

COCKADAY'S SET :: WIRELESS PHOTOGRAPHY

READING THE CRYSTAL'S SECRETS

Amateur Wireless And Electrics

Vol. IX. No. 224

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MAKING FIXED
RESISTERS

A USEFUL TUNING UNIT
IMPROVED AERIALS

RHEOSTATS AND POTEN-
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A 5-VALVE COCKADAY
RECEIVER

GETTING RID OF DIS-
TORTION

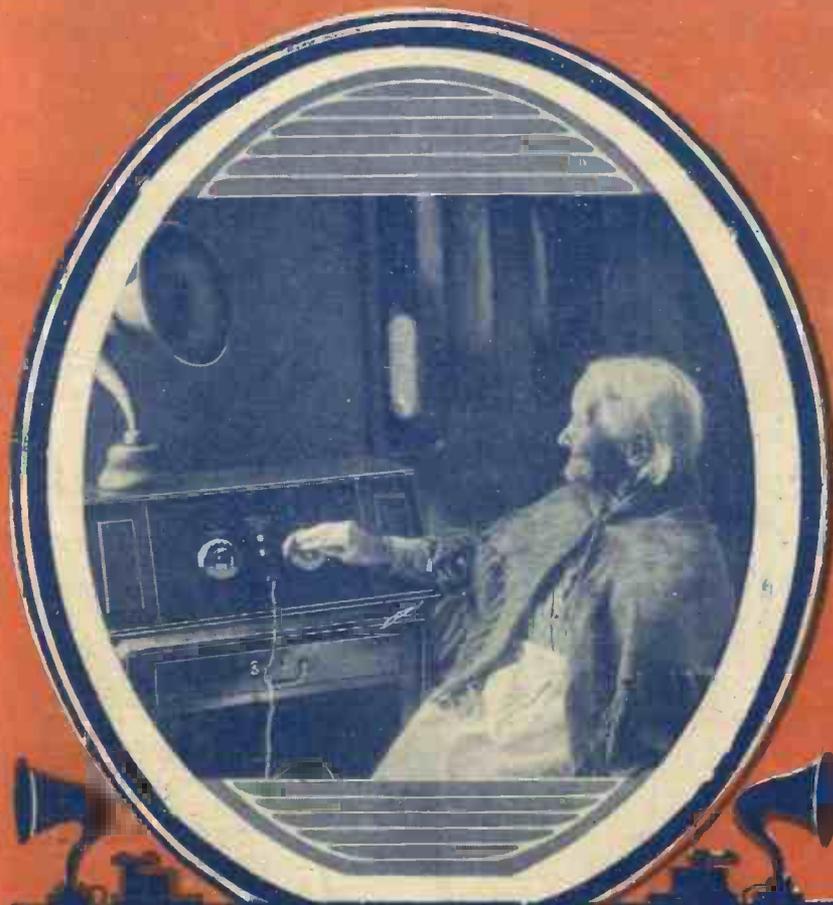
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The Leading Radio Weekly for the Constructor, Listener
and Experimenter

Edited by BERNARD E. JONES

Technical Adviser: SYDNEY BRYDON, D.Sc., M.I.E.E.

Vol. IX. No. 224

SEPTEMBER 25, 1926

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CAN WE READ THE CRYSTAL'S SECRETS?

ON the face of it the crystal detector is one of the simplest things in radio. But in spite of much research and scientific inquiry its secrets still elude us. Everyone knows how it acts as a one-way valve for the electrons. What no one knows is *why* the crystal acts in this manner. Why can electrons pass from crystal to catwhisker (or the reverse), but not in the opposite direction?

Jules and Peltier Effects

Of course, there have been theories galore to account for the rectifying action of the crystal; many of them have been noted in this journal. It has been suggested that the crystal-catwhisker combination constitutes a thermo-couple; that the crystal rectifies because of a thin "skin" upon its surface; that a succession of "Jules" and "Peltier" effects combine to bring about rectification, and so forth.

All these are interesting theories, but none seems to meet the case. Among the latest—and the most plausible in many ways—is that proposed by Mr. A. C. James, of the East London College, and which was recently discussed in the *Philosophical Magazine*.

It is an electrolytic theory, which means that it involves the same general kind of electro-chemical action which takes place when an accumulator is charged or an electric current passed through acidified water. The water thus "electrolysed" is broken up into its constituent gases. Atoms of hydrogen collect at the negative pole and oxygen atoms at the positive pole.

Now galena—which is probably the most widely used mineral as a detector, whether natural or synthetic—consists of lead sulphide, with the formula PbS. It contains lead atoms and sulphur atoms. Mr. James's theory is that the current produces a similar electrolytic dissociation in the galena crystal as in the acidified water; the atoms of lead and of sulphur are driven apart, as are the atoms of hydrogen and of oxygen.

The lead atoms accumulate, he believes, at the point of contact between the crystal and catwhisker. These atoms appear instantly, just as the bubbles of the gases appear immediately the current is turned through water. They may be accumulated, in fact, by a single one-direction pulse of the alternating current; and as more and more lead atoms continue to accumulate in contact with the others, the spot of metallic lead thus formed at the crystal surface affords an easy path for the electrons into or out of the crystal.

This has occurred during one phase only of the current. Suppose now that the current is reversed, the lead atoms would tend to go in the opposite direction. But a number of lead atoms have become attached to the catwhisker, and must be removed. In a sense they must be "dissolved" again in the mass of the crystal, just as some of the active material on the plates of an accumulator becomes dissolved during the discharge of the battery. This removal of the lead atoms absorbs some of the energy of that pulse of current. At the same time some sulphur atoms are left at the point of contact, but, sulphur being non-conductive, no current is passed.

The Complete Cycle

That completes the cycle. There is, of the two phases of current dealt with by the crystal, only one pulse which may pass through from crystal to catwhisker. Thus the detector acts as a one-way valve, and the alternating current impressed upon it emerges as a rectified or direct current.

Mr. James's theory involves the assumption that the lead atoms in a crystal of galena are free to move around through the meshes of a fixed network of sulphur atoms, a point on which we have no definite verification as yet. At the same time there appears no direct evidence to the contrary, while it provides, for the first time, a possible mechanism to explain

(Concluded at foot of next page)

MAKING FIXED RESISTERS

A new component that is coming into extensive use



The Finished Resister.

It is becoming more and more widely realised that with modern dull-emitter valves no fine adjustments of the filament potential are necessary. So long as some means are employed of setting the filament potential at the figure recommended by the makers the valve will give excellent working. The result is that fixed resistances may be used without any loss in efficiency, and this is all to the good, since it means fewer knobs upon the panel, more room behind it, and a distinct saving in the cost of constructing a receiving set.

I have just finished constructing a set of fixed resistances of a particularly handy type that readers will find quite easy to make and most satisfactory to use. The drawing shows a section of a resistance unit (Fig. 1).

The resistance unit consists of a suitable length of $\frac{3}{8}$ -in. ebonite rod threaded with a standard Whitworth die. One end of the rod is inserted into the base of an old flashlamp bulb, the two being clamped together by means of the nuts at either end of a piece of 8 B.A. studding which passes through them. The studding is insulated from the lamp base by means of two thin insulating washers.

Resistance Windings

The windings of the resistance wire lie in the threads cut upon the ebonite rod, one end being secured to the lamp base and the other to the top of the studding. The baseboard mounting is nothing more or less than a flashlamp batten-holder, which can be purchased from almost any electrical shop for twopence. As the cost of making the resistance unit amounts to the same sum, it's cheap enough!

To make the resistance units, proceed as follows: Discover first of all by experiment with a voltmeter the length of wire required to set the filament potential of a given valve at the makers' figure. For dull-emitter valves passing up to .25 ampere of current No. 30 Eureka wire is quite suitable. This wire has a safe load capacity of about .5 ampere and its resistance is a little less than 6 ohms per yard.

The approximate amount of wire needed can be discovered by using the simple rule: resistance equals voltage to be

across the filament legs and gradually reduce the length of resistance wire until you obtain the correct reading.

The Whitworth $\frac{3}{8}$ -in. thread makes sixteen turns to the inch, and each turn allows almost exactly 1 in. of wire to be wound on to the rod. If, therefore, you find that you need 25 in. of wire, your rod former should contain twenty-six or twenty-seven threads. The threaded portion will thus be about $1\frac{5}{8}$ in. in length.

Having put on the thread, cut off a 2-in. length of the rod. It is now necessary to make a hole from end to end with a No. 40 drill. The next process is to remove the base from an old flashlamp. What is to be the lower end of the ebonite rod must now be tapered off so that it may be jammed into the lamp base. Two small insulating washers, one inside and one outside the lamp base, are needed. They can be cut with a pair of scissors from $\frac{1}{16}$ -in. ebonite.

Assembly

Assemble the resistance as shown in Fig. 1, screwing up the two nuts tightly. Solder one end of your resistance wire to the flashlamp base and proceed to wind the rest as tightly as possible into the grooves of the thread. The other end is fixed by means of a nut to the top end of the studding. The resistance is now ready for use in the receiving set.

These resistances will be found extremely handy to use. If a set of different values is made up it is the easiest thing to substitute one for another in the holder. Further, they take the place of filament switches, since a half-turn in an unscrewing direction suffices to put the valve out of action.

J. H. R.

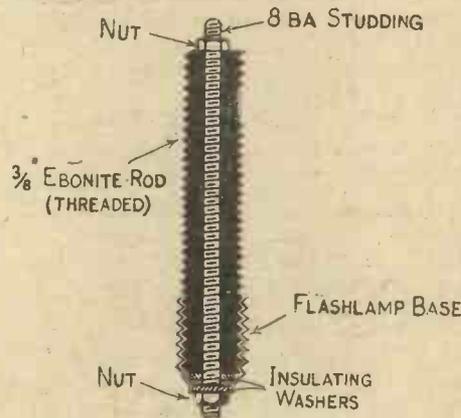


Fig. 1.—Sectional Drawing of Resister.

dropped divided by filament current. If therefore you intend to use a valve requiring .1 ampere at 3.6 volts in connection with a 4-volt accumulator, the voltage to be dropped is 4, which must be divided by .1, the current passed by the valve, and the answer is 4 ohms. You will thus need rather more than 24 in. of wire. Cut off a 28-in. length. Place the valve in a holder and connect one terminal of the accumulator with a piece of copper wire to one of the filament legs. Use your length of resistance wire for connecting the other filament leg to the second accumulator terminal. Now measure the voltage

"CAN WE READ THE CRYSTAL'S SECRETS?"
(continued from preceding page)

the mysterious occurrence of sensitive and insensitive spots on the same crystal surface.

Argentite, which is sulphide of silver, and analogous in many points of behaviour to galena, acts in a similar manner to the latter, except that the movable atoms are of silver, with sulphur again acting as a fixed network. Other crystals, such as carborundum, are thought of as acting in the same general way, due to some electrolytic change inside the crystal.

It might be argued that all this is of little practical importance; we know that crystals rectify, and should be content to leave it at that. But the clue to the crystal's secrets will almost certainly prove the means of bringing about its greater practical utilisation in wireless. "Crystal-clear" is a synonym for the distortionless reproduction towards which every amateur should strive, and it may yet be possible to restore the humble crystal to an honoured position in radio, helped by a better knowledge of the behaviour of its atoms.

A. J. B.

THE "1927 FIVE"

It has no equal. 61 stations—all with ease and speed!
(See page 402)

CARE OF L.T. BATTERIES

NEVER allow your low-tension battery to run too low in order to get the last ounce out of it. A 2-volt cell should not be discharged below 1.8 volts. The life of an accumulator is preserved by charging at frequent intervals.

It should not therefore be necessary at any time to alter the position of filament resistances of the variable type, as when the valves do not function at their best with the resistance properly adjusted the battery needs re-charging.

H. B.

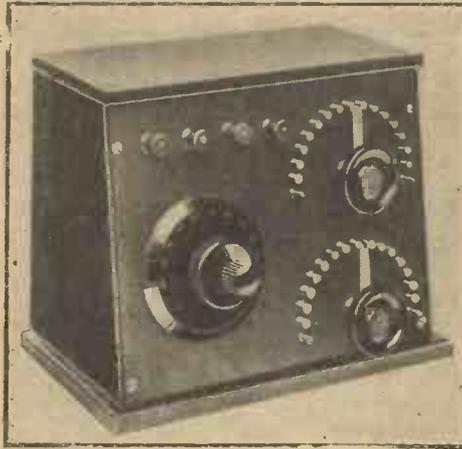
A USEFUL TUNING UNIT

AN INSTRUMENT WHICH REPLACES PLUG-IN COILS

IN designing the tuner to be described, the writer had three particular objects in mind: viz., (1) efficiency, (2) simplicity in construction, (3) small cost.

1. *Efficiency.*—This was obtained as a result of a large number of experiments. When using this tuner on an average receiving set with a .0005-microfarad aerial parallel condenser, all wavelengths between 250 and 2,000 metres can be obtained by operating the uppermost switch on the panel. The lower switch controls the reaction, and owing to the large number of studs, it can be adjusted very finely. A combined variable and vernier condenser connected across the reaction completes an efficient control and obviates the necessity of moving coils.

2. *Simplicity in Construction.*—The average amateur, following the instructions to be given, should experience no



Photograph of Completed Tuner.

- 4 terminals.
- 4 oz. No. 28 S.W.G. copper wire.
- 3 nuts 2 B.A.; 2 countersunk screws 4 B.A. 1/2 in. long.
- 1 1/2 in. screwed rod, 2 B.A.

may vary according to the make of the components. The former can next be made. Set the dividers at 1 3/8 in. and find a centre on the piece of 1/8-in. ebonite so that a full circle can be scribed. Now saw out the circle, keeping as near the mark as possible, and finish with a file.

Three of these discs are required. When complete, a 3/16-in. hole is drilled in the centre of each. Now mark two of these circular pieces for slots as Fig. 2. The slots are made with a hack-saw. Two spacing washers are required. These are made from the 1/4-in. ebonite and are 3/4 in. in diameter, the hole in the centre being 3/16 in. The bracket (Fig. 3) can be made of ebonite, fibre or hard wood. Fig. 4 shows the former complete on bracket.

Assembly

To assemble the former, fix a nut on

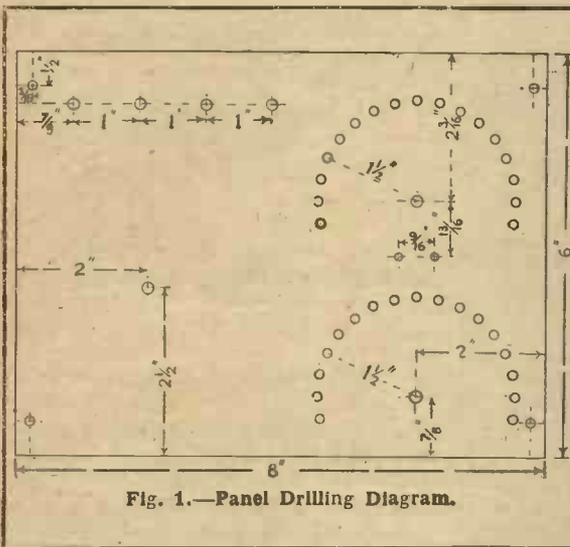


Fig. 1.—Panel Drilling Diagram.

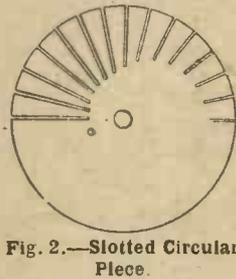


Fig. 2.—Slotted Circular Piece.

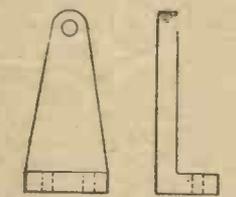


Fig. 3.—Shape of Bracket.

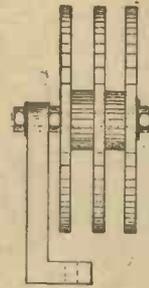


Fig. 4.—Completed Former on Bracket.

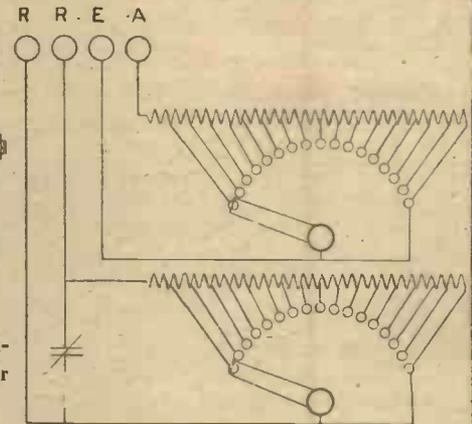


Fig. 5.—Diagram of Connections.

difficulty in construction. The former for the coil windings can be cut with a fret- or hack-saw and finished with a file, no machining being necessary.

3. *Small Cost.*—Compared with the price of plug-in coils to cover the same wavelength band, the cost to make this tuner is comparatively small.

Construction

The following is a list of materials required:

- 1 piece of ebonite 8 in. by 6 in. by 1/4 in.
- 1 ditto 1 3/8 in. by 7/8 in. by 1/4 in.
- 1 ditto 8 1/2 in. by 2 3/4 in. by 1/8 in.
- 2 switch arms 1 1/2 in. radius (30 studs, 4 stops).
- .0003-microfarad variable condenser with vernier.

1 piece of ebonite, hard wood or fibre, to make bracket.

The ebonite panel can be taken in hand first. Mark all centres as shown in Fig. 1. The drilling sizes are not given as they



View of Underside of Tuner.

one end of the screwed rod, then build as follows: Slotted ebonite end, spacing washer, unslotted ebonite, spacing washer, slotted ebonite end. Fig. 2 shows the correct side for the small hole, and both ends of the former should coincide as regards position of small holes and slots. A nut should now be screwed on and all the ebonite pieces clamped tightly together. A piece of screwed rod will be left projecting and will later be used to secure the former to the bracket.

The former can now be wound, starting with the reaction slot (this is the one that was fixed last when assembling). Thread one end of the No. 28 wire through the small hole from the inside and pull through a length of about 7 in. or 8 in. Take the former in the left hand and wind

on 60 turns (the direction can be either clock or anti-clock-wise, but it is important that both aerial and reaction coils be wound in the same direction). Now bring the wire out of the slot nearest the small hole and make a loop about 5 in. long. Take the wire back through the same slot and wind on in the same direction 10 turns. Bring the wire out of the second slot, make a loop as before, then take the wire back through the same slot and wind on 10 turns. Repeat this operation, taking tappings every 10 turns until the last slot is reached, when the wire should be fastened off, leaving a spare length of a few inches. The total number of turns will be 200. The aerial former can now be wound, bearing in mind to wind in the same direction as reaction. Wind on 60 turns and take first tapping, then take tappings every 10 turns until the fifth tapping is taken. Now wind on 20 turns before taking the sixth tapping, and continue to wind 20 turns for each tapping until the last slot is reached. Fasten the wire off, leaving a short length as before. The total number of turns will be 300. Below is a tabulated list of tappings for easy reference.

The bracket can now be secured with a nut to the projecting screwed rod, and the completed former fixed in position on the panel. The connections can now be undertaken. Before soldering the tappings to their respective studs, a wire should connect the earth terminal on the panel, the

bush of the aerial switch arm, and the stud to which the finishing end of the coil will be connected. The beginning end of the aerial coil is connected to the aerial terminal. The tappings on the aerial coil can now be soldered to their respective studs, the last tapping being soldered to the connecting wire already on the stud.

Tappings	Coil Turns	
	Aerial	Reaction
1	60	60
2	70	70
3	80	80
4	90	90
5	100	100
6	120	110
7	140	120
8	160	130
9	180	140
10	200	150
11	220	160
12	240	170
13	260	180
14	280	190
15	300	200

Terminal No. 2 is connected to the moving plates of condenser, and the beginning end of the reaction coil is also connected here. No. 1 terminal is connected to the fixed plates of the condenser, and continues to the bush of the reaction switch arm, also to the stud to which the finishing end of the coil will later be connected. The reaction coil tappings can be soldered now to their respective studs. Reference

to the diagram (Fig. 5) makes all clear. The aerial winding can be seen in the photograph, as a section of the ebonite former has been broken off.

Having completed the tuner, a test can be made. Remove the A.T.I. coil from the receiver and connect the earth terminal on the tuner to the earth plug or socket of coil holder. Connect the aerial terminal on the tuner to the remaining plug or socket of the coil holder. Now remove the reaction coil from the receiver and connect the coil holder plug and socket to the reaction terminals on the tuner.

For a test put both switch arms on about the 4th studs and the condenser all out. Switch the set on, and if it "howls," turn the reaction switch to No. 3 stud. Now tune the receiver as usual and increase reaction with the condenser on tuner. Should the tuner not function properly, reverse the connecting wires on reaction terminals, as the correct position can best be found by trial.

On test, using a .0005-microfarad parallel aerial-tuning condenser, the B.B.C. wavelength band (except Daventry) will probably be obtained on studs No. 3 to 6, both aerial and reaction. Daventry will probably tune on the last stud on aerial switch, and about the 12th stud on reaction switch. The best positions will vary on different receivers, and can only be found by trial.

A number of people who have tested this tuner have found it so efficient and convenient that they have adopted the principle in preference to plug-in coils.

H. STEAD.

AMERICAN "HAMS" IN COMPETITION



Mr. Kilpatrick's Radio Station, 2 E V.

This photograph shows the inauguration of an international competition amongst American "hams" for the best short-wave transmission, using low power. Mayor Walker, of New York, sent a radio message to the world from this amateur station, which is owned by Mr. J. D. Kilpatrick, who is also the "traffic officer" for the test on behalf of the Second District Executive Radio Council and the Radio World's Fair. Mayor Walker's message was sent to the Mayors in every city in the United States, Canada, Mexico and Europe, either directly by wireless or through a relay. Mr. Kilpatrick was "at the key" and standing beside him in the photograph are Capt. George T. Droste, President of the Executive Radio Council, and Mr. G. Clayton Irwin, Jr., General Manager of the Radio World's Fair, which is awarding a silver cup to the winner of the distance test. The numerous cards shown on the back of the transmitter are a good testimony of the station's efficiency.

MAKING USE OF OLD PANELS

IT often seems a pity to scrap an old panel just because it has a few holes drilled in it, but for the sake of appearances we usually have to do so, since, where it is desired to use the panel again for another purpose, the existing holes would be somewhat unsightly.

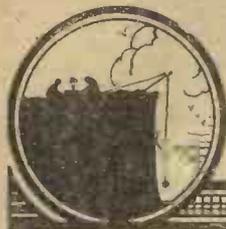
On the other hand, the ebonite is still as useful as a new piece if we could only overcome this little difficulty. A good way of doing this is to cut a piece of black-fibre sheet to a size corresponding exactly with the size of the panel which we are going to make use of for the second time.

Having done this, secure it to the ebonite panel by means of a suitable adhesive, such as Croid or Seccotine, and place it under a flat weight covering the whole of the panel for an hour or two. Drill the holes to be made in the usual manner through the panel just made, having the fibre sheet side uppermost when drilling.

Thus we have that which is apparently an excellent ebonite panel with a dull matt finish, the old holes being hidden behind the fibre sheet.

H. B.

IMPROVISED AERIALS



THIS article is devoted to the consideration of some of the more efficient forms of improvised aerials for portable sets.

If a sufficient length of wire is carried, it is, of course, often possible to erect a temporary aerial on the lines of the usual outside aerial employed as a permanent fixture at home. Besides the necessary wire,

towards the local station may greatly assist in cutting out interference from this source.

The kite aerial is no new idea. In fact, it was used by Marconi in some of his earliest Transatlantic experiments. At the same time, it provides a very simple means of easily erecting an aerial, which in efficiency will be greatly superior to most permanent aerials. Any kind of kite will serve, provided that its surface area is large enough for the purpose in hand. Piano wire is at the same time strong enough and light enough for attachment to the kite, while the disadvantages of its resistance are easily counterbalanced by a judicious use of reaction.

As a matter of fact, a kite aerial approaches more nearly to the ideal, which is a straight vertical wire, than most other aerials, and the range of any set may be greatly extended by its use. It is a matter of no difficulty to design a collapsible form of kite which can be strapped to the case in which the set is carried, so that the portability of the whole outfit is not appreciably affected.

It is not, however, often necessary to carry even a coiled-up aerial about with the set, for various "ready-made" aerials are often available if one only looks around for them. For instance, a fence of the type in which a number of parallel wires are supported by wooden posts can often be used. In dry weather the wires are fairly well insulated from earth, and although the wires are usually of iron they are nearly always galvanized, which means that the conductivity is fairly good.

If the length of the wire chosen (the upper one is, of course, best) is considerable, its capacity to earth will be fairly large. The effective capacity can, however, easily be reduced by using a fixed condenser in series with the lead joining the wire to the aerial terminal of the set. A diagram showing the suggested arrangement is given above. The capacity of the condenser, which may be fixed, can be anything from .0003 to .001 microfarad.

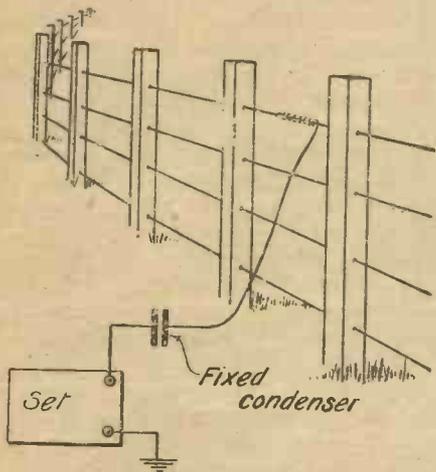
Any conducting body which is insulated from earth may be used in the same way. As another example, good results can often be obtained when using the corrugated-iron roof of a wooden building as an aerial, and many other instances will doubtless occur to the reader. The series condenser should always be used when the capacity to earth of the "aerial" is large.

The use of a tree as a support for one end of an aerial has already been referred to, but the trunk of the tree itself can often

be used as a collector of energy radiated by a transmitting station. To do this two copper nails, provided with terminals, should be driven into the tree, one as high up as possible and the other near the roots. The higher nail is to be connected to the aerial terminal of the set and the lower one to the earth terminal.

The interior of a growing tree is moist, by reason of the sap it contains, and is a partial conductor of electricity. The foliage and upper portion of the tree collect the energy from the ether, and oscillatory currents flow in the trunk which connects the upper part of the tree with the ground. The trunk, therefore, partakes of the nature of the down-lead of an ordinary aerial. There will be a fall in potential along the trunk proportionate to its H.F. resistance. Therefore there will be fluctuating differences of potential at the points where the two nails have been driven in, and these will be communicated to the set via the connecting leads. This arrangement is illustrated below.

Though the above forms an interesting experiment, the efficiency of the arrangement is not great. When really efficient reception is required, a good "earth" is, of course, quite as important as a good aerial. It is well known that a counterpoise is one of the best "earths," and this, when one is not restricted as to space, will not often present any difficulty. Very good results indeed may be obtained with most of the aerials just described if a



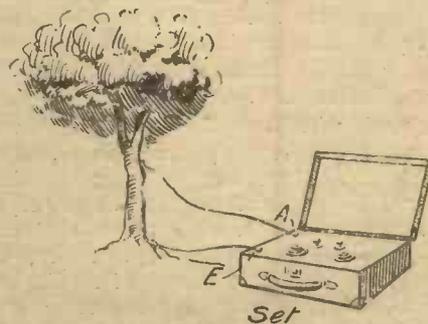
A Wire Fence as an Aerial.

all that is required is some means of supporting one end of the aerial at a fair height above the ground. As a tree, building, haystack, or similar object can usually be found, there will seldom be any necessity to carry a jointed pole.

There is the problem of raising the free end of the wire to the point of attachment, but this will generally be solved readily by some active member of the party volunteering to climb the tree, etc., to which the aerial is to be fastened.

If this is out of the question, a strong cord with a weight at the end may be thrown over the object and used to haul up the aerial wire to the desired height. A useful dodge is to carry a catapult and "shoot" a large nut, with the cord attached to it, through a fork in the tree or over the roof of the building, as the case may be. Care should be taken, however, that the weight does not descend on to the unsuspecting head of some innocent wayfarer, or complications may arise!

As aerials erected in this manner will usually be rather low and make up in length what they lack in height, their directional properties will be worth while considering. For maximum results from any station, the free end of the aerial should point directly away from it. On the other hand, pointing the free end to-



A Tree Trunk Used as Aerial and Earth.

length of insulated wire is laid along the ground immediately beneath the aerial.

If it is not desired to carry such a wire, connection can be made with the ground in the usual way. An earth-tube, which may either be purchased as such or consist of a short length of brass or copper tubing, may be carried with the set and driven into damp ground at the spot selected for reception.

J. F. J.

RHEOSTATS AND POTENTIOMETERS

THEIR PURPOSE IN A SET

Theory

EVERY valve receiver requires at least two electric batteries for its operation, while some require three. Some crystal sets also depend upon the assistance of a single battery. In order to produce the necessary flow of electrons from the fila-

ment a relatively large current for this purpose. Bright-emitter valves, for instance, require, on the average, a current of about .7 ampere, and since dry batteries are incapable of supplying a current of this size, it is necessary to use accumulator batteries for the purpose of heating the filaments of bright valves.

The majority of dull-emitter valve consume a current of about .35 ampere, and these also must be heated by accumulators. Dull-emitters, which only require a current of .06 ampere, can be heated by dry batteries.

As the reader is aware, the strength of

a current is always proportionate to the resistance of the circuit in which it flows. In order to vary the strength of a current, therefore, it is only necessary to connect a variable resistance in series in the circuit, as shown in Fig. 1. The arrowhead at A represents a sliding contact which can be moved up and down the resistance wire RW so as to include any desired amount of the latter in the filament circuit.

In dealing with the grid circuit of a valve, however, it is not the current, but the *voltage*, that matters. Whether grid control be required for the purpose of rectification or amplification, it is the voltage on the grid that must be regulated, and this cannot be done by connecting a resistance in series with the grid.

The voltage on the grid is controlled by a battery and resistance to it as shown in Fig. 2. It will be seen that a resistance RS is joined directly across the battery, the grid being connected to the positive end of the latter. A sliding contact A connects the filament to the other end of the circuit. Now the whole voltage of the battery is across the resistance RS. If the battery is a 4-volt one, for instance, there will be a pressure of 4 volts at R and a pressure of zero volts at S. Between these two points the voltage drops gradually in proportion to the resistance. That is to say, if the resistance between R and A is three-quarters of the whole resistance, the voltage between R and A will be three-quarters of the total voltage (3 volts in this case), since the total voltage is 4. Thus the voltage on the grid can be varied by moving the sliding contact up and down the resistance, so obtaining fine variations of voltage.

Practice

When a resistance is used for varying the current in a circuit it is called a rheostat, and when used as a means of controlling the voltage it is called a potentiometer. In the former case the resistance is connected in series with the battery and the other items that comprise the circuit, whereas in the latter case it is connected in shunt across the battery that supplies the potential. These instruments provide accurate means of varying the current or voltage of a circuit by extremely minute amounts. Sometimes, however, very accurate adjustments are not essential to good results. For instance, when applying a biasing potential to the grid of a low-frequency amplifying valve, it is not necessary to use a potentiometer for the purpose, although some amateurs prefer to do so. The usual method is by inserting one, two, or more cells, as required, in series with the grid. The voltage applied to the plate from the high-tension battery is varied in the same way. This battery usually consists of a number of dry cells connected in series, and by means of a wandering lead any proportion of this number can be connected in the circuit.

When the grid potential is being controlled for purposes of rectification, on the other hand, the voltage value is critical and a potentiometer is necessary. And a potentiometer is also required for use with

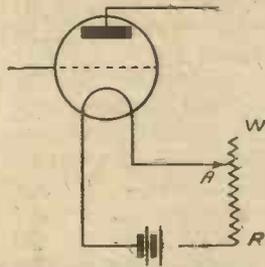


Fig. 1.—Use of Filament Resistance.

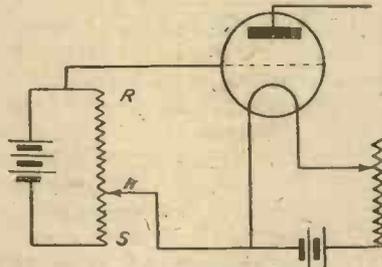


Fig. 2.—Use of Potentiometer for Control of Grid Voltage.

ment of a valve, a current of electricity must be passed through the filament in order to bring it to the requisite temperature at which electronic emission takes place. An accumulator, having a pressure of about 2, 4 or 6 volts, is commonly used for this purpose.

Another battery is essential for the purpose of applying a steady pressure to the plate of the valve, so that when the electron stream makes the valve conductive a current of electricity is drawn from this battery. The latter usually takes the form of a number of dry cells connected in series. A third battery may also be used for controlling the potential of the grid, either for the purpose of rectification or as a means of applying grid bias to a low-frequency valve. And lastly, with regard to crystal sets, certain crystals work better when a small pressure from a local battery is applied to them.

Now it will be realised that all valves do not require exactly the same amounts of current or pressure in order to fulfil their different functions; nor do all crystals require the same amount of local pressure. It is necessary, therefore, to provide some simple means of regulating the electrical supply to the various elements of a valve (or crystal). This is done by using variable resistances, though the manner in which these resistances are connected up in the circuit depends upon whether they are required to regulate the *current* or the *voltage* circuit. Their size and shape, it should be added, depend upon the same factor.

It has already been said that the purpose of passing a current through the filament of a valve is to heat the filament to a certain temperature. Most valves require

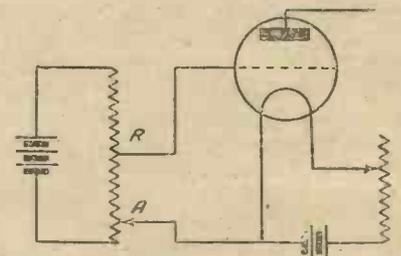


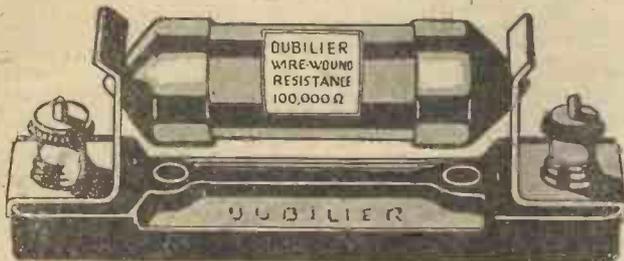
Fig. 3.—Method of Applying Negative Potential to Grid.

crystals which cannot operate effectively without the aid of a local potential, such as carborundum. It will be seen that it contains a number of turns of fine wire wound round on an insulated slab, and fitted with a sliding contact on a brass bar.

Referring to Fig. 2 again, it will be seen that, whatever the position of A, the potential applied to the grid will always be positive owing to the way in which the connections to the battery and potentiometer are made. It is often necessary, however, to apply a negative potential to the grid, and this can be done by revers-

(Continued on page 426)

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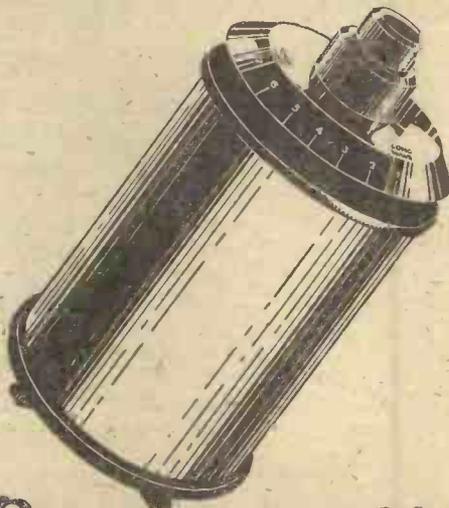
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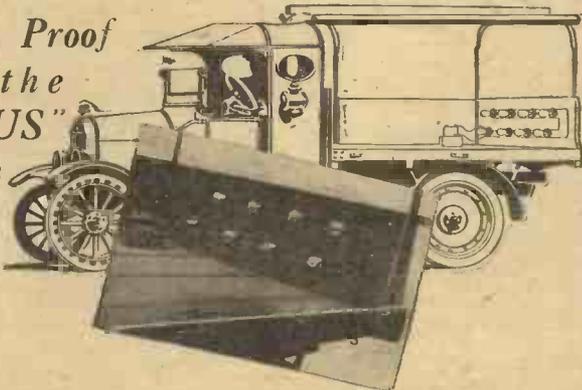
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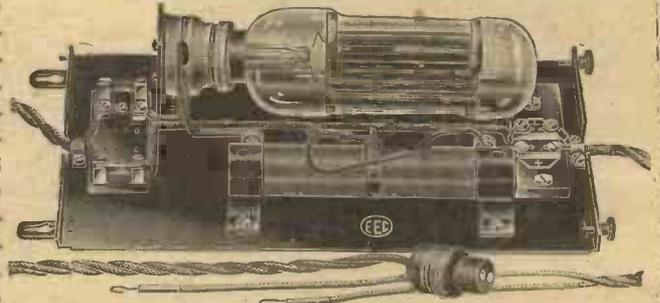
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On Your Wavelength!

A Record

THIS year's Wireless Exhibition very easily broke all records as regards both attendance and business done. Actually the numbers who visited the show during its first week were considerably greater than those recorded during the whole run of last year's Exhibition. Olympia is a big place in which it takes a great many people to make anything like a crowd, but every time I went to the Exhibition I was much impressed by the throngs moving about in the gangways and clustering round the stands like flies round honey-pots. Most firms report that business at the Exhibition was phenomenally good, and in quite a number of cases the entire output of factories up to Christmas time was booked up by orders.

Yet only a few weeks ago the editor of an important lay paper told me solemnly that he did not think that the public now took much interest in wireless! As a matter of absolute fact, there are no signs whatever of any slackening interest; the boot is quite on the other leg, for interest is not only being well maintained, but is increasing daily. Local retailers tell me that they have never done such a large amount of business in wireless goods so early in any previous autumn.

Signs of the Times

One of the most encouraging symptoms of the growing interest in wireless is to be found in the amount of reception that is now done during the summer time. In previous years heaps of people put their sets out of commission altogether almost as soon as they had set their clocks forward (or is it back?—I never can remember) in accordance with the daylight-saving regulations, and did not make much use of them until the clock was put back, or possibly forward, again. This summer, in nearly every house that I have been in, the wireless set has been in regular use; and, what is more, I find a growing number of people taking up long-distance work. This is, I think, partly due to the fact that Frankfurt and Hamburg, owing to their increased output, are now so powerful that they are considerably easier to pick up than some of our own main stations.

The veriest tyro operating a reasonably good set can, in fact, tune in either of them without much trouble. As soon as people realised that they could get a couple of foreign stations, they immediately wanted more, and proceeded to get them. All through this summer it has been possible to tune in on any evening quite a large number of Continental stations, and any amount of people have

been trying their 'prentice hands at DX work with surprising success. To do good work among the distant stations one must have a set that is easy to operate as well as being sensitive and selective. New-comers, having received their first bite from the "DX bug," soon realised that their existing sets were not quite good enough, and the result has been a great deal of rebuilding and replacement—hence the trade in components that has been done both locally and at Olympia.

Americans Good

If you do not mind sitting up until about three o'clock you are pretty sure just now, with a sensitive receiving set, to hear some of the American stations. I have been able so far to identify four that have come my way, and I have heard one or two others whose call signs I could not get. The identified stations are W J Z on 454.3 metres, W G Y on 379.5 metres, W B Z on 331.1 metres, and W P G on 299.8 metres. The fact that the Americans are coming in so well and so early in the season seems rather to discount the theory that last season's failure was due to the prevalence of sun spots. Old Sol is still suffering from his outbreak (which possibly accounts for the prevalence of atmospherics this summer), but here are the Americans with us once more. I have not the least doubt that we shall hear any number of them between now and Christmas. Then why did not we hear them last year? There must be some good reason for it, but so far I have met no one who has discovered it.

A Popular Component

If there were any doubt about the growing passion for long-distance work, proof of its existence would be found in the enormous number of slow-motion condenser dials that are now being sold. We do not require such things on a crystal set, or even on a valve set that is used for receiving only the local station. Their only real usefulness is on the multi-valver of the selective type which is suited for DX work. The fact that they are being sold in such numbers shows that increasing interest is being taken in the reception of far-away transmissions. Do not forget when you are purchasing these components that there is an old proverb to the effect that all is not gold that glitters; there are slow-motion dials and slow-motion dials. The only genuinely useful type is that which gives a perfectly smooth movement of both actuating knob and dial, and enables very fine readings to be taken. If on turning the knob very slowly you find that there are certain stiff places in

its travel, then the component is one of the "and" variety. Fit it to your set, and your hair will rapidly turn grey, for just as you have nearly got the desired station you will reach a stiff place and the dial will suddenly jump a degree or two. As you turn back in an attempt to recover the transmission, all goes well until the critical moment is reached, when there is another jump in the opposite direction. The type I like best is that which has a dial marked off into a hundred main divisions, each of which is subdivided into two. The dial moves behind a little celluloid window upon which is a fine hair-line. With such an instrument you can read quite easily to a quarter of a division, which is equal to rather less than half a degree on a 180-degree dial. Since most 180-degree dials are marked off only into 2-degree divisions, it is difficult to get anything like close readings with them.

The Big Concerts

I am very enthusiastic over the B.B.C.'s scheme for giving us big concerts this winter. Transmission has reached such a pitch of perfection nowadays, and up-to-date receiving sets and loud-speakers have kept pace so well with the progress made in the technique of broadcasting, that it is now really worth while to send out the very best of music. Again, transmissions from a big concert-hall always sound very much better than those from the draped and comparatively small studio. There is a depth and a tone about them that one rather misses in those from the "padded cell." Last, but not least, I am sure that these concerts will do a very great deal to increase the popularity of wireless. When you come to think of it, a ten-shilling licence would not be dear at the price if it included free admission *via* the receiving set to these concerts and nothing else.

A Slight Delay

The new wavelengths are not to come into force until about October 15. Personally, I am very glad that this course has been taken, for the whole success of the scheme depends upon its provisions being faithfully carried out by every station, and it would have been a thousand pities if it had not been given a fair chance, as would have been the case had it been brought into operation in September. I am very curious to see what happens when the new wavelengths are adopted, especially in the matter of heterodynes. Some experts maintain that there will still be heterodynes between neighbouring transmitters if the receiving set is at a great distance from them.

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On Your Wavelength! (continued)

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Personally, I rather doubt this, for there are many stations working on the present wavelengths with less than a 10-kilocycle interval between them which do not heterodyne one another. In some cases a heterodyne can be detected if one tunes to a point midway between the two wavelengths, but there is no sign of it when either station is properly tuned in. One little tip, by the way, with regard to heterodynes may be useful to D.X. workers. If you find that a station when picked up is suffering from a slight heterodyne, you can often get rid of it almost entirely by tuning either slightly above or slightly below the station's true wavelength—it all depends whether the interferer is on the upper side or the lower.

Autumn is Here

Autumn, in the wireless sense at any rate, is really with us now, and stations that have not been heard for months are coming in well, whilst the old stagers have worked up to twice or three times the strength that they had some weeks ago. There is also a blessed diminution in atmospheric interference, which has been more persistent and more violent this summer than in any previous year that I can remember. There has, in fact, hardly been a night since the beginning of April when crackles and fizzes were not about. The number of Continental stations now to be found by the operator of a set with a single high-frequency stage is now a very large one indeed, as you will find if you start at, say, 350 metres and work slowly either upwards or downwards.

We really ought not to call Dublin a foreigner, though he comes under that category in the lists, since he is not a B.B.C. station. His transmissions are coming in extraordinarily well just now, and if you have not heard him you should certainly try for him. He is not at all difficult to find provided that your set is reasonably selective; you will pick him up about half-way between Hamburg and Newcastle. Another station that I would recommend for your attention if you do not live right under 2 L O's aerial is Oslo, which is amazingly well heard in this country. Curiously enough, three of the strongest Continental transmissions come to this country after travelling overland for almost the whole of their journey. These are Barcelona, Rome and Milan. If you care to take a map and lay the edge of a ruler upon your own town and any of these three stations, you will find that the only water that they cross is the English Channel or the Straits of Dover. Further, the great mountain masses of the Pyrenees or the Alps lie between them and this country. I hear, by the way, that Rome's old 1.5-kilowatt transmitter is being re-erected at Venice; it will be interesting to see how its signals reach

this country when it commences to function.

Instruments for All

Some months ago I remarked upon the fact that very few amateurs appeared to realise that one or two instruments are essential to the equipment of the careful experimenter. As a result of those comments I heard remarks that tended to show that whilst many appreciated the value of accurate measurements for careful and conclusive work, yet just as many could not afford the capital outlay necessary for the purchase of meters, and hence were dependent upon results which could only be repeated by guesswork.

Since those remarks one or two very excellent combination instruments have appeared on the market. One which particularly appeals to me is a meter recently advertised in AMATEUR WIRELESS which caters for all the wants of the amateur, inasmuch that it will measure H.T. volts, L.T. volts, plate milliamps and filament current. Good approximate resistance values may be obtained by the aid of the instrument plus a few H.T. batteries, whilst if a constant source of potential is available, such as D.C. mains, really accurate results may be obtained without the need of very great technical skill or ability.

On the Short Waves

I do not think that the average broadcast listener realises the value of a short-wave receiver and the amusement which can be obtained from it. There are many amateurs who are using increased power and working speech on about 45 metres. This can be heard over incredible distances considering the small amount of power used when compared with the broadcast stations, and I know one or two enthusiasts who have made a hobby of listening for these stations and sending them reports, in return for which they receive the transmitter's card, known as a Q.S.L. card. These cards are of various designs, each transmitter doing his best to produce something really striking.

It is interesting to look over some of these collections, for they are standing proof of the owner's ability to receive on short waves. The scheme makes an interesting and absorbing occupation for the winter nights, and interest never flags. Short waves are subject to such strange freaks that a station in Australia or New Zealand may be as loud as your local broadcast station. Far more skill is required for this short-wave reception than for ordinary long-distance broadcast reception, and an advantage is that you are not likely to interfere with your neighbour with your oscillating valve. Another advantage of the short-wave receiver is that excellent results are possible with no

earth and a small indoor aerial, and after 11.30 p.m. G.M.T. several American broadcasting stations may be heard with the greatest ease.

Home-made Atmosphericics

Testing a newly-built and very sensitive short-wave receiver the other day, I was puzzled by an alarming crackling and fizzling, which sounded like an intermittent short somewhere in the wire. I tested out everything, item by item, and could find nothing wrong at all in any of the components. Then I changed the H.T. battery, which had previously been tested with a high-resistance voltmeter and found to be very well "up." The noises ceased. I had wasted at least three hours because I had been foolish enough to use a cheap foreign dry battery when there was a perfectly good H.T. accumulator which only had to be shifted from another set! A week or so later this same new set, which had been put into regular commission, developed occasional small clicks, sometimes coming in little bunches and sometimes at intervals of a second or so. The only thing that had been changed since the set had been behaving itself was the L.T. accumulator, so I put a low-reading voltmeter across the detector valve. The needle was giving a regular little dance, twitching about sometimes as much as a tenth of a volt. Listening whilst watching showed that the noises and the movements of the voltmeter needle coincided.

"Crackle"

Then I thought I would do a little experimenting. First of all I connected the faulty H.T. battery in the detector and H.F. circuit of an excellent four-valve broadcast set, having first ascertained that it was a quiet afternoon, with no atmosphericics at all. When the loud-speaker was switched on I got atmosphericics all right! As much as 4 microfarads shunted across that faulty battery did not cut them out completely, though they were considerably reduced. When I was tired of the row being given out by the loud-speaker, beautiful "grinders" and crashes in the proper atmospheric style, I put back a good H.T. battery, restored the set to its normal good behaviour, and then replaced one of the L.T. accumulator cells with the faulty cell. But still there were little noises. Every now and again there would be a louder crackle, just as though a storm was coming up from a distance. It was quite enough to spoil the perfect enjoyment of listening. Every now and again put a voltmeter across the accumulators when they are on load. Whatever the voltage recorded, it should be absolutely steady. The slightest movement of the needle means noises.

THERMION.

THE COCKADAY FIVE-VALVE EXHIBITION SET

Specially designed for "Amateur Wireless" by Laurence M. Cockaday, the inventor of many well-known circuits

In last week's issue photographs, circuit diagrams and general description of this set were given

THE parts required for assembling the set are stock parts obtainable from all good dealers, and are all the products of well-known manufacturers. The following is a list of the components you will need:

and parts list makes identifying the various instruments easy. The drilling of the panel is not difficult because, counting the double variable condenser as one, there are only three instruments to mount on the panel.

The use of amperites to control all filaments except that of the detector valve simplifies the front panel. On the left-hand side of the panel the aerial-tuning condenser is mounted first, the rheostat in the middle and the dual

condenser on the right. On one strip the aerial and earth terminals are mounted and the strip screwed to the back edge of the baseboard at the right-hand corner (looking at the back). The larger terminal strip carries the battery terminals and the jack.

With regard to the construction of the special coil, this is wound on a cardboard or ebonite former $3\frac{1}{2}$ in. in diameter and $3\frac{1}{2}$ in. long. A winding of 90 turns of No. 24 gauge d.c.c. copper wire tapped at the 45th turn is wound on the former in an even layer, and a small loop is made for the tapping and brought through a small hole made in the former to the inside of the latter. Both ends of the coil are secured by threading through holes made in the former. After the winding is completed the coil is covered with a sheet of celluloid, which is kept in position by sealing the edges with amyl-acetate, so that the celluloid sheet fits tightly round the coil.

When the winding is completed the coil is mounted on a small metal bracket and screwed to the baseboard.

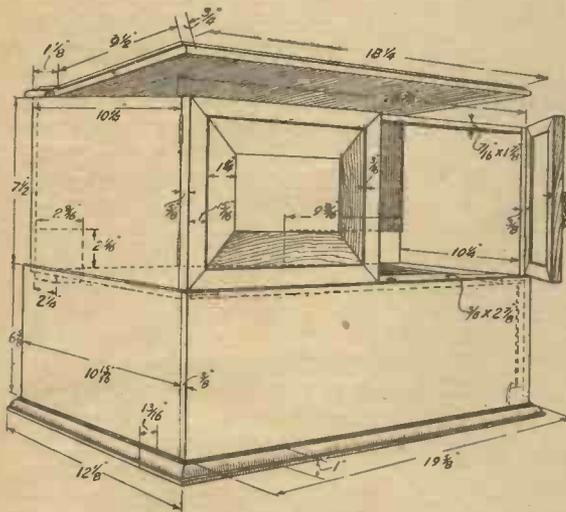


Fig. 4.—Details of Cabinet.

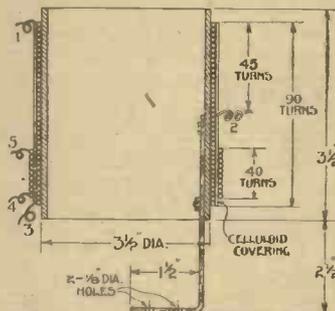


Fig. 2.—Constructional Details of Special Coil.

Fixed coil holder for coil A (Athol); G, .0005-microfarad variable condenser (Igranic); E, F, dual type condenser, .0003 mfd. each set (Igranic); two dials (Igranic Patent Microvernier); P, filament rheostat (Igranic); J, L.F. transformer (Ferranti); K, L, M and K2, L2, M2, two resistance-capacity coupling units (Metro-Vick Supplies); three anti-microphonic valve-holders (Lotus); I, 2-megohm grid leak, and H, .00025-microfarad condenser (Dubilier); 10 engraved terminals (Belling-Lee); ebonite panel, 18 in. by 7 in. by $\frac{1}{4}$ in. (Peto Scott); terminal strips, $9\frac{1}{2}$ in. by 2 in., and $2\frac{1}{2}$ in. by 2 in. (Paragon); cabinet (J. O. Venner of 22 Denmark St., W.C.2); S, four-point jack for inserting loud-speaker and breaking filament supply to all valves (Bowyer Lowe); baseboard 18 in. by $7\frac{1}{2}$ in. by $\frac{1}{2}$ in. thick; four automatic filament resistances, O1, O2, O3 and O4 (Amperites).

Unconventional Components

The inductance of the coupling coil and the capacities of the dual variable condensers are all unusual, and though the experienced experimenter may secure good results and considerable pleasure from approximating the circuit with other parts, he should not judge it in comparison with other circuits under those conditions.

The use of identical letters in the text

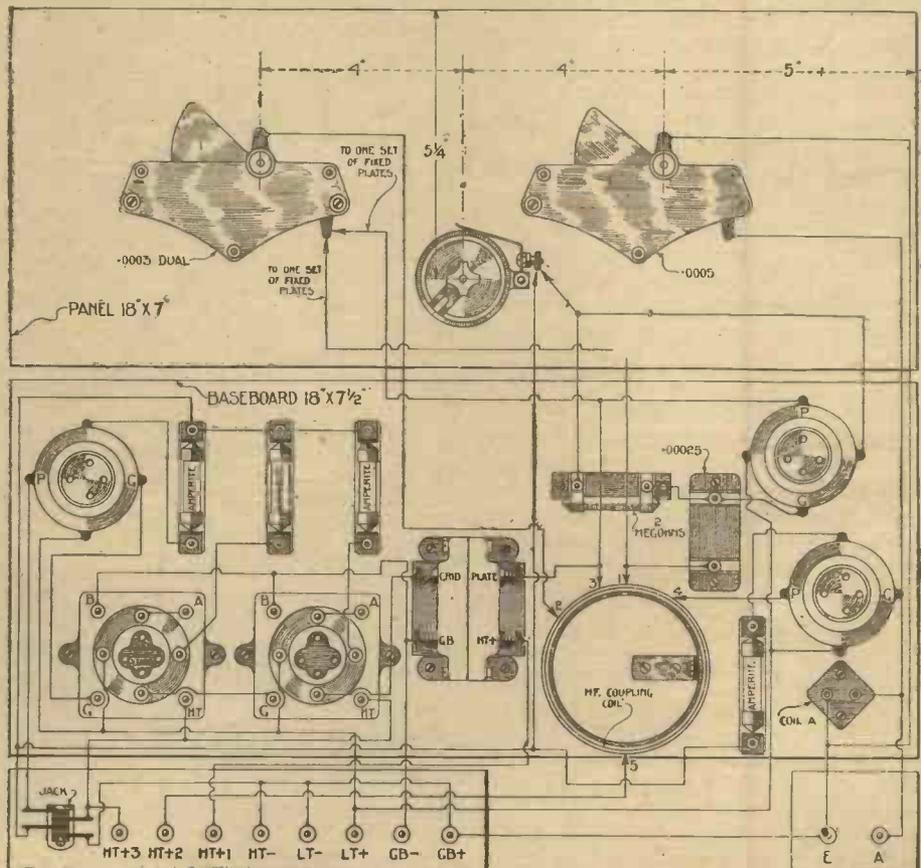


Fig. 3.—Developed Wiring Diagram.

WIRELESS PHOTOGRAPHY FOR EVERYBODY

Details of the System devised by T. THORNE BAKER, F.Inst.P., F.R.P.S.

"A.W.'s" ADVISER IN TELEVISION AND KINDRED SUBJECTS

WHEN one learns that no less than a thousand installations for electrically transmitted photographs are in course of preparation for newspapers in the United States the established position of the telegraphed picture must be fully admitted.

We are on the eve of big events in this country too. For not only has the first photograph now been sent by wireless from America to England by Captain Ranger's system, but photographs have also been transmitted by the writer's little broadcasting instruments over distances of twenty miles, and every hope is entertained of being able to inaugurate some sort of picture service for amateurs in the near future.

The Principle

The principle of this system of transmission is extremely simple. A photograph consisting of lines printed with an insulating ink upon metal foil is used in the transmission. This photographic foil is attached to a cylinder which is revolved by a small clockwork motor, while a steel needle attached to an arm traces over the surface. The insulating lines of which the picture is composed intercept the metallic contact between the needle and the metal base of the picture. A small piece of one of these pictures, much enlarged, is seen in Fig. 1. It will be noticed that the lines narrow or widen out in places, the light parts of the photograph are composed of narrow lines, the dark parts of wide lines, so that as they travel beneath the needle they interrupt the contact for long or short periods which correspond with the light and dark parts of the photograph. There is no secret about these line pictures; they are easily made by means of the process engraver's camera, and can be prepared from any photograph in a few minutes.

The needle and cylinder of the transmitting apparatus are connected to the two sides of a condenser in an oscillating circuit, the latter ceasing to oscillate for the periods during which the needle, coming between two consecutive lines, rests in contact with the metal base and so shorts the condenser.

The arm carrying the stylus is mounted on a carriage, which is made to travel

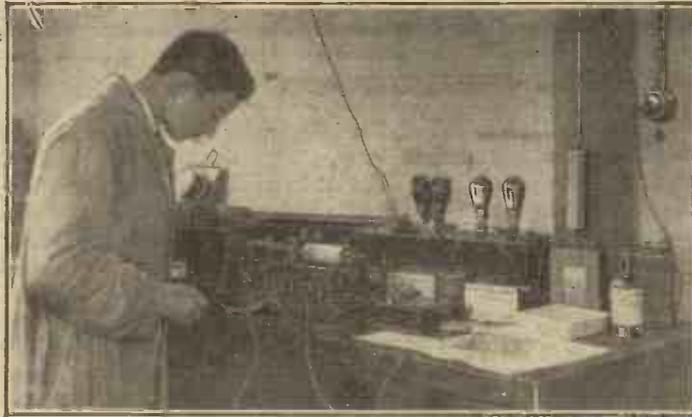


Fig. 3.—The Thorne Baker Photo-telegraphic Apparatus.

laterally parallel to the cylinder, so that the needle traces a spiral path over the surface of the photograph as it revolves. The mechanism by which this is accomplished is as follows: The cylinder (see Fig. 2) is mounted on a steel shaft cut with a thread of $1/75$ th inch pitch; to one end of the carriage is attached a hardened steel knife-edged wheel which travels in the thread; as the shaft revolves the knife-

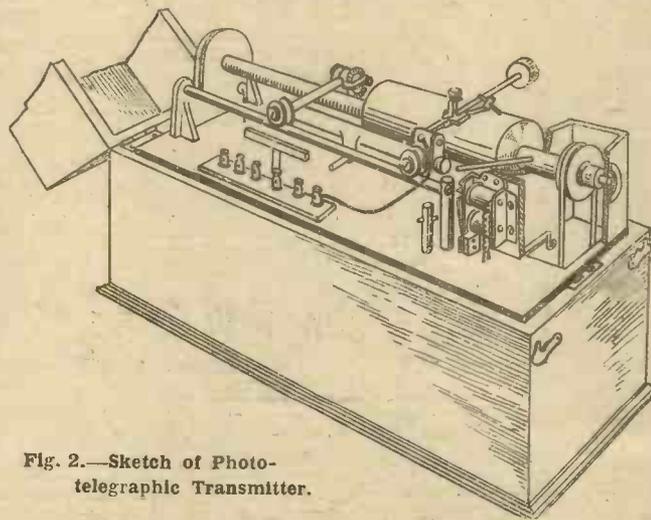


Fig. 2.—Sketch of Photo-telegraphic Transmitter.

edged wheel thus travels along its length, and so gives to the stylus its lateral motion along the cylinder.

The receiving instrument is made on

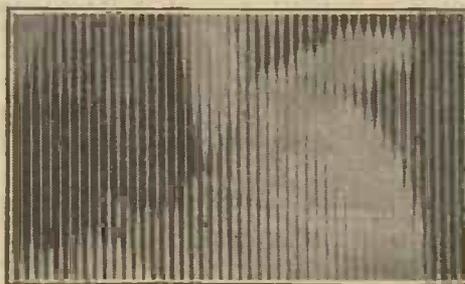


Fig. 1.—Magnified Photograph of Photo-telegraphic Foil.

precisely the same lines, and differs only from the transmitter in that a platinum needle is substituted for the steel one. A piece of paper very much akin to the pole-finding variety, only vastly more sensitive, is wrapped round the cylinder and moistened. The current from the receiving set (of two or more valves) is applied to the instrument, the positive terminal being connected with the platinum needle. Each time a signal is

received from the transmitting station current flows through the paper and leaves a chemical mark. Long and short signals produce large and small dots respectively on the paper, and in this way, when the needle has traced over its entire surface, it has reproduced an image of the original photograph. The apparatus is seen in Fig. 3 in the form in which it has been made for amateur use.

The great obstacle which held up a practical solution of wireless photo-telegraphy for so many years was to discover a method of keeping the cylinders of the two instruments running at exactly the same speed—an essential condition for success. This is accomplished in the writer's apparatus with the aid of a *one second* pendulum. The cylinder is rotated in rather less than one second, and at the end of a complete revolution it is stopped dead by means of a pin on the periphery which strikes against a small check attached to an armature. The pendulum is made to strike a contact at the end of each complete swing—that is, at the end of each complete second,

and this contact closes a circuit which energises a small electro-magnet that attracts the armature, releases the check, and thus allows the cylinder to start a fresh revolution. Provided the pendulums of the two machines are accurately adjusted, the cylinders can be made to rotate in extraordinarily precise synchronism.

The transmission of a photograph is carried out in two and a half minutes. A few morse or other signals are given first, so that the receiver can see that his needle is marking properly. At a given signal from the transmitter the motors are started, the pendulums released, and the telephones switched over to the machine circuits.

T. T. B.

S.P. 18 RED.

A real two-volt power valve. Designed specially for low frequency amplification. Should always be used in last stage for operating loud speaker. It is also suitable as a detector.
 Fil. Volts: 1'6.
 Amps.: '3.

PRICE 14/-

S.P. 18 GREEN.

A high amplification valve having a moderate impedance. Designed as a high frequency amplifier and as a detector. Also suitable for resistance, choke and transformer coupling (except last stage, where an S.P. 18 Red should always be used).

Fil. Volts: 1'6.
 Amps.: '3.

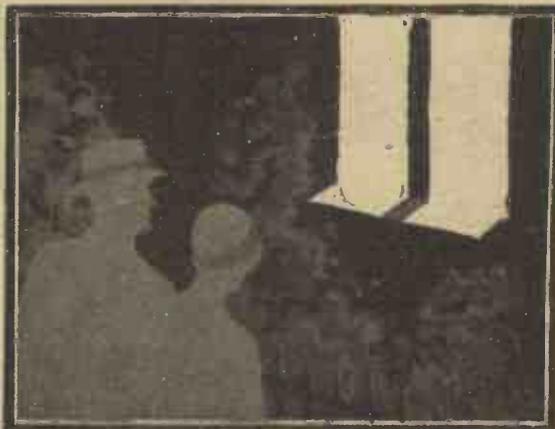
PRICE 14/-

S.P. 18 BLUE.

Extra high amplification valve. Designed for resistance capacity, choke and early stages of transformer coupling. Excellent as a detector or tuned anode H.F. amplifier.

Fil. Volts: 1'6.
 Amps.: '09.

PRICE 14/-



The Jones's become famous

THE OTHER NIGHT wonderful music came from the Jones's house. Passers-by stopped and listened. Could it be Radio? No, each one decided, Radio could never be as lifelike as this.

So the Jones's became famous in the neighbourhood as a talented family. But all the time it was radio—the Jones's set had been equipped with

BENJAMIN
SHORTPATH
RADIO VALVES

Anode and filament are very close together and therefore the Electrons traverse a very short path. This increases amplification. A specially designed filament consumes less current. Tone is improved. Ask your dealer or write for descriptive leaflet giving curves.

THE BENJAMIN ELECTRIC LTD.,
 Brantwood Works, Tottenham, N. 17.

D.E. 55.

A very economical general purpose valve. For high frequency, detector and low frequency (except last stage, when the S.P. 55 Red should always be used.)

Fil. Volts: 5'5.
 Amps.: '09.

PRICE 18/6

S.P. 55 BLUE.

Extra high amplification valve. Designed for resistance capacity, choke and early stage transformer coupling. Also excellent as a rectifier or high frequency amplifier.

Fil. Volts: 5'5.
 Amps.: '09.

PRICE 18/6

S.P. 55 RED.

Super power valve specially designed as a last stage power amplifier. Will give great power without distortion. Also suitable for detector or H.F. amplifier.

Fil. Volts: 5'5.
 Amps.: '25.

PRICE 18/6



RV3

The "1927 Five"

A Year Ahead of
any other Set!

IN THE
OCTOBER
"Wireless
Magazine"

1/- net

Get Your Copy At
Once; the Magazine
will be Out of Print
in a few days.

You saw this Set on the
"Amateur Wireless" Stand at Olympia
In the "WIRELESS MAGAZINE" for October
is a nine-page article giving photographs,
diagrams, details, specification and construc-
tional notes of this, the most remarkable five-
valver yet introduced to the home-constructor.

ON SALE
Friday
September 24

A Dozen Reasons Why You Should Build the "1927 Five"

Because your existing components can be used if they are of the best quality.

Because, using everything new, the cost, including valves and home-made coils, cannot exceed about sixteen pounds.

Because it gets over sixty stations on the loud-speaker—and gets them with ease.

Because it is simple to operate, two of the three dial readings being practically identical.

Because it cannot radiate and interfere with other listeners.

Because there are no switches in the set; a simple plug takes their place.

Because it is selective—at seven miles from 2 LO Cardiff can be received without a trace of London.

Because the circuit is novel, the lay-out thoughtful, and the design of the set absolutely distinctive and ahead of the times.

Because it includes a novel application of the neutralising principle.

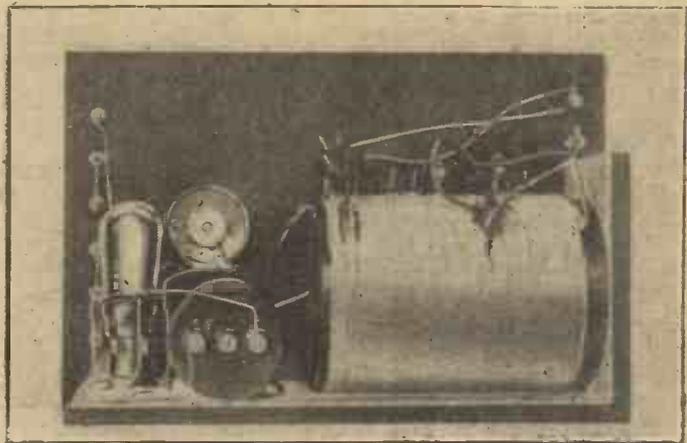
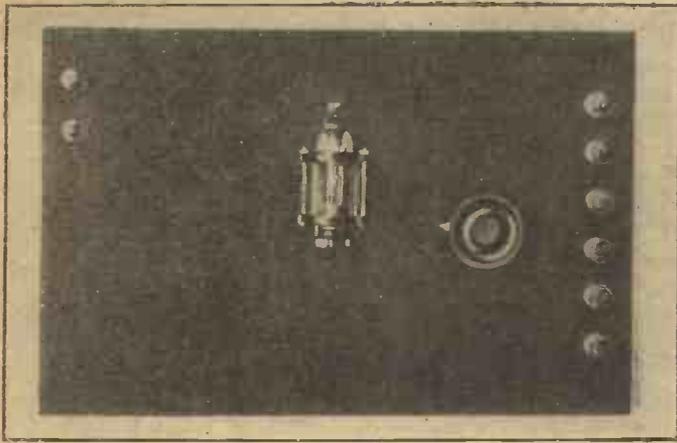
Because each complete H.F. stage is shielded; the metal screens prevent any magnetic interaction between the various parts.

Because it is a true low-loss set; there being no coupled coils, electro-magnetic losses are reduced to a minimum.

Because the Technical Staff of the WIRELESS MAGAZINE will take a personal interest in every "1927 Five" that readers make. They will answer any questions; so you can't get stranded.

And there are at least another dozen reasons which you will appreciate for yourself when you read the article.

"Wireless Magazine" for October, published Friday, Sept. 24



These Two Photographs show Front and Back Views of Panel.

ONE-VALVER for the ABSOLUTE NOVICE

A PURE-TONE SET FOR THE LOCAL STATION

THE question which first arises when the installation of a single valve is contemplated is in what manner it is best to use it. This will depend to a large extent upon the results desired. If maximum purity of a local station with comfortable volume is desired, the means described in this article is the best; but should long-distance work be the object, then this method is unsuitable.

As regards purity, the set will be found to lack nothing in this respect compared

each for filament); one filament rheostat (5 ohms); one Ever-ready H.T. battery (60 volts); piece of ebonite, 12½ in. by 8 in. by ¼ in.; eight terminals; one cardboard tube, 4 in. in diameter by 6 in. long (former for coil); ½ lb. No. 20 d.c.c. wire; two Lico clips (Burndept); one valve socket; wood for case, screws, etc.

The wooden stand on which are mounted the tuning inductance, transformer and valve holder is shown in Fig. 1. It consists of two pieces of wood screwed to-

gether, one piece being 5 in. by 12 in., the other 5 in. by 7½ in. drilled as shown in Fig. 2. The two pairs of small holes marked X in the diagram are for anchoring the ends of the coil to the former. The larger holes Y are for fixing a small wooden cross piece at the base of the former in order to screw the completed coil to the short side of the stand. This piece of square-section wood (1 in. square) is fixed in position by means of two screws passing through the former from the outside, as shown in Fig. 3. The small hole marked A is for screwing the coil down to

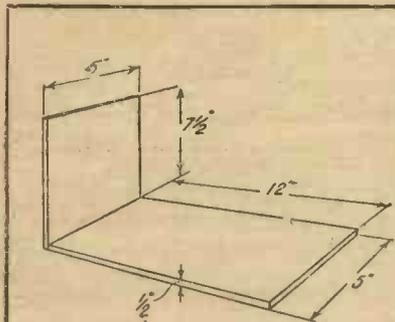


Fig. 1.—The Stand.

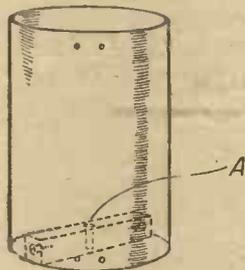


Fig. 3.—Method of Fixing Inductance.

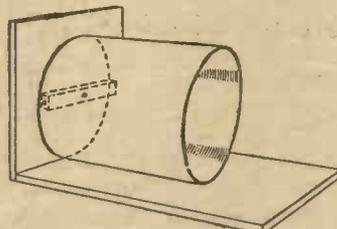


Fig. 4.—Inductance Former in place.

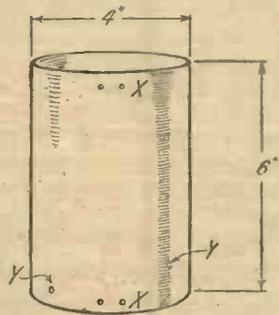


Fig. 2.—Inductance Former.

to the ordinary crystal receiver, whilst the increase in volume which might reasonably be expected is something of the order of 300 to 400 per cent. The component parts specified are those used in the model shown in the photographs, but the constructor may, of course, vary these to suit his pocket and fancy.

Components

One Formo transformer (Perfection); one dull-emitter power valve (Marconi D.E.2 L.F.); one Mic-Met crystal detector; two dry cells at 1s. 6d. (1½ volts

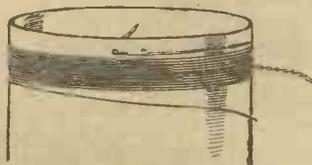


Fig. 5.—Method of Winding Inductance.

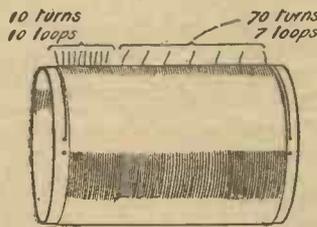


Fig. 6.—Details of Tappings.

together, one piece being 5 in. by 12 in., the other 5 in. by 7½ in.

Tuning Inductance

The tuning inductance has next to be prepared. The cardboard or ebonite former on which the coil is wound must be

the long side or base of the stand. The method of fixing is shown in Fig. 4.

Winding the Inductance

The inductance is wound by passing the beginning of the wire through one pair of the holes X, and fixing it firmly in position and then winding the wire, each turn of wire touching the preceding one. The turns of wire must be counted as they are wound on, and each turn for the first ten turns has a loop, as shown in Fig. 5. After the first ten turns have been wound on in this manner and the loops taken as described, six groups

of ten turns are now wound on, a loop being taken at each tenth turn. A further ten turns complete the coil, and the end of the wire is secured (see Fig. 6). The loops should all be on one side of the coil.

Preparing the Tappings

Each loop is stripped of the cotton-covering, and then cut at the top and the wire

Fig. 8, and when the holes are drilled the filament rheostat, crystal detector and terminals can be mounted in the positions shown.

Wiring

The wiring of the set is carried out according to the theoretical diagram (Fig. 9), and if this is carefully followed

found on the crystal the tuning may be accomplished by varying the positions of the Lico clips on the coil. Remember that the maximum unused portion of the coil should be at the end which is next to the clip which is attached to the earth-lead clip on the terminal of the transformer. Fine tuning is done with the aerial clip on the single-turnappings.

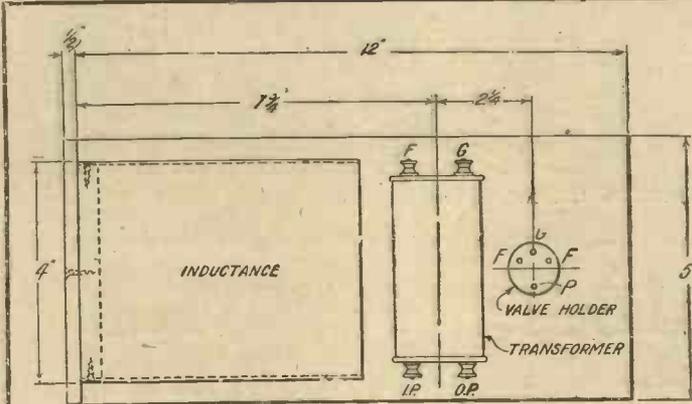


Fig. 7.—Position of Components.

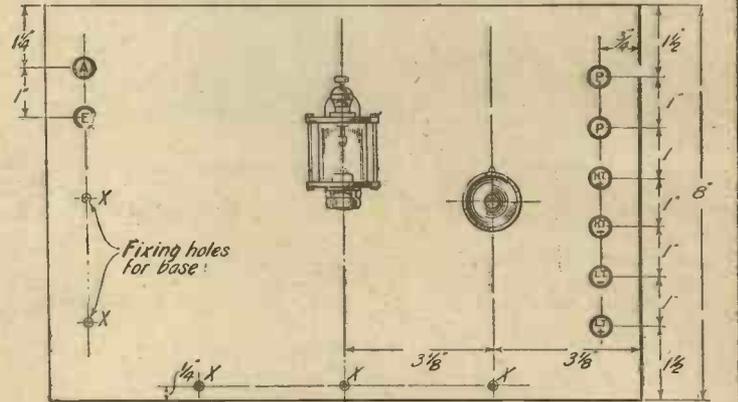


Fig. 8.—Layout of Panel.

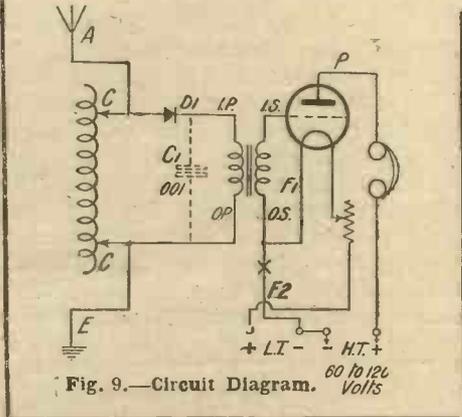


Fig. 9.—Circuit Diagram.

tightly twisted, so that the two ends of wire make contact. The coil is now ready to screw to the stand, when the inductance, transformer and valve socket can be mounted in position, as shown in Fig. 7.

The Ebonite Panel

The layout of the panel is shown by

no explanation will be necessary. After the wiring is completed the panel may then be screwed to the stand, and contact made between the wires and the component parts. The panel is fixed into position by means of screws passing through the countersunk holes marked X in Fig. 8. The wires are connected as follows: Referring to the circuit diagram, the wire P goes to the plate of the valve, the wire F1 to one filament leg of the valve, and the other wire F2 from terminal L.T. negative to the O.S. terminal of the transformer. The wire D1 from the catwhisker of the detector goes to IP terminal of the transformer. The Lico clips C are used for selecting turns of wire on the tuning inductance for tuning purposes. The grid leg of the valve is joined to the IS terminal of the transformer.

Operation

The operation of the set is exceedingly simple. After a sensitive spot has been

As regards the valve portion of the receiver, the anode voltage may be anything between 60 and 120 volts, providing that a suitable grid potential is applied to the L.T. negative end of the secondary winding. Grid bias is applied at the spot marked X in the circuit diagram. A small dry-battery unit of 1.5 to 4.5 volts is used for this purpose, the positive terminal being connected to L.T.— and the negative terminal to the transformer. The set will give quite good results without grid bias so long as the anode voltage does not exceed 60 volts.

The filament brightness should be kept as low as possible consistent with maximum results. If long life of the valve and battery is desired this rule should be rigidly adhered to.

The set will give excellent results at distances up to 15 miles from any main broadcasting station, or about five miles from relay stations. It will not work a loud-speaker at these distances. A. J. C.

A VALVE HINT

MANY a good valve which could easily be given a fresh lease of life is thrown away and replaced by a new one because its owner has failed to realise the fault that has caused it to cease to function properly. A glance at the base and pins of a valve will reveal that four copper-wire leads emerge from the base close to the valve pins, to which their ends are soldered. If one of the pins becomes a little loose, the strain imposed by putting the valve into a holder or pulling it out again may cause one of these fine leads to come adrift. The result depends upon which of the leads is affected.

If it is one of the leads from the filament, then the valve will not light up

and its owner will in nine cases out of ten diagnose a burn-out. Should it be the grid or plate connection, lost emission will probably be suspected when the valve is tested. When a valve goes wrong, always examine the pins before discarding it as useless. Unless the break occurs inside the cap a repair can be effected by the use of a small soldering iron, and when this is done the valve becomes as good as ever. Though makers are very careful in their choice of fluxes, soldered joints are apt to deteriorate in time and to set up a high electrical resistance.

J. H. R.

A man who stole two sets of wireless headphones from Bellahouston Hospital, Glasgow, where he had been a patient, has been sentenced to a month's imprisonment.

PHONE or LOUD-SPEAKER CONNECTIONS

MOST phones or loud-speakers have one tag or terminal, as the case might be, marked positive. The positive connection thus indicated should go to the positive side of the battery and not the negative side. If this point is not observed, the phones or loud-speaker may become de-magnetised. This point, which may seem obvious to those who know, is not really so, as a battery is marked "positive" because it is positive, and is therefore generally connected to the opposite or negative of another battery, whereas the positive indication of an earpiece merely means that this side should go to the positive of the battery.

H. B.

"A.W." TESTS OF APPARATUS

Conducted in the "Amateur Wireless" Research and Test Department

Philips H.T. Supply Unit

FOR those who are fortunate enough to be supplied with a house electric-light system the troublesome dry-cell H.T. battery should be a thing of the past. The photograph illustrates an H.T. supply unit manufactured by Philips Lamps, Ltd., of 145, Charing Cross Road, London, W.C.2.

This instrument possesses the advantage that it can be adjusted to supply the actual plate voltage required for the amplifying valves and at the same time a lower voltage can be selected for the H.F. and detector valves. The latter voltage is adjustable in three stages.

A two-electrode rectifying valve is used possessing a plate and filament the current for which is taken from the A.C. mains through a special winding on a power transformer. All the smoothing apparatus and transformer are enclosed in a metal case.

On test we found the unit to give a par-



Philips H.T. Supply Unit.

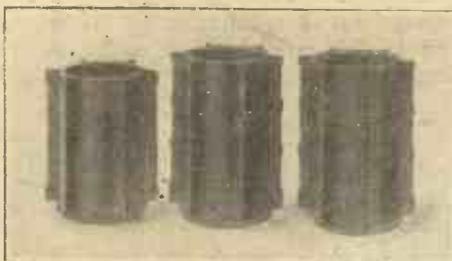
ticularly smooth plate voltage, and the smoothing system is so good that only a very faint hum can be heard when using phones. With a loud-speaker no hum could be heard at all. Reception is free from the parasitic noises usually associated with dry-cell batteries, and there is plenty of spare power for a multi-valve receiver.

Formers for the "1927 Five"

IN the issue of the WIRELESS MAGAZINE published on the 23rd of this month will be found details of the construction of the latest five-valve receiver. The British Ebonite Co., Ltd., of Nightingale Road, Hanwell, London, W.7, have supplied us with ebonite formers and socket platforms on which the special coils required for the set may be wound.

The diameter of these formers across opposite "peaks" is 3 in., and they are

therefore suitable for the winding specifications given. It will be noted, however, that there is insufficient room for the mounting of the plugs and sockets as shown in the original article, and it is suggested that the spacing of the plugs



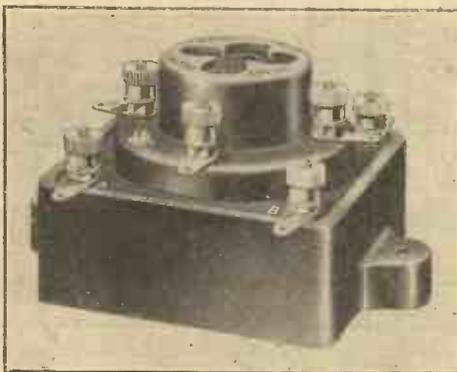
Becol Coil Formers.

and sockets be reduced to suit the former. We have tried out some coils wound on the formers supplied, and results are in no way affected and are identical to those obtained with the original coils.

The plug spacing recommended is as follows: distance between sockets on major axis, 1½ in. instead of 2 in.; distance between sockets on minor axis, 1 in., as before. The plugs on the mounting base should be also spaced to the above dimensions. With these formers the constructor may make the coils for himself.

Metro-Vick Resistance-capacity Unit

THE photograph illustrates a resistance-capacity coupling unit, together with an anti-microphonic valve holder, manufactured by Metro-Vick Supplies, Ltd., Metro-Vick House, Charing Cross Road,



Metro-Vick Resistance-Capacity Unit.

London, W. The plate resistance, coupling condenser and grid leak are contained in the moulded case on which the valve holder is mounted, and the connections are brought out to terminals mounted at the corners of the moulded case.

The valve holder possesses real anti-

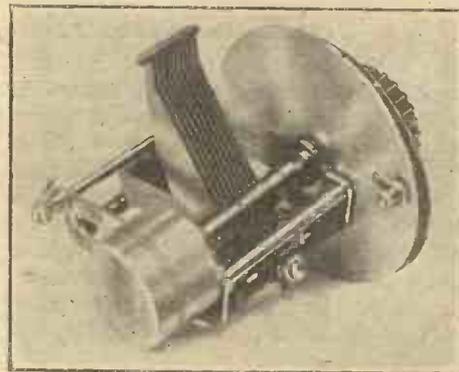
microphonic properties, and in this respect is one of the best we have tested. When a valve is inserted, it swings with a very slow motion. No amount of external vibration will cause the valve to howl.

We have used two of these units in a receiver which will shortly be described in this journal. The amplification obtained is almost perfect and, provided that suitable plate and grid-bias voltages are applied, there is no distortion whatever.

Ormond S.L.F. Condenser

THE Ormond Engineering Co., of 199 to 205, Pentonville Road, King's Cross, London, N.1, are producing a new variable condenser of the straight-line-frequency type which embodies their well-known slow-motion device.

On inspecting one of these components one is struck with the great advance that British manufacturers have made during the last year. Up to the middle of 1925 the Americans were far ahead of us in the



Ormond S.L.F. Condenser.

design and finish of their components, but this is no longer the case.

The moving plates have the usual elongated form to give the S.L.F. effect, and they are connected to the nickel-plated frame of the condenser. They are strengthened at their extremities by a clamping bolt passing through holes in each plate and separated by brass distance-pieces.

The fixed plates are insulated from the frame by four small pieces of ebonite, in each case a point contact being obtained between the two fixed-plate supports and the insulators. A large black 4-in. dial is provided with a quick- or slow-motion control knob. Behind the dial is fixed a metal screening plate having a diameter of 4 in.

The quick-motion is beautifully smooth, and the slow-motion mechanism gives a very fine adjustment, having a gearing ratio of approximately 50-to-1.

GETTING RID OF DISTORTION

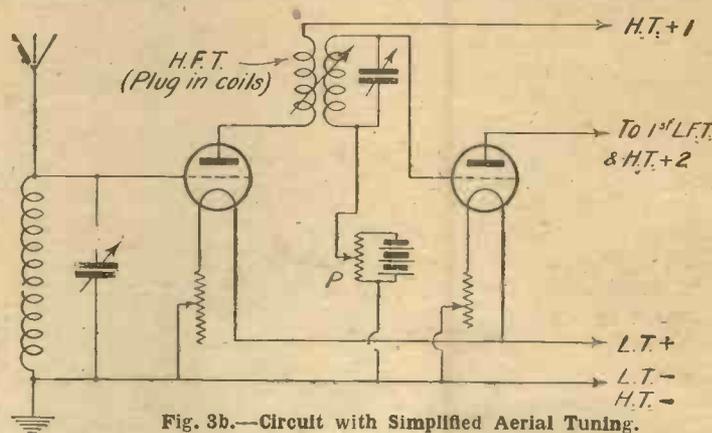
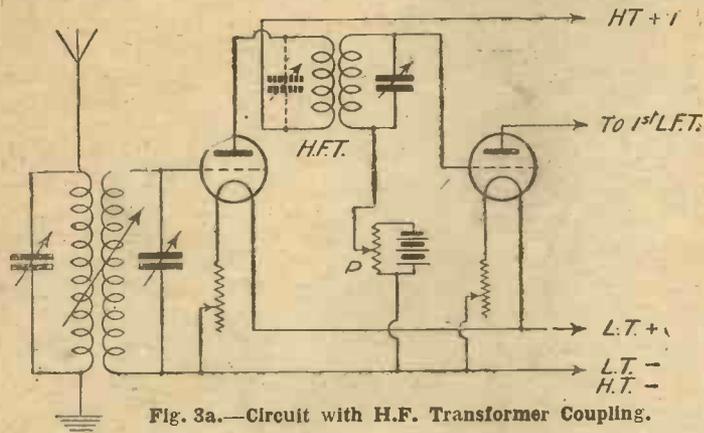
This is the second and concluding article on obtaining perfect reception

By Lieut.-Com. H. W. SHOVE, R.N.

IN his own broadcast receiver the writer uses crystal rectification with one (or two) H.F. valves and three L.F. For local reception, where H.F. is not necessary even though the distances (120 miles from 5 X X and 41 from 2 L O) are considerable, he uses a galena crystal. For more distant stations (with H.F.) a perikon or car-

(untuned) primary the greater the stability, but the less the signal strength. The selectivity of such a transformer will probably be quite sufficient, and with a suitable primary coil there will be enough reaction without the loose-coupling in the aerial circuit. We may therefore return to the simple aerial tuner of Fig. 1 if we adopt

higher impedance to treble than to bass notes. It is often recommended to use .05-microfarad coupling condensers. But, as the fruit of a good deal of experiment with resistance- (and choke-) coupled amplifiers, the writer is of opinion that .25 microfarad is the minimum size to ensure sensible equality of amplification,



borundum, the latter being preferred in spite of the need for initial applied potential, on account of its great stability. Nevertheless, it is recognised that there is a prejudice against the crystal as a "finicky" adjunct to a valve set, and we will therefore stick to valves throughout in the re-designing of the set now under discussion. For absolute purity we must sacrifice signal strength and adopt "lower-bend" rectification, as shown in Fig. 3a. We may have to look round a bit for a suitable valve and take some care over the adjustment of H.T. volts and potentiometer setting. But it will be worth while in the end. It will be noted that in Fig. 3a H.F. transformer coupling has been substituted for the tuned-anode of Fig. 1. This has been done to avoid the risk of partial "cumulative" rectification, or distortion, through the condenser and leak necessitated with the latter method. A loose-coupled transformer, consisting of two plug-in coils, will be found to give good results, and an additional means of controlling both selectivity and stability by variation of the coupling and the relative sizes of coils. The smaller the

it and thus avoid the complication of three tuning condensers (see Fig. 3b).

We now come to the L.F. side. For absolute purity such as we are seeking no iron-cored transformers or chokes can be allowed here. These can only be approximately aperiodic, and, as we require absolute aperiodicity over the whole range of audio-frequencies, we are driven back on resistance coupling as the only means

while at the same time allowing the grids to be maintained at the correct working potential by the 1-megohm or .5-megohm leaks and the grid-bias batteries. The value of the leaks is far more critical than that of the condensers. Too high a value is often used. As a rule, best results are obtained with the .5 leaks, and sometimes the use of a lower value in the last stage effects improvement. The

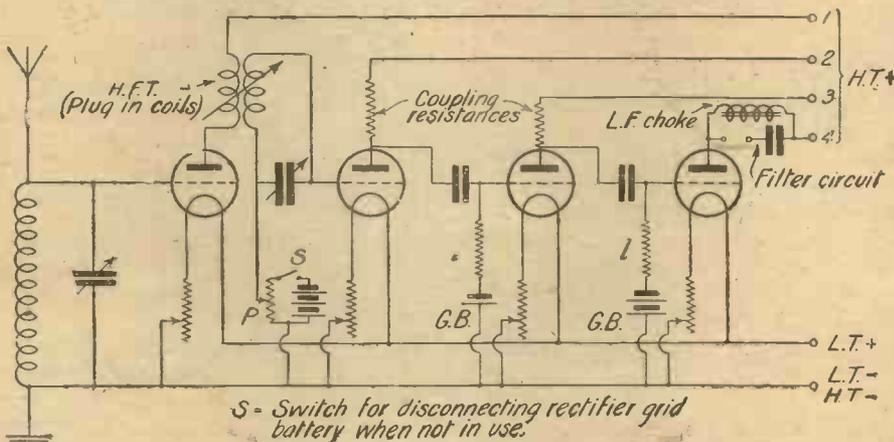


Fig. 4.—The Final Circuit Suggested for a Four-valve Receiver.

of attaining our object. So here again, in both L.F. stages, we must sacrifice signal strength to purity.

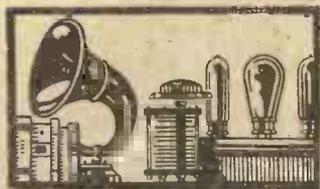
But even then we do not reach perfection, for, however large the coupling condensers necessary to isolate the valve grids from the H.T., they will always offer a

adjustment of leaks and grid bias, however, depends largely on the type of valve (which should be one specially designed for this form of amplification).

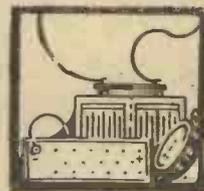
As stated earlier, the resistance-capacity method is very prone to develop "crackling" noises. These may be due to bad insulation and, apart from the ordinary seats of this trouble, care should be taken that there is no leakage across the coupling condensers. Here, as elsewhere, it pays to use really first-class components, mica dielectric being preferably to paper.

The resistances must be of a value to suit the valve impedance and the available H.T., so that the voltage drop across them is just sufficient to reduce the anode

(Concluded on page 419)

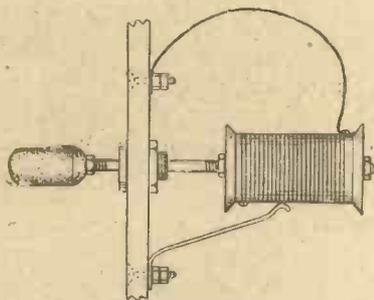


PRACTICAL ODDS & ENDS



A Push-pull Rheostat

THE arrangement of the emergency filament rheostat shown in the sketch should be easily understood; a small cotton-reel is wound with resistance wire to conform with the desired purpose, and then clamped to one end of a brass spindle

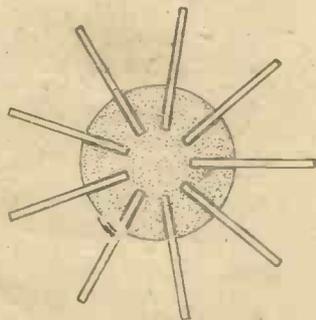


Push-pull Rheostat.

which is made to slide accurately in a brass bush attached to the vertical panel. Above the bush is bolted a springy brass strip, the free end of which engages the winding; below the bush is attached a small bolt carrying a flexible lead which is connected to one end of the winding. The connections are made to the lock-nuts on the two bolts. B. M.

A Simple Coil Former

ONE seldom finds a use for the two smallest sizes in a set of six card inductance formers. The sketch shows



Simple Coil Former.

how these may be converted into useful "spider" formers of any desired size. Wooden strips are glued into the slots to form the spokes, the card then acting as a hub or central support for same. Owing to the fragile nature of such a former, care should be taken to avoid undue strain when winding same, otherwise some of the spokes may be detached. O. J. R.

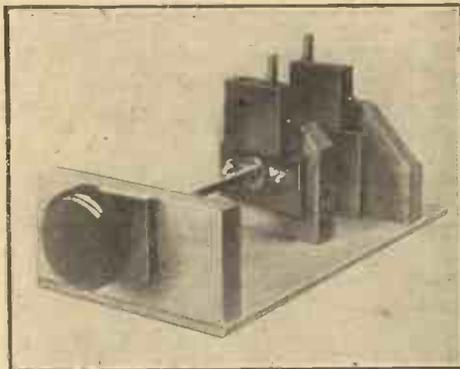
Plug-in Coils

THERE is a point about plug-in coils known as X coils, which are usually provided with two tapping points. When these coils are used in an aerial circuit the socket element of the coils should go to earth, which means that the pin of the coil holder should connect to the earth side of the receiver. The aerial invariably connects to either one of the taps upon the plug-in coil itself. H. B.

Easily-made Coil Holder

HERE is an efficient slow-motion two-way coil holder which can be constructed for a very small sum from odds and ends which would otherwise be useless.

The photograph shows the main scheme of construction, and no detailed dimensions are given, since these will depend upon the available material.



Easily-made Coil Holder.

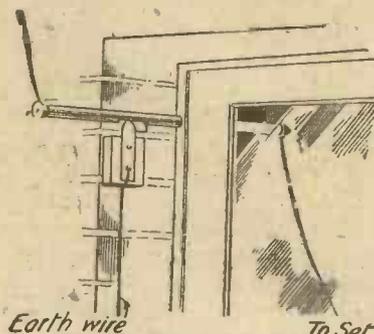
The fixed coil socket is screwed to a shaped piece of wood as shown, while the moving socket is similarly mounted, but on a smaller block of wood. The slow-motion movement is obtained by means of a length of 2 B.A. studding turning through a terminal head mounted on the moving socket.

At the knob end of the 2 B.A. studding the latter is kept in position by the ebonite knob on one side of the wooden support and a large washer soldered to the studding on the other side. Rotation of the knob then causes the moving-coil socket on its wooden support to be gradually moved nearer to, or farther away from, the fixed coil socket. G. R.

Novel Earthing Switch

SHOWN in the sketch is a simple method of earthing the aerial by the simple act of turning the lead-in tube

round. It will be seen that a small section of the ebonite tube is cut away in order to expose a short length of the brass rod. Immediately beneath the lead-in tube, on a block of wood, is mounted a springy strip of brass, bent round as



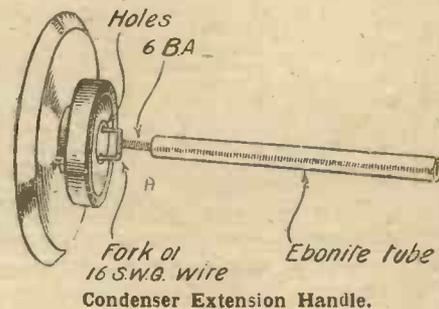
Novel Earthing Switch.

shown, so that it makes contact with the brass rod of the tube.

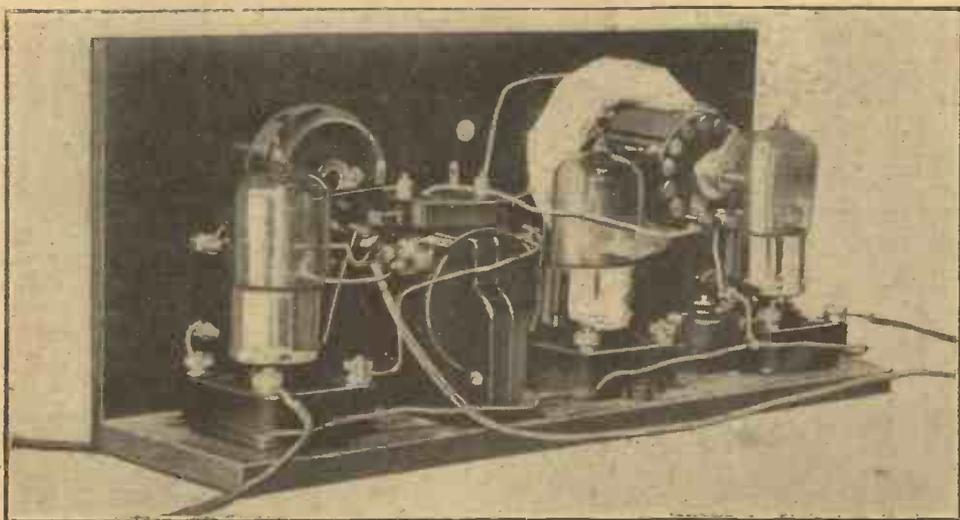
If the brass strip is connected to earth it will be seen that the simple act of revolving the lead-in tube automatically earths the aerial when required. The only precaution necessary is to have a lead-in tube the insulation of which is above suspicion. A. S. H.

Condenser Extension Handle

A SIMPLY constructed extension arm can be made by first drilling and tapping a 6 B.A. hole in one end of a 4-in. length of ebonite rod. Then shape a short length of 16 s.w.g. copper wire, as shown in sketch, the prongs being 1/8 in. long and



1/4 in. apart. This fork is then soldered centrally on the head of a 6 B.A. bolt. To use this extension arm, two holes 1/8 in. apart must be drilled 1/8 in. deep in an ordinary ebonite knob, such as is usually fitted to a variable condenser. The final fitting arrangements are made clear in the sketch. W. G. A.



Three-quarter View of Set.

MOST portable sets suffer from the defect of being rather bulky affairs. Here is the design of an attaché-case three-valve set, the outside dimensions of which are but $12\frac{1}{2}$ in. square by 6 in. deep, a truly miniature affair. Within this space of half a cubic foot is housed an efficient receiver of three valves (one high-frequency, detector, and one low-frequency amplifier), a frame aerial, two-volt accumulator, and high-tension battery. Room is also left for telephones.

The objection might be raised that an accumulator is undesirable for a portable, and that dry-cell batteries are the correct equipment. The writer's opinion, how-

ever, is that the little care necessary to ensure the set is kept always in an upright position is easily offset by the greater dependability of the accumulator. However, a reference to one of the photographs shows that there is room to spare in the battery partition, quite enough for a dry-cell battery of sufficiently large proportions to supply three dull-emitter valves.

it a most pleasingly neat appearance. The frame aerial consists of 16 turns of silk-covered flex wound on a wooden rectangular former 12 in. square. No. 26-gauge wire is used. The loop fits closely into the lid and is secured in its place by beading of the picture-frame variety. The ends of the frame aerial form flexible leads which are clamped beneath two terminals on the set equivalent to aerial and earth terminals. This arrangement suffices for the reception of the B.B.C. shorter wave stations. A plug is fitted, however, for "loading" for the reception of Daventry and other long-wave stations.

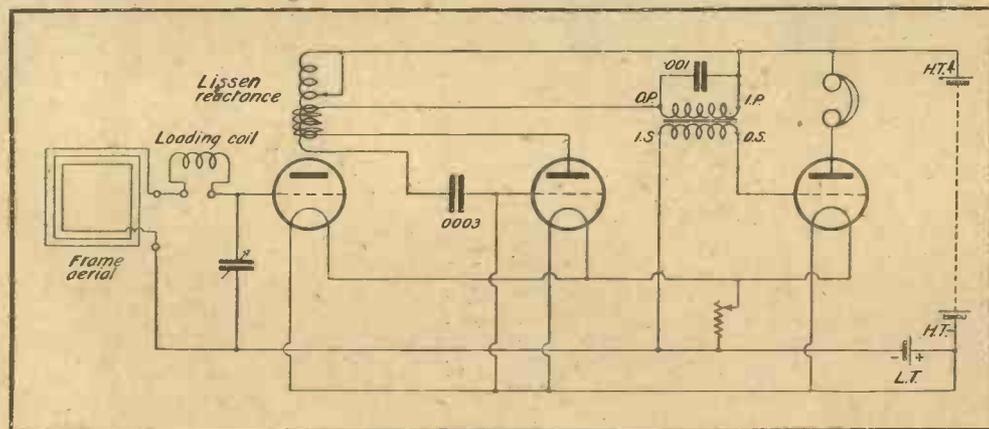
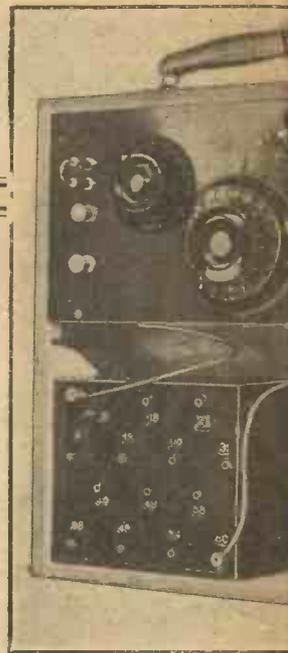


Fig. 1.—Circuit Diagram.

The case of the set is of $\frac{3}{8}$ -in. soft wood sides and three-ply top and bottom. The whole is covered with hide, which gives

The circuit is shown by Fig. 1. The high-frequency valve is coupled to the detector by a Lissen reactance unit which has a wavelength range of from 200 to 3,000 metres. The frame-aerial circuit is tuned with a General Radio Co. variable condenser of the type that is contained in its own dial. It is the employment of this component that contributes more than anything else to the compactness of the set. It occupies no space at all behind the panel, as the photographs show.

MINIATURE SET



Photograph showing

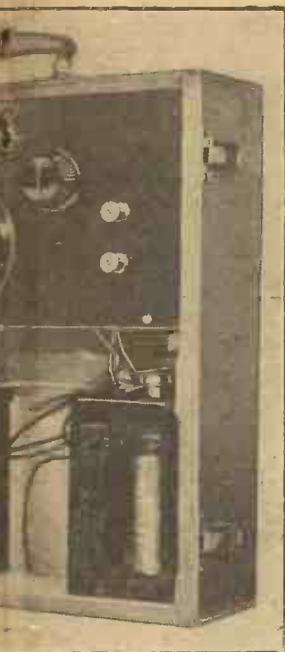
Simple
Construction
—
Lightest
Possible
Weight

Reaction effect is obtained in a somewhat unusual manner. It is unique in two respects, firstly by its method of application, and secondly by its space-economy



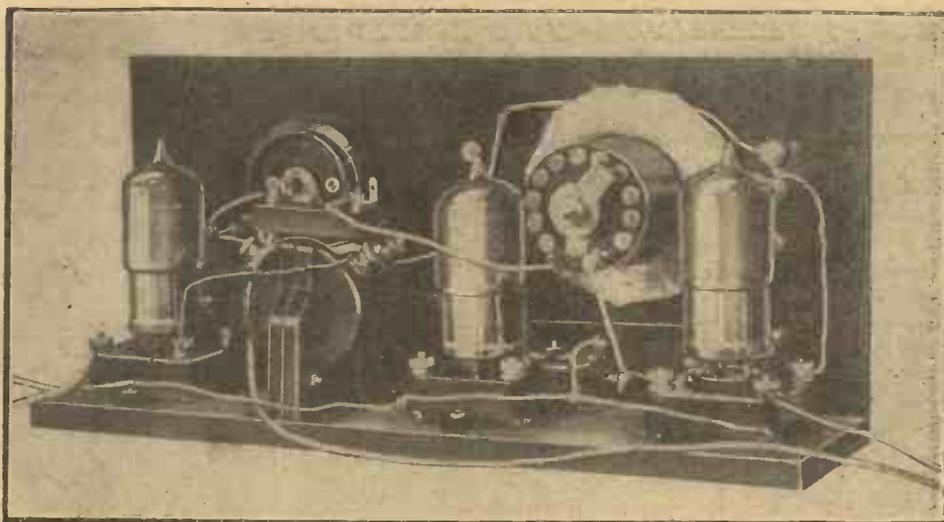
Photograph of Com

A PORTABLE SET



Position of Batteries.

**Powerful
Results
on
Long and
Short
Waves**



View showing Disposition of Components.

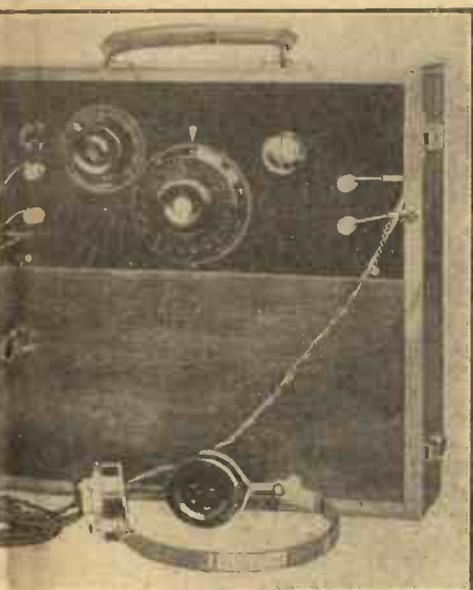
able value, reaction is then controlled by the rheostat. Failure to oscillate at all indicates the need of a larger coil. Conversely, if the set persists in oscillating as soon as the valves are heated sufficiently to work at all, then a smaller coil is indicated. The value of this coil does not appear to be very critical, however, and that suitable for the shorter waves is also satisfactory for Daventry.

The low-frequency transformer used is an imported one, and was chosen for its miniature size. It is, nevertheless, fairly heavy, a point which is usually the sign of an efficient transformer. An English transformer that would fit in the same

loading-plug socket, are mounted on the ebonite panel. This assembly occupies the uppermost portion of the body of the attaché-case, which is 4 in. deep. The remaining half is then free for the accumulator and the high-tension battery. The lid of the attaché-case, which is 2 in. deep, houses the frame aerial.

Fig. 2 shows the layout of the panel and Fig. 3 is the actual wiring diagram. The set is found to work a loud-speaker quite well as much as fifteen miles from the London station, while it is quite surprising what other stations can be found from time to time on the telephones. Of course, when working off the frame aerial

property. A basket coil of 50 turns arranged in the plate circuit of the detector valve is simply slipped over the Lissen unit. Provided this coil is of suit-



Completed Portable Set.

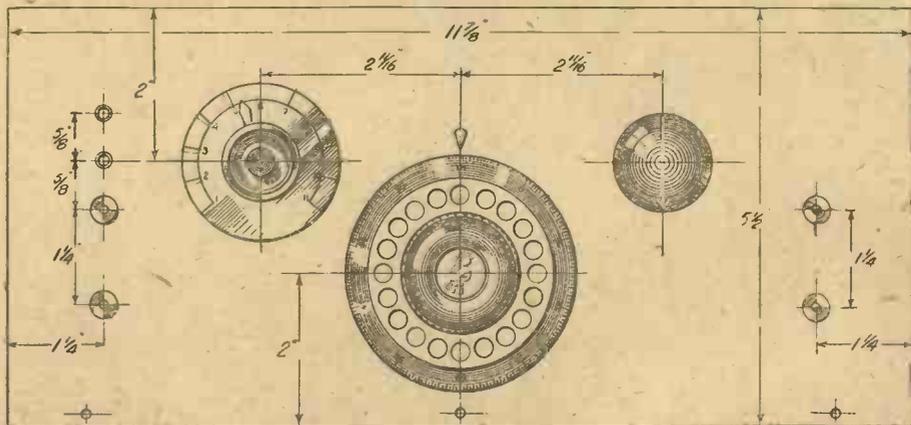


Fig. 2.—Elevation of Panel Layout.

place is the small one made by Messrs. Lissen. A Watmel combined grid leak and condenser is used, and is another aid to compactness. The valve holders are of the anti-vibration type, which is always advisable in the case of a portable.

The valve holders of the low-frequency transformer are mounted on a baseboard screwed to the back of the panel, while a single rheostat for all three valves, the Lissen reactance, and the G.R.C. condenser, as well as the four terminals and

the set is delightfully selective, and cutting out the local station does not present any serious difficulty. Furthermore, the frame being in the lid of the case, it can be most conveniently swung so as to take advantage of the directional effect.

Should it be desired, the set can be used on a conventional aerial and earth system by connecting the aerial to the uppermost terminal on the left-hand side of the panel and earth to the lower one.

(Continued at foot of next page)

HOW AMERICA RUNS A RADIO EXHIBITION

The Elaborate Programme of the Radio World's Fair

DURING the Radio World's Fair, which opened in New Madison Square Garden, New York City, on September 13 and lasted for a week, millions of Americans have had the opportunity of inspecting the marvellous new radio receivers and accessories on view.

It was a spectacle to evoke genuine enthusiasm not only because of the advanced designs of the apparatus, but because of the picturesque setting under which Radio 1927 made its official bow.

The Radio World's Fair, as the name indicates, is international in scope. Features of interest across the Atlantic and Pacific Oceans were staged, and representatives of a dozen foreign governments and many foreign concerns were present to witness the display and to participate in the events.

Above all, from the standpoint of public interest, the exposition was the opening gun in the radio year. All that happened within the spacious auditorium was conveyed to 10,000,000 listeners by radio, twenty stations standing by to transmit the entertainment by notable artists and famous men and women in the political, theatrical and business life of the nation.

The Opening Ceremony

The opening ceremony constituted a parade on the morning of September 13 down Broadway to City Hall, New York City, where Mayor Walker reviewed the

procession and greeted the visiting manufacturers and special guests of honour.

Heading the procession was a portable broadcasting station 6XBR, which is owned by Warner Brothers, motion picture producers. A programme was broadcast from this mobile station and retransmitted by WFBH, the Hotel Majestic station.

Mrs. Lotta Harrauff, of Princeton, Illinois, Queen of American Radio for 1926-27, was received by Mayor Walker, and was special guest of honour at the Radio World's Fair.

It was arranged for her to fly on Sunday morning, September 12, from her home to Chicago in a specially engaged aeroplane, and board the Twentieth Century Limited, with her secretary.

The opening ceremonies were transmitted by WLWL, WEAN and WMAC. Governor Alfred Smith officially declared the exposition open. He presented the silver trophy to Mrs. Harrauff, and bestowed his official congratulations upon Arthur T. Haugh, President of the Radio Manufacturers' Association, and upon U. J. Herrmann and G. Clayton Irwin, Jun., co-directors of the exposition.

An extraordinary entertainment programme was a feature of the show. In the limelight was a famous crooner of southern songs, Miss Caroline Lee, of Clearwater, Florida, winner of third prize in the Radio Queen Contest, who was another guest of honour.

Thirty stations transmitted programmes from the Central Broadcast Studio. All the feature programmes were heard through the W E A F and W J Z chains.

International Set-building Contest

Of very special interest was the international amateur set-building contest.

England accepted the challenge to show its finest home-constructed sets. Nineteen of the finest sets were sent to America, following elimination contests held in London under the auspices of AMATEUR WIRELESS. They were judged for efficiency and beauty of workmanship alongside at least one hundred radio sets built by American enthusiasts, including several girls.

Several other nations were represented by two or more sets. Readers will remember that it is proposed to award a trophy emblematic of the world's champion set-builder to the winner of the international competition.

VARIABLE CONDENSERS

MANY constructors do not consider the dial readings of a variable condenser as they should do. Where calculations are to be made, or comparisons deducted, or tabulated, this is an important factor.

A dial indicator should therefore be used, and it must be remembered that when the moving vanes are at the "all out" position, the dial reads 0 degrees. **B.**

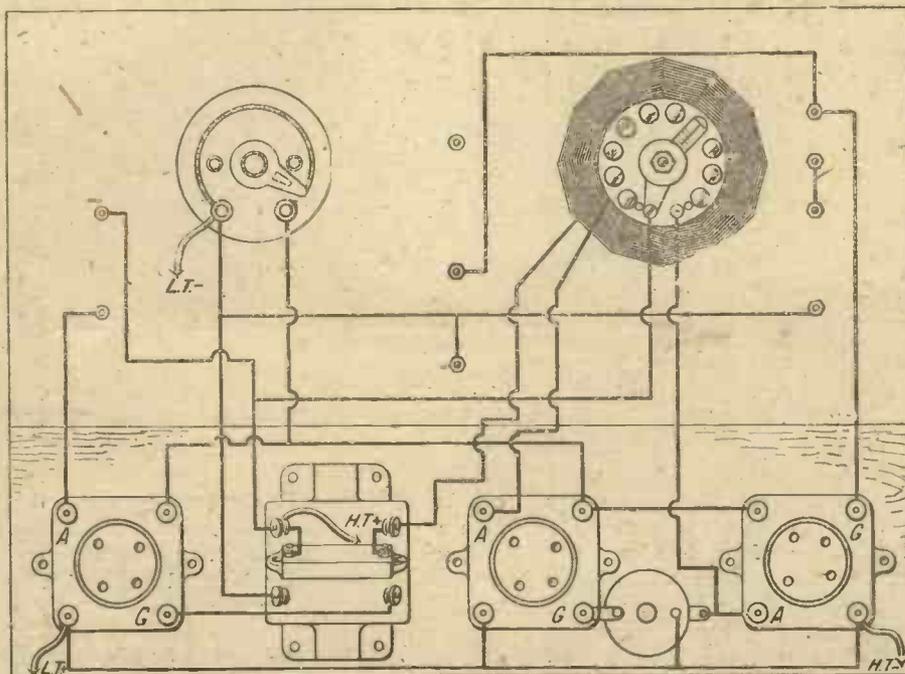


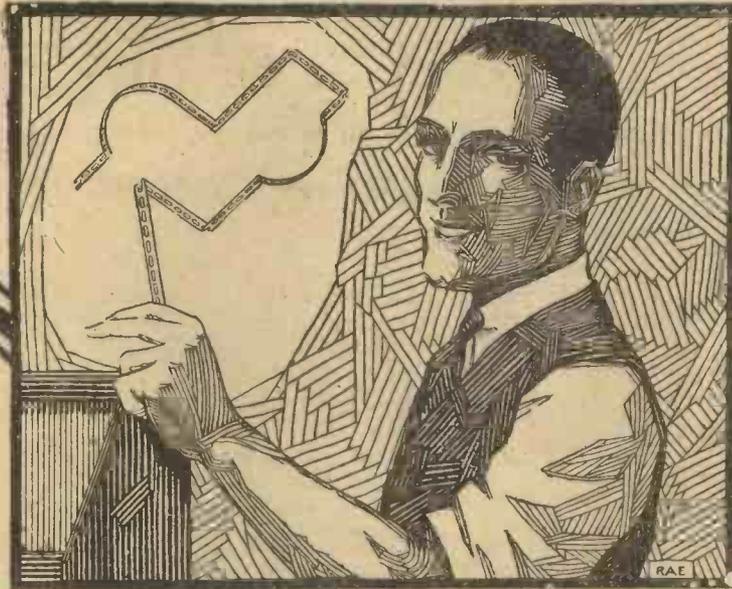
Fig. 3.—Developed Wiring Diagram.

"A MINIATURE PORTABLE SET" (continued from preceding page)

Connection to the frame aerial can be left, or it can be thrown out and tuning effected on a tapped coil inserted in the loading socket, in which case earth connection must be made to both terminals so as to strap them together. Owing to the damping effect of an aerial it will often be found that the extra volume given by the use of an outdoor aerial is disappointing. The increase in range, however, will be marked. **D. H.**

A wireless telegraphy station has been installed at Skutari (Albania). It transmits on a wavelength of 1,000 metres.

On a recent occasion the broadcasting station at Dortmund relayed a concert from the Minister Stein Colliery in that district. The microphone was installed at a depth of some 800 metres, and conveyed to listeners the noises of explosions, the cutting of coal, and the rattling of the trucks. It is proposed to relay sounds from various other industrial works in the neighbourhood.



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"SIMPLE-STRIP" is made of the finest hard-drawn copper—heavily tinned—perforated to take 4B.A. connections, and will stay put without solder. No need for bits and pieces. One length of "Simple-Strip" will cover several connections. And between these connections it will turn and twist as you will.

The most complicated circuit can now be wired by any amateur without difficulty and without waste.

Simple-Strip may be cut with an ordinary pair of scissors, bends and twists can be made with the fingers to any angle.

Simple-Strip must be included in the kit of every wireless enthusiast. It has many uses: A spade terminal with one snip of the scissors: A battery or accumulator connection: An excellent clip for gas or water pipe—and 101 other uses.



CLUES DOWN.

- 1 Hinder, to obstruct.
- 2 Exclamation.
- 3 Over.
- 4 Large Inns.
- 5 Level.
- 6 Cross Gallows.
- 7 Consumed.
- 8 Help.
- 9 Sharp, tapering body.
- 10 Enclosure.
- 15 Islands.
- 17 Edge.
- 18 Dye.
- 21 Cease.
- 23 Warbles.
- 25 Turkish institution.
- 27 Former Russian Parliament.
- 28 Impaired by surroundings.
- 30 Meals.
- 31 Omit.
- 34 Certain.
- 37 Evil.
- 38 Perform.
- 39 Preposition.
- 41 Part of the verb to be.
- 45 Spike of corn.
- 47 The ocean.
- 49 Abyss.
- 50 To navigate.
- 51 Measure.
- 53 Lively.
- 54 Narrow openings.
- 55 Protuberance.
- 56 Outlet.
- 60 Small ocean.
- 61 Animal.
- 63 Denial.
- 64 Father.
- 67 Doctor (abbreviated).

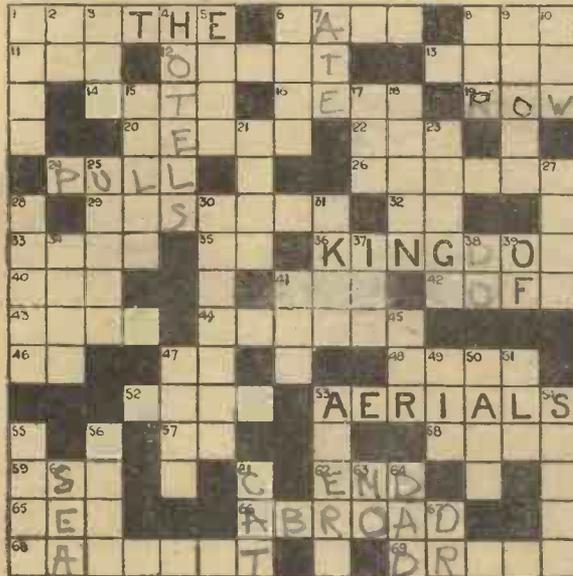
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ASK YOUR WIRELESS SHOP
HOW YOU MAY WIN £500
WITH YOUR SOLUTION**

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The New London Electron Works Ltd., Dept. 89, London, England.

CLUES ACROSS.

- 1 Pacify.
- 6 Acid.
- 8 Serpent.
- 11 The definite article.
- 12 Open, public.
- 13 Fit for use.
- 14 Religious act.
- 16 Fish.
- 19 Violent noise.
- 20 Understanding.
- 22 It is.
- 24 Tug.
- 26 Matched.
- 29 Exercises.
- 32 At home.
- 33 Employs.
- 35 On high.
- 36 Sphere of influence.
- 40 Total.
- 41 To feel pain.
- 42 Seat.
- 43 Conveyance.
- 44 Colour.
- 46 Scriptural pronoun.
- 47 Myself.
- 48 Recess.
- 52 Animal.
- 57 Exists.
- 58 Cultivates.
- 59 Custom.
- 62 Conclusion.
- 65 Persons.
- 66 Widely, expansively.
- 68 Lover of own land.
- 69 Pulls along.



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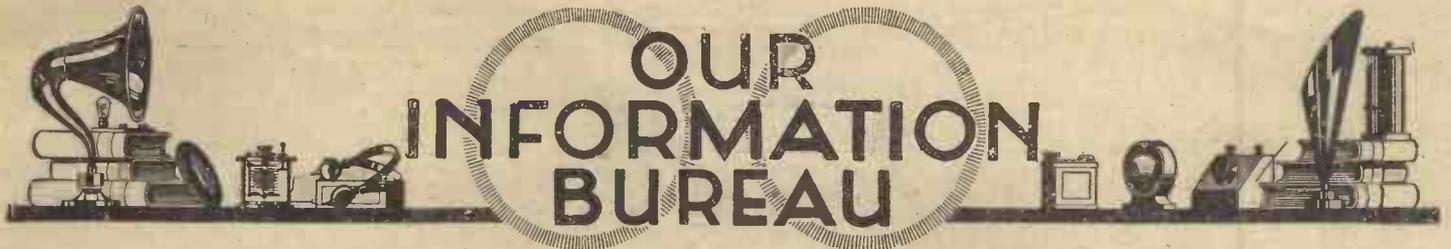


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RULES.—Please write distinctly and keep to the point. We reply promptly by post. Please give all necessary details. Ask one question at a time to ensure a prompt reply, and please put sketches, layouts, diagrams, etc., on separate sheets containing your name and address. Always send stamped, addressed envelope and attach Coupon (p. 428).

Good H.T. Accumulators

Q.—Under the sub-title "Foolproof," on page 234 of the August 28 issue of "A.W.," "Thermion" refers to a more or less foolproof H.T. accumulator. Could you please state which particular make is indicated?—R. B. (Exeter).

A.—Reference was made to the Duros H.T. accumulator, which can be obtained from the Economic Electric Co., of 10, Fitzroy Square, W.1, at 12s. per 20-volt unit.—THERMION.

Phones and Crystal Set

Q.—In a crystal set which consists merely of a variometer, phones and crystal detector, does it matter whether the phones are connected to the aerial side of the variometer or not?—N. S. (E.7).

A.—For best results with the type of set you mention, the crystal detector should be connected to the aerial side of the variometer and the phones to the earth side. If this is not done there will be some risk of a proportion of the H.F. energy being by-passed to earth via the capacity which exists between the telephone receivers and the head of the wearer.—J. F. J.

Grid and Anode Rectification

Q.—What is the difference between grid rectification and anode rectification?—L. A. (Belfast).

A.—When grid rectification is employed the oscillatory currents are rectified between the grid and filament of a valve, which act as the elements of a 2-electrode valve. The rectified current is made to charge a small fixed condenser connected in series with the grid, so that the cumulative effect of a group of oscillations causes a reduction of the grid potential. A corresponding reduction of the anode current follows the fall of grid potential, so that if the phones are connected in the plate circuit the signals may be said to have been both rectified and amplified. When used for anode rectification a valve has applied to it such grid and anode voltages as will lead to its being worked at or near one of the bends of its characteristic curve. There are two such bends representing respectively the point at which anode current commences and the point at which it reaches maximum value. When the valve is operated at one of these points only one set of half-cycles (either positive or negative) can affect the anode current, thus allowing rectification to be obtained.—B.

Condenser Across Transformer Primary

Q.—Some circuits show a fixed condenser across the primaries of L.F. transformers. Is this condenser necessary, and if so, what should be its value?—K. S. (Ashbourne).

A.—Whether such a condenser will be necessary depends upon the circuit used, the make of transformer, and its position in the set. Generally speaking, when reaction is used a condenser having a value of .001 or .002 microfarad should be connected across the primary of the transformer, which is connected in series with the reaction coil. This will enable the H.F. currents which have to pass through the reaction coil to get easily across the high inductance of the transformer primary. In the case of some transformers, however, the winding will have

sufficient self-capacity for the purpose. It is not necessary to place a condenser across the windings of other transformers in a straight-

OUR WEEKLY NOTE

WHEN TO USE SEPARATE RHEOSTATS

At the present time, when there is a great reaction against using a multiplicity of controls in wireless sets, there is some danger of "simplification" being carried too far.

Take, for instance, the question of filament rheostats. At one time each valve had its own particular rheostat. Nowadays a single master rheostat is often considered sufficient, while in some cases, rheostats are omitted from the set altogether.

There is no harm in running two identical valves, fulfilling the same purpose, through a common filament resistance, provided that it is not desired to cut one of them out at times.

But even if the same valves are used throughout the set it is quite a mistake to apply the same filament voltage to the valves acting as H.F. amplifiers, as detector, and as L.F. amplifiers. At least three separate rheostats should be provided in such a case.

When a switch is provided to enable one of two L.F. valves to be cut out at will each valve should have a separate filament resistance. Otherwise, if the filament current of both valves is correctly adjusted and one of the valves is then cut out, the remaining filament will be lighted too brightly.

THE BUREAU.

One Valve and Frame Aerial

Q.—Is it possible to receive a main station on the phones, using a straight detector circuit and frame aerial, at a distance of six miles?—O. R. (Cardiff).

A.—Provided that use is made of reaction, good phone reception should be quite possible under the conditions you suggest. The larger the area of the frame windings the better will be the results.—J. F. J.

Diameter of B.A. Screws

Q.—Could you give me a table showing the diameter of B.A. screws, the number of threads per inch, and tapping-drill sizes?—A. C. (E.3).

A.—The table for which you ask is given herewith.—B.

No.	Approx. Number of Threads per in.	Full Diameter in inches.	Full Drill Size.
8	59.1	0.087	48
7	52.9	0.098	46
6	47.9	0.110	43
5	43.0	0.126	37
4	38.5	0.142	31
3	34.8	0.161	29
2	31.4	0.185	22

Making a High-tension Rotary Converter

Q.—Referring to the articles on "Machine-made High Tension," appearing in the July 24 and 31 issues of "A.W.," I should like to know where suitable stampings can be obtained for the armature and field magnets. Also please explain the particulars relating to the low-tension armature coils.—A. W. F. (South Shields).

A.—Armature and field-magnet stampings in special "Lohys" quality iron are obtainable from Messrs. Joseph Sankey and Sons, Ltd., Albert Street Works, Bilston, Staffs. The point upon which querist is doubtful seems to relate to the winding of the low-tension armature coils. The specification calls for 3 plus 3 turns per coil of stranded copper made up of 28 No. 36 bare-copper wires laid together and braided with double silk overall. A "double" former-wound coil is one that has two sections of the winding wound off continuously on the same former before the wire is cut. At the end of the first section a loop of wire is left out, long enough to reach the commutator bars, and the winding then continued on the same former until the end of the section, when it is cut. The double coil so formed is taped up as though it were a single coil, leaving the start loop and finish out for connection to appropriate commutator segments. It is easier to assemble multiple coils in the armature slots like this than it would be if each coil were made as a separate unit. The same applies to the high-tension windings. A number of sections is wound, looping out at the end of each section, until the requisite quantity is obtained. The matter will be found explained in greater detail in A. H. Avery's "Dynamo Design and Construction."—A. H. A.

circuit set, but it may sometimes improve the tone to do so. In the case of reflex receivers, a condenser should always be tried across those transformer windings which are connected in series with H.F. circuits.—J. F. J.



AN INTERFERENCE TIP



Miss Mavis Bennett.

NEXT WEEK AT 2LO

By "THE LISTENER"



Mr. Charles Wreford

ON Sunday next a popular programme will be given in the afternoon, with Frederic Collier, of the B.N.O.C., W. H. Squire, the well-known 'cellist, and the Creswell Colliery Band. In the evening the Wireless Orchestra, conducted by John Ansell, will give an orchestral concert, assisted by Dennis Noble and Leonard H. Warner.

A varied day is promised for Monday, amongst the talks being those given by Mr. E. Kay Robinson, Mr. A. W. P. Gayford, the Rt. Hon. Lord Northesk, and Desmond MacCarthy, the literary critic of the B.B.C. Light music will be represented by the R.A.C. Dance Band and Alex. Fryer's Band from the Rialto. As a contrast, chamber music will form the greater part of the evening programme, with the Spencer Dyke Quartet and Frederick Thurston. The week's piano-forte recitals are given by Isobel Gray and Claude Pollard; Hubert Carter is the soloist.

Sir H. Walford Davies commences his talks again on Tuesday, also M. Stephan and Mr. F. W. Heald. The dance bands will be those of William Hodgson at the Marble Arch Pavilion and the London Radio Dance Band under Sidney Firman. Later in the evening will be broadcast a performance of Basil Hood's light opera

Young England, the music by G. H. Clutsam and Hubert Bath. The artistes in the cast are Mavis Bennett, Gladys Palmer, Joseph Farrington, Robert Chignell, Tommy Handley, Harold Kimberley, and Stuart Robertson. Later, items will be contributed by Charles Wreford, the Yorkshire dialect entertainer, Gladys Newth, and George Briery, and the late feature will be Jack Howard's Band.

On Wednesday M. Camille Couturier's orchestra will be heard from Frascati's Restaurant, followed later by Alex. Fryer's Band. The singers during the evening are Mary Somerville and E. Arnot Robinson. A Chinese programme has been arranged by Mr. C. A. Lewis, when vocal and orchestral items will be given.

A special feature will be some Dutch songs and examples of yodelling by Peter Van Dyke, songs by the Irish vocalist, Jerome Murphy, and a newcomer to the microphone in Leonard Henry.

On Thursday the chief item of the programme will be a symphony concert by The National Orchestra held at the Royal Albert Hall, and conducted for the opening one of the series by Sir Hamilton Harty. Both British and foreign works will be heard, and during the season a

revival of Berlioz's *Messe des Morts*, only heard once in the thirty years since it was written.

The chief orchestra in the day on Friday is that of Frank Westfield, from the Prince of Wales's Picture Palace, Lewisham. This orchestra is one of the largest in the suburban picture houses, and is conducted by Mr. Westfield, who admits that he has thousands of letters expressing their appreciation of his work. It is certainly one of the finest broadcasting orchestras heard every week. One would like to suggest a daily broadcast in place of some of the dull fixtures now obtaining.

Variety in Talks

Amongst the talkers are M. Stephan, in French; Mr. Percy Scholes, on music; Mr. Allen S. Walker, on architectural delights; and A. J. Alan. The Victor Olof Sextet will provide the classical element, with the singers Glyn Eastman and Mary Crauford, lighter work being heard with the London Radio Dance Band under Sidney Firman.

Contrast will be provided on Saturday by the Radio Follies Concert Party and the classical solos of Boris Pecker, Kathleen Cooper, the two pianists, Isabel Gray and Claude Pollard, with a feature programme by Vivian Foster.

THE SPEED OF WIRELESS WAVES

WE know that the waves employed in wireless are much like the ether waves of which light is composed except that their wavelength is longer. Indeed it is probable that radio waves are exactly like light except in this respect.

Text-books assure us that radio waves travel with the speed of light, 186,329 miles per second, but it must be admitted that at present that is really an inference rather than a proven fact. Beginning with the one of Hertz, several experiments have been performed to prove that the speed of wireless waves and light waves were identical, and results have gone to show that this is true—within the limits of experimental error.

But these error limits have been too wide; it has remained possible that the speed of radio might not be *exactly* the

speed of light. Radio is becoming far too exact a science to be satisfied with inferences and surmises. It is true that the difference, were any found, would scarcely be important in practice.

But there are theoretical reasons why scientists want to know for certain, so that some importance attaches to the experiment conducted by the American Bureau of Standards, when an electrical impulse was sent by land wire from the Cosmos Club at Washington to the transmitting station of the Radio Corporation at New Brunswick, N.J.; thence by radio to the receiving station at Warsaw, Poland; on by land wire to the Polish transmitting station; thence by radio back again to Riverhead Long Island; and finally by land wire back again to a receiver on the same table as the transmitter from which it originated.

In this test the most precise measuring instruments were employed, and the time needed for the complete circuit was determined at .046 second. After due allowance had been made for the effects of the land wire portions of the circuit and for all other disturbances, the speed of the radio waves worked out very close to its theoretical value.

It is probable, then, that further refinements of the apparatus, especially the elimination of all the land lines, will give us before long a definite proof that radio has exactly the speed of light.

A. J. B.

The Berlin short-wave telephony transmitter which is nightly relaying the concert programmes has increased its power to 3 kw.

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AN experimental journey between Paris and Rabat is to be made by Lieutenants Gerardot and Cornillon for the purpose of registering observations with regard to the manner in which wireless can be used aboard an ordinary aeroplane over a long distance.

The B.B.C. announces that when the European broadcast wavelengths are rearranged—on about October 15—all broadcast stations will be equipped with a calibrated electrical indicator of special design, and whenever a station departs from the wavelength allocated to it warning will be given by means of a luminous signal.

A recital by Mr. Albert Sammons, violinist, and Mr. Gordon Bryan, pianist, will be contributed from Bournemouth on September 29.

Among the future National Concerts from the Albert Hall will be Berlioz' "Messe des Morts," which requires a specially-trained chorus of about 200 voices, a full orchestra, and a brass band. The band and chorus will be brought from Manchester for the performance, the date of which has not yet been fixed.

The Manchester station of the B.B.C. is actively co-operating with the city authorities in the development of Civic Week, and has arranged for the leaders of branches of the city's activities to broadcast short descriptions of the city's progress. The station has also undertaken the production of a concert by Lancashire artists to be called the "Red Rose" concert.

The equipment of the Daventry high-power broadcasting station was recently overhauled. It is reported that the B.B.C. hopes to arrange for the power of the station to be increased.

The new Daventry aerial, which is 600 ft. in length, was recently installed. All that listeners knew was the B.B.C. announcement that there would be an interruption on account of certain necessary adjustments. It will be recalled that on December 5 it was announced that owing to the weight of frost the great aerial at Daventry had collapsed.

Mr. Peter van Dyke will be heard on September 29 in light Dutch numbers and yodelling. Mr. Jerome Murphy, Irish entertainer, will also contribute on that evening. The compère for this programme will be Mr. Leonard Henry, a newcomer to broadcasting.

At the Berlin Radio Exhibition the authorities have been enterprising enough to produce the model of a whole town completely fitted with aerials to show how wireless masts should be erected to be technically correct, and yet not destroy the general appearance of the city.

It is hoped that Sir John Martin-Harvey will broadcast portions of his well-known play *The Only Way* from 2 L O on October 10.

Dr. James Robinson, D.Sc., Ph.D., in an address to Edinburgh Rotary Club, declared that "death rays," power transmission, and the increase of fertility among crops were all outside the scope of wireless. He did not believe wireless would displace the cable service for a hundred years or so.

Scottish music-lovers are to be well provided for during the coming season. In addition to the Albert Hall series of orchestral concerts, the augmented Glasgow station orchestra is giving public concerts monthly in St. Andrew's Hall, Glasgow, with distinguished conductors and artists.

An honour was conferred on a Workington, Cumberland, bride and bridegroom, when the B.B.C. broadcast from 2 L O Mendelssohn's wedding march. Two loud-speakers were installed at the bride's home. It was previously announced that the arrangement, which was given great publicity, had been cancelled. This was done in order to avoid further unwanted publicity.

The attempt of the B.B.C. to broadcast the speeches at the Assembly of the League of Nations at Geneva recently was hardly a success. When the speeches should have begun it was announced that the lines were not ready, and half an hour later London listeners were informed that engineers were still making tests of the lines between here and Paris. At 1.15, without warning, the transmission from Geneva began. As on previous occasions, it was loud, but very indistinct.

Owing to the amount of work necessary to adapt transmitters the new wavelengths for the European wireless stations will not be introduced until October, instead of this month as previously announced.

A new system of "wired wireless" reception is reported. Mr. Chisholm, the inventor, suggests that broadcasting can be transmitted through existing metallic conductors direct to a loud-speaker, with only a cheap intermediary attachment. The scheme has, he states, been tried out on a group of bungalows from the power station which supplies their electrical power.

The B.B.C. have made elaborate advance fixtures in connection with the Albert Hall concerts, which have been provisionally fixed for October 21, November 9, November 25, December 16, one in January, two in February, three in March, and one in April.

It is stated that the wireless station in Tientsin is able to communicate with the stations at Harbin, Manchuria, and at Yunnanfu, Yunnan Province, S.W. China. Private messages are being accepted for transmission to these two cities.

On the Moray Firth, Newcastle is the best B.B.C. station after Aberdeen, followed by Daventry. Glasgow is poor, but Norway and Sweden come in well.

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Count Alessandro Volta, the well-known Italian physicist, was born at Como, Italy, in 1745. In commemoration of the centenary of his death, on March 5, 1827, an international exhibition, in which a radio section will play an important part, will be held in his native city between May and October next year.

The new broadcasting station in the Free City of Danzig was formally opened on September 20. It will act as a relay station to Koenigsberg, but as a small studio has been installed it will, at least once or twice weekly, as is the custom with other German relay stations, put on its own programmes with local talent. The WL allotted to Danzig by the Geneva Bureau is 272.7 metres, in common with Norrkoeeping, San Sebastian and Cassel.

Since the Frankfort-on-Main broadcasting station has increased its power many reports have been sent in from various parts of the United Kingdom confirming that the transmissions are being received on ordinary crystal sets.

The Telefunken Company has installed a high-power low-wave telephony transmitter at its Berlin works. For the present transmissions are being effected daily for a period of about one hour from 14.20 B.S.T. on 25.3 and 40.2 metres. In the former case the call sign is A G A; in the latter, A G C.

It is reported that the new Antwerp Telephony and Electrical Works Company has been granted a fifty-year concession for the installation and operation of broadcasting stations in Greece.

At Sombernon, a small town in the neighbourhood of Dijon, a new experimental broadcasting station is being erected by a group of amateurs.

The Greek Government proposes to install powerful wireless telephony and telegraphy transmitters at Athens, Patras and Janina, each of about 3 kilowatts. Further small stations are to be erected at Chio, Syra and Zante.

The new broadcasting station installed at Caracas (Venezuela), Ayre, is a 1-kilowatt station transmitting on a wavelength of 375 metres. It is run by the Empresa Venezolana de Radiotelefonía by concession from the Venezuelan Government.

The Uruguayan Government is installing at Monte Video a new 1-kilowatt telephony transmitter which will serve as the official broadcasting station.

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The B.B.C. is seeking the collaboration of the three agricultural colleges in Scotland—at Glasgow, Edinburgh and Aberdeen—in the framing of future talks. The Glasgow College has agreed to co-operate, the principal stating that the talks to farmers had already done a great deal of good in the institution.

Before the new European broadcasting wavelengths can come into operation it will be necessary to equip every station with a calibrated electrical indicator, which will probably take the form of a neon wavemeter. Should a station go off its wavelength, the effect would be that the valve would go out, and thus act as a warning to the engineers.

On the occasion of the relay of *Riverside Nights* from the Lyric Theatre, Hammer-smith, on September 23, Mr. Nigel Playfair will introduce Mr. T. S. Lonsdale, the author and composer of the famous song "Tommy, Make Room for Your Uncle," which was first heard in 1876.

On September 28 the London studio will broadcast *Young England*, a light opera produced at Daly's Theatre in 1916.

Portions of the Scottish Military Searchlight Tattoo, which is being held in the grounds of Dreghorn Castle, will be broadcast from Edinburgh on September 28 and 30 and October 2. On Friday, October 1, the entire performance will be relayed.

CHIEF EVENTS OF THE WEEK

SUNDAY, SEPTEMBER 26.

London Massenet Programme.
Birmingham Symphony Concert.
Cardiff Famous Overtures.
Manchester The Mexborough Excelsior Male Voice Quartet.

MONDAY.

London The Spencer Dyke Quartet.
Aberdeen *A Gentleman's Gentleman*.
Bournemouth Manchester Calling Bournemouth.

TUESDAY.

London *Young England*.
Birmingham Bright and Breezy.
Belfast The Round Table Singers.
Manchester The Eights Concert Party.

WEDNESDAY.

London A Chinese Programme.
Cardiff Light Descriptive Music.
Manchester Mildred Dilling, America's Greatest Harpist.

THURSDAY.

London E.B.C. National Concert relayed from the Royal Albert Hall. First Concert.

FRIDAY.

London The Victor Olof Sextet.
Cardiff Irish Programme.
Edinburgh Scottish Command Military Searchlight Tattoo.
Manchester English Opera Series.
Newcastle 1—*Maritana*.
An Elder of the Kirk.

SATURDAY.

London The Radio Follies Concert Party.
Manchester Madrigals of Tudor Days.

In the belief that the trade will benefit if oscillation can be diminished, and frankly denying any altruistic motive, a Scottish wireless service firm is offering to help anyone—free of charge—who is suspicious of his receiving apparatus being a cause of trouble.

The penalties for Glasgow wireless pirates are increasing. A fine of £4 was imposed on the latest offender, who explained that he had a small crystal set from which he could not get results.

Among the feature programmes being given from the Glasgow station towards the end of September is the story of the city of Venice told in music in an historical manner, and another demonstrating French musical art.

"Protecting Dull Emitters."—In connection with the above article, which appeared on page 306 of our September 11 issue, Messrs. A. H. Hunt, Ltd., of H.A.H. Works, Tunstall Road, Croydon, remind us that they have marketed a safety fuse-plug, the "Saveit," which is a fitment which would make for economy in any valve set. It is better to lose a pea lamp than a valve. Messrs. Hunt inform us that they hope to fit these fuses soon with special fuse bulbs having a current consumption of not more than .05 of an ampere, which will enable any .06 valve to be protected.

EDISON BELL RADIO

"THE CONNOISSEUR'S FIRST CHOICE"

EDISON BELL "PRINCE" 2-VALVE SET.

This very attractive set is shown with the doors of cabinet open. Size 13 by 12 by 10 inches deep, ebony engraved panel, fitted in solid oak cabinet with folding doors of Jacobean design. Simple and selective control with Reaction and Filament Rheostat. This set comprises one Detector and one stage of Low Frequency, Patent Rotary Coil Holder, giving smooth and efficient reaction. Leads are supplied for H.T. and L.T., also Grid Bias, which should be 4½ volts with tappings to obtain the best musical quality. The well-known Edison Bell Coils are supplied for 280-500 metres. Undoubtedly the "Prince" represents one of the finest 2-valve sets on the market.



THE EDISON BELL "PRINCE" 2-VALVE SET.

PRICE £4 : 10 : 0

(Valves, Batteries and Marconi Licence extra.)

This attractive and efficient single valve set received a great deal of attention at the National Radio Exhibition, where it was on view, the superb workmanship having a big appeal to all.

Our latest illustrated catalogue will interest you, copies of which can be obtained free from your dealer, or upon direct application to the company.

TESTED 500 VOLTS
FLAT TYPE



EDISON BELL, LIMITED,
LONDON, S.E. 15, AND AT HUNTINGDON.

TESTED 500 VOLTS
UPRIGHT TYPE



INSIST ON EDISON BELL CONDENSERS

THEY ARE BRITISH MADE AND GUARANTEED BY A NAME WITH 30 YEARS REPUTATION BEHIND IT

"GETTING RID OF DISTORTION" (continued from page 406)

voltage from that of the battery to that recommended by the makers of the valve. A good general rule is to use twice the necessary voltage and to make the resistances equal to the valve impedances.

The amplification is, of course, increased by raising the value of resistance and H.T. Wire-wound resistances are preferable to the "cartridge" type, as the latter (especially the cheaper makes) often partially disintegrate after being in use for some time, with consequent development of "crackling."

Quality

We now arrive at the final form of our four-valver, as shown in Fig. 4. We have gone a long way from our original standard circuit, and, if the owner of the latter builds up this new set, he will probably be very disgusted with the "poor signal strength" when he switches on his loud-speaker. In fact, not one of the valves is now being worked "all out" (quite apart from actual overloading). Neither (if he still uses the same instrument) is the loud-speaker. But if he has a musical ear he will probably be forced to admit that the quality of the "gentle tones" he now hears compares more than favourably with the previous hearty roar. If he is not satisfied, his best course is really the addition of a fifth valve (resistance coupled, of course) to make up for the deficiency in strength, but if he does thus bring his volume up to the previous standard he will perhaps reintroduce distortion by *overloading the loud-speaker*. This is commoner than many realise.

Again, the last valve may not be capable of handling the large output. The remedy for the last trouble is, of course, to use a power valve, but a good-sized drawing-room can be comfortably filled without overloading an ordinary valve.

Overloading the Loud-speaker

Overloading of the loud-speaker may be due to the saturation (magnetic) of the iron core, though the rest of the instrument is quite capable of handling *fluctuations* of current of the amplitude applied. In this case a filter circuit, as shown at the right of Fig. 4, will often enable it to work quite satisfactorily. Here, as in L.F. intervalve coupling, the size of the condenser and the impedance of the choke are important. The condenser should not be less than .25 microfarad (preferably as big as 1 microfarad). The secondary of an L.F. transformer (even if its primary is defective) often makes a good choke.

H. W. S.

Aberdeen listeners continue to be troubled by interference from GSW (Stonehaven) and ships working in the North Sea. It is feared that the forthcoming change in the broadcast station's wavelength is not sufficient to obviate the nuisance.



The new series of
CLEARTRON VALVES
have proved like the
LODGE 'N' CIRCUIT
the famous non-radiating set
the "Hit"
of the Exhibition



C.T. 15 Standard
14/-

Cleartron Standard and "Plus" Valves are exclusively used in Sir Oliver Lodge's latest and greatest Wireless achievement.

To ensure
MAJESTIC Volume,
Operatic Purity of Tone,
and REAL Long Distance,
be sure to fit your sets with



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CLEARTRON NEW MODEL VALVES

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AT STANDARD PRICES

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America's Foremost Valve made in Britain's newest Factory and SOLD WITH THE IRONCLAD GUARANTEE.

SEND for 1926/27 Catalogue giving full technical data, also ask for The Lodge "N" Descriptive Booklet, with "Foreword" by Sir Oliver Lodge.

CLEARTRON RADIO LTD

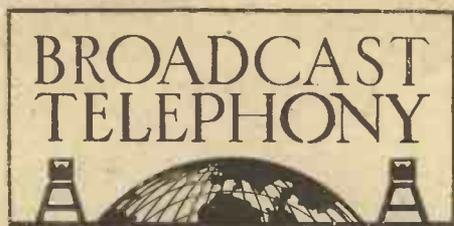
ONE CHARING CROSS, LONDON, S.W.1

Telephone: Regent 2231-2.

Telegrams: "Cleartron, Westrand, London"

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CT/62



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

GREAT BRITAIN

The times given are according to British Summer Time.

London (2LO), 361 m. 1-2 p.m., con.; 3.15-4 p.m., transmission to schools; 3.30-5.45, con. (Sun.); 4.15 p.m., con.; 5.15-5.55, children; 6 p.m., dance music; 7-8 p.m., time sig., news, music, talk; 8-10 p.m., music; 9.0, news (Sun.); 10 p.m., time sig., news, talk, special feature (Mon., Wed., Fri.). Dance music daily (exc. Sundays) from 10.30 until midnight.

Aberdeen (2BD), 495 m. Belfast (2BE), 440 m. Birmingham (5IT), 479 m. Bournemouth (6BM), 386 m. Cardiff (5WA), 353 m. Glasgow (5SC), 422 m. Manchester (2ZY), 379 m. Newcastle (5NO), 404 m. Much the same as London times.

Bradford (2LS), 310 m. Dundee (2DE), 315 m. Edinburgh (2EH), 328 m. Hull (6KH), 335 m. Leeds (2LS), 321.5 m. Liverpool (6LV), 331 m. Nottingham (5NG), 326 m. Plymouth (5PY), 338 m. Sheffield (6FL), 306 m. Stoke-on-Trent (6ST), 301 m. Swansea (5SX), 482 m. Daventry (25 kw.), high-power station, 1,600 m. Special weather report, 10.30 a.m. and 10.25 p.m. (weekdays), 9.10 p.m. (Sun.); 11.0 a.m., light music (exc. Sat. and Sun.); relays 2LO

from 4 p.m. onwards, own con. on Mon. Dance music daily (exc. Sun. and Tues.) till midnight; on first Friday in each month until 2 a.m.

IRISH FREE STATE.

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

CONTINENT

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

AUSTRIA.

Vienna (Radio Wien), 582.5 m. and 531 m. (5 kw.). 11.00, con. (almost daily); 15.30, con.; 19.25, news, weather, time sig., con.; 22.00, dance (Wed., Sat.).

Graz, 401 m. (750 w.). Relay from Vienna. Also own con. (Wed.), 20.10.

BELGIUM.

Brussels, 487 m. (1.5 kw.). 17.00, orch. (Tues., Thurs., Sat. only), news; 20.00, lec., con., news. Relay: Antwerp, 265 m. (100 w.).

CZECHO-SLOVAKIA.

Prague, 372 m. (5 kw.). Con., 19.00-23.00, daily.

Brunn (OKB), 521 m. (3 kw.). 19.00, con. (daily).

Koszice, 2,020 m. (2 kw.).

DENMARK.

*Copenhagen (Radioraadet), 347.5 m. (700 w.). Sundays: 10.00, sacred service; 16.00, con.; 20.00, dance. Weekdays: 20.00, lec., con., news; dance to 24.00 (Thurs., Sat.).

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

*Relayed by Odense (810 m.), Sorø (1,150 m.).

FINLAND.

Helsingfors (Skyddskar), 520 m. (500 w.).

*Tammerfors, 368 m. (250 w.).

*Jyvaskyla, 561 m. (100 w.).

*Pori, 254.2 m. (100 w.).

*Oulu, 233 m. (100 w.).

*Relay Helsingfors.

GRAND DUCHY OF LUXEMBURG.

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

FRANCE.

Eiffel Tower, 2,650 m. (5 kw.). 06.40, weather (exc. Sun.); 07.15, 08.00, physical exercises; 11.00, markets (exc. Sun. and Mon.); 11.20, time sig., weather; 15.00, 16.45, Stock Ex. (exc. Sun. and Mon.); 18.00, talk, con., news; 19.00 and 23.10, weather; 21.00, con. (daily). Relays PTT, Paris; 07.15, 08.00 (daily), also on Sat., 21.10-23.00.

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

L'Ecole Sup. des Postes et Télégraphes (PTT), Paris, 458 m. (800 w.). 07.15, 08.00, physical exercises (exc. Sun.); 20.30, lec. (almost daily); 21.00, con. (daily).

Le Petit Parisien, 333 m. (500 w.). 21.15, con. (Tues., Thurs., Sat., Sun.).

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

Radio-Toulouse, 432 m. (2 kw.). 17.30, news (exc. Sun.); 20.45, con.; 21.25, dance (daily).

Radio-Lyon, 280 m. (1.5 kw.). 20.20, con. (daily). Temporarily closed.

Strassburg, 205 m. (100 w.). 21.15, con. (Tues., Thurs.).

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

*Lyon-la-Doua, 480 m. (1 kw.). Own con., 20.00 (Mon., Wed., Sat.).

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SOLDERING SET—complete

All Hardware and Ironmongery Stores sell FLUXITE in tins, price 8d., 1/4 and 2/8.

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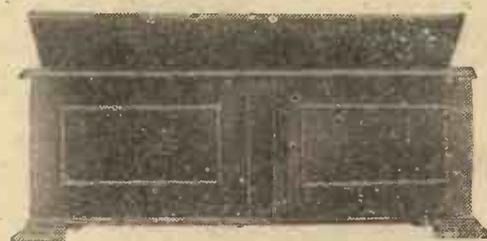
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CAXTON 4-VALVE CABINET

Made for Sets "All Concert Receiver," "Fieldless Coil Three Valve Set," "Any Valve Low Frequency Amplifier."

Special Cabinets made to customer's measurements. Prices Quoted.



Cash with Order. Fumed Oak ... £1 5 0
Dark or Jacobean Oak ... £1 10 0
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Detachable 7" deep Base Board to mount 16" by 8" panel to slide out of Cabinet front. The two beaded front doors as illustrated, placed 2 ins. in front of the enclosed panel at 10/- extra.

Ebonite or Radion Panels Supplied and perfectly Fitted at low extra cost.

All Polished with the new enamel that gives a glass hard surface that cannot be soiled or scratched. SENT FREE.—Catalogue of standard Wireless Cabinets in various sizes and woods.

Packed and delivered free in U.K.

No. C2

CAXTON WOOD TURNERY CO., Market Harborough

*Marseilles, 351 m. (500 w.).
 *Toulouse, 260 m. (500 w.).
 *Bordeaux, 411 m.
 *Grenoble, 588.2 m. (500 w.).
 *Relays of PTT Paris.
 Montpellier, 220 m. (200 w.). 20.45 (week-days only).
 Angers (Radio Anjou), 300 m. (250 w.).
 Daily: 20.30, news, lec., con.
 Bordeaux (Radio Sud-Ouest), 332 m. Con.,
 21.00 (Mon., Fri.).
 Mont de Marsan, 390 m. (300 w.). Con.
 (weekdays only), 20.30.
 Algiers (N. Afr.) (PTT), 310 m. (100 w.).
 22.00, con. (Mon., Thurs.).
 Ste. Etienne (Radio Forez), 220 m. (100 w.).
 Testing.
 Casablanca (Morocco), 305 m. (600 w.). 19.00,
 con.

GERMANY.

Berlin, on 504, 571 and 52 m. (4 kw.). 06.30,
 con., physical exercises (Sun.); 09.00, sacred
 con. (Sun.); 12.55, time sig., news, weather;
 18.30, orch.; 20.30, con., weather, news, time
 sig., dance music until 24.00 (Sat., Sun.,
 Thurs.). Relayed on 1,300 m. by Königswuster-
 hausen (1,300 m.) and Stettin (241 m.).

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

Breslau, 418 m. (4 kw.). 12.00 con. (daily),
 Divine service (Sun.); 17.00, con.; 19.00, lec.;
 20.30, con., weather, time sig., news, dance
 (relays Berlin). Relay: Gleiwitz, 250 m.

Frankfort-on-Main, 470 m. (4 kw.). 08.00,
 sacred con. (Sun.); 16.00, con. (Sun.); 16.30,
 con.; 20.00, lec., con., weather. Dance: relays
 Berlin. Relay: Cassel, 273.5 m.

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

Königsberg, 464 m. (4 kw.). 09.00, sacred
 con. (Sun.); 16.30, con.; 17.00, con. (Sun.);
 19.30, lec.; 20.00, con. or opera, weather, news,
 dance (irr.). Relay: Danzig, 272.7 m.

Leipzig, 452 m. (4 kw.). Relayed by
 Dresden (294 m.). 08.30, sacred con. (Sun.);
 20.15, con. or opera, weather, news, cabaret or
 dance (not daily).

Munich, 486 m. and 204 m. (4 kw.). Relayed
 by Nuremberg (340 m.). 11.30, lec., con.
 (Sun.); 16.00, orch. (Sun.); 16.30, con. (week-
 days); 18.30, con. (weekdays); 19.15, lec., con.
 (Sun.).

Muenster, 410 m. (1.5 kw.). Relayed by
 Elberfeld (259 m.), 750 w.), Dortmund (283 m.).
 11.45, radio talk, Divine service; 12.00, news
 (Sun.); 19.40, news, weather, time sig., lec.,
 con.

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

Stuttgart, 446 m. (4 kw.). 11.30, con.
 (Sun.); 16.30, con. (weekdays); 17.00, con.
 (Sun.); 18.30, time sig., news, lec., con.
 (daily); 21.15, time sig., late con. or cabaret.

HOLLAND.

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

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

HUNGARY.

Buda-Pesth (Csepel), 560 m. (2 kw.). 17.00,
 dance music; 20.00, con. or opera; dance
 nightly.

(Continued in second column of next page)

EXPERTS IN RADIO ACOUSTICS SINCE 1908

TWO NEW
 CONE SPEAKERS

THE Ellipticon has been described as "the best
 loudspeaker on the market" by one who is
 fully qualified to judge, and who has no personal
 interest in our success. And we honestly consider
 that it is one of the best instruments we have ever
 turned out. The Tablecone, too, can really be said
 to be superior to similarly priced Cones.



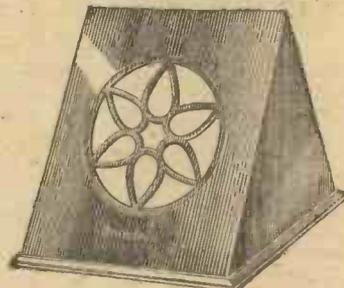
THE ELLIPTICON

(Registered Trade Mark)

The new Brandes Cone. Undoubtedly the
 best loudspeaker produced, it brings
 tone of great depth and sweetness. The
 cone has a large vibrating area and a
 driving unit of special design. The
 magnets in the unit are unusually large.
 There is no diaphragm but a small arma-

ture which, actuated on the "push-pull"
 principle, reacts to the faintest impulse.
 The specially designed cabinet "reflects"
 the sound in rich and mellowed tones.

Height ..	13 1/2 ins.	£5 10
Depth ..	7 1/2 ins.	
Width ..	10 1/2 ins.	



THE TABLECONE

Attractive cabinet of unique design,
 finished in dark walnut. The cone unit
 is fitted with a large magnet and the
 circular diaphragm has an extremely
 sensitive driving unit which provides
 plenty of volume with unblemished tone.

Supplied complete with cord connection.
 It has a genuine claim to be superior to
 any similarly priced cone speaker.

Height ..	10 ins.	£2 15
Depth (at base) ..	11 1/2 ins.	
Breadth ..	9 1/2 ins.	

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Glasgow.

"BROADCAST TELEPHONY" (continued from preceding page)

ICELAND.
Reykjavik, 328 m. (700 w.). Con., 20.30.

ITALY.
Rome (IRO), 425 m. (3 kw.). 10.30, sacred con.; 17.30, relay of orch. from Hotel di Russia; 17.55, news, Stock Ex., jazz band; 20.30, news, weather, con.; 22.15, late news.
Milan, 320 m. (1 kw.). 20.00-23.00, con., jazz band.

JUGO-SLAVIA.
Belgrade (Rakovitza) (HFF), 1,650 m. (2 kw.). 17.00, news (daily); con. (Tues., Thurs., Sat.).
Agram (Zagreb), 350 m. (500 w.).

LATVIA.
Riga, 475 m. (1.2 kw.). Con. daily, 21.00-22.00.

NORWAY.
Oslo, 382 m. (1.5 kw.). 19.15, news, time, lec., con.; 22.00, time, weather, news, dance relayed from Hotel Bristol, Oslo (22.30-24.00, Sun., Wed., Sat.).
Bergen, 400 m. (1 kw.). 19.30, news, con., etc.
*Rjukan, 445 m. (50 w.).
*Porsgrund, 405 m. (100 w.).
*Relays Oslo.

POLAND.
Warsaw, 482 m. (2 kw.). Daily: con., 11.00-13.00; 15.00-23.00.

RUSSIA.
Moscow (RDW), 1,450 m. (12 kw.). 17.55, news and con.; 23.00, chimes from Kremlin.
(Popoff Station), 1,010 m. (2 kw.). 19.00, con. (Tues., Thurs., Fri.).
Radio Peredacha, 410 m. (6 kw.).
Trades Union Council Station, 450 m. (2 kw.). 18.00, con. (Mon., Wed.).
Leningrad, 940 m. (2 kw.). Weekdays: 16.00.
Nijni Novgorod, 860 m. (1.2 kw.). 17.00 (Tues., Fri., Sun.), con.
Astrakhan, 650 m. (1 kw.).
Kieff, 780 m. (1 kw.). 18.00, con. (daily).

SPAIN.
Madrid (EAJ6), 392 m. (1 kw.). Daily: con.
Madrid (EAJ7), 373 m. (1.5 kw.). Con. daily. Closes 00.30 (Mon., Wed., Sat.).
Madrid (EAJ4), 340 m. (1 kw.). 16.00, con. The Madrid stations are again working to a rota, varying time of transmissions daily.
Barcelona (EAJ1), 325 m. (1 kw.). 17.00-21.00, news, lec., con. (Sun.); 18.00-23.00 (daily).
Barcelona (Radio Catalana) (EAJ13), 462 m. (1 kw.). 19.00-23.00, con., weather, news.
Bilbao (EAJ9), 415 m. (500 w.). 19.00, news, weather, con. Close down 22.00.

Bilbao (Radio Vizcaya) (EAJ11), 418 m. (500 w.). 22.00-24.00, con. (daily).
Cadiz (EAJ3), 357 m. (550 w.). 19.00-21.00, con., news. Tests daily (exc. Sun.), 01.00.
Cartagena (EAJ15), 335 m. (500 w.). 20.30-22.00, con. (daily).
Seville (EAJ5), 357 m. (500 w.). 21.00, con., news, weather. Close down 23.00.
Seville (EAJ17), 300 m. (500 w.). 19.00-22.00, con. (daily).
San Sebastian (EAJ8), 346 m. (1.5 kw.). 17.00-19.00, 21.00-23.00 (daily).
Salamanca (EAJ22), 355 m. (1 kw.). 17.00 and 21.00, con. (daily). Closes down 23.00.

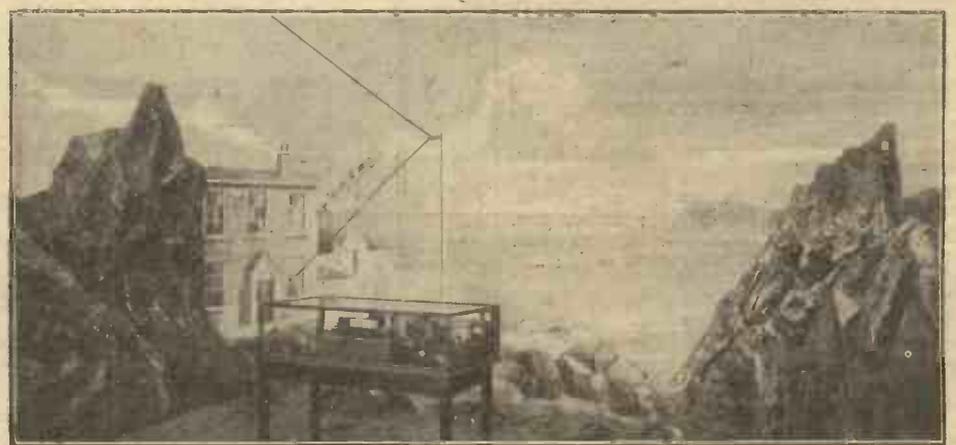
SWEDEN.
Stockholm (SASA), 430 m. (1½ kw.). 11.00, sacred service (Sun.); 18.00, sacred service; 19.00, lec.; 21.15, news, con., weather. Dance (Sat., Sun.), 21.45.
Relays.—Boden (SASE), 1,200 m.; Eskilstuna, 250 m.; Falun (SMZK), 370 m.; Gothenburg (SASB), 288 m.; Gefte, 208 m.; Jönköping (SMZD), 199 m.; Karlsborg (SAJ), 1,365 m.; Karlscrona (SMSM), 196 m.; Kristinehamn (SMTY), 292 m.; Karlstad (SMXG), 221 m.; Linköping; 467 m.; Malmö (SASC), 270 m.; Norrköping (SMVV), 260 m.; Örebro, 237 m.; Östersund, 720 m.; Sundsvall (SASD), 545.6 m. (1 kw.); Trollhattan (SMXQ), 322 m.; Umea, 215 m.

SWITZERLAND.
Lausanne (HB2), 850 m. (1½ kw.) (temp.). 20.00, lec., con. (daily).
Zurich (Hongg), 513 m. (500 w.). 11.00, con. (Sun.); 17.00, con. (exc. Sun.); 20.15, lec., con., dance (Fri.).
Geneva (HB1), 760 m. (2 kw.). 20.15, con. (daily, exc. Sun.).
Berne, 435 m. (1.5 kw.). 10.30, organ music (exc. Sat.); 16.00, 20.30, con.
Basle, 1,000 m. (1½ kw.). Con. daily, 20.30.

ARRANGEMENTS OF COMPONENTS

WHEN arranging the components in a receiver it is advisable to remember the following points: To keep the valves as well spaced as possible, also such components as transformers, H.F. or L.F., and chokes, H.F. or L.F. The directions of the windings of various components are also to be considered where inter-reaction may possibly take place. The winding of a transformer should be placed at right angles to the winding of another transformer, or two inductance coils, and items of a like nature.

H. B.



Above is shown the striking tableau, set up at the Radio Exhibition at Olympia by the Marconiphone Company, depicting the scene in the old barracks on Signal Hill, Newfoundland. It was here that Marconi heard the historic three dots which were transmitted from Poldhu, Cornwall, on December 12, 1901.

Wood or metal?



"Swan-neck"
De Luxe
Type AR 88.0
(oak) or
Type AR 88.M
(mahogany)
Price - 95/-

Wood or Metal?

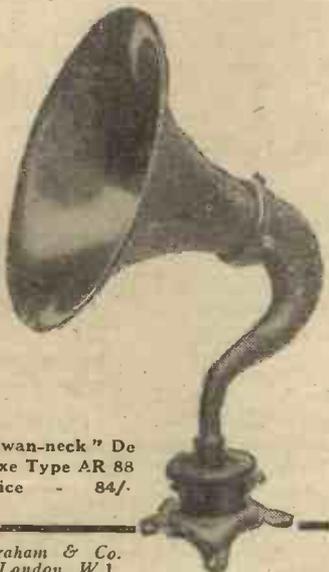
Like the first talking machines, most of the earlier wireless loud speakers were "tinny"—they had so-called "tin" or metal horns.

The wooden horned Amplion gave immeasurably superior results and this type of construction became associated in the public mind with better radio reproduction.

Progress, involving the introduction of certain exclusive features, has resulted in the entire elimination of "tinniness" in the metal horned Amplion also, and there is now little to choose in efficiency between the two types. They differ mainly in appearance and in price.

AMPLION

Obtainable from all accredited AMPLION STOCKISTS.

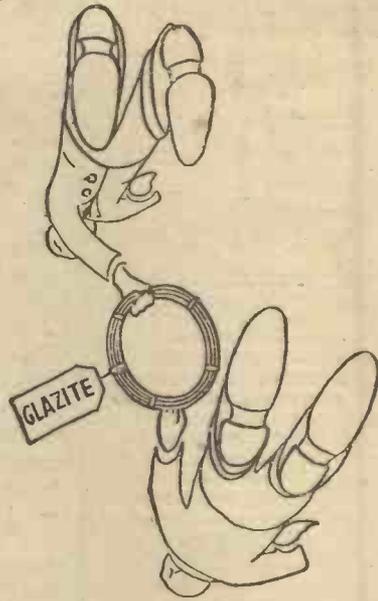


"Swan-neck" De Luxe Type AR 88
Price - 84/-

Announcement of Alfred Graham & Co. (M. Graham), 25, Savile Row, London, W.1.

To Ensure Speedy Delivery, Mention "A.W." to Advertisers

whichever way you look at it—



you can't beat Glazite for wiring!

If you want ease of wiring—GLAZITE. If you want neatness—GLAZITE. If you want economy—GLAZITE. If you want perfect insulation—GLAZITE.

In every way GLAZITE is the best way to wire a set! Flameproof and damp-proof, it will not deteriorate in use. Try GLAZITE next time.

GLAZITE
BRITISH MADE
COLOURED CONNECTING WIRE
[RED · YELLOW · BLUE · BLACK · WHITE and GREEN]

Obtainable in ten-foot coils, price 1s. 2d. per coil. Or in two-foot lengths—four assorted colours—1s. per packet. Write for interesting descriptive leaflet to

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Playhouse Yard, Golden Lane, London, E.C.1

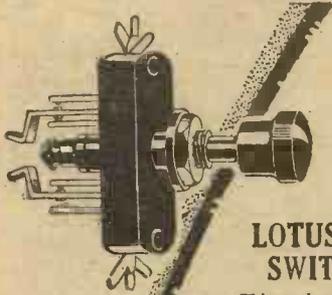
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for over  40 years



JUDD

The latest in Jacks & Plugs

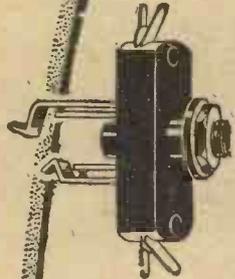


LOTUS JACK SWITCHES

This push-pull switch is designed to occupy the minimum space, being only 1½ in. deep. Of the finest Bakelite, it has nickel silver springs and contacts of pure silver. Soldering contacts can be made to suit any wiring.

PRICES

No. 9, as illustrated 4'-
others from 2'9



LOTUS JACK

Designed to take up the least space, the depth back of panel being 1½ in. Made from best Bakelite mouldings, with nickel silver springs and pure silver contacts. One-hole fixing. Soldering contacts can be brought into any position.

PRICES

No. 3, as illustrated
others from 2'-to 3'-

LOTUS JACK PLUGS

Designed for use with Lotus Jacks. Made from best Bakelite mouldings and nickel plated brass. To fix, the wires are placed in slots and gripped in position by a turn of the screw cams. Made by the makers of the famed 'LOTUS' Vernier Coil Holders and 'LOTUS' Buoyancy Valve Holders.

PRICE 2'.

From all reliable Radio Dealers

LOTUS

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Garnett, Whiteley & Co., Ltd.

Lotus Works,
Broadgreen Road, Liverpool.



Cabinets Cheap and New

SIR,—I should like to thank Mr. Reynolds for his article on "Wireless Cabinets—Cheap and New" in AMATEUR WIRELESS of September 4. His idea is both ingenious and serviceable. My own receiver was awaiting a cabinet when the above article opportunely appeared, and at once appealed to me.

I liked the idea, as in some respects a cover has certain advantages over a cabinet, one thing being that you can get at the set's "innards" much easier than with a totally enclosed container. So on reading the article I straightway clapped on my hat and made for Hobbies' branch in this city and procured the materials, though they cost a little more than the sum Mr. Reynolds mentions, but nothing to weep over. A couple of evenings later saw the job completed. Made according to Mr. Reynolds' specifications, modified to suit my own requirements (a slightly smaller panel, etc., than named in the article), there was something about the cover's appearance, however, that did not chime with my critical sensibilities. It seemed to lack symmetry—or finish, or both. The panel came flush with the tabletop, and looked much like a picture would minus the bottom portion of its frame, or a column without a plinth. I therefore obtained a small board ¾ in. thick and ½ in. wider than the overall dimensions of the cover. I then slightly bevelled the top edges with a fine file and glasspaper, and afterwards screwed it to the base-board of the set. I next screwed rubber feet at each of the four bottom corners of this board. These additions have improved the appearance of the set considerably, and at only very slight extra cost. It is now possible to lift the whole set without first taking the cover off, which was not possible before. Moreover, and best of all, it looks exactly like a new cabinet, and would deceive even the very elect! Only critical examination could detect the difference.

Trusting the above may be of service to others who make up this useful article.—A. J. W. (Manchester).

The Railways and Wireless

SIR,—It seems a pity that the resourcefulness of our wireless inventors and manufacturers is not given the encouragement with which wireless is fostered in European countries.

Almost simultaneously with the opening of our first National Radio Exhibition at Olympia, for example, when close upon two hundred exhibitors (a record number) are showing hundreds of intriguing devices, I read that the German railways have arranged for the home and foreign

market reports and quotations to be picked up at fixed receiving stations and telephoned to catch express trains for the benefit of the trades concerned.

One would like to imagine that any British railway would be as quick to apply the progress of science for the benefit of its patrons.—W. T. K.

Daventry's Harmonic

SIR,—On the night of September 6, when Daventry broadcast dance music till midnight, about 11.30 p.m., when all the other B.B.C. stations had closed down, I put on my set (which is a two-valve one) to try and get any foreign station that might be on, I received 5 X X at loud-speaker strength on a wavelength of about 320 metres. I had only a No. 50 aerial coil and a No. 75 coil reaction in use.—C. A. W. (Whitley Bay).

Quality of Transmission

SIR,—May I be permitted to reply to H. W. T.'s letter in No. 222 of AMATEUR WIRELESS? His apparent satisfaction of 2 L O's transmission proves nothing so far as this locality is concerned. I thought I made it clear in my last letter that I was not speaking for Londoners.

We here are over fifty miles from 2 L O and over one hundred miles farther from 5 X X, which, by the way, is the station most of us here use on account of morse interference. I still maintain that the average studio transmission is bad in comparison with the Eastbourne relay as far as this locality is concerned. There are several other relays that are good; one in particular is the organ recital from one of the London picture houses on Wednesday afternoons.—H. P. (Hove).

"Packing Pictures and China for Removal" is the title of an illustrated article appearing in the current issue of "The Amateur Mechanic and Work" (3d.), and should be useful to many readers. Other articles appearing in the same number are: "Panels for the Amateur," "Lost Keys: A Useful Hint," "How the Ratchet Screwdriver Works," "Making a Pair of Lattice Steps," "An Easily-made Umbrella Stand," "Renovating and Reenamelling a Bath," "Two Chucking Hints," "How to Install a Bed Light."

ELEKTRITE CRYSTAL

A SAMPLE of the Elektrite crystal, complete with tweezers and a catwhisker, has been supplied to us for testing purposes by P. Barnard and Co., of 9 to 10, Savoy Street, London, W.C.2. The crystal consists of galena having a medium grain with high facets.

On test we found the crystal to give good results and to be equal in sensitivity to our standard. There were no dead points on any part of the surface. We can recommend this crystal as an excellent sample of its species.

**BY FAR THE BEST
YET
MADE**



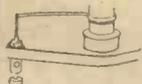
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RATIO
200-1**



Fixed vanes insulated from end plates by porcelain.



Rotor vanes of decrement shape



Soldered pig-tail connection to rotor vanes



Dust-proof cover for gear mechanism



Definite stops on rotor spindle

—this is the report of all the Radio authorities to whom we submitted the PYE CONDENSER before placing it on the market.

The same skill and care that have made our scientific instruments world-famous have been brought to bear on this new condenser. The 200-1 vernier movement works as smoothly as the adjustment of a microscope and with the same complete freedom from backlash. The metal work is of solid brass and the insulation of porcelain.

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.0003 "	
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All types, voltages, etc., in Double and Treble Capacities. Dry Batteries for Low Tension, Hand and Pocket Lamps.

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You will Help Yourself and Help Us by Mentioning "A.W." to Advertisers

AUSTRALIAN LICENCE ADMINISTRATION

REPLYING to questions in the Australian House of Representatives recently, the Postmaster-General said the whole administration dealing with licences for broadcasting and listening-in was undertaken by the Government, and the administration included costs of printing and issuing licences. Complete figures in regard to the estimated cost of these services to June 30, 1926, could not be furnished. The department retained 2s. 6d. per licence; this covered printing and issuing of licences throughout all post offices in the Commonwealth, accountancy, general supervision, inspection of stations, and all other services to ensure observance of the regulations. The total amount received for licences to June 30, 1926, was £279,267. The total money paid and remaining to be handed over to the broadcasting companies between the inception of the authorised service and June 30, 1926, was £242,696.

From a return recently furnished to the Australian House of Representatives it is learned that the total amount paid by the Government to the capital of Amalgamated Wireless, Ltd., to June 30, 1926, was £25,000 10s.; the amount paid to this company for working expenses to the same date was £251,958 11s. 9d. The total amount received by the Government from the receipts of this company to the date

referred to was £106,228 11s. 10d. The Government, as holder of 500,001 shares in this company, will receive just over half the profits of the company, if any. The Government does not accept full liability for the losses in the business of the company and the Government, and the only losses it would bear would be those of a shareholder in the company.

"RHEOSTATS AND POTENTIOMETERS" (continued from page 394)

ing either the battery connections or the leads from the grid and filament. A still better way of doing this is by connecting the grid leak to the centre of the resistance, as shown in Fig. 3. This latter method permits of either a positive or negative voltage being supplied to the grid without involving any further change in the connections. When the sliding contact A is on one side of the centre point R the potential is positive, and when A is moved to the other side of R the potential is negative.

The ohmic resistance of a potentiometer is always high, because it is connected directly across the battery. The wire actually "short circuits" the battery; if the resistance were low, therefore, there would be a relatively big discharge of current. A resistance of 4 ohms, for instance, across a battery of 4 volts would carry a current of 1 ampere, but this ampere current would be wasted, since it is voltage, and not cur-

rent, that is required. On the other hand, with a potentiometer of, say, 3,000 ohms across a 4-volt battery, the current discharge is extremely small.

The opposite considerations apply to rheostats, of course. The resistance wire is wound on a circular ring, and the sliding contact consists of a metal arm which rotates about an axis at the centre of this ring. The resistance of this rheostat is about 15 ohms. It could therefore not be used for all dull-emitter valves, many of which consume only a small fraction of the current consumed by bright valves. The resistance element in rheostats does not always consist of wire; in many instruments of modern design powdered carbon is used, the resistance of the latter depending upon the pressure exerted on it. Several of these instruments are designed to give a resistance range of 0 to 60 ohms, thus making them suitable for use with any type of valve. M. E.

Sydney S. Bird, of Cyldon Works, Sarnesfield Road, Enfield Town, Middlesex, is the manufacturer of the Cyldon S.L.F. ball-bearing variable condenser, of which a descriptive leaflet has been received.

The "1927 FIVE," see page 402 for an announcement regarding this amazing set.



IGRANIC FRESHMAN FIXED CONDENSER.



IGRANIC FIXED GRID LEAK.



IGRANIC MOUNTING BASE.

ACCURATE, CONSTANT, CONVENIENT

The method of constructing IGRANIC FRESHMAN FIXED CONDENSERS ensures accurate and constant capacity values. Every user of fixed condensers who appreciates the importance of obtaining the exact capacities specified for a circuit can be sure of doing so by using Igranic Freshman Fixed Condensers.

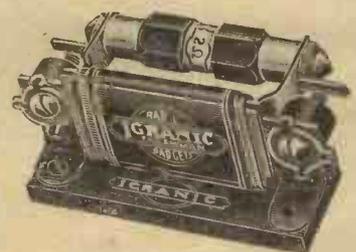
They are convenient, too; they can be mounted in several different ways, or can be supported on the wiring of a receiver.

IGRANIC FIXED GRID LEAKS are also accurate, constant, and silent in operation. They, too, can be mounted in different ways. The conical ends are fitted with spacing connectors; two clips, two special spade terminals and two screws and nuts are included with each grid leak.

THE IGRANIC MOUNTING BASE has been designed specially for mounting Igranic Freshman Fixed Condensers on a baseboard. An Igranic Fixed Grid Leak can also be mounted on the same base.

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IGRANIC FIXED GRID LEAKS ..	2/3 ..
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Works: BEDFORD.

TRADE BREVITIES

AN interesting pamphlet dealing with Lewcos screened coils has been sent us by The London Electric Wire Co. and Smith's, Ltd., of Playhouse Yard, Golden Lane, E.C.1.

The new issue of the Marconi Log Book which we have just received is a decidedly useful acquisition for the DX enthusiast. Besides the numerous log pages in this book there is a comprehensive section devoted to the particulars of Marconi valves. This book was received from The Marconiphone Co., Ltd., of 210-212, Tottenham Court Road, London, W.1.

Publication No. 4,926, issued by The British Electrical Sales Organisation, of 623, Australia House, Strand, W.C.2, is in the form of a novel station log, made to illustrate the Beco hornless loud-speaker.

Sinew terminals are the subject of two pamphlets we have received recently from Clarkes, of Sinew Works, Redditch. With these and other kindred articles the wiring up of receivers is greatly simplified.

We are asked to state that The Chloride Electrical Storage Co.'s Irish representative, Mr. E. C. Hart, has removed to more convenient premises at 8, Pearse Street, Dublin. Also that on and after September 20 the Manchester Exide Sales Depot will be at 18, Bridge Street, Manchester.

Amongst recent leaflets received from The Mullard Wireless Service Co., Ltd., of Mullard House, 21, Denmark Street, London, W.C.2, is a particularly interesting one, dealing with this firm's new power amplifying valve, Type DP425, which, as its type number suggests, is a 4-volt power valve which passes .25 amp. current.

The story of the Marconi valve is the title of a very readable little booklet just issued by The Marconiphone Co., Ltd., which takes the reader in an interesting way through the whole process of Marconi valve manufacture. 210-212, Tottenham Court Road, W.1, is the address of this company.

The latest edition of the Cosmos envelope folder No. 4,117/3, has been received from Metro-Vick Supplies Ltd., of Trafford Park, Manchester. In it are details of the new S.P.18 Blue Spot valve, with the high amplification factor of 35, and also the new range of Cosmos valves for use with 6-volt batteries.

A leaflet relating to the Cone loud-speaker has been received from the American Radio Corporation, Ltd., of 18, Conduit Street, Bond Street, London, W.1.

PROPOSED RADIO SOCIETY

IT has been proposed to form a Radio Society in the Birchfield and Witton districts of Birmingham. The secretary, Mr. S. G. Phillips, of 61, Broadway, Handsworth, Birmingham, will be glad to hear from anyone living in these districts who is interested in the project.

TUNGSTONE'S SECRET—

USES ONLY PURE LEAD, MACHINE PASTED PLATES, NO SEPARATORS



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is the amount of Electrical Current given out by any Battery in proportion to the amount put in by the Dynamo.

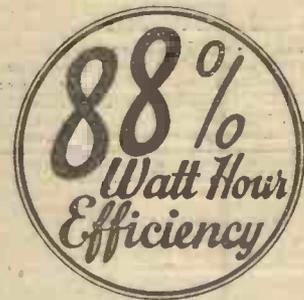
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Sent post free. Copy of the Original British Government Test Certificate with "Unique Booklet of the Battery Trade," Inaugurating Revolutionary Methods favourable to Users. For the first time in the World's History of Accumulator Manufacture, Tungstone as the result of its original Design and Manufacture on Standardised, Interchangeable and Accessible principles can issue a definite Priced Parts List of all its Component parts and Plates for fitting in any Tungstone Battery by unskilled labour. No other Accumulator maker in the World has ever issued a complete Parts List for Battery Owners.



T.A.73

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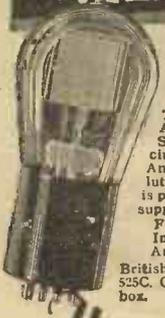
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Fil. 5.5 max. 25 amps.
Impedance 8,000 ohms.
Amplification 7.2.

British Base 525B. American Base 525C. Guarantee in every valve box.

Use **Reliable Valves**

Obtainable from **BARKERS, BENETFINKS, GAMAGES, WHITELEYS,** and most other untied dealers.

If any difficulty write the sole manufacturers:
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List Free on request.

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VALVE **1/9** HOLDER

DON'T PAY MORE

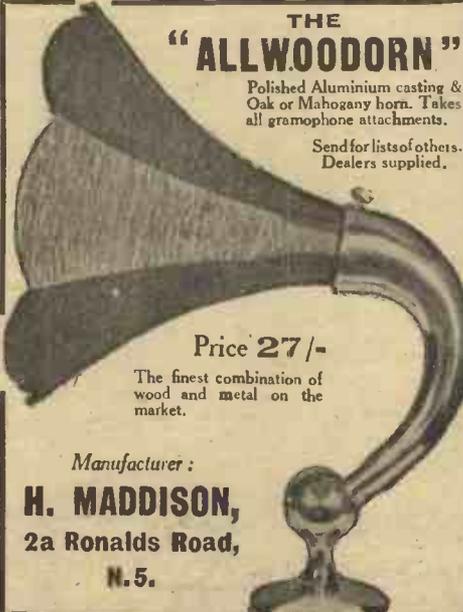
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Shows how to choose a valve to meet special requirements—high-frequency amplification, detection, and either low-frequency or intermediate-frequency amplification ; how the valve has developed. Full of data and practical hints.

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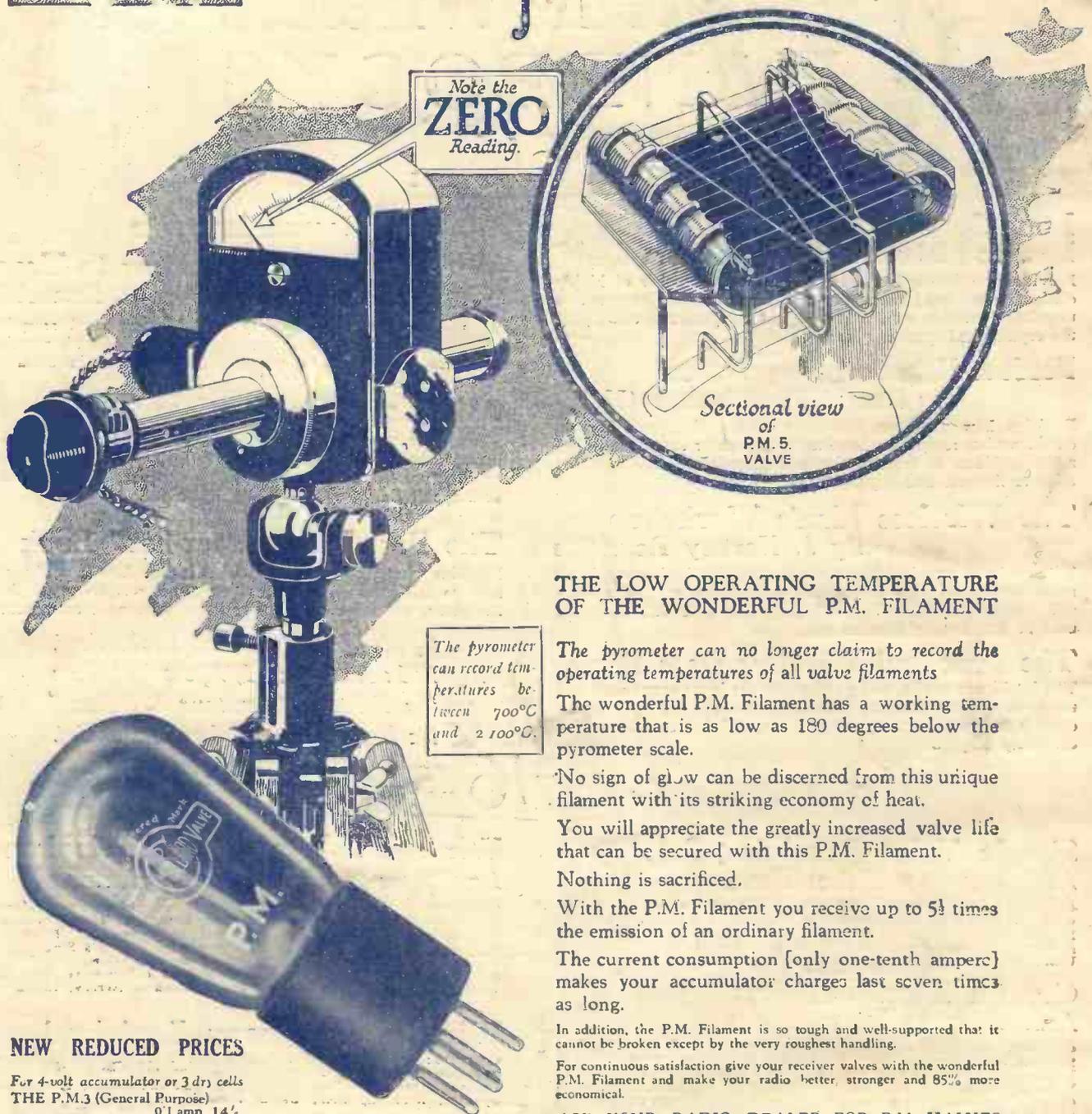
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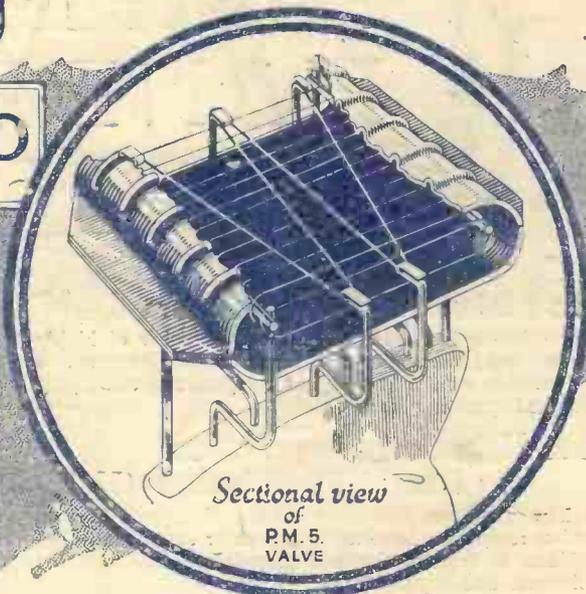
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