:: THE BROADCASTING COMPANY'S ARRANGEMENTS ::

Amateur Wireless And Electrics

FREE POST REPLIES

No. 21 SATURDAY, OCTOBER 28, 1922 Price 3d

CONTENTS

A FREAK RECEIVING SET BUILT IN A COCO-NUT, WHICH WAS ON VIEW AT THE RECENT EXHIBITION

Amateur Wireless and Electrics

No. 21 October 28, 1922

NOISY AMPLIFIERS

An Article Describing a Simple Method of Improving the Note-magnifier

THOSE readers who have acquired a low-frequency amplifier having two or more stages of amplification, and are unable to get full magnification and at the same time freedom from howling or self-oscillation, will find in this article a simple method of overcoming their difficulties. Low-frequency amplifiers, or note-magnifiers as they are sometimes called, have an unfortunate habit of setting up a loud howl at the least provocation, and usually the only way to stop this howl is to reduce the high tension current and increase the filament current of the valves until they glow too brilliantly for the peace of mind of the operator, who is usually correct in assuming that some new valves will be his next expense. He reduces his filament current a little and immediately the howl returns.

Fig. 1 is a diagram of a typical three-valve low-frequency amplifier having separate high- and low-tension batteries. Where separate low-tension batteries are used for receiver and amplifier, the low-tension negative terminal of the amplifier should be connected to earth as shown. This connection should be omitted in cases where the receiver and amplifier valves are supplied from the same accumulator. In Fig. 1, T1, T2 and T3 are iron-cored transformers of the step-up variety—that is, the secondary has more turns than the primary. A and B are the input terminals for connection to the telephone terminals of the receiver. The fixed condensers C1 and C2 across the primaries of the second and third transformers should be about .002 microfarads, and C3, which shunts the telephones and high-tension battery, should be much larger; .01 microfarads would be suitable. This type of amplifier is fairly well standard, and in very many cases it will be found impossible to prevent howling unless the valve filaments are forced beyond their normal brilliancy.

The amplifier can be made to function correctly by means of a slight modification of the existing circuit, which stops any tendency to howl, permits of putting a lower voltage on the valve filaments, and at the same time increases magnification to a surprising extent. The secret is to keep the grids at a steady negative potential. Fig. 2 shows how this is done.

Operating the Marconi Portable Receiver.

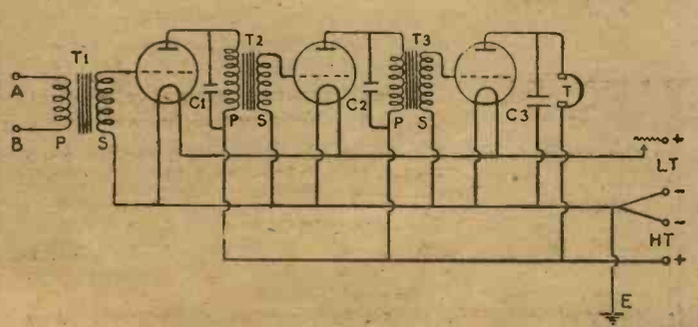


Fig. 1.—Circuit Diagram of Typical Three-valve Low-frequency Amplifier.

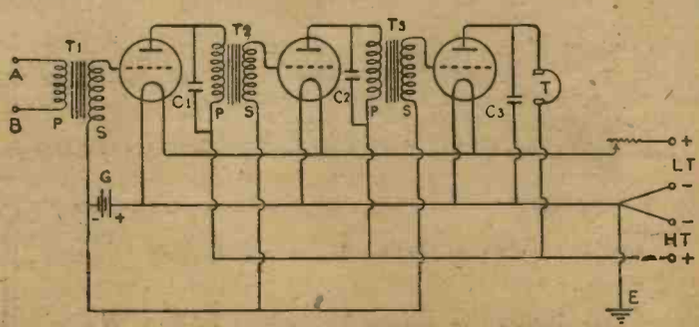


Fig. 2.—Diagram of Modified Circuit for Preventing Howling.

Instead of connecting the secondary windings of the transformers to the negative of the low-tension battery as before, they are now taken to the negative end of a battery of two small dry cells G. The positive end of this battery is connected to the negative of the filament battery, and it is as well to bring out the dry battery connections to a pair of terminals on the face of the panel in order that they may be short-circuited if it is desired to test the amplifier without the dry cells in circuit. The writer uses two Leclanché cells, giving three volts in all, but tests should be made using one, two and three cells in order to discover what voltage is best suited to the valves in use.

It may be thought that in Fig. 1 the grids are already sufficiently negative, being connected to the negative of the filament battery. This is not so, for the reason that the grid voltage is practically nil, the grids being at earth potential.

P. T. B.

A Transformer Suitable for Low-resistance Phones

THE use of a telephone transformer in valve sets is always to be recommended, as not only does it protect the delicate windings of head-sets and prevent demagnetisation, but also it helps to cut out many extraneous noises. It is not generally known, however, that by using a telephone transformer in a crystal circuit the ordinary commercial watch-case telephones can be used with great success and so render unnecessary the purchase of expensive high-resistance telephones.

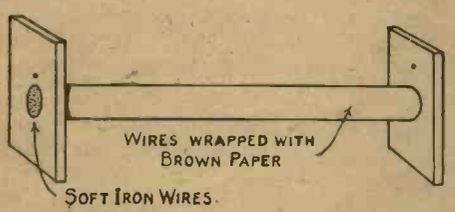


Fig. 1.—Former with Core.

Materials

The materials required to make this instrument are:

120 yd. of No. 36 d.c.c. copper wire.
2½ oz. of No. 44 s.s.c. copper wire.
A few feet of No. 22 soft iron wire cut up into lengths of 4½ in.
About four terminals.

Core

The core of the transformer should be made first. This consists of a bundle of short lengths of No. 22 gauge soft-iron wire, each wire being 4½ in. long, sufficient lengths being used to make a bundle about ½ in. in diameter. A strip of strong brown paper about 10 in. long and 4½ in. wide should be tightly bound round the wires, making them into a neat round bundle, the end of the paper being securely fastened with glue. When finished the whole should be dipped in hot paraffin wax.

Two pieces of good dry wood (preferably mahogany) are now required to fit securely on each end of the core to form a bobbin. These should be about 2¼ in. square and ¼ in. thick with a hole bored through the middle of each to allow them to fit, one at each end of the core, the arrangement being shown in Fig. 1.

Primary Winding

The bobbin thus made has to be wound with 2½ oz. of No. 44 gauge s.c.c. copper wire. This is a tedious job, but must be done carefully as the efficiency of the instrument will depend upon this winding. Anyone with a little ingenuity can soon put together a small winding machine which will save much time and trouble.

Before commencing the winding a small hole should be bored with a needle through each of the wooden blocks, in one block as near to the core as possible, and in the other about ¼ in. up from the core. The winding can now be commenced, leaving about 6 in. at the beginning for connections later. This should be threaded through the small needle hole nearest the core and tucked away somewhere outside for the time being.

The winding should commence at the end of the bobbin where the spare 6 in. was threaded through the hole, and should be wound as evenly and closely as possible to the other end of the core, and then wound back again, continuing in this way until the whole 2½ oz. has been wound on. Great care should be taken not to break the wire, which is very thin, but should a breakage occur the joining must be neatly soldered and dipped in hot wax.

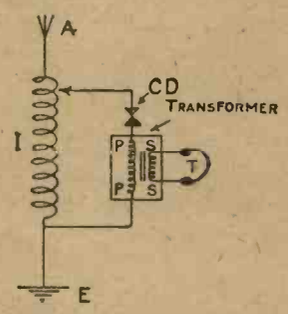


Fig. 3.—Circuit Diagram showing Use of Transformer.

When the whole of the wire has been wound, the last 6 in. should be carefully threaded through the other needle hole and carefully tucked away. The winding should now be tested for breakages with a battery and telephone. In this case a battery and bulb would be of no use.

Secondary Winding

If the winding appears to be continuous it should be neatly covered with two layers of waxed paper, and it is then ready to receive the secondary windings.

This is a much simpler matter. About 120 yd. of No. 36 s.c.c. copper wire should be wound on in exactly the same way as the thin wire, a few inches being left at the beginning and end of the wire for taking to terminals later. This wire must not be joined in any way to the thin wire.

Testing

When finished, another test should be made to ensure that no break has occurred, the test being made with a small 4-volt battery and bulb. In this case the bulb should light. If no break has occurred the wire should be covered with a few layers of waxed paper and the whole instrument fixed to a small mahogany baseboard. Four terminals should be fitted on the latter, preferably two at each end, and the loose wires which were left over at the beginning and ending of each winding taken to them. It is very important that the terminals should be carefully labelled, the two with the thin (44 gauge) wires attached being marked "P" (primary) and the other two with the thicker wires marked "S" (secondary).

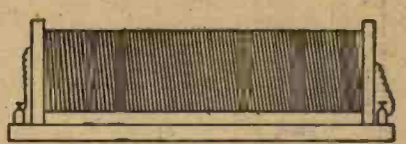


Fig. 2.—Completed Transformer.

The instrument is now complete and ready for use and will be found to well repay the time and trouble spent on it. It may, if desired, be given a coat of shellac varnish.

Connections

The sketch (Fig. 2) shows what the completed instrument should look like, and the diagram (Fig. 3) shows how the transformer should be used with low-resistance receivers.

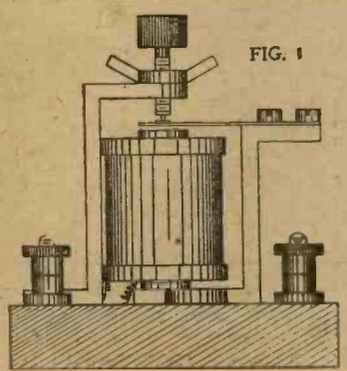
In use, the two wires of the receiving set which would normally have been connected to the telephones should be connected to the terminals marked P and the telephones connected to the terminals S. The two ear-pieces should be wired up in series.

W. D.

How to Make a Test Buzzer

Constructive Details of a Simply-made Yet Highly-efficient Instrument

THE buzzer here described will be found to be very useful for testing the sensitivity of crystal receiving sets. It is simple in construction, and the high note is more pleasant to the ear than the drone of the oscillations given forth by the mechanism of an electric bell.



Figs. 1 and 2.—Elevation and Plan of Buzzer.

Figs. 1 and 2 are the elevation and plan of the instrument. The contact-screw standard (Fig. 3) is made from ⅛-in. sheet brass, and the magnet frame (Fig. 4) is made of ⅛-in. soft sheet iron. The wing-nut (Fig. 5) is of ⅛-in. sheet brass. When cut to the shape and dimensions of Fig. 5 bend up the wings as shown in Fig. 1.

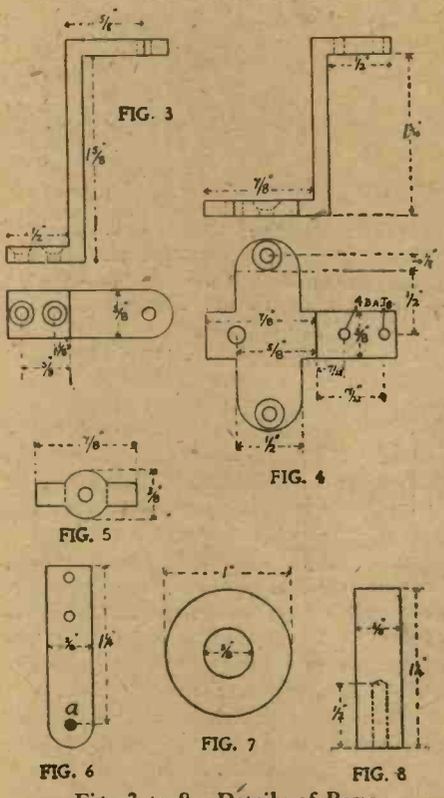
Thin clock-spring is used for the armature (Fig. 6). The fixing-screw holes are 4 B.A. clearance, and should be drilled to correspond with their associating holes in the magnet frame. A small hole is drilled at *a*, and a small piece of platinum wire (slightly longer than the thickness of the spring) is driven into it. The projecting portion of the wire is then hammered to the form of a small flat disc as shown in Fig. 1.

Ebonite ⅛ in. thick is preferable for the coil-cheeks (Fig. 7), but hard wood may be substituted if, when finished, the cheeks are given a coat of shellac varnish. Make the core of the coil (Fig. 8) of soft iron. The lower end is drilled and tapped 2 B.A. for the purpose of affixing the coil to the magnet frame. Before being assembled it should be well annealed in order that any hardness caused by working the metal may be removed. This having been done, the cheeks are affixed with shellac varnish (thick) so that the ends of the core project for a distance of $\frac{1}{16}$ in. That portion of the core between the cheeks is covered with a layer of waxed paper, and for extra insulation may also be given a coating of shellac varnish. When the varnish has set and the cheeks are secure in their positions, drill a small hole in the lower cheek close to the core and another close to the outer edge of the same cheek. The coil is now ready for winding.

The wire used is No. 30 silk-covered. Obtain a long 2 B.A. screw and cut off the head. Screw the shank into the hole in the base of the core. By this means the coil may be wound in the lathe or on a wheel-brace held in a vice. Insert the end of the wire through the inside hole in the lower cheek and wrap about 6 in. of it round the winding spindle. Now proceed to wind the coil in even layers to within about $\frac{1}{16}$ in. of the edge, taking the finishing end through the other hole in the cheek. Cover the winding with a strip of oiled silk and put aside.

The contact screw is 4 B.A., and is fitted at one end with a platinum contact and at the other with a small knurled ebonite knob.

Fasten the coil to the magnet frame with a ⅝-in. 2 B.A. screw, and then screw the armature spring into place with two ⅛-in. 4 B.A. screws. Fit the contact screw and wing-nut to the standard and then screw these portions of the instrument on to the base in the positions shown. The connections are shown in Fig. 2. One end of the winding is taken to A, the other end is neatly soldered on to the base of the contact-screw standard, the magnet frame is connected to B and D, and C is connected to the contact-screw standard. Although the wiring is shown on the upper surface of the base for clearness, it is much neater to run the connecting wires along shallow grooves cut into the bottom of the base.



Figs. 3 to 8.—Details of Parts.

A and B are connected to a battery of two dry cells with a tapping key in circuit with which to signal when testing. C is connected to an aerial rod. This is only a piece of ⅛-in. brass rod about 18 in. long, supported vertically on an insulating base. D is connected to earth.

The buzzer is adjusted by loosening the wing-nut and advancing or withdrawing the contact screw until the best note is obtained, and then clamping up. J.McG.

A Novel Means of Increasing Condenser Capacity

IT was the writer's misfortune on one occasion to be held up for a large-capacity variable condenser. The capacity of the variable condenser on hand had a maximum of .001 microfarads, and one of .002 microfarads was required. The following method was used to produce the desired capacity. A small glass jar or container was obtained of such a size as to be capable of holding the vanes. This was partly filled with insulating oil, so that when the vanes of the condenser were fitted into the container they were completely submerged in the oil, when the desired capacity was obtained. The reason, of course, is that as the specific inductive capacity of air is denoted by 1, and insulating oil has a specific inductive capacity of 2.2, the capacity of an air condenser in oil is almost doubled. L. C.

All About the Valve.—III

The Third of a Series of Articles Explaining the Principles and Action of the Thermionic Valve

IN the first place, the "characteristic curve" of a two-electrode valve is merely a graphical method of illustrating the effect upon the thermionic flow (or plate current) of a progressive variation in the voltage applied to the plate, say from zero to any given higher or lower value.

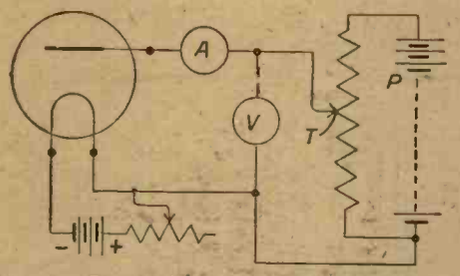


Fig. 6.—Circuit Arrangement for Investigating Effects of Plate Voltage.

A circuit arrangement for investigating this effect is shown in Fig. 6. The plate of the valve is connected by a sliding point T to the rheostat of a potentiometer giving a range of, say, 30 volts. As it is not necessary to throw the plate negative, relatively to the filament, the latter is connected to the negative end of the potentiometer. A milliammeter A is inserted in series with the plate, and a voltmeter V is in shunt between the plate and filament.

Starting with the tapping T at the lowest end of the potentiometer, it is gradually moved upwards, and readings are taken of the current in milliamps shown in A for every upward step of, say, 2 volts registered by V.

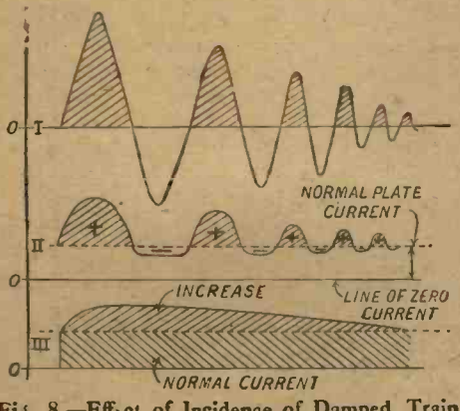


Fig. 8.—Effect of Incidence of Damped Train of Waves on Plate Current.

The resultant curve will be of the order shown in Fig. 7.

From a survey of this curve it is clear then that if we adjusted the tapping T to, say, a point x corresponding to a steady positive potential of 10 volts on the plate, there would flow through the plate circuit a corresponding steady current amounting approximately to 0.75 milliamps.

Now consider the effect of applying a signal impulse giving a variation to the steady potential of, say, 2 volts on each side of the normal. The negative half-wave of the signal will reduce the total applied voltage to 8 volts and the point z will be reached, corresponding to a normal plate current of 0.5 milliamps.

On the other hand, the ensuing positive half-wave of the signal will raise the total applied voltage to the point y (12 volts), at which the corresponding plate current has a value of 1.5 milliamps.

The resultant increase of current (namely, 1.5 − 0.75 or 0.75 milliamps) is obviously greater than the resultant decrease (namely, 0.75 − 0.5 or 0.25 milliamps) for each high-frequency cycle. The net result on the plate current of the incidence of a damped train of waves is seen in Fig. 8. Each positive half of the high-frequency train creates a comparatively large "hump" or increase above the dotted line representing the normal plate current, whilst each negative half of the wave trai-

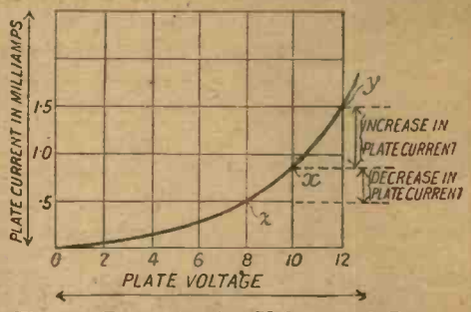


Fig. 7.—Curve showing Voltage and Current Effects.

gives rise to a practically negligible fall below the normal.

The successive pulses of non-directional current are amalgamated into the elongated hump shown in the lowest part of the figure in the manner previously explained, and each hump corresponds, as before, to one click. D. ALCASE.

Hints on Receiving Telephony

IN view of the fact that a great many people are taking up wireless with the sole object of receiving speeches and music from the broadcasting stations, and in many cases have announced their intention of not even troubling to listen to commercial messages in Morse, it is considered that a few devices gathered in the course of several years amateur wireless work and that are not usually known to the beginner may be of interest.

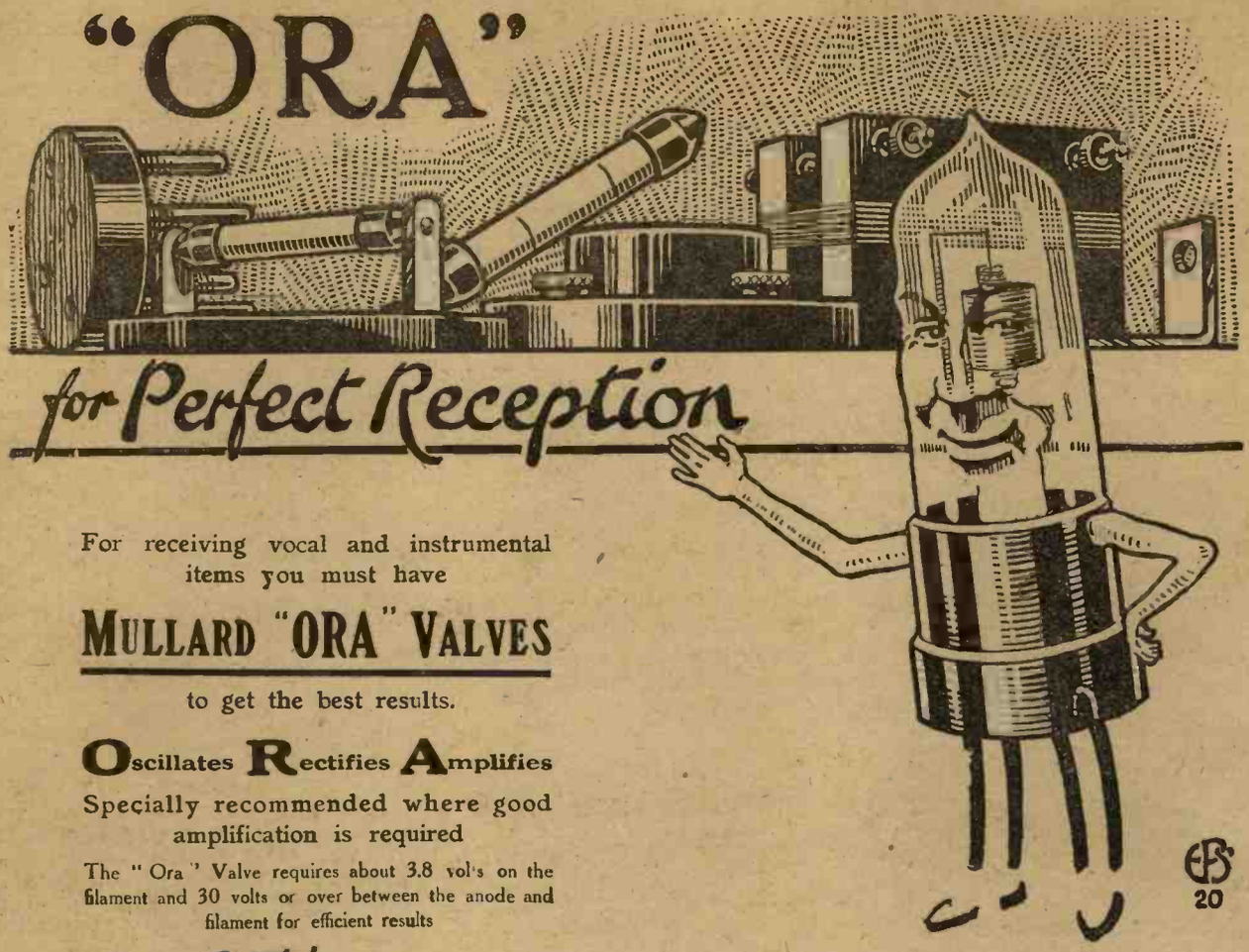
Beginners' Apparatus

In the first place it is probably correct to assume that most beginners will start with a crystal set, but I venture to suggest that before long most, if not all, of them will need something a little more sensitive and will naturally turn to valves. Some may perhaps be in the fortunate position of being able to purchase expensive multi-valve sets, but to the majority the question of cost will be of considerable importance, and it is for these individuals that the following remarks are primarily intended.

A great many experimenters are prone to despise a single-valve set, and airily give as their opinion that nothing under, say, three valves is of any use, but a single-valve set handled by an expert is capable of yielding astounding results, and will give all the amplification necessary when one is prepared to wear head telephones. The reason why many amateurs fail to obtain good results from a single-valve set is almost invariably due to inefficient control over reaction. Added to this a great many do not yet seem to have realised that in order to receive telephony properly the valve must not be allowed to oscillate. The reaction coil should only be used for increasing signal strength and not for setting up a heterodyne, as when receiving continuous wave signals. An amateur who oscillates on telephony to all intents and purposes converts his receiving set into a transmitter, and every other amateur within a considerable radius has his reception spoiled by the continuous howl which results. While searching for weak telephony it is necessary to oscillate, but immediately the carrier wave is found tune down to the "silent" point and then slowly loosen the coupling of the reaction coil until the set stops oscillating, meanwhile keeping in the "silent" point by means of the aerial tuning condenser. If

(*Continued on page 469*)

"ORA"



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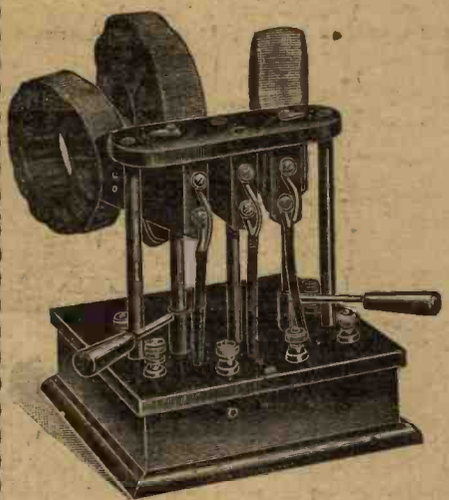

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6 volt 40 amp.	2	8	9	1	6
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Prices of several other capacities on application.					
FULLER STANDARD PLATE TYPE ACCUMULATORS					
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BROWN "A" TYPE HEADPHONES					
120 ohms	2	2	6	1	0
8,000 ohms	2	9	6	1	0
SULLIVAN HEADPHONES					
8,000 ohms	1	16	6	1	0
COIL HOLDER, as illustrated	1	5	0	1	0
BURNDEPT COILS, short wave set of 4	1	5	0		9
INTERVALVE TRANSFORMERS	1	5	0	1	0
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"ORA" VALVES		15	0	post free	
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(for panel mounting) 001 mfds.	1	4	6	,,	,,
ditto in Ebonite case 0005 ,,	1	0	6	,,	,,
·001 mfds	1	6	6	,,	,,
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MULLARD GRID LEAKS ...		5	0	,,	,,
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EBONITE SHEET, cut to size per lb.		4	6	,,	,,
TERMINALS, 4 BA. per doz.		3	0	,,	,,

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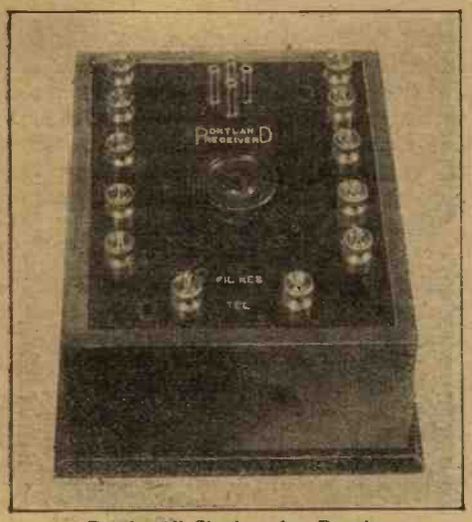
HINTS ON RECEIVING TELEPHONY (*continued from page 466*)

you are in doubt as to whether you are still oscillating touch the aerial terminal with the finger, and if you do a loud click in the telephones will result. Further loosening of the reaction coil is then necessary until no click is heard on the same test being applied. The next



"Portland" Single-valve Receiver.

step is to bring the reaction coil or its equivalent back again as close as possible to the point where oscillation commences without actually oscillating. By the equivalent of the reaction coil is meant one or more of the devices given below, while all achieve the same result but in a much more delicate manner.

Modifications

Fig. 1 shows a standard single-valve circuit which gives good results, but I would like to draw attention to one or two possible modifications which are well worth trying, and which in some circumstances may materially improve matters. In the diagram it will be observed that the telephones are between the H.T. battery

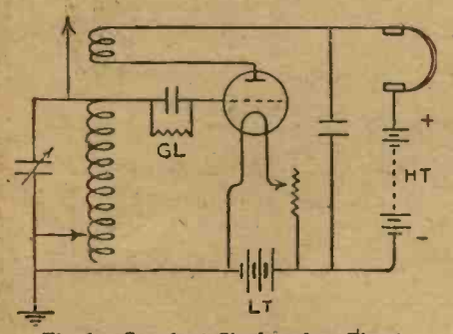


Fig. 1 — Standard Single-valve Circuit.

and the reaction coil instead of being, as usual, on the negative side of the latter, this generally giving the better results. Both methods should, however, be tried, for many small factors come into play to determine their relative efficiency on any particular set. The operation is quite simple—merely make the phones and H.T. change places, keeping the positive of the H.T. towards the reaction coil.

The Grid Leak

The value of the grid leak (G.L.) is a source of bother to many people, and writers almost invariably give as the best value 2 or 3 megohms. After considerable experiment the writer found that for short waves the best value is about half a megohm, provided the condenser across it is quite small—somewhere about .0002 mfd. Some valves will even give better results when the grid leak is taken completely away.

One other change which should be tried is to move the connection between the earth and the filament battery from the negative side (where it is in the diagram) to the positive. This will have the effect of putting a positive potential on the grid of the valve, and is usually regarded as a cause of parasitic noises, but this is one of the cases where theory does not always agree with practice.

Overlap

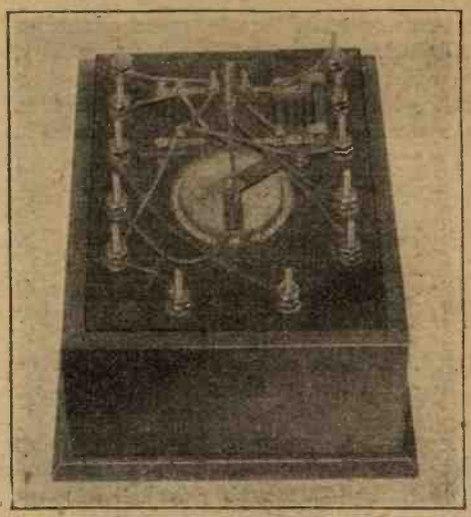
Attention should then be concentrated on the elimination of what is known as "overlap," the comparatively unknown cause of many troubles. To ascertain if "overlap" is present the following experiment should be tried: Steadily increase the coupling of the reaction coil and note the exact adjustment at which oscillation commences. Then, without interfering with any other part of the set, loosen the coupling and note the adjustment at which oscillation stops. If these two adjustments do not exactly coincide, "overlap" is present. This is almost invariably caused by incorrect values of H.T. and filament brilliancy, and suitable correction of these will usually remedy the evil.

Probably the best method of control is to have a variable condenser across the telephones and H.T. in place of the fixed one shown in the diagram—usually known as the "high-frequency by-pass condenser." A variation of this condenser will replace an alteration of the coupling of the reaction coil, in such a manner that a considerable movement of the condenser is necessary to equal so slight a movement of the reaction coil that the hand could not make it, thus affording a much finer adjustment. The great objection to this method is the cost, for this condenser must of necessity be large—quite .001 mfd.—and the cost of a variable condenser of this size is considerable. Of course the difficulty can be overcome to a certain extent by having a much smaller variable condenser in parallel with the existing fixed one, but this is not altogether satisfactory.

Other Suggestions

Another method of attaining the same object—and one much favoured by amateurs on account of its comparative cheapness—is to put a very small variable condenser across the reaction coil. The operation of this condenser is the same as before, the only thing to remember being that the condenser must be quite small, certainly not more than .0001 mfd.

Somewhat the same result is obtained if a variable condenser of about .0003 mfd. is substituted for that in parallel with the grid leak, usually known as the grid condenser; but this method is not always to be recommended, since the grid leak needs a certain value of condenser to function properly, and an alteration of this value will sometimes upset matters.



Rear View of Panel of "Portland" Receiver.

A method which usually gives excellent results but sometimes entails additional complications is what is known as potentiometer control of the grid. In this, the connection shown in Fig. 1 between the earth and the filament is removed from the negative of the L.T. battery and joined to the slider or middle terminal of the potentiometer of about 250 ohms resistance. The two ends of the potentiometer coil are joined one to each side of the L.T., and the effect of moving the slider towards the negative side is to increase reaction, while a movement towards the positive side has the opposite effect. The trouble with this

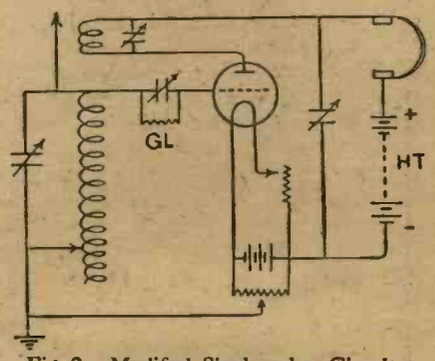


Fig. 2. - Modified Single-valve Circuit.

method is that it frequently happens that on certain wave-lengths better results are obtained without a grid leak and condenser, while on others these units are necessary, thus involving some form of switch gear, which is to be deprecated.

Fig. 2 is a diagram similar to Fig. 1, but with all these devices incorporated. It is, of course, understood that usually only one of these is necessary. A. E. G.

TELEVISION.—II

THE ELECTRIC EYE: SOME EARLY APPARATUS

WILLOUGHBY SMITH, a well-known English telegraph engineer, requiring a very high resistance for testing submarine cables at the shore ends, was led, on account of its seeming suitability, to employ a stick of selenium. The results, however, were most unsatisfactory, the readings obtained varying in a most

Fig. 1.—Diagram of Simple Form of Selenium Cell.

unaccountable manner, hardly two being similar. Upon investigation, it was found by Mr. May—Willoughby Smith's assistant—that the variation in resistance was caused by the action of light upon the selenium, the resistance being much less when exposed to bright daylight than when placed in the dark.

Selenium

This peculiar property of selenium has been very thoroughly investigated by a number of scientists, and the result of their work has enabled many useful scientific wonders to be performed. Among the many purposes in which selenium plays a leading part may be mentioned, the automatic control of electric street lamps; the optophone, an instrument for enabling the blind to read ordinary printed matter; photo-telegraphy, and television.

In its normal state selenium is practically a non-conductor of electricity, but when it has been prepared—that is, reduced to a crystalline condition by being heated at a certain temperature for some time and then slowly cooled—it will be found to have become a high-resistance conductor, its resistance being 40×10^9 (forty thousand million) times greater than copper; as already stated, the resistance of prepared selenium varies under the action of light.

Selenium Cells

For convenience, selenium is made up into what is known as a "cell," which in its simplest form consists merely of some prepared selenium sandwiched between two conductors. Cells of any resistance can be made, it being possible to obtain them with a resistance as low as 40 ohms or as high as 1,000,000 ohms. The resistance of a cell to a great extent depends upon the distance apart of the two conductors or, in other words, the thickness of the selenium section between them, so that the closer together the two conductors are the less is the resistance of the cell, and *vice versa*. By connecting a number of these simple elements in parallel a large light-active surface of the same resistance as one element can be obtained.

A modern cell consists of a small square or rectangular piece of porcelain upon which a double coil of fine platinum wire is wound. The prepared selenium is placed in the spaces between the wires and forms a high-resistance conductor between them. A diagram of a cell is given in Fig. 1. The resistance of a cell is reduced about one-half when brought from the dark and exposed to bright sunlight, intermediate reductions being obtained by exposing the cell to varying degrees of light.

Early Television Apparatus

The arrangement and action of the earliest apparatus devised for television was somewhat as follows: At the transmitting end there was a screen which was divided into a number of small square compartments, each compartment containing a selenium cell. At the receiving station there was a similarly divided screen, each compartment in this case containing a small electric globe. One wire from each cell was connected to a common battery terminal, the other battery terminal being connected to earth. At the receiver one wire from each globe was also earthed. The remaining terminals on each selenium cell and globe were separately connected by a wire in such a manner that each cell at the transmitter was connected to the globe that occupied a similar position on the receiver.

Now imagine this selenium-cell mosaic at the transmitter to be influenced by a simple black-and-white image projected upon it. Those cells which come under the illuminated portion of the image will have their resistance reduced sufficiently to allow current to flow through the various line wires and light the lamps to which they are connected at the receiver. The cells, however, which remain unexposed do not permit of current passing to the receiver globes.

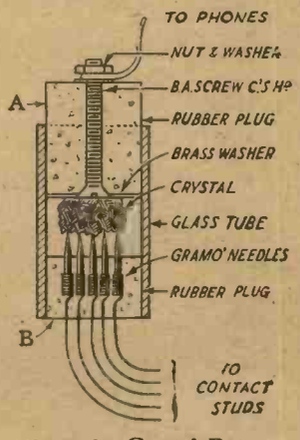
In this manner a fairly good representation of a simple black-and-white image can be obtained, but the limitations of the method are obvious. Not only is it restricted to working over extremely short distances, but to transmit any complicated subject with reasonable accuracy would necessitate the use of a very large number of selenium cells and globes, with a correspondingly large number of connecting wires.

Apparatus working on similar lines to the above has actually been constructed by Rhümer, of Berlin, but owing to its elementary construction the apparatus only lends itself to the reproduction of simple patterns such as squares arranged in different combinations. The transmitter and receiver in this case only contained twenty-five elements, and they cost £250. Later it was proposed to build a complete apparatus of 10,000 elements at a cost of £250,000.

A Glass-tube Crystal Detector

THE advantages of the special detector illustrated will be readily seen. Its chief object is to prevent the tiresome and constant adjustment of the ordinary "cats whisker" type in finding and maintaining a sensitive spot in the crystal.

In the figure A is a rubber plug through which is driven a B.A. screw with a thin brass washer at the bottom to which the crystal is soldered. At the top is a nut and washer for connecting the wire of the circuit. B is a similar rubber plug into which a number of gramophone needles are driven. The needles have a few turns of thin wire soldered to them previous to



Glass-tube Crystal Detector.

being driven in. Wires from the needles are then taken to small contacts and operated by a suitable switch.

Both plugs are pushed, cork fashion, into a glass tube making fairly firm contact one with the other.

The switch provides a ready and definite means of finding a fresh sensitive point, should the one being used suddenly go "dis."

W. A. D.

Broadcasting - - The Situation

The British Broadcasting Company's Policy and Arrangements

A MEETING of the British Broadcasting Company was held on October 18th, when the policy and arrangements of the company were, for the first time, made public. A very comprehensive report of the meeting was published in the *Times* the following day, and this we print below almost in its entirety. Our own views upon the situation are given in another column.

Sir William Noble, formerly Engineer-in-Chief to the Post Office and now a director of the General Electric Company, presided over the meeting, which was attended by over two hundred representatives. Associated with him were representatives of the six companies who have guaranteed the capital of the new company (£100,000), and who will be immediately responsible for £60,000. These companies are the British Thomson-Houston Company, General Electric Company, Marconi's Wireless Telegraph Company, Metropolitan-Vickers Electrical Company, Radio Communication Company, and the Western Electric Company.

The Company

The chairman said a complete agreement had been reached with the Postmaster-General. The British Broadcasting Company would be a public utility service for the broadcasting of news, information, concerts, lectures, educational matters, speeches, weather reports, and theatrical entertainments. The capital would be £100,000 in £1 shares, and any *bona-fide* British manufacturer could join the company by taking one or more shares. The directorate would consist of eight directors and a chairman. One director would be appointed by each of the six guarantor companies and two by the other members of the company. The chairman would be Lord Gainford, a former Postmaster-General.

Conditions

Each member was required to pay £50. The money so received would not be used by the company, but would be put to a separate account and returned to the member when he left the company. Every member undertook that the apparatus he sold, except batteries, accumulators, and aerial equipment, was made in this country. The apparatus he sold must be engraved or otherwise marked so that its origin was known. Members would pay to the Broadcasting Company, to meet the expenses of broadcasting, a royalty on each apparatus as follows:

Royalties

Crystal set, 7s. 6d.; microphonic amplifier, without using valves, 7s. 6d.; crystal set and one valve, £1 7s. 6d.; crystal set and two valves, £2 2s. 6d.; one-valve set, £1; two-valve set, £1 15s.; three-valve set, £2 5s.; four-valve set, £2 15s.; on each other set a royalty *pro rata* to the above; each telephone ear-piece, 3d.; each loud-speaker with or without trumpets, 3s.; each valve, 2d.

Members also undertook not to make broadcast apparatus for any person who was not a member of the company. Only members of the company could have sets approved by the Postmaster-General, and each set would have to be stamped with the approval mark, "Type approved by P.M.G. B.B.C." For transmission purposes every member who had inventions must give the use of them to the company, that was to say, all patents would be pooled, so that the Broadcasting Company would be free of all royalties. By the licence which the Postmaster-General would grant to the Broadcasting Company the Postmaster-General guaranteed that no foreign-made sets would be allowed to be sold for broadcasting purposes.

Protection

The Postmaster-General could not see his way to protect the company against foreign importations for a longer period than two years, and therefore the committee had decided that they could not guarantee a broadcasting service for longer than two years, because at the end of two years they did not know what would happen. It had been agreed, however, that before the two years expired the position would be reviewed by the Postmaster-General and the company. The licence to be issued by the Postmaster-General to the public would cost 10s., half of which would go to the Post Office and half to the British Broadcasting Company. The broadcasting licence had printed on it a note to the effect that the licence applied only to apparatus with the approved mark of the Postmaster-General.

Wave-lengths

Since the negotiations began an important concession had been obtained as regards wave-length. It was first decided to limit the wave-length for broadcasting sets to 550 metres, but this was later raised to 700 metres, and now there was no limit. This meant that anyone with a broadcasting set would not only be able to receive the broadcasting programmes efficiently, but would be able to "tune-in" for any outside station. It was confidently hoped that this would mean a considerable addition to the numbers applying for broadcasting licences, so that the income of the company would enable it to provide really high-grade programmes. The committee were fully alive to the necessity of having good programmes, and recognised that it was only by doing so that the success of the scheme would be assured. At the present time they were negotiating with the Postmaster-General to get authority to raise the power of the broadcasting stations from one and a half kilowatts to three kilowatts. In conclusion, the chairman said that, as soon as the company was registered and the directors appointed, consideration would be given to the question of commencing broadcasting. It was provided that the Broadcasting Company could not declare a dividend of more than 7½ per cent.

Foreign-made Sets

A general discussion followed, and there seemed to be considerable misapprehension as to the position of foreign-made sets and sets which might be manufactured in this country, but by others than members of the company. Sir William Noble stated that the Postmaster-General had undertaken on behalf of the Government that foreign apparatus would not be imported for the purpose of broadcasting, and it was for the Postmaster-General and Parliament to decide what steps should be taken to give effect to that pledge. Mr. Kellaway had undertaken that no sets which arrived in this country subsequent to July 18th would be allowed to be sold for broadcasting purposes. With regard to those imported prior to that date, evidence had to be given that they were purchased before July 18th, that their number was reasonable, that they satisfied the conditions laid down by the Post Office, and that, if approved, the seller would have to pay upon them to the Broadcasting Company the same royalty as was paid on other sets.

The Amateur

The position of amateur experimentalists was also raised, *and it was stated by a representative of the Post Office that it had not been altered.*

It was unanimously agreed to proceed with the registration of the company.

An Editorial Comment

The Amateur's Point of View

WE may attempt to explain one or two points in the agreement, the meaning of which may not be apparent to every reader. The greater part of Sir William Noble's statement is perfectly understand-

(*Continued on page* 475)

IN the first place, it is assumed that a rough idea has been formed of the supply on which the rheostat is to be used. The first point on which to decide definitely is the maximum voltage drop which the rheostat is required to give. The next factor to settle is the minimum current which will be required. This may have to be modified afterwards, as a very small minimum current compared with the voltage is apt to give rise to absurdly large dimensions. The total resistance of the rheostat winding is given by Ohm's Law:

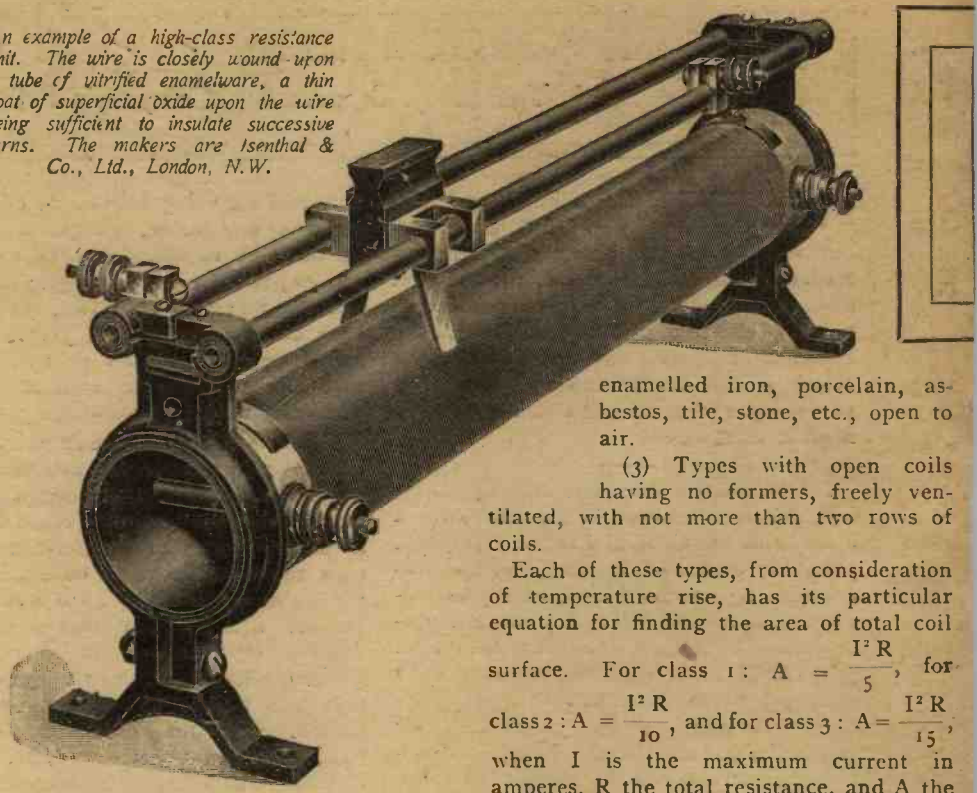
$$R = \frac{E}{C}$$

when C is the minimum current in amperes, E is the maximum voltage drop, and R the total resistance in ohms.

Considerations of Design

The next, and most important, point to decide is the maximum current which will be allowed to pass through the instrument, for this governs the question of wire used (as these remarks apply to wire rheostats only) and also the insulating material to be used. This maximum current should always be plainly marked on the finished instrument, thus lessening the danger of someone "burning it out."

Up to this point rule-of-thumb working is all that is required, but from now onwards there is more demand for common sense, as the actual numerical data in hand are not sufficient to determine all that is required, thus necessitating several assumptions. In order to limit the number of possible solutions, and to simplify the working as far as possible, the writer has divided wire rheostats into three broad classes, with reference to the insulating material used, as follows:



An example of a high-class resistance unit. The wire is closely wound upon a tube of vitrified enamelware, a thin coat of superficial oxide upon the wire being sufficient to insulate successive turns. The makers are Isenthal & Co., Ltd., London, N.W.

Types

(1) Types wound on formers of wood, ebonite, moulded composition, fibre, ivory, and all combustible substances. Also all rheostats whose windings are totally enclosed, allowing for no ventilation.

(2) Types wound on formers of slate, enamelled iron, porcelain, asbestos, tile, stone, etc., open to air.

(3) Types with open coils having no formers, freely ventilated, with not more than two rows of coils.

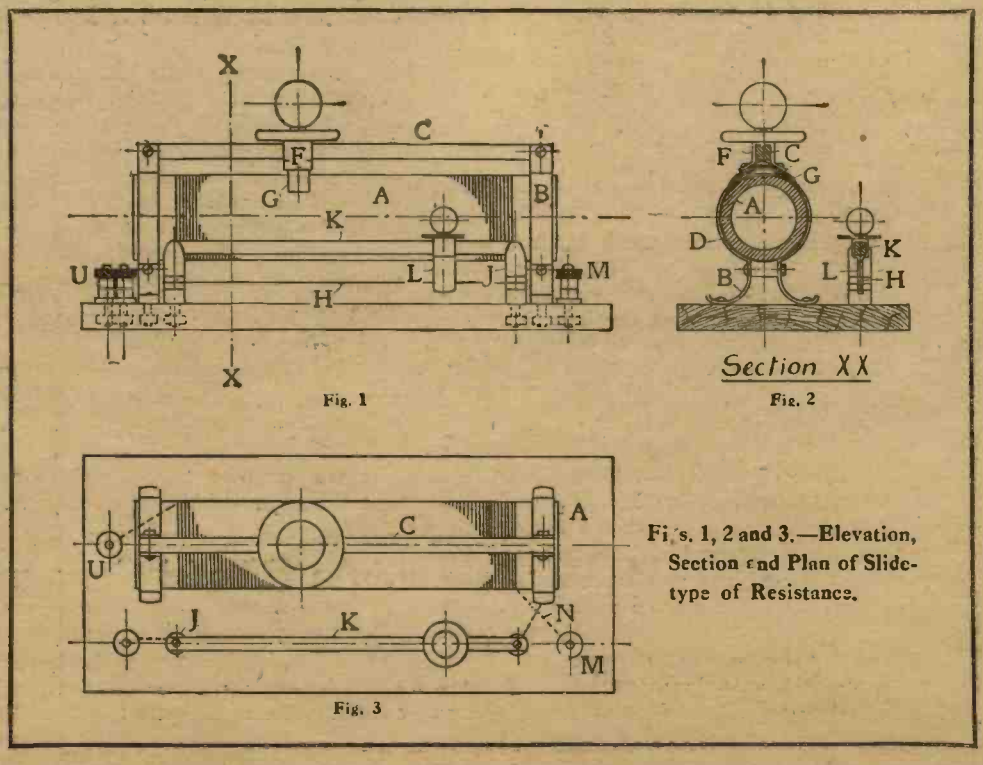
Each of these types, from consideration of temperature rise, has its particular equation for finding the area of total coil surface. For class 1: $A = \frac{I^2 R}{5}$, for class 2: $A = \frac{I^2 R}{10}$, and for class 3: $A = \frac{I^2 R}{15}$, when I is the maximum current in amperes, R the total resistance, and A the total area of coil surface in square inches. This value of the area, however, assumes that the wire is close-wound, and for rheostats which are wound with bare wire on formers a space equal to about half the diameter of the wire is left between the turns, thus making the total coil-area 1.5 A. If the rheostat is of the open-wound type, with no formers, a space equal to about one and a half times the diameter of the wire is left between the turns, giving the total area of coil surface to be 2.5 A.

The procedure is as follows: Try the formula for class 1 and find the area. Correct this area for spacing, if necessary, and judge whether or not it will be convenient to make an instrument of this area. If not, try class 2, and so on. This is the point at which to decide upon the arrangement of coils to be adopted, as described later in the notes on construction. If a single coil is to be used a reasonable length is assumed, and this is divided into the area (that is, A, 1.5 A or 2.5 A, as the case may be); the result is the girth or perimeter of the coil. Various lengths are tried until the one which gives the most reasonable proportions is found.

The same method is applied to rheostats with more than one coil, the length in this case being the total length to which the coils would stretch if they were placed end to end. Dividing this length into the surface area (either A, 1.5 A or 2.5 A, according to the design) gives the perimeter of one coil.

Wire

The next step is to decide what kind



Figs. 1, 2 and 3.—Elevation, Section and Plan of Slide-type of Resistance.

RHEOSTATS

The Principles Involved—Types—Resistance Elements—Construction

of wire is to be used. For rheostats it is not usually necessary to have wire which is specially alloyed to give constant resistance at all temperatures (or has a very low temperature coefficient). The price of the wire obtained from a current catalogue will be the best guide. A list of the more important materials, with their values of ρ (specific resistance) is given below:

Substance	ρ	*Substance*	ρ
Advance	19.2 × 10⁻⁶	Krupp Metal	33.4 × 10⁻⁶
Argentan	11.2 ,, ,,	Lead	7.8 ,, ,,
Calido	39.3 ,, ,,	Manganin	16.5 ,, ,,
Climax	34.7 ,, ,,	Monel Metal	16.1 ,, ,,
Constantan	19.3 ,, ,,	Nichrome I	38.8 ,, ,,
Copper	0 63 ,, ,,	Nichrome II	42.6 ,, ,,
Eureka	18.5 ,, ,,	Nickel	3.9 ,, ,,
Excello	36.0 ,, ,,	Platino'd	18.4 ,, ,,
Ferro-Nickel	11.1 ,, ,,	Resista	29 9 ,, ,,
German Silver	13.0 ,, ,,	Rheostan	17.5 ,, ,,
Ideal	19.3 ,, ,,	Rheostine	29 9 ,, ,,
Ia Ia	18.9 ,, ,,	Rose's Metal	25 4 ,, ,,
Pure Iron	3 48 ,, ,,	Superior	34.3 ,, ,,
Soft Steel	4 6 ,, ,,	Therio	18.4 ,, ,,
Hard Steel	17.9 ,, ,,	Wood's Metal	22.2 ,, ,,
Soft Cast iron	29.3 ,, ,,	Zinc	2.1 ,, ,,
Hard ,, ,,	38 9 ,, ,,		

The diameter of the wire in inches is given by $d = \sqrt[3]{\frac{\rho A}{.785 R}}$, when ρ is the specific resistance in ohms per inch-cubed (from table). A is the area obtained from the formula (not corrected for spacing) and R is the total resistance, as before. The diameter of the wire having thus been calculated, the nearest S.W.G. size is found from a table, and the length to be obtained is given by $L = \frac{A}{d}$ (this is independent of the spacing).

This completes the design from the electrical standpoint, everything required now being known. There are many other lines of attack possible, but the above method is perhaps the easiest to follow. It may seem a long process, but need not cause discouragement, as in reality it is quite straightforward, all that is required being the application of a few formulæ.

Self-induction

It may have been noticed that the above working assumes that continuous current is being dealt with. As a matter of fact, these kinds of rheostats (except the multi-coiled open type) are not very suitable for alternating current unless non-inductively wound (zigzag and not spiral), although they are often used for induction motors. If, however, they are intended for alternating current, they will be quite safe from the power point of view, as the maximum power which an alternating current can possess is equal to that of a continuous current with the same voltage and amperage.

Well-known Patterns

The design of the rheostat having thus been dealt with, some general types of well-known patterns will be described. The sliding type is shown in Figs. 1, 2 and 3. There are modifications of this type, as, for example, those with two cylindrical coils and those with one rectangular coil. This particular type has one cylindrical coil and is well suited to amateur construction, having no cast parts. The former (A) in this type is usually either solid slate, hollow porcelain, or enamelled iron tube, but any material with sufficient mechanical strength can be used, this having been determined in the design. The only material which has serious mechanical objections is wood, as it shrinks when the wire gets warm and the latter then comes loose.

When bare wire, or in fact any wire larger than about No. 20 S.W.G., is used, as mentioned before, a space must be left of about half its diameter, and in this case the former must be threaded. This, in the case of a round former, is done in a screw-cutting lathe, or, failing this, with the special tool shown in Fig. 4, which can easily be made. Two wooden uprights, one fixed and one made to slide up and down, are fitted to the base; these uprights have circular holes cut in them to take, in one case, the former (a stiff working fit) and in the other case a bolt, the thread of which is forced in the hole and screwed into the former. As close to the fixed upright as possible a small wooden block is fixed, against which the tool, which is ground as for screw-cutting, is clamped. The pitch of the thread is chosen as nearly as possible the same as that desired for the former. The end of the bolt is screwed into the former, so that when the head is turned the tool cuts a thread on it. Quite a shallow cut is all that is required to keep the wire in position, the depth being best obtained by trial. The former should be rubbed with soap as it passes through the hole.

Winding the Wire

When the former is made the wire is wound on and fixed at each end by being passed through a hole and soldered. A sufficient length is left blank at each end

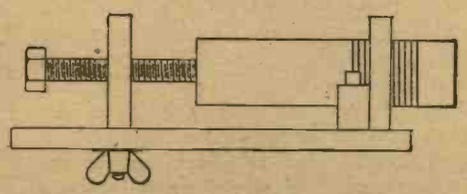


Fig. 4.—Simple Device for Threading Former.

SOME DETAILS OF THE RHEOSTAT

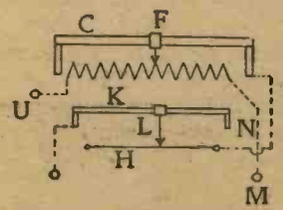


Fig. 5.—Diagrams of Connections for Sliding-type Resistance.

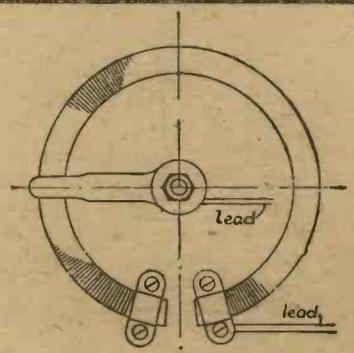


Fig. 6

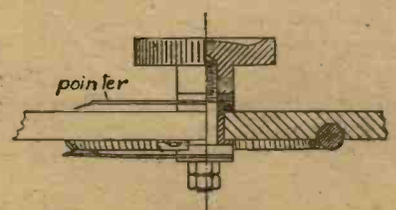


Fig. 7

Figs. 6 and 7.—Underneath Plan and Part Section of Rotary Resistance.

to accommodate the standards B, the former projecting slightly at each end. The standards are made in two halves, bent to shape from steel strips of a sufficient thickness to give the legs the necessary rigidity. The halves are clamped together round the former with bolts and nuts as shown. The guide C is clamped in the top, a spacing block D in the bottom. If the former is fragile, such as a porcelain tube, a strip of leather or fibre D must be placed under the clamping ring.

The guide C is of square brass rod, and carries the slider, which is surmounted by an insulating disc and a knob. The bridge, or saddle, F fits on the guide, and has five or six layers of thin phosphor-bronze or hard brass strip G screwed to it. These form the contacts, and are bent round in the manner shown, so as to spring stiffly on to the surface of the coil. The top strip is bent up slightly in the centre, so as to act as a spring, bearing against the under side of the guide as shown in the section.

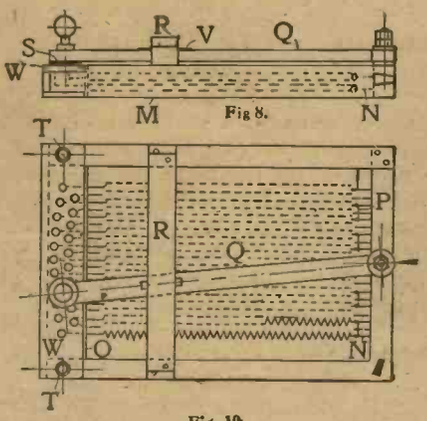
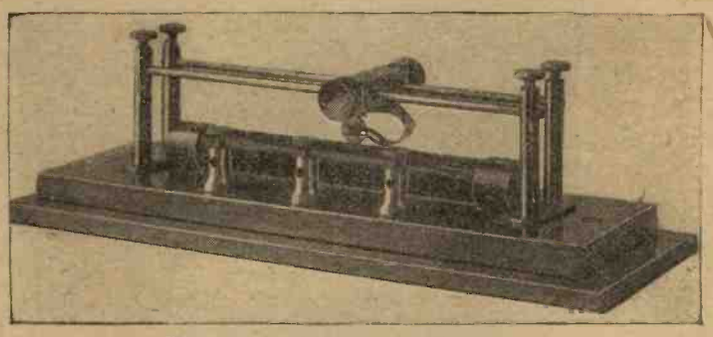


Fig. 8. Fig. 9. Fig. 10

Figs. 8, 9 and 10.—Side and End Elevations and Plan of Open-coil Rheostat.



Photograph of Wheel-type Rheostat.

Fine Adjustment

As the instrument is shown, it has an improvement in the form of a slide wire H for fine adjustment. This is unusual in this type of instrument, but is a great asset. As is shown in the figure, it is fixed at each end to the brass pillars J which are fixed to the base by nuts from underneath, and which also carry the guide K. The wire is insulated from the pillars by small fibre bands, as shown. The slider in this case carries a clip L of brass or phosphor-bronze, which makes firm contact with the wire, the length of which should be at least a turn and a quarter of the coil. The connections of the instrument are as follows: The current enters at the terminal M, goes to the coil via the thick copper wire N, up through the slider to the guide C, back to the standard B, down a thick copper wire to the slide wire, up the slider to the guide, and to the other terminal via the pillar J. The connections (shown in diagram form in Fig. 5) are so arranged that to increase the resistance both the coarse and fine adjustment sliders are moved in the same direction to avoid confusion in use.

A third terminal U is provided, which is connected to the other end of the main coil so that the instrument may be used as a potentiometer. In this case the supply is connected across the main coil and a tapping of any desired fraction of the supply E.M.F. taken from one end of the coil and the slider. If it is desired to dispense with the fine-adjustment wire no wooden base is needed, two of the terminals in this case being fixed to brass bands clamped round the former at each end, and the third to any part of either standard, or one end of the guide. This is the more usual arrangement. The brass parts should be lacquered.

Rotary Rheostats

The small rotary type of rheostat (Figs. 6 and 7) is of interest as being that most usually employed for the valve-filament current regulator in wireless receiving sets. The construction is fairly well explained by the figure. The only point which might not be quite lucid is the coil. The former is made from a circular section or ebonite or erinoid rod, which is screw-cut. The coil is first wound in the lathe on a mandrel slightly smaller than the former, and is then screwed on to the former, which has afterwards to be bent round into a circle by the application of boiling water. The coil, when made, is pressed into a groove turned or cut in the face of the ebonite panel, the ends being secured with small brass straps as shown. The latter is bushed with brass to take the spindle, which carries a brass or phosphor-bronze contact arm, springing stiffly on to the coil. The part which makes contact is bent up at each side so as to move smoothly over the turns of wire.

Nowadays, especially in the cheaper patterns, it is often the practice to omit the bent former altogether, using instead a disc with a groove round the edge into which the coil is sprung. This type is simpler, but the coil is liable to get pulled out, causing endless annoyance.

One more type of wire rheostat is to be dealt with, namely, the old-fashioned open-coil type shown in Figs. 8 to 10. This is suitable for heavier loads than the preceding types owing to the fact that its wires can be raised to a higher temperature and can dissipate heat more quickly. In practice it is invariably made from iron castings, but it is thought that a design carried out in wood would be more acceptable.

In this case the great point to be observed is that all the coils must be kept at least 1½ in. from any wood part. Beech is the best wood to use, but any fairly hard wood will do. The frame M is dovetailed and pinned together as shown. Two rows of coils are sprung between the screw-eyes N, which are fastened into the back bar of the frame, and the slate panel O, which is pierced with holes corresponding to the screw-eyes. Two coils are made together, with a straight piece P between them, which is passed through two adjacent screw-eyes. The two other ends are fastened, each with its neighbour from the next coil, through the holes in the slate, to the two brass studs corresponding to the eyes. Thus there is one stud for every two coils. It is as well to line the under side of the stud panel W with asbestos sheeting. The arm Q is pivoted to the centre of the back bar, and is kept down to its work by the bridge R. A piece of thick copper wire conveys the current from the brass spring contact S, which bears on to the studs, through the arm to the spring contact V, which in its turn bears up against copper strip fitted along the bridge R.

The terminals T are screwed into the frame as shown, one being connected by thick copper wire to the end stud on the left-hand side and the other to the copper strip under the bridge R.

The best method of winding the coils is to mount a mandrel of the right size in a lathe, first close-wind the coils and then pull them out to the required pitch afterwards. They should be stretched fairly tightly when mounted in the frame.

This pattern of rheostat is intended for use in a vertical position, as when screwed to a wall, for this gives freer circulation of air. The same applies to the sliding type, but both may be used quite satisfactorily in a horizontal position.

M. Saxon Snell.

A Novel Crystal Cup

THE centre terminal piece fixed to the top of the carbon rod of a dry cell, if broken off and the carbon cleaned out makes an excellent crystal cup, and has the merit of costing nothing. R. B.

BROADCASTING—THE SITUATION (*continued from page 471*)

able, and readers will have a keen interest in finding out what is their position under the new arrangements.

Licences

Anybody can have a broadcast "listener's-in" licence by paying 10s. at the post office for it. What does this licence entitle him to? It gives him the right to use a receiver of a type approved by the P.M.G. and bearing the official mark of approval.

How can that mark of approval be obtained? By a member of the British Broadcasting Company only, and by that member submitting a type to the P.M.G. Apparatus made by a firm outside the British Broadcasting Company will not get the mark of approval, and therefore the amateur will not be entitled, by the terms of his licence, to use it. That seems to be perfectly clear.

Briefly put, the broadcast licensee can use only a wireless set bought complete from the trade, and it is up to him to see that it bears the mark of the P.M.G.'s approval.

The Amateur Experimenter

What is the position of the true amateur —the experimenter? Note, towards the end of the report, the sentence which we have put in italics. Surely the statement was made by the representative of the Post Office with his tongue in his cheek? So the position of the amateur experimentalist has not been altered! How very interesting! But what is the position? Does it not come to this: that the only person who can obtain an experimenter's licence is the one with sufficient knowledge of the subject to satisfy the rather exacting demands formulated by the questions on the application form? We want to know what is going to happen to the thousands and thousands of people who, in possession of only elementary knowledge, have been able to make highly successful receivers. Have these experimenters to drop their home-made gear into the dustbin, or use it secretly and in fear of a vague law? We should like to have seen a statement that the P.M.G. will deal generously—really generously—with everybody possessing the necessary patience, skill and enthusiasm to make his own set. For the good of the country, people who make their own sets should be encouraged. The more of them the better. Our fear is, though, that a very great number of these people will find it very difficult indeed to satisfy the Post Office officials as to their knowledge of the science and technique of wireless, and consequently there is every risk of a grave injustice being done.

Some Advice

Our advice to all readers who have made, or are making, their own sets is to apply for an experimenter's licence and not for the "listener's-in" licence. We feel certain that, sooner or later, the P.M.G. will agree that the man who has taken the trouble to ground himself in the subject sufficiently to allow of his making a set has a right to be called an experimenter.

As we have said repeatedly, we quite agree that no "listener-in" or experimenter, unless specially licensed, should be allowed to use any apparatus, whether bought or home-made, which re-radiates signals into the ether. It should be an offence to have in one's possession, without special permission, apparatus which, used carelessly or ignorantly, can cause considerable inconvenience to other "listeners-in." We quite agree that anybody seeking a licence to transmit should have special qualifications. But beyond that we do not wish to go. By all means let the mere "listener-in" who wants the music and the fun of broadcasting buy his set and help to pay, in that way, his share of the broadcasting expense. But let the other man—the enthusiast, the electrical experimenter, however humble his attainments may be—let him be free to use any set he likes as long as that set cannot cause interference.

PROGRESS

Some Remarks Inspired by a Visit to the Recent Exhibition

THE outstanding impression borne in upon one at the recent exhibition was that wireless telephony had become tremendously popular within the past few months, due probably to the imminent settlement of the much-vexed broadcasting question, and in no little degree to the efforts of wireless clubs.

What impressed the visitor first of all was the obsolescence of the old loading-coil solenoid type tuner and its supersession by the more compact coil tuner, employing "pancake" or duo-lateral coils giving a range of anything from 180 to 25,000 metre wave-lengths, capable of the very finest tuning and adjustment, and free from "dead-end" effects.

Especially is this the case with those coil-holders where the coils are held in position by a gimbal mounting, thus allowing the most exact tuning, dispensing with variable condensers, and giving an extensive range with the minimum number of coils and, in addition, getting the vario-coupler effect. This certainly marks a decided advance in tuning.

Semi-automatic Instruments

Another step in the right direction is the manufacturers' keen appreciation of the public's needs, which was strikingly evidenced in the many interesting receiving sets exhibited, easily and quickly (almost automatically) adjustable to any of the English broadcasting wave-lengths, it being necessary with some of the sets simply to throw over a switch to the "on" position and rotate a disc until reception is clear. When finished, the switch has only to be thrown back to the "off" position, thus disconnecting the valves and earthing the aerial and protecting the instruments from lightning or static discharges.

Then one noticed several good adapters to plug into electric light sockets. It is claimed these are perfectly safe to use and have an efficiency of about 75 per cent. of a regulation outside aerial, which, of course, they replace.

5-electrode Valves

One also saw, *en passant*, the 5-electrode valve, consisting of filament and two plates and two grids, which is claimed to be thrice as powerful as the triode. A distinct improvement seems to have been effected in one of the triode valves shown with a metal hood over the filament, thus utilising the total emission from the filament and eliminating charges on the glass bulb.

Crystal Reception

It is rather disappointing that so little progress seems to have been achieved towards the greater perfection of crystal reception, and it is to be hoped that our serious experimenters will have something of real interest to show us at the next convention regarding this excellent mode of rectification.

Telephones and Loud-speakers

Telephones also might be further improved to meet the conditions imposed by wireless reception, and the loud speaker, although recently somewhat better in quality, is still a "loud speaker." Do let us have a "clear speaker." Then, too, there is the other side of the question to be considered—the persons speaking or singing for reproduction by the loud speaker. Are they selected especially for the timbre and pitch of their voice; are they trained singers or elocutionists, or both; and have they been instructed in regard to speaking or singing, to produce, enunciate, etc., in a manner most calculated to reduce to a minimum the mechanical defects of the telephone? Here seems to be a useful field for research for our students of the telephone and acoustics.

Conclusion

One thing that impressed itself on one's attention was that from point of attendance this exhibition has been an unqualified success, and if the public interest continues to increase in its present ratio, we shall require an Olympia to house the exhibition next year, and in time it will bid fair to approach the popularity of the Motor Show.

W. P. A.

Radiograms

A NOVELTY to be presented at the Empire Theatre, Stratford, next week is a wireless vocal doll. The automaton is entirely self-contained, and has no connections or contacts of any kind. To hear a doll on the stage reproduce a song sung by a singer (Miss Nella Allen) in her dressing-room in some remote part of the building is a distinct novelty. The entire apparatus is covered by patents.

An insurance company announces that for an annual premium of 7s. 6d. it will cover loss of or damage to the wireless apparatus, including aerial, third party damage up to £500 (any one accident), including damage to property belonging to or under the control of the insured. The company referred to is the Liverpool Marine and General Insurance Company, Limited, 7, Angel Court, London, E.C.

It is thought likely that the condition as to unrestricted wave-lengths of receiving apparatus will be modified after practical experience has been had of a broadcast service.

A tank capable of being directed from a wireless station many miles distant is undergoing trials.

Canadian wireless experts will shortly visit this country in order to discuss with the Post Office authorities a proposal to build a great wireless station in the Dominion.

Scottish experimenters are now finding it possible to hear more telephony than was formerly the case. Generally, Marconi House is coming in better in the western part of the country, and on a recent evening Writtle was heard excellently on four and five valves in Glasgow. Quite a number of inhabitants of lonely districts in the Highlands are taking steps to secure sets which will keep them in touch with the pleasures of civilisation.

Wireless news services are used by all the five daily papers of Washington, U.S.A.

Broadcasting at a big Housing and Health Exhibition in Glasgow is proving a great success, and is easily one of the most attractive items in the show. The opening ceremony was performed by Lady Weir, who, speaking into a wireless microphone, had her voice carried to all parts of the exhibition. The broadcasting is being carried through by a local firm of piano and music sellers in conjunction with the Marconi Company.

It is officially stated that officers and other ranks of the Regular Army, Militia, Territorial Army, or Officers Training Corps who wish to instal private wireless sets for sending or receiving messages, are subject in all respects to the Postmaster-General's regulations governing the installation and working of such sets.

Arrangements have been made whereby at the Glasgow and District Radio Club's exhibition on Saturday, November 4, a special message will be sent to the show from the Northolt station. The transmission will take place at 7 p.m. on a wave-length of approximately 7,000 metres.

Wireless clubs are springing into existence in various parts of Scotland with remarkable rapidity. In quite a few of the smaller towns, such as Falkirk and Hamilton, enthusiastic bands of amateurs are forming themselves into energetic organisations. So far these clubs are for the most part isolated bodies, being quite independent in action. It is suggested that some sort of Scottish affiliation should be formed, to the advantage of all concerned.

A Czecho-Slovakian wireless company with a capital of 100,000 crowns, has been formed. The concern is named "Radioslavia," and is intended for the construction and maintenance of wireless stations and the transmission of Press traffic.

In the action brought by the Marconi Wireless Telegraph Company, Limited, against the Mullard Radio Valve Company, Limited,, for infringement of valve patents owned by the plaintiff company, Mr. Justice P. O. Lawrence decided on October 19th that the Mullard valve did not constitute an infringement of either of those letters patent. The defendants had alleged that the letters patent were, and had been, at all material times invalid, but his lordship held that this attack made by the defendant company on the validity of the plaintiff company's letters patent failed.

A very curious incident occurred at the reception of the Prince's broadcast speech. One of the Alexandra Palace attendants, who has been deaf for some years, heard every word of the speech in the grounds some 200 feet away from the nearest Magnavox.

FORTHCOMING EVENTS

TELEPHONY TRANSMISSIONS

Eiffel Tower (F L). 2,600 metres. Each afternoon (Saturdays excepted).

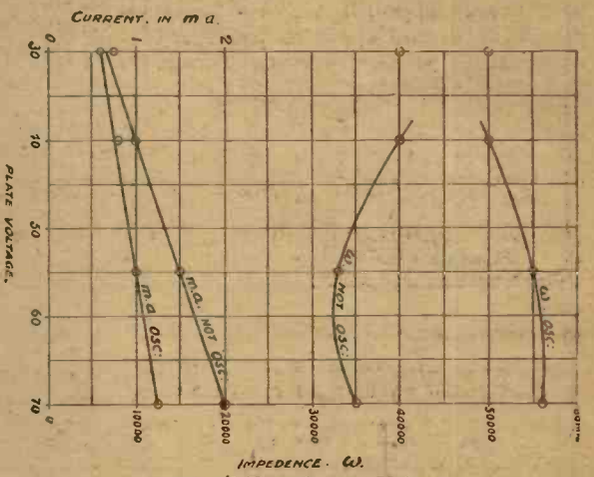
The Hague, Holland (P C G G), 1,085 metres, G.M.T. Oct. 30, 3-5 p.m.

Writtle (2 M T), 400 metres. Oct. 31, 8 p.m.

CORRESPONDENCE

The Intervalve Transformer

SIR,—In the interesting article on the above by Mr. W. J. Joughin in No. 15 of AMATEUR WIRELESS a table is given of readings based on measurements of a receiver in use, and a suggestion is made that some relationship exists between the quantities. As a matter of interest, the writer plotted the given values as per accompanying graph, from which it is evident that the voltage-current points lie on straight lines having the following equations:



Graph of Transformer Values.

Not osc. : m.a. = 0.0333 V − 0.333

osc. : m.a. = 0.01625 V + 0.13

From the right-hand curves it will be noticed that minimum impedance when the valve is not oscillating occurs when the plate voltage is about 60, while the maximum value of impedance is reached with the valve oscillating and plate voltage about 65. Readers who are in a position to take measurements from their apparatus would derive valuable information from the plotting of co-ordinate values of various kinds, inasmuch as they could speculate with some degree of certainty as to the direction in which their experiments is leading them.—J. C. (Belfast).

A CHANGE OF ADDRESS.—Will readers note that Radio Supplies, 236, High Holborn, London, W.C.1, have moved to an address exactly two doors away, namely, 234, High Holborn, London, W.C.1.

Transmitting licences are being granted to American newspapers at the rate of about two each week.

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Condenser Capacity

Q.—Please state the capacity of a tubular condenser, whose plates are 3 in. long and form two halves of a tube 2¼ in. in diameter, these moving plates to rotate. How should two such condensers be connected to obtain maximum total capacity?—H. G. S. (4043).

A.—This type of condenser is known as the parallel-plate condenser and may be calculated by the following:—

$$S = \frac{A K N}{5{,}000 \times 900 \times d}$$

Where S = capacity in microfarads.

A = area of one plate in square inches.

K = the specific inductive capacity of the dielectric (Glass = 8.45 approximately).

N = the number of dielectrics under strain.

N = the thickness of the dielectric in inches.

Considering the above prticulars,

$$S = \frac{3.92 \times 8.45 \times 1 \times 16}{5{,}000 \times 900 \times 1} = \frac{106}{900{,}000}$$

= .00011 microfarads approximately.

To obtain maximum value for two or more condensers always connect them in parallel with each other.—L. C.

CLUB DOINGS

Barnsley and District Amateur Wireless Association

Hon. Sec.—G. W. WIGGLESWORTH, 13, King Edward Gardens, Barnsley.

AT the official opening night of the above association, held on October 11th, the address was followed by a lecture divided into two parts—the first part on "Heterodyning," and the second part on "Directional Wireless."

In his remarks upon heterodyning, that is of beat reception without an oscillating aerial, the president emphasised the necessity for eliminating interference with other people's reception. To this end the president stated his intention of presenting to the association a "Heterodyne" wave-meter. The president's lecture on directional wireless was clearly elucidated by means of a large map, and appliances for tracing both land and air transmitting stations.

Wolverhampton and District Wireless Society

Hon. Sec.—J. A. H. DEVEY, 232, Gt. Brickkiln Street, Wolverhampton.

AT a meeting of the above society held on Oct. 11th a very interesting lecture was given by Mr. D. P. Baker on "Time—Sundials to Wireless."

The lecturer in his discourse took the meeting back to the old methods of recording time, leading up step by step to the most modern methods of recording time by wireless.

The Leicestershire Radio and Scientific Society

Hon. Sec.—J. R. CRAWLEY, 269, Mere Road, Leicester.

THE Leicestershire Radio and Scientific Society held their bi-monthly meeting on Oct. 9th, when S. Skeet, Esq., delivered a lecture on "Set Construction." This he did very successfully, illustrating his remarks by many beautiful examples of his own work.

The Wakefield and District Wireless Society

Hon. Sec.—ED. SWALE, 11, Thornes Road, Thornes, Wakefield.

A MEETING was held on Oct. 6th in the Y.M.C.A. when Mr R. Leedal, A.M.I.E.E., read a paper on "Accumulators." Many useful hints on the use and care of accumulators were given by Mr. Leedal On Oct 13th another meeting was held in the Y.M.C.A., when Mr. Bateman gave a very interesting lecture on his own receiving station. Mr. Bateman had on show a good deal of his apparatus, and very ably described it, drawing diagrams on the blackboard and showing how one, two or three valves could be used at will.

Tottenham Wireless Society

Hon. Sec.—R. A. BARKER, 22, Broadwater Road, Bruce Grove, N.17.

THE third meeting was held on Oct. 5th, and was opened with half-an-hour's buzzer practice. The chairman then gave a lecture on "Retro-active Amplification," which was of great interest to everybody present. It was decided that the future place of meeting should be the Bruce Grove Schools, Sperling Road, and that the evening should be changed to the Wednesday of every week.

The Fulham and Putney Radio Society

Hon. Sec.—J. WRIGHT DEWHURST, 52, North End Road, West Kensington, London, W.14.

AT a meeting held on October 13th after the preliminary business was isposed of, Mr. Houstoun opened discussion on the various forms of amplification and the screening of transformers, and Mr. Houstoun promised to have a set at the next meeting with a new type of screening arrangement. Another discussion was started on accumulators, and Mr. Calver gave a short explanation of the various ways the plates are now made. Mr. V. Craster mentioned a method they have in America of exchanging a fully charged element for a discharged one to obviate the waiting for accumulators to be recharged.

Sunderland Wireless and Scientific Association

Hon. Sec.—H. G. MAC COLL, North Elms, Sunderland.

THE last general meeting of the session was held at the Technical College on Sept. 23rd. Nominations having been received for the officers and committee for the ensuing year, Mr. R Sutherland Allan opened a discussion on the programme for the next session. He informed the meeting that a suite of rooms had been obtained for the association at Westfield House, consisting of a reading room, experimental and lecture room, secretary's office, and cloak room. These rooms are to be open daily for the use of members.

He then explained that the committee had arranged to run a number of courses of lectures jointly with the Sunderland Y.M.C.A. Radio Society. The following courses had been arranged:—

(1) Course of 24 wireless lectures.

(2) Course of 12 lectures on elementary magnetism and electricity (before Christmas) followed by 12 elementary wireless lectures.

(3) Course of elementary wireless lectures for beginners.

(4) Lectures on other scientific subjects, lecturettes, debates, etc.

(5) Four public popular lectures

(6) Courses of senior and junior buzzer practices.

The association held a wireless and scientific exhibition in connection with the Sunderland Housing and Health Exhibition, at the Whitehall Rink from October 3rd to 14th.

The Liverpool Wireless Society

Hon. Sec.—MR. C. L. LYONS, 76, Old Hall Street, Liverpool.

A MEETING of the above society was held on October 12th, when Professor E. W. Marchant, D.Sc., delivered an address on the subject "Wireless Broadcasting." Briefly tracing the early history of wireless telegraphy point by point right up to the latest developments of the science, he entered upon the main features of his address, which were the advantages and disadvantages of wireless broadcasting as we might expect to develop into in the course of a very short space of time.

Belfast Radio Association

Hon. Sec.—MR. S. DICKSON, 11, Eglantine Avenue, Belfast.

THE inaugural meeting of the above association was held on Oct. 6th. Applications for membership are invited.

ANNOUNCEMENTS

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

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

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