gave a very full account of the production of the human voice and the action of the ear for reproducing these sounds and transmitting them to the brain.

**Barking and District Radio Society.**

*Hon. Sec.*—C. R. WILLET, Congregational School-room, Barking.  
At a meeting of the society held on Nov. 26 Mr. R. C. Jones gave a lecture on "The Thermionic Valve." The lecturer described the workings of the earlier type of two-electrode and later the three-electrode valve, together with their underlying principles. Mr. Jones then discussed the working of the valve, its various functions in receiving and transmitting apparatus.

On Nov. 30 an interesting discussion on the reception of American broadcast telephony and amateur transmissions was led by Mr. J. A. Partidge (2KF), who related how he frequently rises at 2 a.m., and on these occasions is nearly always successful in picking up a transmission emanating from across the Atlantic. Mr. T. Allison (5PU) also reported that he had had similar success.

**Manchester Wireless Society**

*Hon. Sec.*—Y. W. P. EVANS, 2, Parkside Road, Princess Road, Manchester.  
On Nov. 15 Capt. Hollingworth lectured on the subject of "Amplifiers." He commenced with the suggestion that he would endeavour to prove why amplifiers did not amplify, and by a series of lucid explanations succeeded in pointing out in a very non-technical manner the several drawbacks which prevent users from obtaining the full percentage of amplification which is in most cases expected. In

the lecturer's opinion the greatest enemy of amplifiers, and incidentally the experimenter, is "stray capacity" in the circuit, and it was very clearly illustrated how this could be overcome to a great extent, but even then only a small percentage of amplification could be expected. In the design of transformers (L.F.) the intercapacity action between the windings was far more important than the magnetic flux. Invariably an amplifier will not amplify until it is forced, and then it overdoes it to such an extent as to cause distortion. In using three stages of L.F. it was the rule to expect a 5 to 1 step up in each case, but it was considered lucky to obtain a maximum total of 25. The only way to obtain more amplification was to employ more H.T. and negative grid-bias, and this meant that the L.F. transformers should be of robust construction and of good insulation resistance. Correct grid potential on rectifier was essential. The most important circuit of all amplifiers is the resonance or aerial circuit, and this should be of the very lowest resistance, and preferably nothing finer than 20 s.w.g. should be used. One incident was mentioned in which it was stated that the best reception had been obtained on a single turn of thick wire as aerial coil and a one microfarad condenser in parallel.

**Radio Society of Highgate**

*Hon. Sec.*—J. F. STANLEY, 49, Cholmeley Park, Highgate, N.6.  
On Nov. 30 a lecture was given by Mr. J. F. Stanley, entitled "Distortion in Valve Receivers." It was shown how distortion can and does occur in high-frequency circuits, and how the use of reaction increases this distortion by reducing the time constant of the circuit. The behaviour of a valve was then considered when acting as a rectifier, and the relative merits of anode rectification and grid rectification were discussed from the point of view of the amount of distortion caused.

**Tottenham Wireless Society**

*Hon. Sec.*—S. J. GLYDE, 137, Winchelsea Road, Bruce Grove, Tottenham, N.1.  
On Nov. 28 Mr. J. Kaime-Fish gave the second of his series of lectures on the "Fundamentals of Wireless," his special subject being "Condensers." The lecturer dealt with both the theory and practice of the use of condensers, explaining methods of determining capacity.

**City of London Phonograph and Radio Society**

*Hon. Sec.*—J. W. CRAWLEY, 27, Horsham Avenue, N.12.  
On Nov. 30 a demonstration was given by Mr. T. Allison (5PU). Using a straightforward circuit,

1 det. and 1 L.F. (power valve) with 120 H.T., with a frame aerial, the demonstrator proved to those of us who had hitherto looked upon the loud-speaker as a necessary evil that purity of tone and faithfulness to the original can be obtained such as no gramophone can give. The loud-speaker used was a "Brown," and the demonstrator showed that the distortion commonly heard is not the fault of the loud-speaker.

**North Middlesex Wireless Club.**

*Hon. Sec.*—H. A. GREEN, 100, Pellatt Grove, Wood Green, N.22.  
On Dec. 1, by the courtesy of the authorities, a party of members of the club spent a very instructive and enjoyable afternoon at the National Physical Laboratory. It is impossible to see more than a small section of the laboratory in a single visit, but those who were fortunate enough to be able to join the party were taken over the departments dealing with the testing of hulls of ships and aeroplanes, fine measurements and wireless research.

**The West London Wireless and Experimental Association**

*Hon. Sec.*—H. W. COTTON, 19, Bushey Road, Hayes, Middx.  
At a meeting held on Nov. 20 Mr. P. Lowry-Mullings read a paper before the members present entitled "Crystals for Wireless Reception."

**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.

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Price **£3-7-6** Plus B.B.C. Tax - 1/-

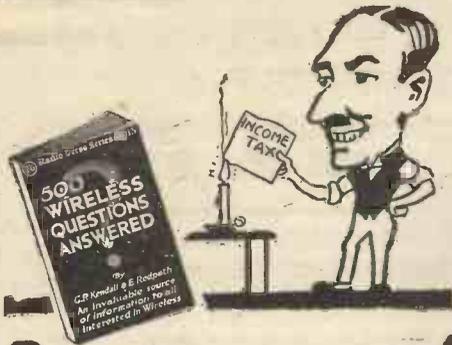
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WHEN you come up against a knotty problem in wireless, don't worry about it—don't trouble to seek advice from your friends, but get a copy of "500 Wireless Questions Answered," 2/6, from any bookseller. You will find it a wonderful help. Certainly it will save its cost many times over.

- Other good Radio Press books include:
- Wireless for All. John Scott-Taggart, F.Inst.P. ... 6d.
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## DEC. 19

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DISPLAY OF BARGAINS

WIRELESS AND EVERYTHING FOR IT

- ELKAY Lightweight Headphones 4,000 ohms, all guaranteed, per pair **12/9**
- FELLOWS' New Lightweight Phones, 4,000 ohms, stamped B.B.C. **18/6**
- SUPER PHONES, Light, Easy Adjustment, 4,000 ohms, guaranteed **13/9**
- N & K (The genuine article), 4,000 ohms, all guaranteed Per pair **12/9**
- ALSO BROWN'S, BRUNET, THOMSON-HOUSTON (French), ETC.

- ALL MAKES of VALVES in STOCK  
MARCONI R; EDISWAN, MULLARD and COSSOR (Red and plain top)
- DULL EMITTERS, Ediswan and Marconi **21/-**  
Special packing and post 1/- each extra EACH
- State what Make of LOUD-SPEAKER you Require  
EVERY TYPE IN STOCK

- DUTCH VALVES ... 6/11 & 7/11
- L.F. TRANSFORMERS, Ratio 5 to 1. All guaranteed (postage 1/-) ... each 11/3
- CRYSTAL DETECTORS ... 1/9, 1/3, & 10/d.
- CRYSTAL DETECTORS, enclosed in glass case ... 2/6, 2/3, 1/8
- AERIAL WIRE, 7/22, guaranteed hard-drawn copper, 100 ft. (postage 1/-) ... 1/10d
- CONDENSER VANES, fixed or moving, per doz. **3 1/2d.**
- REAL GOLD CAT'S WHISKERS ... each 2d.
- REAL GOLD CAT'S WHISKERS per doz. **1/5**
- SILVER CAT'S WHISKERS ... each 1d.
- SILVER CAT'S WHISKERS per doz. **7d.**
- CONDENSER SCALES, 0 to 180 ... each **3 1/2d.**
- IVORINE LABEL SET, 12 different titles the set **6 1/2d.**
- BASKET COILS, set of 6, up to 3,000 metres **2/4**
- SLEEVING, 3 yds. assorted colours, for 1 1/2d.
- NUTS, 2 B.A. ... per doz. **2 1/2d.**
- NUTS, 4, 5, 6 and 8 B.A. ... per doz. **2d.**
- WASHERS, 4 B.A. ... per doz. **1d.**
- WASHERS, 2 B.A. ... per doz. **1 1/2d.**
- CONTACT STUDS, with nuts and washers ... per doz. **4d.**
- TERMINALS, with nut and washers, each 1d., 1 1/2d. & 2d.
- EBONITE KNOBS, 2 B.A., each 2d. & 3d.
- SPACING WASHERS, large ... per doz. **2 1/2d.**
- SPACING WASHERS, small ... per doz. **1 1/2d.**
- CRYSTAL CUPS, 2 screw ... each 1d.
- CRYSTAL CUPS, 4 screw ... each 2d.
- FIXED CONDENSERS, all capacities, each 10/d.
- EBONITE, cut to any size by machinery while you wait ... per lb. **3/6**
- TELEPHONE TERMINALS, nuts and washer, each 1 1/2d. ... per doz. **1/3**
- W.O. TERMINALS, nuts and washers, each 2d.
- PANEL BUSHES, drilled ... each 1 1/2d.
- TOP CONDENSER bushes ... each 4d.
- BOTTOM CONDENSER bushes ... each 1d.
- SWITCH ARMS, 4 laminations, ebonite knob, complete with panel, bush, nuts, and spring washer ... 1 1/2d.
- STOPS, with nuts ... 1st doz. **6d.**
- FILAMENT RESISTANCES, smooth action, marvellous value ... 1/9
- With engraved dials ... **2/6**

- FILAMENT COMPLETE CIRCLE RESISTANCE SCALES, 0 to 300 ... each **6d.**
- BELL WIRE, tinned copper, 12 yds. ... **6d.**
- VALVE LEGS, nut and washer ... each **1d.**
- VALVE PINS, nut and washer ... each **1d.**
- PLUNGER SPRINGS, complete ... each **1d.**
- SLIDER ROD, brass, 13 in. long, 1/2 in. square, drilled ... each **3 1/2d.**
- SLIDER KNOB ... each **2d.**
- SWITCHES ON EBONITE, S.P.S.T. (quality the best) ... each **1/6**
- SWITCHES ON EBONITE, S.P.D.T. (quality the best) ... each **1/11**
- SWITCHES ON EBONITE, D.P.D.T. (quality the best) ... each **2/9**
- CONDENSER SPINDLES, all sizes in stock, from ... each **1 1/2d.**
- SCREWED ROD, 2 B.A., 12 in. long, each **2 1/2d.**
- SCREWED ROD, 4 B.A., 12 in. long, each **3d.**
- RUBBER-INSULATED LEADING-IN WIRE ... per yd. **1 1/2d.**
- VARIABLE GRID LEAK (pencil type) **1/11**
- INSULATORS, white reel, 2 in., each 1d., per doz. **11d.**
- INSULATORS, white etc., each 2d., per doz. **18**
- WOUND INDUCTANCE COILS (postage 9d.): 12x4 9x4 8x2 1/2 6x3 6x2 2 1/2 2/3 1/11 1/8 1/3
- TAPPED INDUCTANCE COILS, 20 tapplings, wound to 1,600 metres ... each **2/8**
- VARIOMETERS (Tube type), complete with knob ... 3/11 & 2/11
- DOUBLE 'PHONE CORDS, full length ... 1 1/2d.
- HERTZITE, Genuine, in box ... **8d.**
- TALITE, Genuine, in box ... **8d.**
- PERMANITE, Genuine, in box ... **8d.**
- ZINCITE, Genuine, in box ... **8d.**
- EBONITE, Genuine, in box ... **8d.**
- MIXED CRYSTALS (6 kinds) ... **9d.**
- CARBORUNDUM ... **5 1/2d.**
- ZINCITE AND BORNITE, both in box **1/-**
- COIL PLUGS, real ebonite, 1/3, 10/d., and 9/d.
- H.F. PLUG TYPE TRANSFORMER: 1 150 to 450 metres ... **3/0**
- 2 250 to 700 " ... **4/-**
- 3 450 to 1200 " ... **4/3**
- 4 900 to 2000 " ... **4/6**
- 5 1600 to 3200 " ... **4/9**
- 6 2200 to 5600 " ... **5/-**
- EBONITE CONDENSER KNOB AND DIAL **1/8**
- SUPER QUALITY 2-WAY COIL HOLDER ... **5/3**

- VARIABLE CONDENSERS of high quality, With aluminium top and bottom plates. Complete with knob and dial, guaranteed accurate: Vernier ... **4/-**
- .0001 ... **4/-**
- .0002 ... **4/8**
- .0003 ... **5/6**
- .0005 ... **6/-**
- .00075 ... **7/-**
- .001 ... **8/-**
- REAL EBONITE 3-WAY COIL HOLDER **7/9**
- O.B.A. NUTS ... per doz. **4d.**
- DETECTOR ARMS, Ball Joints, Ebonite Handle and Whisker Holder ... **3 1/2d.**
- WOOD SCREW TERMINALS ... each **1 1/2d.**
- SHELLAC ... per bot. **10/d. & 6d.**
- AERIAL PULLEYS, each 10/d., 8/d., 6/d. & 4/d.
- TINFOIL large sheet **4d.**
- COPPER FOIL, 6 in. wide ... per ft. **5d.**
- GRID LEAKS, 2 1/2 and 2 meg. ... each **10/d.**
- FLEX (Twin), various colours, per yd. **2d.**
- CONNECTING WIRE, tinned copper, 20 gauge ... 3 yds. **2d.**
- ENAMEL WIRE, in 1/4, 1/2 and 1 lb. reels: 22 24 26 28 per lb. **2/4 2/8 3/2 3/6**
- Note: Bobbins 2d. each extra.
- POTENTIOMETERS, guaranteed up to 500 ohms, superior make, compact size **7/3**
- CRYSTAL DETECTOR, glass enclosed, fitted on 4 X 2 ebonite panel with terminals for aerial, earth and 'phones, already wired and beautifully finished **4/9**
- VALVE HOLDERS ... each 10/d. & **1/3**
- BATTERIES, H.T. dry: 30 volts, including Wander Plugs ... **5/9**
- 30 volts, including Wander Plugs ... **9/6**
- AMALGO-PLASTIC METAL, for fixing crystals. No Wood's metal necessary **6d.**
- GOLD SEAL PLASTIC METAL, for fixing crystals ... **6d.**
- IVORINE NAME-PLATES, all readings, each 1d., per doz. **9d.**
- EARTH CLIPS, Copper, adjustable, each **5 1/2d.**
- FILAMENT RESISTANCES, smooth action, marvellous value, ... **1/9**
- With engraved dials ... **2/6**
- FILAMENT RESISTANCE DIALS **8 1/2d.**
- THE WONDERFUL TITANIC CRYSTAL SET, stamped B.B.C., including 1 pair of 4,000 ohms headphones, aerial wire, insulators, leading-in wire, lead-in tube, earth clip, etc. Maker's price 3 guineas. Our price ... **33/9**

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# THE THRILL OF DISTANCE

## THERE IS NOTHING LIKE

LISSEN radio frequency amplification for bringing in distant stations. Concerts from many cities come in with a certainty which has to be experienced to be understood.

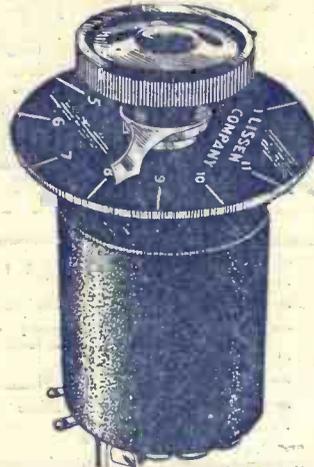
With aerial reaction, always use one stage of LISSEN REACTANCE (Prov. pat.). It obviates the need for using a tight reaction coupling, and brings in the messages of distant stations clear and strong, because there are no peaks and depressions in the amplification range.

Its rapid tuning, ease of handling, simple adjustment and its extraordinary efficiency, have made LISSEN REACTANCE (Prov. pat.) the most widely used H.F. coupling. Every stage added to a receiver gives great range and power. IT MAKES H.F. AMPLIFICATION EXTREMELY EASY.

Takes the place of plug-in coils, inconvenient plug-in transformers, and bulky anode coils. As well as adding great range LISSEN REACTANCE (Prov. pat.) steps up even the loudest of signals almost as much as a good audio frequency transformer.

Diagram with each shows the two easy connections—LISSEN ONE-HOLE FIXING, OF COURSE—switch already mounted dispenses with drilling and soldering.

These prices now bring LISSEN Reactance within the reach of all.



Sold previously for 37/6 and 27/6 respectively. Large production, brought about by greatly increased demand, have now made it possible to sell LISSEN Reactance at

**17/6** for 150-600 metres range, with 6-point switch complete.

**19/6** for 150-10,000 metres range, with 11-point switch complete.

### Successfully used in the Reception of AMERICAN TELEPHONY

LISSEN REGENERATIVE-REACTANCE (Prov. pat.) makes a receiver extremely sensitive. It replaces aerial reaction—is non-radiating—replaces plug-in coils—it is lower in cost than a set of coils to cover the same wide range—it is easier to handle, one knob controls tuning and reaction—reception is often possible with both aerial and earth connections dispensed with—cuts out the local station and tunes in the others with full built-up strength—Continental stations come in easily. Introduced into the anode circuit, it forms an unequalled first stage H.F. Blue print with each shows easy connections—unbroken regeneration possible over the whole range—150 to 4,000 metres.

Complete with internally connected switch—no soldering—LISSEN one-hole fixing, of course.

**£2 : 12 : 6**

Tune always with a Vernier (preferably use the LISSEN VERNIER, barely 1 in. diameter, specially designed for fine tuning in H.F. circuits, 3 1/2 in. long, 12/6).



### A Sentinel beside your Receiver—the LISSENCEPTOR (Prov. pat.)

It stands beside your receiver and acts as an impassable barrier to any unwanted signals and all interference. May be built into a receiver or used outside it without a single alteration in the wiring of any set being necessary. No losses owing to its design and windings. It is, however, important to use a condenser to tune it which has low losses (preferably use the LISSEN-MICA VARIABLE CONDENSER, .0005 capacity, 17/6). Attach this combination to any receiver and—FORGET THE INTERFERENCE.

LISSENCEPTOR, Mark i type, for broadcasting ... 7/6  
 Note the price. " " " " 600 metre traffic 7/6  
 LISSEN ONE-HOLE FIXING—table or panel mounting.



The LISSENCEPTOR intercepts unwanted frequencies.

### LITTLE SWITCHES—THAT "CLICK" HOME

New LISSEN lines—two little switches that are the neatest, handiest little things of their kind—small, easily fixed, robust, positive movement—they "make" with a reassuring "click." No capacity effect at all—contacts which are self-cleaning and which do not short when changing over.

LISSEN plunger type com. LISSEN plunger type build on and off and two SERIES PARALLEL way switch (Prov. pat.) use switch for H.T. or I.T. batteries (Prov. pat.), or for any plain length 2 in., inter-stage 1 in. base, switching—LISSEN length, 1 1/2 in., ONE HOLE FIXING, OF LISSEN one-hole fixing, OF COURSE. Note the price ... 2/9 the price 3/9



### Have you been using the wrong filament control?



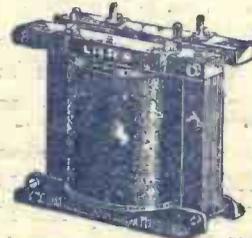
The beautiful stepless, noiseless operation of the LISSENSTAT will be a revelation to you.

See how quiet your valves have now become. Notice how gradually you can increase your valve current. See how quietly your valve lights up, how quietly it goes out. Notice how you can pass such a fractional current through the filament that there is not the slightest trace of a glow in the metal. Here is a control at last which gives perfect tuning adjustment. For long distance work your LISSENSTAT will be essential—it will add range to your receiver in a way you never thought filament control could. The LISSENSTAT saves your valves too. It is easy to fit—goes in between anything. LISSEN one-hole fixing, of course. LISSENSTATS are sold at 7/6

LISSEN variable anode resistance, 20,000 to 250,000 ohms, positive stops both ways. 2/6

Build up beautiful tone quality—the LISSEN T1 transformer has a coil which would amplify by itself without any iron core at all. It should always be used immediately behind the detector valve, price 30/-

Why the LISSEN T2—use a good transformer for the 2nd and 3rd stages—impedance may be lower and ratio higher—the LISSEN T2 is recommended—may be used throughout, of course. 25/-



An excellent light transformer—the LISSEN T3 is one of the best light transformers made. Compares with many expensive transformers because of its skilfully balanced design. 16/6

BUILD WITH ALL LISSEN PARTS—they go together easily—they include everything you need to go behind your panel—THEY ARE THE LARGEST SELLING PARTS.



Correct Grid Potential

Use the LISSEN VARIABLE GRID LEAK—resistance continuously variable, 1/2 to 6 megohms. You can select the exact value of leak resistance. In this way the charge that can accumulate on the grid can be closely regulated so that the free negative grid potential is always at the correct value for the best operation of the detector valve. The LISSEN VARIABLE GRID LEAK gives great sensitivity in some circuits—in others and with some valves variable grid control is not so important.

Positive stops at maximum and minimum resistance. Length 3 1/2 in.—pencil thickness—LISSEN one-hole fixing, of course. Note the price for a LISSEN part 2/6

# LISSEN LIMITED

16-20, Woodger Rd., Goldhawk Rd. SHEPHERD'S BUSH, LONDON, W.12.

N.B.—Close to Goldhawk Road (Met.) Station, Shepherd's Bush (Central London), Hammersmith Tube, Phone 2339 Hammersmith

LISSEN PARTS—WELL THOUGHT OUT, THEN WELL MADE