HOW TO STOP THE HOWL

Amateur Wireless And Electrics

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PRINCIPAL CONTENTS

WELL ILLUSTRATED

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WIRELESS ON LONG-DISTANCE TRAINS

Many Experiments are being carried out with a view to the instal-lation of receiving sets on passenger trains.

Amateur Wireless and Electrics

Vol. III. No. 58 July 14, 1923

Stop that Howling!

THERE are times when one's set commences to howl with a perseverance worthy of a better object, and with such ferocity that one is driven to profanity. Weird cat-calls, shrieks of agony, and all the moans of a soul in torment emanate from headphones or loud-speaker. One wonders sometimes how so small an instrument can produce such a volume of discordance.

Re-radiation or Oscillation

On the commencement of the howl tap the finger on the aerial terminal to test whether the howling is due to re-radiation or oscillation, for if that should be the case you will be reproducing your own trouble in the receivers of other people up to a half or three-quarters of a mile away. If oscillation is present a distinct "plop" will be heard in the phones as your finger touches the terminal, followed by another click as your finger is removed.

The remedy in this case is so simple that one wonders why offenders continue to inflict such unnecessary trouble on other people: the reaction coupling is too tight —loosen it. If this does not check the howling, perhaps your filaments are too hot: turn them down until the interference ceases.

Another Reason for Howling

But the fact that your set is howling need not necessarily mean that it is radiating and causing trouble to other people. The cause of the howl may be due to certain parts of the set reacting together and causing internal oscillation. Therefore if on testing for reaction in the manner described above, no "plop" is heard and the set is howling continuously, you can be pretty certain that the trouble is due to inter-reaction between some of the internal parts of the set.

To the amateur whose set seems particularly prone to howl this article is specially addressed. Systematic searching for the trouble will always result in its discovery and elimination, and the best system of trouble-hunting to work upon is here explained.

Connections

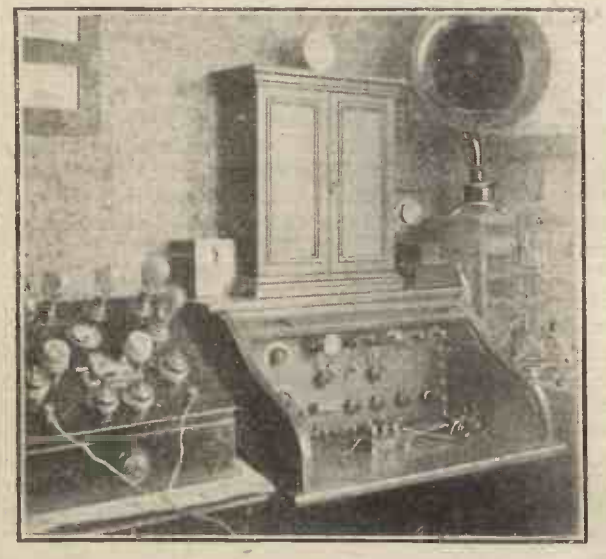
First of all examine the external connections and see that all are firmly made and that the aerial and earth leads are not running too close together or parallel. Then go over the internal wiring and make sure that no two wires are too close or running parallel where not well insulated, especially the connections to the grids of the valves. Try the effect of removing or substituting the grid-leak, particularly if the detecting valve is a new one, or if you are using a different one from that with which you usually listen-in. It often happens that the grid-leak is unsuitable in such a case.

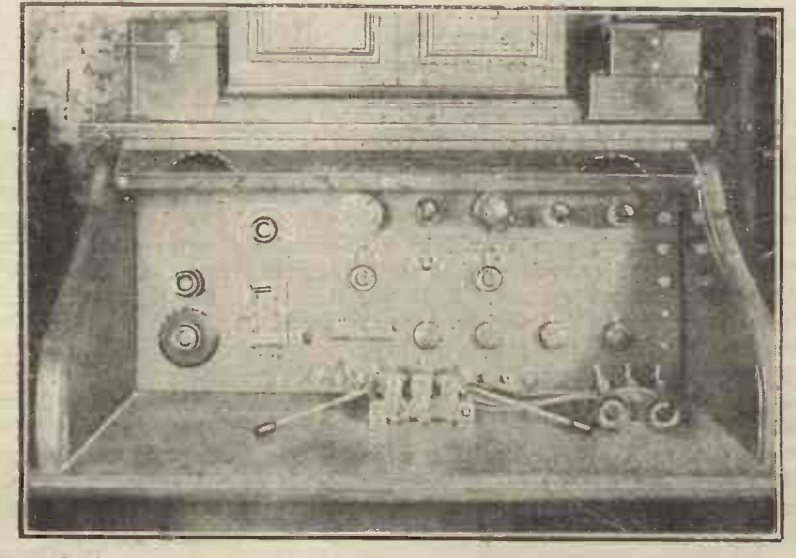
Lastly, the valve you are using may have become "soft" or gassed by excessive plate voltage, and the latter is causing the trouble. Besides turning down the filaments, try reducing the H.T. voltage.

When "Fading" Occurs

"Fading" is another annoying fault that sometimes occurs in a valve set, and the worst of it is that it generally happens at a critical moment when you are enjoying a certain item or piece of music.

An Amateur Receiving Set in a Roll-top Desk





How a receiving set can be conveniently mounted in a roll-top desk is shown in the above photographs, which depict a station built by Mr. F. Worrall, of Bolton. The illustration on the left shows the whole receiving station and that on the right is a near view of the panel. The receiver is a 4-valve set, so arranged that either one, two, three or four valves may be used. A switch is provided to use either direct or loose coupling, and another to remove the reactance connections.

The circumstances by which fading occurs are more often than not beyond the control of the amateur. Sometimes it is due to some peculiarity in the formation of the earth, which causes the wireless waves to be occasionally deflected from their direct course. Again, it may be due to another transmitting station which is sending on a wavelength nearly the same as, or a direct multiple of, that of the station you wish to hear. When this happens the waves of the two stations become jumbled together and alternately get in and out of step with one another, causing beats that occur at regular intervals. If these beats occur rapidly they cause the receiving set to howl, or they may alternately cause the signals to increase and decrease, so producing the phenomenon of fading.

Here again the grid leak may be at fault, and this portion of the set should be overhauled as mentioned above. Test the two batteries also, as a battery that is running down may cause irregular signal strength, though it is more likely to give rise to a gradual fading away of signals until there is dead silence. If this is the case a few minutes rest will often allow the batteries to recuperate a little and provide another short spell of entertainment, when the same thing will be repeated.

Small Details that Count

Do not forget that more troubles are likely to develop from the neglect of small details than from any really radical fault in the set. Loose leads account for a great many of the little odds and ends that are constantly cropping up to annoy you. All sorts of troubles can be traced to loose connections—crackling noises, "frying," lack of signals or loss of strength, or even fading if the loose connection is moving about very slightly.

Keep your set clean. A considerable amount of leakage may occur over the surface of a panel if it is covered with dust. Moisture, too, is apt to condense on the surface of the panel, so that cleanliness in this respect is amply rewarded by increased efficiency. Don't forget to clean the valve legs and the valve sockets occasionally. The thin coating of rust or oxide which is wont to form on them can have a considerable bearing on your signal strength. Terminals also should be examined at frequent intervals, so that clean, tight connections are assured. Switches, especially of the "knife" variety, require even more attention, and should be kept as clean and bright as possible.

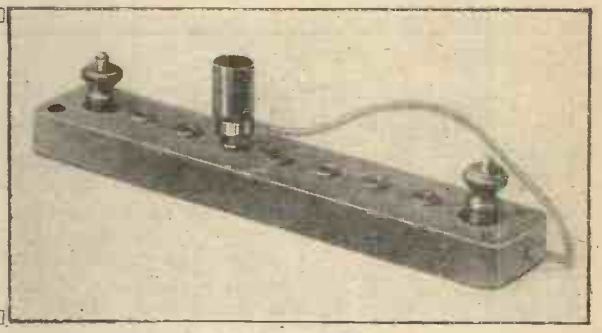
Look to Your Batteries

A word about the batteries. Keep the surface of both spotlessly clean, in order to minimise the risk of leakage. This will be rather difficult in the case of the L.T. accumulator, owing to the tendency of the acid to creep, and of the gassing that takes place when the cells are charged. But keep the surface of your accumulator as clean as possible. Another point to remember is to keep the acid solution in the battery up to its required level—quarter of an inch above the surface of the plates—adding clean distilled water to make up for evaporation.

Then periodically the cells should be cleaned out and refilled with fresh acid of the correct purity and specific gravity. This job is generally left to the electrician, and should be done every six months or so, and more often if the sediment that collects on the bottoms of the cells shows any likelihood of touching the plates.

By keeping the foregoing hints in mind, and following them, the amateur can rest assured that he is helping his set to attain that purity of reception which is, or should be, the aim of every one of us. A. J. B.

Making a Variable Grid Leak



Variable Grid Leak.

TWO odd strips of ebonite or fibre, two terminals, seven contact studs, a short piece of flex wire, a few lines drawn with a pen, an old wander plug and six small screws are all that is required to construct a very efficient variable grid leak. Reckoning the value of the indian ink lines and the wander plug as nil (the latter being retrieved from a disused high-tension battery), the cost of the remaining materials should not exceed 1s. 6d.

Fig. 1.—The Leak Line.

Fig. 2.—Ebonite Mount.

Fig. 3.—Plug.

Fig. 4.—Ends of Ebonite Strips.

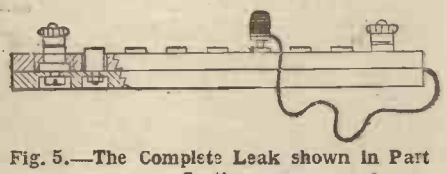


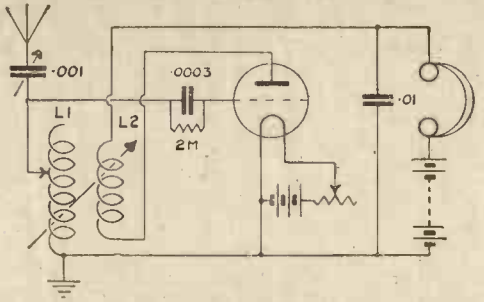
Fig. 5.—The Complete Leak shown in Part Section.

Two strips of $\frac{3}{16}$-in. sheet ebonite, preferably matted, each 5 in. long and about 1 in. wide, are marked off and drilled as shown in Figs. 1 and 2 respectively. The instrument shown in the photograph is made of red vulcanised fibre, but this is purely a matter of taste. The two end holes in one strip are drilled for two small terminals, the other seven holes being provided for the contact studs. All holes are well recessed underneath to accommodate the nuts. An indian ink line is drawn along the top surface of the strip between each hole with the exception of the space between the last two holes (see Fig. 1). Each contact stud is drilled down through the centre as shown in section at Fig. 3, and the wander plug is made to fit tightly into these holes. A small washer made from several thicknesses of soft tin foil is placed under the shoulder of each contact stud to ensure good contact with the ink line, and the studs are then screwed firmly in position.

The holes in the second strip should be large enough to slip over the terminals and studs. Before attaching the terminals slip on the top strip, place both strips in the vice, and drill a hole in the right-hand end, as shown by Fig. 4, large enough to take the flexible wire. Take off the top strip, attach the left-hand terminal in the same manner as the contact studs, secure the bared end of the short piece of flexible wire under the shoulder of the isolated terminal on the right, and fit the wander plug to the opposite end. The top strip may now be permanently screwed down. If there are no taps and dies available, small wood screws may be used if holes are first drilled in the bottom strip. The instrument should now be nicely trimmed up round the edges with a file and some emery-cloth, and if necessary the space between each strip can be sealed up with paraffin-wax. The general arrangement of the device is clearly indicated in Fig. 5.

It will be seen that different values can be obtained by altering the position of the wander plug, and the advantage of such an arrangement should be readily appreciated by experimenters. The correct value of the leak in a rectifying circuit is a very critical factor, and dabbling with separate leaks made up in a haphazard way is a tedious job necessitating many connections and disconnections. This trouble can be obviated by means of a few simple adjustments if a variable leak is used, and properly constructed the one described will be satisfactory in every way. O. J. R.

150 Receiving Circuits in Diagram and Picture



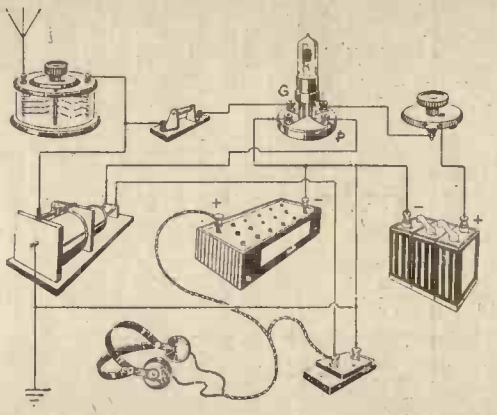
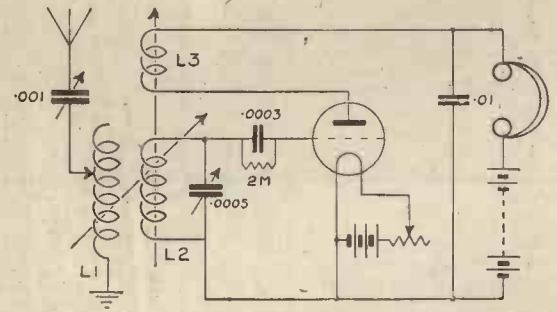


Fig. 21.—A simple reaction circuit, which must not be used on broadcast wavelengths. If L2 is coupled sufficiently closely to L1, the magnified oscillations in the plate circuit will be passed into the aerial circuit, and from there through the valve, resulting in still further increases in plate current. A variable condenser of about .0002 microfarads may be placed across the reaction coil L2.



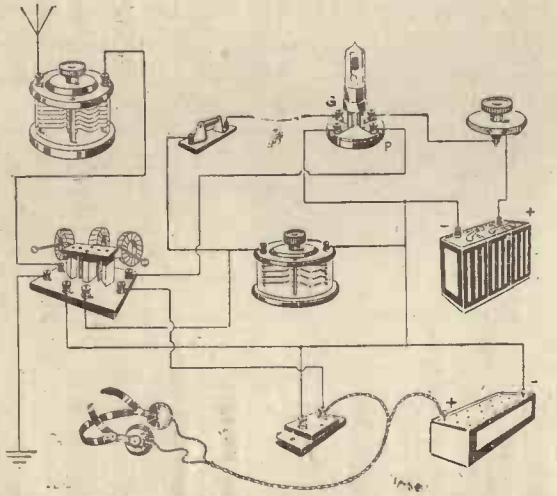
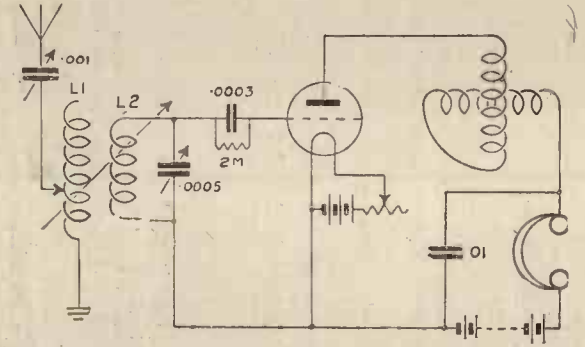


Fig. 22.—Similar to Fig. 21, but a three-coil tuning system is shown. This circuit may be used on broadcast wavelengths provided L1 and L2 are spaced well apart to prevent the reaction coil L3 energising the aerial coil.



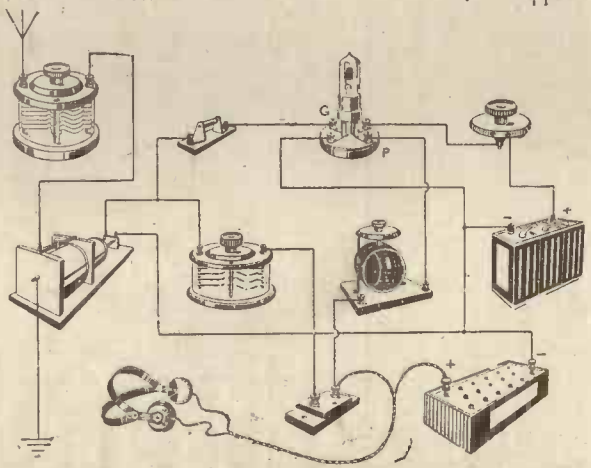
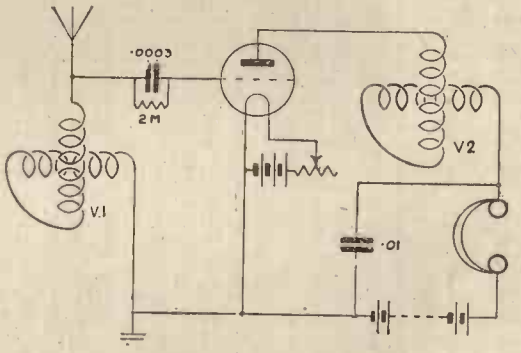


Fig. 23.—A very efficient regenerative circuit for short-waves. The variometer in the plate circuit, if tuned to the frequency of the incoming oscillations, will set the whole system oscillating. If this circuit is used for broadcasting, the variometer should be slightly mistuned.



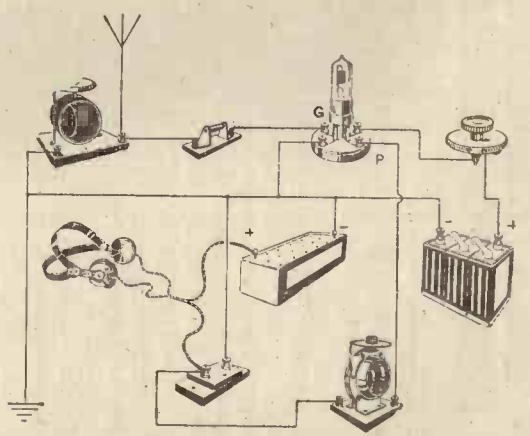


Fig. 24.—In this circuit, two variometers V1 and V2 are used. As this circuit will energise the aerial when the grid and plate circuits are in tune, it should not be used on broadcast wavelengths.

A Transmission Board or Chart

AN IDEA FOR WIRELESS CLUBS

WE reproduce on this page an original idea for a chart showing at a glance all the well-known broadcasting transmissions (according to British Summer Time). It has been drafted by Mr. A. H. Clifton, and readers will recognise its value at a glance. Merely by running the eye down a vertical column it is possible to see exactly those stations that are transmitting at any given hour on any evening of the week. Thus the experimenter, sitting down to his set at 9.45 on Monday evening, observes by a momentary glance that all the British Broadcasting Company's stations are at work; that The Hague and Radiola will last well into the next hour; that Radio-Riviera will be on for fifteen minutes (but can he hear it?); and that Prague is on, but it is doubtful when it closes down.

We should like to reproduce this chart from time to time in AMATEUR WIRELESS; but there are technical difficulties in the way of making the periodical alterations, however slight they might be, and it is thought that wireless clubs would like to have a chart of this kind available at their meetings, and that many wireless manufacturers and dealers would welcome it as a show-window attraction. In the majority of cases it would be sufficient if a chart for just one evening were exhibited. At any meeting of a wireless society a request by the president would certainly result in a member volunteering to attend a quarter of an hour before the usual meeting time for the purpose of bringing the broadcasting chart up to date, a matter of no difficulty whatever if only a one-evening chart were in question.

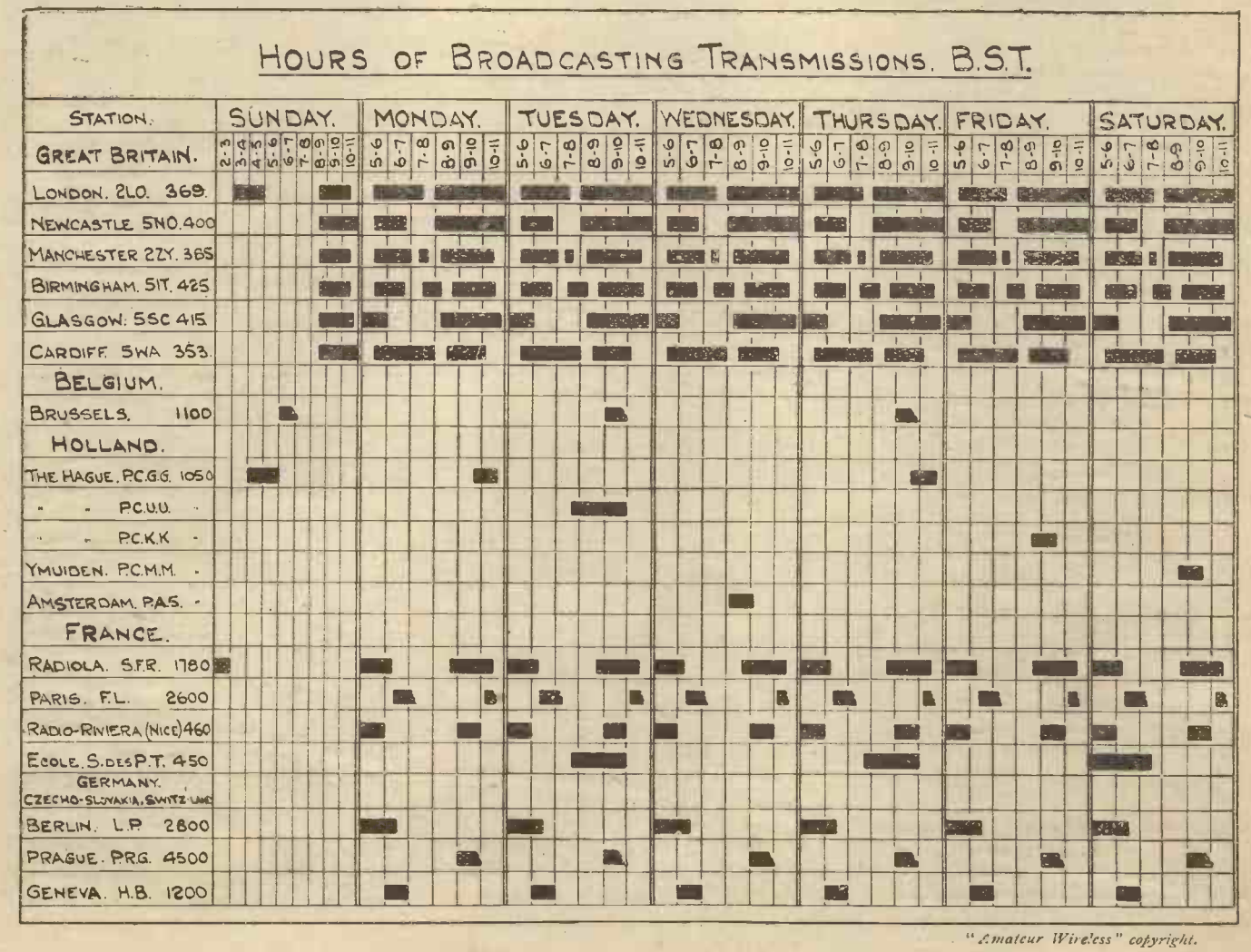
Every reader will have his own idea as to the most practical form in which to construct the chart. The names of the stations need to be set out perfectly clearly; the individual names will not vary, but occasionally one may drop out or a new one be inserted. The problem is to arrive at a form of chart that can be quickly brought up to date. Personally we incline to one of two ideas in this connection. In the first place we should work in half-hours instead of in hours; that is, each vertical column or unit space would be half an hour, so that the reading for the evening would be as follows:

TUESDAY

5.0—5.30	5.30—6.0	6.0—6.30	6.30—7.0	7.0—7.30	7.30—8.0	8.0—8.30	8.30—9.0	9.0—9.30	9.30—10.0	10.0—10.30	10.30—11.0	11.0—11.30	11.30—12.0

If the whole chart were contained in a tray, each half-hour space could consist of a square block of wood—white on one side and black on the other. The black would represent transmissions and the white "nothing doing." By means of a steel point any block could be picked out and reversed. A better idea would be to attach narrow mouldings (picture moulding fashion) horizontally across the board, and on these narrow mouldings to hang S-shaped-pieces of thin metal, painted black

(*Continued on page 54*)



The Microphone Amplifier

AND HOW IT WORKS

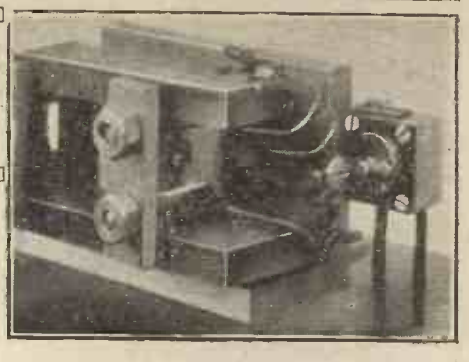


Fig. 1.—The Microphone Amplifier.

IT is well known that at the present stage in the development of wireless it is almost impossible to use more than three stages of low-frequency amplification without producing distortion. Moreover, there are times when three stages will not give sufficient volume of sound. It was for use in cases like this that the Brown microphone amplifier was developed. This instrument magnifies without distorting, and can thus be used in conjunction with a three-valve L.F. amplifier without producing any disturbing noises. Normally the addition of this amplifier is equal to two extra note-magnifiers. Another advantage is that the microphone amplifier is more economical in operation than an equivalent two-valve set.

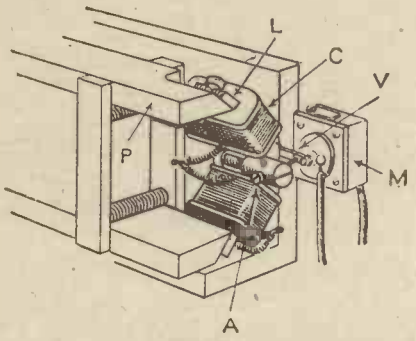


Fig. 2.—Details of Parts of Amplifier.

Working Principle

An ordinary microphone consists of two discs, between which are placed loosely-packed carbon granules. When one speaks air waves are produced which strike the front disc and cause it to vibrate. Thus the carbon granules are sometimes compressed and at other times the pressure is released. It will be apparent from this that when they are compressed the resistance is much less and more current will flow in the microphone circuit. On the other hand, when the pressure is released the resistance will be greater, and consequently less current will flow.

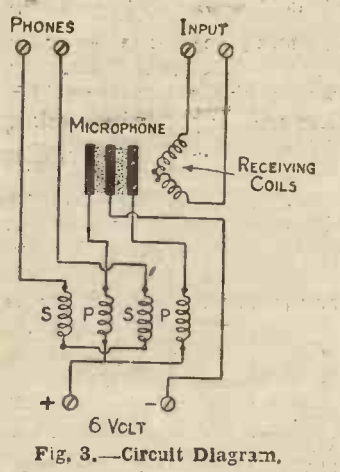


Fig. 3.—Circuit Diagram.

The principle of operation of the Brown amplifier is that magnetic means are employed to actuate the microphone instead of air waves, as when speech is transmitted. The general arrangement of the apparatus will be seen from the photograph, Fig. 1. Fig. 2 shows the positions of the components in detail. P is a permanent magnet, at the side of which are built up the coils C on laminated cores L. A is an adjusting screw to prevent the vibrating reed V from sticking to the magnet. One end of the reed is rigidly attached to the centre disc of the microphone M.

The Circuit

The circuit diagram is shown in Fig. 3. The terminals marked input are connected to the phone or output terminals of a valve or good crystal set. The receiving coils have a resistance of the order of 2,000 ohms. The microphone has three discs, of which the centre one is rigidly attached to the vibrating reed (not shown in circuit diagram). A six-volt accumulator is connected across the middle disc and each of the outside ones, both of which are connected in series with the primary of an open-core transformer, marked P. It will be seen that these are in parallel. The secondaries S are connected in series and placed across the output terminals, to which phones or a loud-speaker may be attached.

When a fluctuating current flows through the receiving coils the vibrating reed will cause the centre disc to move also, thus causing a difference in resistance on each side of the microphone. The result of this is that a variation of potential will be caused in one primary, with very little current variation. In the other primary there will be a large current variation and little difference in potential. These coils are connected in parallel, and as they are supplied from a common battery the total watts in each circuit will be the same. But as the secondaries are in series a difference of both current and potential will be induced in them by the primaries, and therefore a step-up or amplifying effect is obtained.

Transformers

The two transformers are mounted on the base of the instrument, together with a small condenser, not shown in Fig. 3. It is claimed that this amplifier is more economical in operation than a two-valve note magnifier, which it will replace. It is not guaranteed to work with a crystal set in the ordinary way, but will if reasonably loud signals are received in the first place.

S.

Simple Tests for Condensers

THAT most indispensable of wireless instruments, the condenser, whether of the fixed or variable type, should invariably be tested for good insulation before being put into use in a receiving circuit.

The apparatus required for the tests are a flashlamp bulb, a battery to light it, and a telephone receiver.

For the first test connect condenser, bulb, battery and phone all in series. If a variable condenser is being tested, swing the moving plates a complete half turn backwards and forwards.

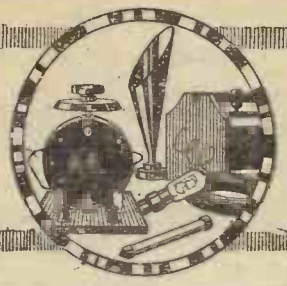
If the bulb does not light up it may safely be concluded that there are no unwanted metallic contacts bridging the positive and negative sections of the condenser.

The second and third tests—for the quality of the dielectric itself—will concern the fixed type of condenser only. In the case of the moving plate variable condenser the dielectric is, of course, air.

Touch the two contacts of the condenser with the terminals of the battery, thus putting the two momentarily in series; the plates of the condenser should now be holding a charge, and this can be verified by joining up the telephone receiver in series with the condenser. If everything is as it should be a click will be heard in the phone at the moment of contact.

The final and most severe test is to charge up the condenser as described above, but instead of testing with the receiver immediately, let an hour elapse before so doing. If at the end of that time the charge is still there, as proved by the phone, the condenser may be passed as satisfactory.

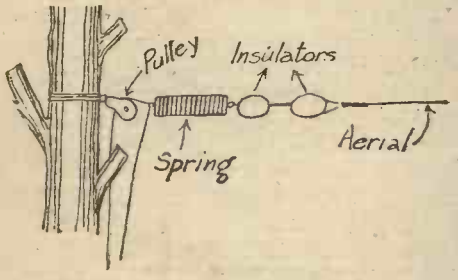
A. P.



A PAGE OF ODDS—AND—ENDS

Aerials Attached to Trees

AN aerial attached to a tree which sways in the wind is likely to be a source of trouble unless means are taken to overcome, as much as possible, the movement and strain.



Method of Attaching Aerial to Tree.

The way in which this can be done is shown in the accompanying illustration.

The spring should be strong, and it should be difficult to stretch it more than an inch or so by pulling with the hands. It must be thoroughly greased or oiled frequently to keep it from rusting.

The end of the aerial nearest the house can be brought to a pulley secured to a chimney or wall. A. W. X.

A Cheap Lead-in Tube

THE materials required for making the above will be one piece of glass tube about ⅜ in. diameter (the cost should not exceed 3d.) and one piece of rubber tubing to fit fairly tightly inside the glass tube. It should be about 4 in. longer than the glass. Before putting the rubber in place it should be given two good coats of shellac varnish. The rubber, when in the tube, should be left 2 in. clear on each side, and when the lead-in wire is inserted the tube should be filled up at each side with rubber stopping as used for cycle tyres. Putty could be used. The projecting ends of the tube should finally receive a good coat of varnish. A. P.

A New H.T. Battery

IN No. 6 of AMATEUR WIRELESS, p. 109, is described a high-tension battery composed of thirty small Daniell gravity-type cells, the containers being test tubes 6 in. long by 1 in. diameter. This battery would be quite satisfactory in use, the only objections being that it is rather messy and not very portable. To overcome these difficulties the writer devised the following modifications.

The test tube has the usual copper sulphate crystals at the bottom with an insulated copper wire running up to the top of the tube, but instead of putting water in, the tube is half-filled with fine sawdust made thoroughly damp with a solution of copper sulphate in water.

The zinc strip is then put in, resting lightly on the sawdust and running up the side of the tube, which is filled to the top with sawdust dampened as before, but this time with a solution of zinc sulphate in water. The strength of either solution is unimportant.

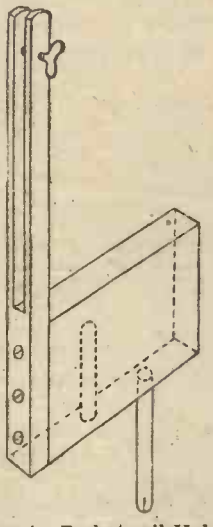
The advantages of a cell made in this way over the more usual type are obvious, as by pouring a small quantity of melted pitch or paraffin-wax over the top of the sawdust an absolutely dry battery is obtained, with no loss of voltage. When the cells go "dead" it is an easy matter to pour a small quantity on to the sawdust,

A. E. G.

Plug-in Basket Coils

A SIMPLE and inexpensive method of fixing basket coils to the usual standard plug-in coil holders is shown in the diagram.

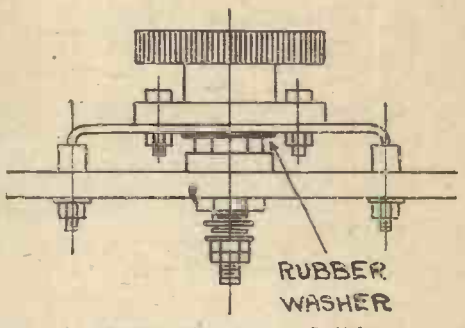
A piece of ½-in. ebonite rod is sawn down the middle to a depth of 3½ in., a small wing nut and bolt being screwed through a hole ¾ in. from the top. The bottom portion of the rod is filed flat and screwed into a single coil holder as shown. A few of these will enable a set of basket coils to be used as easily as the more costly plug-in coil. C. C. B.



Plug-in Basket-coil Holder.

An Efficient Change-over Switch

THE chief difficulty in making a change-over switch is the question of inserting the switch arms in the knob. The disadvantage of the ordinary ebonite knob is that the boss on the under side is too small in diameter, and for the amateur who is not in a position to make his own knob specially the following method will suffice: The switch arms should be bolted to a piece of ebonite about 1½ in. by 1 in. by ¾ in. The size can be varied to suit the requirements of the maker.



Efficient Change-over Switch.

The ebonite should be drilled in the centre to suit the centre spindle, and can be attached to the knob with about four small screws. The nut on the under side also keeps the ebonite in position.

The accompanying sketch and this description give all the information the reader will require. AMATEUR.

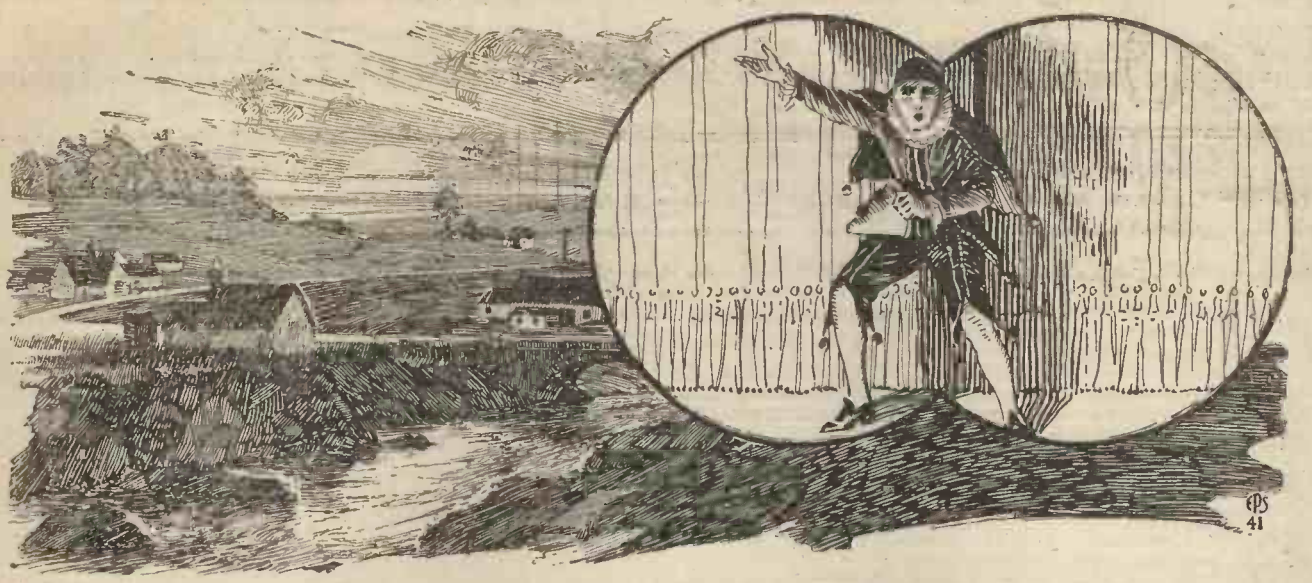
Keeping Accumulators Filled

NOW that the hot weather is here amateurs will have to take extra care in seeing that the level of the acid in their accumulators is up to the mark on the case. The liquid soon evaporates, and if left in that condition the battery will soon deteriorate. Only distilled water should be used for this purpose, unless one lives in the country, when clean rain water may be used. Distilled water can be obtained from any chemist. See that it is kept in a clean bottle and well corked. D.

Making Holes in Ebonite

TO make holes in ebonite without a drill may seem difficult, but wonders may be done with a red-hot knitting needle. A hole any size can be made in a moment and the ebonite does not suffer in any way, that is, it does not crack or char.

To tap such a hole, just use a screw of the requisite size whilst the ebonite is still warm. To repair holes in ebonite, plug in a piece of scrap roughly shaped and push down with a warm iron. An almost invisible repair results if the work is carefully carried out. I. S.



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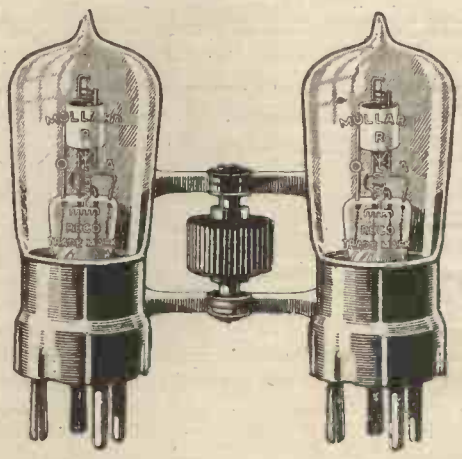

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AERIAL INSULATORS, REEL, each 2d., 2 for 3½d. .. STRAINER ..	each	-/3½
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AERIAL PULLEYS, 2½" Galvanised	each	-/6
BATTERIES, FLASH LAMP, 4-volt (Make your own H.T.), each 5d.	per doz.	4/6
CONDENSER VANES. Fixed or moving	per doz.	-/6
CONDENSER SPACERS. *Accurate* small, per doz. 3d., large, per doz.		-/4
CONDENSER SCALES, IVORINE. Engraved, not printed	each	-/5
CONDENSER DIALS, EBONITE. Engraved, beautiful finish	each	1/3
CONDENSER SPINDLES, SQUARE Section, screwed, 2 BA, Vernier to .0005, each 4d.; .00075 and .001	each	-/5
CONDENSER ADJUSTABLE PIVOTS	each	-/3
CONDENSER TOP BUSH with flange	each	-/1½
CONDENSER TOPS AND BOTTOMS. Drilled for standard fittings	each	-/10
CONDENSER. Fluted Knob and Dial combined. Beautiful finish	each	2/-
CRYSTAL CUPS. 3 Fixing screws	each	-/2
CRYSTAL DETECTORS. Mounted on Ebonite. Adjustable in every way	each	2/-
CONTACT STUDS. ¼" x ¼" with nut and washer	per doz.	-/6
CONTACT STOPS. ¼" x ¼" with nut and washer	per doz.	-/9
CORE WIRE. Soft Iron	per ½ lb.	-/6
COIL MOUNTING PLUGS. Universal fitting	each	1/3
DUCONS. While they last	each	7/6
EBONITE. Don't buy loaded ebonite. Get maximum area for minimum weight (cut to size)	per lb.	3/6
EBONITE. Manufacturer's scrap pieces in 1 lb. parcels	per lb.	2/6
EARTH CLIPS. Fix on water pipe. Adjustable to any size	each	-/4
FOIL COPPER. per sheet 4d. FOIL TIN	per sheet	-/3
FILAMENT RESISTANCES. A real piece of apparatus	each	2/6
FILAMENT RESISTANCE. EBONITE DIALS. engraved	each	-/10
FILAMENT RESISTANCE. SCALE, engraved ivorine	each	9/9
FORMERS, PIRTOID, for Honeycomb coils	each	-/3
INDUCTANCE TUBES. Specially impregnated, 12" long 2" to 4" diam.	each	-/4
INDUCTANCE TUBES. Specially impregnated 12" long 4½" "	each	-/5
INDUCTANCE TUBES. Specially impregnated 12" long 5" to 6"	each	-/7
INDUCTANCE SLIDERS with spring and plunger	each	-/4½
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INSTRUMENT WIRES. A huge stock of specially purchased wire in all coverings. Perfect. At bargain prices. Send 1½d. stamp for price list.		
INSULATING SILK SHEET	per sq. ft.	1/-
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MICA. Pure Ruby. Pieces 2½" x 2½"	each	-/1
NUTS. Brass, Hexagon, 2, 3 and 4 BA, per doz. 3d.; 5 and 6 BA, per doz.		-/2½
RESISTANCE WIRE for Filament resistances	per yd.	-/1
ROUND LOCKING NUTS 2 BA brass	each	-/2
SCREWED BRASS ROD. 12" lengths 2 BA, each 3½d. 4 BA	each	-/3
SHELLAC. Flake	per pkt.	-/6
SWITCH ARMS. 4 LEAF. Splendid Knob, Hefty bush, beautifully polished, with nuts and spring washer	each	1/6
TERMINALS, not Tintacks. *Standard* pattern according to size	per doz.	1/6, 2/-, 2/6
TERMINALS. *Telephone*	per doz.	2/6
TERMINALS. *Telephone*, wood screw	per doz	2/6
WASHERS, BRASS. 2 to 6 BA	per doz.	1½
WASHERS, COPPER SPRING	each 1d., per doz.	-/8
VALVE SOCKETS with nut and washer	each	-/1
VALVE PINS with nut and washer	each	-/1
VALVE HOLDERS with 8 nuts and 4 washers	each	-/10

ON THE STRENGTH of the above prices you have doubtless already decided to send us your order. But perhaps you want some scientific components also. Then take our advice—Buy the Best, don't be "PENNY WISE, POUND FOOLISH." We Supply—

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CRYSTALS (J. L. Cartwright and Co.'s), Carborundum, Copper, Pyrites, Galena, Bornite, Iron Pyrites, Silicon, Manganese	per box	-/6
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FIXED CONDENSERS (J. L. Cartwright and Co.'s)	each	2/-
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HEADPHONES, Western Electric. 4,000 ohms	per set	32/-
HEADPHONES, Western Electric while they last, 8,000 ohms	per set	32/-
HEADPHONES, Special French, very sensitive	per set	15/-
LOUD SPEAKERS, Western Electric, 4,000 ohms	each	50/-
TRANSFORMERS. High Frequency Plug-in Type (J. L. Cartwright and Co.'s) double groove, No. 1, 350M 6/6, No. 2, 550M, 7/-; No. 3, 930M, 7/6; No. 4, 1400M, 8/-; No. 5, 2000, 8/6; No. 6, 3500M, 9/-; No 7, 10,000M, 10/6.		
TRANSFORMERS. Low Frequency (J. L. Cartwright and Co.'s)	each	21/-
TRANSFORMERS. Telephone (J. L. Cartwright and Co's.), while they last	each	12/-
VALVES. Ediswan A. R. Type	each	15/-
VALVES. Marconi Osram. R. type	each	17/6
VALVES, DUTCH	each	9/6

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·001	8/-	·001	6/6
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·0003	4/11	·0003	3/6
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Vernier	3/3	Vernier	1/9

Pair of ebonite drilled cords to fit yourself on above 1/- extra

NOT A BAG OF PARTS.

NOTE.—Postal Charges 9d. per set, otherwise not executed.

To callers 1d. in the 1/- discount off condensers.

Variometer on ebonite, W. 250/750 metres, internally wound. Very fine. Sell at sight, 17/11.
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Fil. Resistance, 1/8, 1/10, 2/3.
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2 BA Nuts, 3 doz. 7d., 1/10 gross.
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Terminals, special offer with nut, 4 for 3½d.
Valve Legs and Nuts, 1d. each, 9d. doz.
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Switch Arms, very good, 8d., 10d., 1/3.
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Genuine (Shaw's) Hertzite, 9d., 1/-, 1/3.
100,000 ohm Resistance, 2/3.
T.M.C. Phones, 4,000 ohms BBC, 22/6.
Grid Leak and Condenser, .0003, 2/-.
Coil Holders, 3-way on ebonite, 6/- and 6/6.
15 v. HT Batteries, 2 plugs, 2/3½.
30 v. HT Batteries, 2 plugs, 4/1½.
36 v. HT. Batteries, 2 plugs, 4/6½.
100 feet 7/22 Aerial wire, 4 Insulators, the lot 2/6.
Real Ebonite Knobs, 2 BA Bush, 3d.

Marconi R valves, latest type, 45-60 v., 14/11.
Brunet 4,000 ohm genuine 1st quality Headphones, 17/11.
German 6,000 ohm Headphones, extra loud, 15/11.
H.T. Batteries, 2 Wander plugs, 66 volt, 8/-.
H.T. Batteries, 2 Wander plugs, 60 volt, 8/-.
Aerial Wire, 7/22 per 100 feet, 2/3½. and 2/1½.
Rotax Accumulators, 4 v. 40 amp., 15/6.
Phone Cords, double, extra long, 10d.
5-1 Intervalve L.F. Transformers, 11/6.
Wound Coils, 6 × 3, Turns 180, W.L. 1,100, 1/6.
Wound Coils, 12 × 4, Turns 400 W.L. 3,800, 2/6.
Variometers, very good value, 250/750, 3/5.
Crystal Detectors (whisker), extra value, 1/1 and 1/3.
Large Telephone Terminals, 2 B.A. with nut and washer, 2 for 3d.
Terminals, all kinds, with nuts and washers, 4 for 5½d.
Basket Coils (6 in set) up to 3,000 metres, well made and efficient, 2/2.
1 Switch Arm, 12 Contact studs and nuts, the lot 1/-.
Sleeving, takes 18-gauge wire, 3 yards for 1/-.
Insulating Hooks, 3 for 3½d., 1/- doz.
D.P.D.T. Switch, compact high class article, 2/3½.
4 yards Copper 18 gauge connecting wire, 2d.
6 yards Bell wire, 2½d.
6 yards Bell wire, D.C.C., I.R., 3½d.
Radio Instruments, Ltd., L.F. Intervalve, 25/-.

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On Your Wavelength!

A New Valve

I MENTIONED a short time ago in these notes that we were likely ere long to see some rather startling developments in receiving valves, and now something quite new is announced from America. This is the C-299, made by the Cunningham Company, of San Francisco. There are two ways of making a valve economical in its requirements. Either you can reduce the voltage or you can design it to work upon a very small current consumption. In some an attempt has been made to do both; the Mullard L.F. Ora A., for example, take .2 ampere at 1.5 volts, whilst the American W D-11 uses .25 ampere at 1.1 volts. To my mind the most sensible solution is to whittle away the current needs and not to bother too much about the E.M.F. One can easily obtain high potentials; that is only a matter of wiring dry cells in series. Look at your high-tension battery, which, despite its small size, may give from 30 to 100 volts. Current, however, is a different matter altogether. When it comes to supplying from a quarter of an ampere upwards no primary batteries are of any use, since their output is not sufficiently steady, and we must perforce use the expensive, cumbrous accumulator, whose acid electrolyte makes it anything but a desirable article of drawing-room furniture. There are probably few dry cells that will supply even .25 ampere for more than a short period without becoming wobbly and causing the valve to play weird pranks. The C-299 asks for nothing like so much. It is content with the almost incredible ration of .06 ampere!

* * *

What it Can Do

The E.M.F. that it needs is just under 4½ volts, which is, of course, easily obtainable from three dry cells wired in series. Now an ordinary bell battery will supply the 60 milliamperes called for with the utmost ease. In fact, it will do a great deal more. You can use two of these valves for long periods on end from the trio of series-connected cells. Even a four-valve set can be worked from them, provided that you are careful to switch off during the three-minute and longer intervals in order to give the cells a chance of recuperating. Valves of this type should make an immense difference to the progress of wireless as a general hobby, for with them even those who live in remote country places can use valve sets with the greatest ease. Gone is the heavy messy accumulator, gone the need for constant recharging. In its place you have the clean dry cell which can be bought anywhere, and replaced when it runs out for a trifling sum. The price of the new valve is most reasonable. It sells at $6.50, which at the present rate of exchange (4.62 dollars to the pound) works out at, roughly, 28s. Even with an *ad valorem* duty of 33⅓ per cent. its British price would be only 37s. 4d., which compares very favourably with those of our own dull-emitters. Let us hope either that one of our valve makers will produce something as good—and as cheap!—or that some enterprising firm will import the C-299 and put it on the market here. I hear that the "A.W." valve man hopes to obtain some of these new "toobs" and to report upon their performances shortly.

* * *

Sunday Programmes

Though I have refrained from referring to the matter, since 2LO's staff seemed to be hard enough worked as it was, the Sunday programmes have always struck me as a blot on the B.B.C.'s escutcheon. On the one day in the week on which leisure allows nearly every wireless man in the country to use his set we used to have a wretched little programme not starting until 8.30 and ending after only one and a half hours. The first indications that an improvement was contemplated was when, instead of the usual rather meagre fare, we had the Russian Balalaika (I hope that's spelt right!) Orchestra. Then came the announcement that we were to have an afternoon entertainment from 3 o'clock until 5. This is exactly what is needed, and if only arrangements could be made on the lines of experiment that have recently been carried out for simultaneous broadcasting from all stations between these times, so as to give owners of small sets in the provinces a fair chance, I venture to predict that the popularity of wireless would increase by leaps and bounds.

* * *

No Pleasing 'Em

Mr. Burrows was quite pathetic the other night when he told us his little tale of woe. It seems that he and his staff are being peppered at times by the carping and bitter-tongued critic. "Instead of the old time Uncle Arthur," he said, "I received the other day a letter addressed to 'The Foreman, The London Gas Works, 2, Savoy Hill'"! I would not change places with him or any of his accomplices for anything in the wide world. They think out something new and put it on after spending considerable time and trouble in arranging the necessary preliminaries. Next morning's post brings a variety of letters. Ninety per cent. are delighted; seven per cent. express opinions that are neither one thing nor another; the remainder indulge in remarks of the most caustic nature, and even prevail upon their M.P.'s to ask silly questions in the House! No programme can consist of items that please everyone, but there will always be a good deal that is to the taste of all listeners-in.

* * *

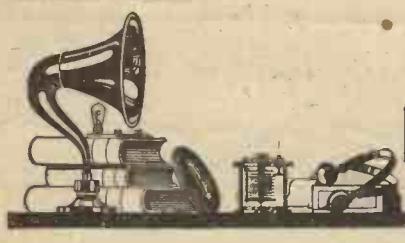
Damping

Most of us are rather prone to adopt amplification devices whose efficiency *if unchecked* is little short of phenomenal. I refer chiefly to the tuned plate. Have you ever tried to use two or three of these in series, even with the aid of a potentiometer? If you have you will have realised the feeling of impotence of the ancient Irishman who endeavoured to drive to market three pigs who each had widely different ideas as to the direction in which they wished to go. As he expressed it subsequently, "the divil himself was in 'em." That, to put it mildly, is how I could refer to tuned-anodes. The only way to control the beasts is to use damping plates, or to insert series resistances as has been described by other writers in the pages of AMATEUR WIRELESS. This is all very well at first sight, but it means that you are losing on the swings what you gain on the roundabouts. For one H.F. valve give me the tuned-anode every time. Thereafter I would hark back, old-fashioned though you may deem me, to the good old transformer.

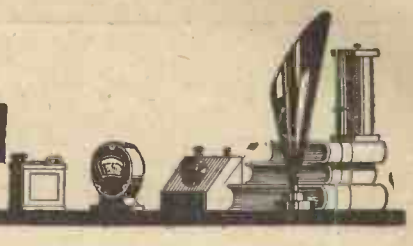
* * *

A Confession

I am going to lay bare the secrets of my soul. Before broadcasting started I had no soul for good music. The frowsy locks of professional musicians of the male sex were to my eyes like a red rag to a bull's; they were effeminate-looking creatures, and the fact that one saw them as they played was enough to stifle any stirrings of the soul produced by their strains. Now, thanks to wireless, I find that I really like classical music. The splendid talks given by Major Bavin and Mr. Percy Scholes have helped me and thousands of others to realise something of what are in the compositions of the great masters. I hope that 2LO and other stations will continue to give us Wagner, Gounod, Chopin, Tschaikovsky and Chaminade, and will not be led by any clamour from a few disgruntled souls to fill their performances with laments about "Coal Black Mammies" and things of that kind. THERMION.



OUR INFORMATION BUREAU



RULES.—Please write distinctly and keep to the point. We reply promptly by post. Please give all necessary details. Ask one question at a time to ensure a prompt reply. Always send stamped addressed envelope and Coupon (p. 55).

Making a Multiple-secondary Transformer.

Q.—I wish to make a transformer to work on a 240-volt circuit to give voltages of 30, 25, 15, 12, 8, 6, 4 and 2. Kindly give constructional details and quantities of wire required. (N. F. G. London, W.).

A.—Unfortunately two of the most important facts essential in the design of any

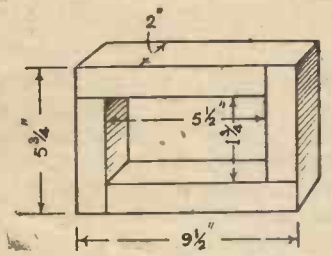


Fig. 1.—Transformer Core.

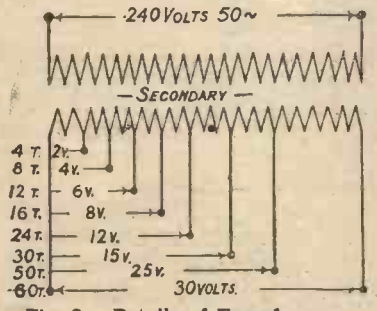


Fig. 2.—Details of Transformer.

transformer have been omitted from this enquiry, namely, the frequency of the primary supply volts, and the current output required from the secondary. The following data are therefore calculated on the assumption that the primary windings of the transformer will be supplied with 250 volts at the most general frequency of 50 cycles per second. If this is not correct, the whole of the windings will need modification in consequence, since other things being equal, the number of turns on a transformer winding are inversely proportional to the frequency of the circuit. Also it will be assumed for purposes of calculation that an output of half a kilowatt will be sufficient from any of the secondary windings. The general design of the transformer will be of the core type, on the lines laid down in "Auto-transformer Design" (A. H. Avery) and as per Fig. 1, which gives the principal dimensions of the "Stalloy" iron-core built up of laminated strips of No. 28 S.W.G. thickness. The sectional area of this core is 4 sq. in., and the working flux density about 56,500 lines per sq. in. These factors enable the number of primary turns to be calculated from the formula: $\text{Turns} = \frac{\text{Volts} \times 10^8}{\text{Total flux} \times 4.44 \times \text{frequency}}$ giving a total of 480 turns, or approximately two turns per volt. Since the output on the secondary is to be 500 watts, the input for the primary will be slightly greater owing to inevitable iron and copper losses. A 90 per-cent. efficiency would be a fair figure for an instrument of this size, therefore the total input when the secondary is fully loaded will be: $500 \times \frac{100}{90} = 555$ watts, and the current will be watts divided by volts $= \frac{555}{240} =$ 2.31 amperes. Working at a current density of 1,500 amperes per sq. in. the nearest size of wire will be No. 18 S.W.G. d.c.c. copper. Having settled the primary windings the secondaries are very simply calculated, since their turns are proportional to the volts required and their gauges to the current they will have to carry. A stated above, the primary windings indicate a "constant" of 2 turns per volt, and the same applies to the secondary windings which are cut by the same magnetic flux. Therefore the respective number of turns on the individual secondary windings will be as follows:

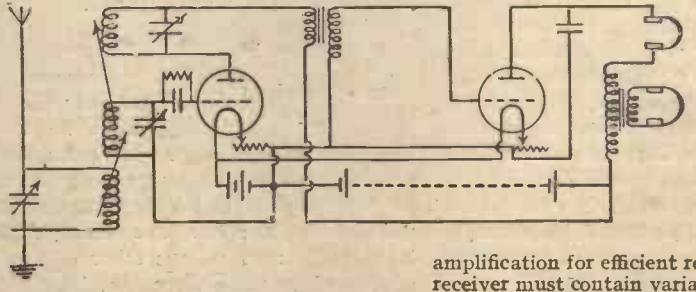
2 volts	= constant	2	× 2	= 4	turns
4 ,,	= ,,	2	× 4	= 8	,,
6 ,,	= ,,	2	× 6	= 12	,,
8 ,,	= ,,	2	× 8	= 16	,,
12 ,,	= ,,	2	× 12	= 24	,,
15 ,,	= ,,	2	× 15	= 30	,,
25 ,,	= ,,	2	× 25	= 50	,,
30 ,,	= ,,	2	× 30	= 60	,,

With the same output from any of the secondary windings, namely, 500 watts, the current will vary inversely as the pressure, and the respective currents associated with these various voltages will be:

Watts.	*Volts.*	*Amperes.*	
500 ÷	2 =	250	= 1 in. by 0.16 in. copper strip
500 ÷	4 =	125.0	= 1 in. by 0.08 in.
500 ÷	6 =	83.3	= 1 in. by 0.05 in.
500 ÷	8 =	62.5	= 1 in. by 0.04 in.
500 ÷	12 =	41.6	= 1 in. by 0.03 in.
500 ÷	15 =	33.3	= No. 8 S.W.G.
500 ÷	25 =	16.6	= No. 10 S.W.G.
500 ÷	30 =	16.6	= No. 11 S.W.G.

A summary of the above winding data will be found in the winding diagram (Fig. 2).—Q.

Q.—Can you give me a circuit diagram for a two-valve (detector and L.F.) receiver using a loose-coupler and tuned reactance arranged so that high-resistance and low-resistance



Two-valve Circuit (1 Det. and 1 L.F.) for use with High and Low Resistance Phones.

phones can be used at the same time?—D. M. (Bournemouth).

A.—The circuit shown will meet your requirements. The condenser across the reactance should be a small one, not more than .0003 microfarad. It may be found necessary to put a .002 microfarad fixed condenser across the primary of the transformer and results may also be improved by putting a large condenser across the H.T., although this is not essential. The high-resistance phones are shown in series with the primary of the telephone transformer.—R.

Condenser Across "I.P." and "O.P."

Q.—Is a fixed condenser necessary across the primary of a low-frequency transformer?—I. G. H. (Manchester).

A.—The primary of the first low-frequency transformer should be shunted by a fixed condenser of about .002 microfarad, although sometimes this condenser may be omitted without detriment to signal strength, owing to the capacity between successive turns of the primary winding acting as a condenser by-passing any high-frequency currents which may be flowing in the circuit. When more than one stage of low-frequency amplification is used, only the primary of the first transformer need be shunted by a condenser, although condensers across the other transformers will assist in stabilising the low-frequency circuits when there is a tendency to howl.—B.

Insulating Guy Wires.

Q.—When using a small aerial with guy wires, is it necessary to break the latter up by means of insulators, and if this is done will it affect signal strength appreciably?—J. K. (Earls Court).

A.—When using a high unscreened aerial it is certainly advisable to put two insulators in each guy wire. If this is not done energy will be picked up by the wire and conducted straight to earth instead of flowing through the aerial and the relatively high impedance of the set. With a low aerial which is probably already screened the improvement will not be as great.—R.

Broadcast Receiver

Q.—I am about to purchase a broadcast receiver, and would like your opinion as to the best type to buy. I wish to receive all the broadcast stations.—NOVICE (Bury St. Edmunds).

A.—You will need a receiver having at least one stage of high-frequency amplification, a valve detector, and two stages of low-frequency amplification for efficient reception. Also your receiver must contain variable reaction of some kind, preferably coupled to the tuned-anode coil or high-frequency transformer between the high-frequency valve and the detector. This is a most important point, as without reaction you will probably not hear more than two or three of the broadcast stations. Study the advertisements and arrange for a demonstration of a receiver which has variable reaction.—B.

Workshop Hints: Some Improvised Tools

ALTHOUGH there are hundreds of people engaged in making wireless apparatus for experimental purposes at the present time, there are only a few, comparatively speaking, who are fortunate enough to have a complete set of necessary tools or a handsomely-equipped workshop.

With a little care, however, many commonplace tools can be made to perform the same work as those of a more intricate variety. Three simple makeshift methods are described below, and there are many others that will suggest themselves to the ingenious worker.

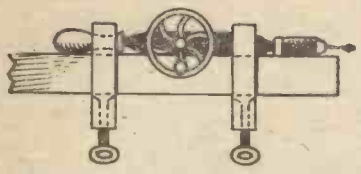


Fig. 1.—Improvised Lathe.

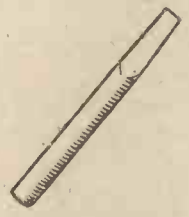


Fig. 3.—Easily-made Tap.

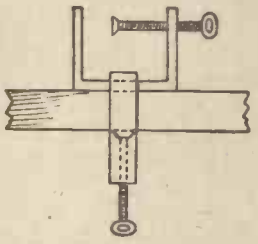


Fig. 2.—Temporary Vice.

A Makeshift Lathe

An ordinary hand or breast drill can, in some cases, make quite a good lathe for small work such as panels when used in the following manner.

Obtain two ordinary clamps, such as are included in fretwork sets, and with these clamp the drill to the bench in the manner shown in Fig. 1. With assistance to supply the necessary power to the drill both hands are left free to hold and steady the material being worked.

Temporary Vice

Using the same two clamps mentioned above as at Fig. 2, a vice of no mean utility can be rigged up in a few minutes. To prevent any risk of scratching or such damage the work should be held between two pieces of fibre or wood material.

Easily-made Taps

Taps for lightly tapping ebonite panels, condenser tops, etc., can be made very quickly by getting a steel bolt of the same gauge as the rod to be used and filing off the thread on four sides, as in Fig. 3. For use in a hand drill the head may be cut off and the end filed to fit the chuck.

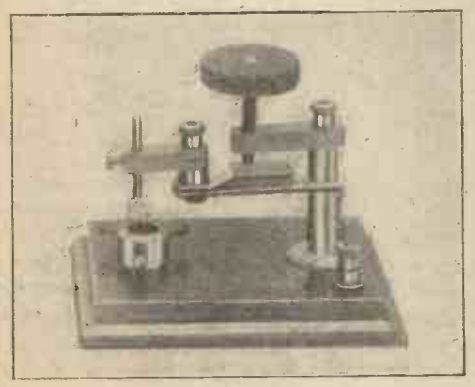
F. T. W. D.

A Few Components

"Lattikone" Inductance Coil.

A Neat Transformer (G. Z. Auckland & Son, London).

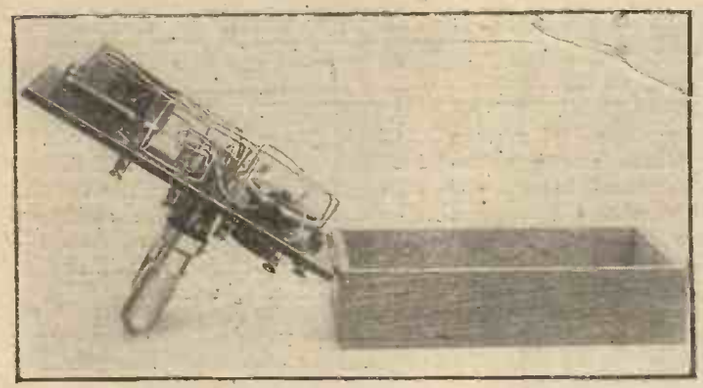
Plug-in H.F. Transformer (Grafton Electric Co., London).



Auckland Crystal Detector.

Tapped H.F. Transformer (H. W. Sullivan, Ltd., London).

Auckland L.F. Transformer.



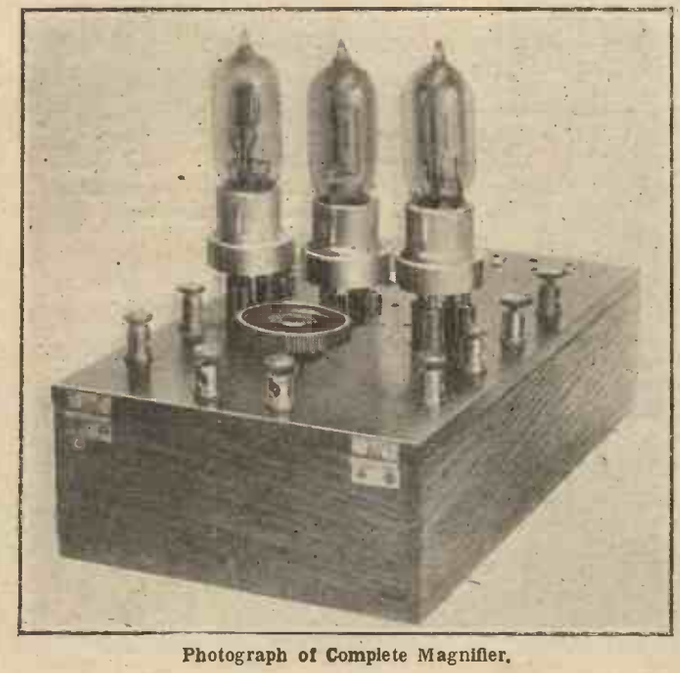
Photograph of Instrument with Panel Raised.

A NOVEL NOTE

An Addition to the "Amateur Wireless" Ideal Unit Set

THE great point about the AMATEUR WIRELESS ideal unit set, which was fully described in Nos. 25 to 28 and 30, and some modifications in Nos. 46 to 49, is that one can make all kinds of additions to it and try a variety of fresh designs with the minimum of trouble. One system of amplification or rectification can be tried most easily against another. A further point is that if the panels are hinged to their cabinets it is possible, by substituting flex leads for the brass coupling rods, actually to work the set with one or more units open, so that resistances, grid leaks, condensers and so on can be changed whilst reception is going on and the improvement (or the reverse) duly noted.

Since the original set was made up and described a good many additions have been made to it, some of which will be described in this and succeeding articles; the present instalment deals with a novel type of note-magnifying unit which was constructed early in the year. It has now been in use for a long time, and it has proved so satisfactory that it is employed in preference to any other for the reception of telephonic transmissions. After a long series of tests made with low-frequency transformers of nearly every well-known make, I realised that there is no such thing as a perfect iron-cored transformer. For all ordinary purposes they are good enough; they will bring in both speech and music sufficiently well to give real pleasure; but should you set yourself, as I have done, the task of producing a considerable volume of sound without a sign of distortion or harshness at any time, with the entire elimination of all that is throaty or "gramophony," you will come to admit that when more than one stage of low-frequency amplification is used transformers, no matter how you shunt them with resistances or supply biasing potentials to the grids, have inherent defects with which nothing will do away. Their shortcomings are in many cases so small that it may seem hypercritical to regard them as faults or to notice their presence; but the difference between a set with transformer coupling and one such as that to be described is quite remarkable. With the one you cannot rid yourself of the idea that the sounds are coming out of an artificial reproducing device. With the other they are completely natural, and even at a distance of, say, fifty or a hundred yards—that is a great test—they are still as near perfection as can be desired.



Photograph of Complete Magnifier.

Amplification Systems

Resistance-capacity amplification is used a good deal on the high-frequency side of sets for long-wave work, but it has not so far become popular in this country for audio-frequency magnification. The principle is the same for whichever purpose it is employed. If we place two resistances in series in a circuit (Fig. 1), one variable and the other fixed, and adjust the movable one (B) so that the two are exactly equal, there will be a total potential drop across the circuit which is evenly distributed throughout. If we regard the resistance of the rest of the circuit as zero then the voltage drop will be equally divided between the two resistances; that is, the drop across A will be exactly equal to that across B. Now let us reduce the resistance of B by moving the sliding contact. The total voltage drop in the circuit remains unaltered, but its parts are different. The drop across B is decreased, whilst that across A becomes greater.

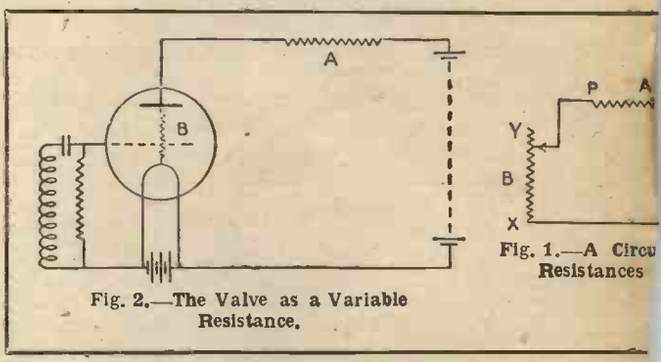


Fig. 2.—The Valve as a Variable Resistance.

Fig. 1.—A Circu Resistances

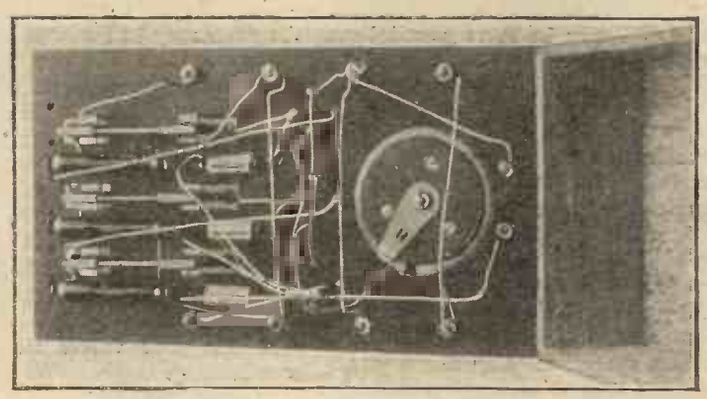
Modern Theory

In accordance with modern theory, current flows from the negative pole of the battery to the positive through the circuit. When the resistances are equal the potential difference between the points X and Y, Fig. 2, is the same as that between P and Q. If, however, we reduce the resistance of B the difference of potential between X and Y is less than that between P and Q.

Now in the valve, so long as the lead-in is not attached we have a constant resistance (Fig. 2) in the anode circuit be-

C-MAGNIFIER

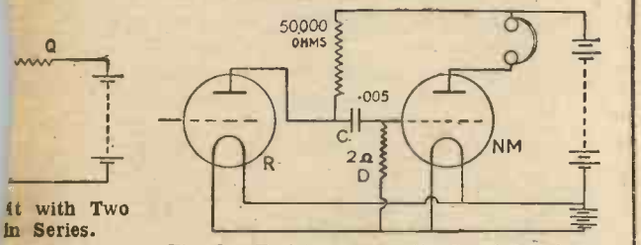
By
R. W. Hallows



Photograph of Underside of Panel.

tween the filament and the plate. Place a milliameter in the plate circuit when the filament battery is not switched on.

Nothing at all is registered. Now switch on. Immediately the needle indicates a steady current of perhaps 1 milli-ampere. If your H.T. battery is of 60 volts, this by



ft with Two
n Series.

Fig. 3.—Resistance-capacity Coupled Valves.

Ohm's law shows that the resistance is 60,000 ohms. Now attach the lead-in and tune in a strong signal. You will see the pointer of the milliameter making small movements. The current is varying. It cannot do so unless the resistance alters. The grid controls the plate circuit by making tiny alterations in the resistance. We may therefore regard the valve itself as a variable resistance corresponding to B in Fig. 1. Thus if the resistance of the valve is lessened by a positive potential or the grid the potential drop between filament and plate will fall, and that across the fixed resistance A will rise. If B is reduced there will be an increase in the flow of current through A.

Valve Coupling

Fig. 3 shows how to make use of this for the purpose of coupling two valves. The condenser C serves as a barrier to prevent a steady positive potential from the high-tension battery from reaching the grid; it also acts as a by-pass for oscillating impulses. The grid leak D allows a steady potential to arrive on the grid from the low-tension battery. As the internal resistance of the rectifying valve R is varied by its grid, varying potentials of relatively considerable magnitude will be transferred to the grid of the note-magnifier NM by way of the condenser. These will control the plate circuit of the second valve, producing in it still larger variations of current than those which occur in the first.

At first sight you might be disposed to regard the capacity of the grid condenser C as a printer's error. A capacity of .005 microfarad for a grid condenser sounds terrific when we remember that that of the rectifying valve is but .0003 microfarad. The value is correct. The grid of the rectifying valve has to deal with *radio*-frequency impulses, which pass easily through a tiny condenser. When rectified and slowed down to audio-frequency the impulses require a far bigger capacity if they are to have a free passage. A condenser of .0003 microfarad would not pass them at all.

Resistance-capacity-coupled note-magnifiers do not give valve for valve such amplification as is obtainable by the use of transformers, for we cannot contrive with them such a big step-up in voltage as is provided by the transformer with a winding ratio of 1 to 3 or even 1 to 5. Actually, a resistance-capacity-coupled valve has about 75 per cent. of the efficiency of a transformer-coupled valve as regards volume of sound. For this reason the panel designed to replace two low-frequency transformer units was made with three resistance-coupled valves. Its three valves give slightly greater amplification than the two which they have superseded, but, as has been said, there is no comparison between the two in the matter of quality.

Wiring

Fig. 4 shows the wiring of the unit, which is not really very complicated. Those who intend to make it up are not advised to begin straight away by laying out and drilling the panel. The values of the condensers, of the grid leak and of the resistances are rather critical. Those given in the drawing work well with the D.E.R. valve, for which they were designed, but they will probably not suit many other valves.

The best method is to make a bench "hook-up," as shown in Fig. 5, beginning with one valve and adding others one by one.

Not a penny need be spent on ready-made apparatus. The resistances can be made from strips of cartridge paper thoroughly soaked in indian ink and allowed to dry. If they are made rather large to

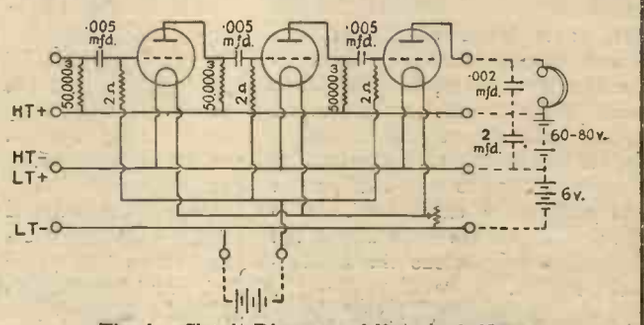


Fig. 4.—Circuit Diagram of Note-magnifier.

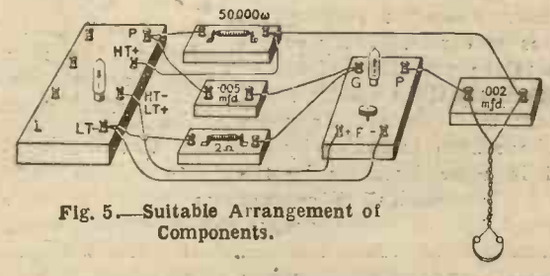


Fig. 5.—Suitable Arrangement of Components.

begin with they can be gradually reduced with a pair of scissors whilst the set is in operation, until the best value is found. The grid leaks may be mere pencil lines on paper, the proper size being found by trial.

Condensers

The condensers can be made up quite easily from copper foil and ruby mica .002 in. thick. Instructions for doing this will be found in the "Work" Handbook "Wireless Telephony and Telegraphy," price 1s. 6d. Two foils with an overlap of 2 in. by 1 in. will give a capacity of .001 microfarad, and each additional foil will increase the capacity by this amount. Condensers of capacities ranging from .003 to .007 microfarad can thus be made up and tried out.

If the condensers are too small, speech will be faint and indistinct. If they are too large a curious effect will be observed. When current is switched on an interval of perhaps as much as a dozen seconds will occur before anything is heard. This is due to the charging up of the condensers.

The extra grid cells needed will usually be provided by one pocket flash-lamp battery attached to the terminals at the lower end of the panel; some valves, however, will require a good deal more than this for proper working to be obtained.

Once the correct values have been found the parts may be mounted upon a panel of the same size as those used for other units in the set. There is only one point that calls for attention, and that is in the filament rheostat. High-temperature valves pass an amount of current ranging from .4 ampere (Ora, Xtraudion, Cossor) to .75 ampere (R, Ediswan, V24). Three in parallel will thus need from 1.2 to 2.25 amperes, which is a good deal for one rheostat to carry. Be sure, therefore, that you obtain one capable of taking the current that your valves will need without over-heating.

Operation

In use the unit will be found to act excellently. The filament current is rather critical, but otherwise there is no special difficulty on short waves. When, however, one deals with very long waves the unit may be found liable to oscillate. This can be overcome quite easily by reducing the filament current. If any one of the three valves shows a tendency to oscillate on short waves, the value of its grid leak is not quite correct. A little thickening or reducing of the pencil-line grid leak will usually set matters right. R. W. H.

Indoor "Earths" and the Liability for Damage

By a Barrister-at-Law

IT is a common practice when there is difficulty in getting convenient access to an "outside" earth to make use of the nearest gas or water supply pipe as a substitute. If there is a choice, a water-pipe is preferable for many reasons. In the first place, it is made of lead and a soldered connection presents little difficulty. In the next place, all the joints in the total length of pipe-line are metal to metal, and therefore of low resistance. Gas-pipes, on the other hand, are usually made of wrought iron, to which it is more difficult to solder the earth lead. Also any joints that occur are generally filled with red-lead, which lessens the conductivity of the system.

Gas-pipe Earth Dangers

At the same time there is a widespread feeling of "nervousness" regarding the use of gas-pipes as earths. Many people are fearful as to the possibility of fire or explosion, particularly if the outside aerial should be struck by lightning. In many cases tenants have been forbidden by the landlord, and in some instances by the inspectors of gas companies, to connect their wireless sets to the gas-supply pipes.

There is practically no ground for such excessive precaution. In the ordinary way the voltages and currents picked up by any receiving aerial are exceedingly minute, and represent an absolutely negligible amount of energy. There is no possibility of "sparking" or fire arising from such currents.

In the very remote contingency of the aerial being struck by lightning, it is difficult to say precisely what effects might follow. The first tendency would be for the charge to spread itself uniformly over the entire pipe system. This would reduce the voltage, and the charge could then gradually leak away without causing any damage. On the other hand, the charge might jump from the gas-piping through the first available discharge path to earth. This would probably create a heavy spark or flame discharge which might burn or damage any woodwork in the vicinity, but it could not ignite or explode the gas in the pipes. Coal gas only becomes explosive when it is mixed with air. In fact, it cannot even burn until brought into contact with the atmosphere.

The Gas Company's Legal Position

As regards the power of a gas company to forbid the use of such earths, it may be of interest to set out the legal position.

Usually the house service-pipes leading from the meter are landlord's fixtures, over which, however, the gas company has a right of inspection. As regards the gas itself (as distinct from the pipes, etc.), the ownership of such gas passes from the company to the occupier automatically as it flows through the meter. Neither the house-pipes nor the gas that they contain, therefore, belong to the gas company. The latter in effect are merely licensed or allowed by the landlord or tenant to use the pipes for the sole purpose of passing gas *from their outside mains into the house* for the use of the occupier.

In the absence, therefore, of any distinct agreement made with the gas company regarding the use of the inside supply pipes as an earth, the company would appear to have no legal power to object. To support any claim to do so they would have first to prove either that damage had been actually caused to their property (that is, to the meter, *outside* mains, and the gas they contain), or else that there was reasonable cause to fear such damage. It is extremely unlikely that any court would grant an injunction based on either of these grounds.

The Landlord's Legal Position

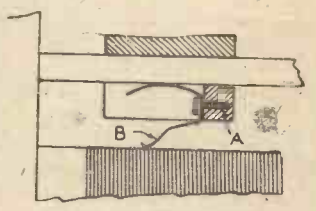
The position of the landlord is rather different. If the aerial should be struck by lightning there is always a *possibility of damage* if the only earth is inside the house. In these circumstances it is perhaps reasonable that a landlord should ask for an indemnity against such damage. This risk will, of course, be covered at a very small premium by any insurance company.

The Safe Way

The safest course is undoubtedly to use an "outside" earth wherever possible, together with a switch to connect the down lead directly to earth whenever the receiving set is out of use. With such an arrangement there is absolutely no risk of damage from lightning. D. L.

An Improved Slider

AN improvement on the ordinary round slider is shown in the accompanying illustration. A block of fibre or ebonite is cut to fit the square brass rod. In this groove is fitted a small block A,



Improved Type of Slider.

to which is attached the contact spring B. No special measurements are given. The sides should be milled so that a firm grip is obtained. It is important that the spring should be bent up at the right angle at the point of contact. W. J.

:: Progress and Invention ::

Clip-in Resistance

AN improved form of clip-in resistance, such as used for grid leaks, is shown in Patent No. 198,189/23 (W. Ede, E. W. Scammell, and S. H. van Abbott, all of Birmingham). The resistance is formed by a thread of cotton or other suitable material, impregnated with a solution of copper sulphate. Alternatively any other

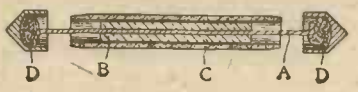


FIG. 1

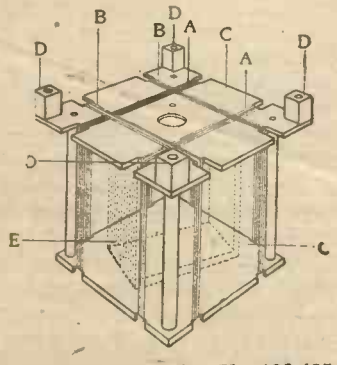
FIG. 2

Figs. 1 and 2.—Longitudinal and Cross Sections of Clip-in Resistance (No. 198,189/23).

conducting and non-polarising liquid can be used. In Figs. 1 and 2, A is the thread of cotton, enclosed in a glass tube B. This is in turn placed in a slightly longer vulcanite tube C. The ends of the cotton are placed in small pads of cotton D, which are also impregnated, and make contact with the copper caps.

A Radiogonimeter

THE object of the invention described in Patent No. 198,425/23 (L. G. Preston, C.B., C. E. Horton, B.A., and G. W. Harris, A.M.I.E.E., all of H.M. Signal School, Portsmouth) is to improve the electrical efficiency and simplify the construc-

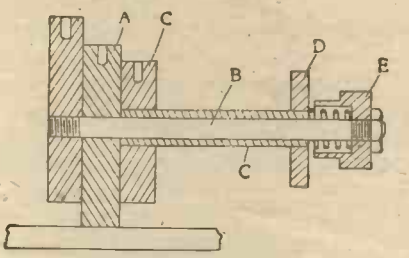


Details of Radiogonimeter (No. 198,425/23).

tion of radiogoniometers. Two field coils A and B, having their axes at right angles, are each wound in two sections, proportioned and spaced so as to give an even magnetic field. The plates C are made of insulating material, notched to receive the fixed-coil windings. Small pillars D are provided, so that the instrument can be fixed to a panel. The movable search coil E is mounted on a rotatable spindle, to which may be attached a pointer.

A Simple Coil-holder

IN Patent No. 198,589/23 (A. W. Knight, of Peckham) is shown a simple and improved form of coil-holder. The general arrangement is clear from the figure. A is a piece of ebonite fixed rigidly to a base and provided with sockets for the ordinary plug-in slab, honeycomb or lattice-wound coils. Through this ebonite is placed a brass rod B, to which is attached another block, as shown. Over this rod is fixed a movable tube C, to the end of which is fixed a third block. Coils are placed in the sockets provided, and the coupling altered by turning the knobs D and E. A spring and lock-nut are provided to keep the pieces of ebonite in close contact. In order that the axes of the coils may be in a



Coil-holder (No. 198,589/23).

straight line the blocks can be made in steps to accommodate various coils.

Talks, Tests & Telephony

EXPERIMENTAL transmissions are still going strong in spite of the fact that enthusiasts are almost compelled to wait until eleven pip emma each night before they can commence operations. It has been said that the operators of these stations sit up all night and sleep all day; but this is a libel. One cannot help sympathising, however, when each station closes down at about twelve-thirty with: "Well, old man, I am closing down early; going to have an early night to-night."

It appears strange that these stations do not devote a little attention to working on very low power, on, say, 175 metres. In most instances communication could be established between one and another over short distances with exceedingly low power. Some months back I heard 2 X R and 5 T R working together. The distance between them is something like eight miles or so, and 5 T R was using a power of only 2 watts at the time. I do not think that this power would interfere with listeners-in on 300 metres or over unless the listener is a very near neighbour. If this scheme were adopted a great deal of work could be done during broadcasting hours on these short waves and low powers without interfering with the amusement of broadcast listeners-in. Anyway, it could be tried, and if a "broadcatcher" objected, he is bound to be a near neighbour and no doubt a satisfactory agreement could be arrived at.

2 K T of Wanstead has now developed enormous strength in his signals. Since he has raised his aerial a matter of 15 ft. or so the strength is almost doubled.

2 N M of Caterham is also doing well. Reports of reception of him have been received from the North and Midlands, and he appears to work quite easily with French amateurs. He evidently is quite at home with the "Beers"!

A station which has also increased its lung power by alterations to his aerial is 5 D T of Forest Hill. I believe that his aerial mast is 75 ft. higher. Loudspeaker reception of his speech with two valves is possible fifteen miles away.

2 M C of Westcliff on short waves is also good. His gramophone music is extremely well modulated and pleasant to listen to twenty-three miles away on two valves.

2 P X has during the last week or so been indulging in duplex telephony, and has demonstrated the possibilities of this quite effectively. It was not many months back that this stunt was thought impracticable, but now it seems to be well on the way to universal adoption, as many other stations have also given it a trial.

2 O M and 5 C P are still going as strong as ever. When these two stations get going they make things quite lively in their corner of the ether.

On the whole the work being done by the stations I mention and many others is very creditable, and tends to show that the enthusiasm of their owners remains unabated. The list of amateur transmitters is rapidly becoming larger, and it is understood that we are now well down the alphabet in the six series. The amateur-transmitter movement is one which has come to stay and which has got to be reckoned with in the future.

CRITICUS.

About the Accumulator

THERE are two types of electric cell, the primary cell and the secondary cell, or storage cell. In a simple primary battery consisting of a zinc rod and a copper plate immersed in sulphuric acid, the energy generated when the zinc dissolves in sulphuric acid appears as electrical energy. This is shown by connecting a voltmeter between the zinc and the copper plate. This type of cell is not particularly efficient, for after a minute or so the copper plate is covered with bubbles and the current ceases to flow. This phenomenon is known as polarisation.

The same thing happens if we electrolyse water with one Daniell cell (E.M.F. 1.07 volts). The current passes for a moment or two, then it stops, and nothing will induce it to flow, except the addition of a second Daniell cell. The water is decomposed into its constituents, namely, oxygen and hydrogen.

The Gas Battery

If in this experiment the cells be quickly replaced by a voltmeter it is found that the bubbles of oxygen and hydrogen that have not detached themselves disappear, and a momentary current flows in the opposite direction with a maximum E.M.F. of 1.47 volts.

This is termed the back E.M.F. of polarisation, and explains why it is impossible to electrolyse water with only one Daniell cell. The back E.M.F. of polarisation of water is greater than the electrolysing E.M.F.

The accumulator is based upon this principle. The first accumulator was Grove's gas battery.

Many workers set themselves the task of improving the gas battery, and among the most successful was Planté. He used lead electrodes, as he found that the gases liberated combined with the electrodes.

Forming

The anode he found was coloured brown with lead peroxide and the cathode was covered with grey spongy lead. This cell had an E.M.F. of 2 volts and was superior to the Grove gas battery in many respects. Planté found that by repeatedly charging and recharging his cell the active material could be made to extend right through the plate. But this was a tedious process.

Faure found that this tedious process of formation could be reduced to about twenty-four hours by filling a lead grid with active material. The anode he filled with a paste of red lead and sulphuric acid, the cathode with a mixture of litharge and sulphuric acid. Then by passing a current through the cell for about twenty-four hours the plates were formed. When the cell is fully charged the anode is brown and the cathode is grey, and the E.M.F. is about 2.2 volts. When the cell is discharged both plates become coated with lead sulphate.

The electrolyte of an accumulator is a good conductor of electricity, therefore the internal resistance is extremely small, in fact, in the neighbourhood of 0.01 ohm. It is obvious that when an accumulator is short-circuited a very large current will flow. From Ohm's law:

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

If the voltage be 2 volts and the internal resistance 0.01 ohm, then the current (C) will be 200 amperes.

If 200 amperes are being taken out of an accumulator in a very short space of time the chemical action will be so violent that the plates will buckle.

If the instructions which are printed on the side of every accumulator are adhered to, and special precautions are taken against short-circuits, and the voltage per cell is not allowed to fall below 1.8 volts per cell, the accumulator will last for several years. N. C. S.

Around the Showrooms

"Sterling" Units

ONE of the neatest series of units on the market at present is that made by the Sterling Telephone and Electric Co., Ltd., of 210-212, Tottenham Court Road, W.1. Three of these units are shown in the photo. Five terminals are provided on each side for making connections. A number of units can be connected in cascade by means of connections, one of which is shown on the extreme right. The metal sockets in this connector are fixed on a rocker, so that it does not matter if the units are not exactly level. The low-frequency units are made with one, two, or three valves. Detectors and high-frequency units will be placed on the market as soon as possible. Each unit is mounted on a hardwood base, complete with polished black metal cover.

Three Sterling Units.

Another New Filament Resistance

A filament resistance called the "Filafone" has fitted underneath the usual contact arm (it is a rotary resistance) another one which acts as a switch to cut out an amplifier and change the phone connections. This second arm, insulated from the first, extends further on one side of the spindle than on the other. The two ends make contact on two concentric split rings, like a commutator. The connections are changed when the resistance is turned to the off position. Electro Devices, of Victoria Road, Oulton Broad, Lowestoft, make these instruments.

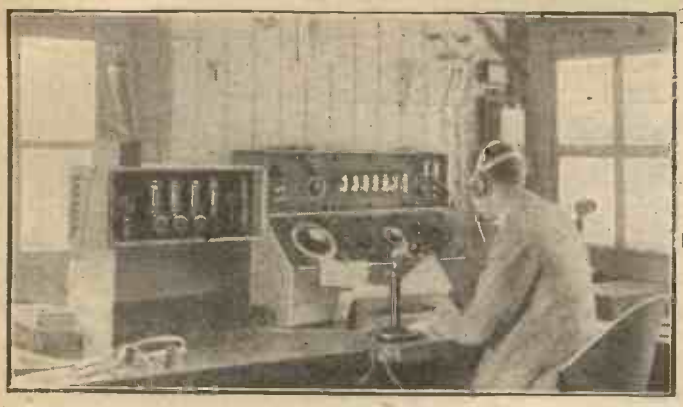
Lids that Make Shelves

Some neat two-, three- and five-valve cabinet sets are being made by the British Radio-Wireless Manufacturing Co., Ltd., of Electric House, Ship Yard, 116, Wardour Street, W.1. Unlike the majority of cabinet sets, the panel is horizontal and is enclosed by a lid, the two halves of which swing down to form shelves to hold batteries, etc., when the cabinet is open. Although primarily intended for broadcast reception, these receivers can be wired to cover any required wavelength range. This firm also manufactures "O-Solowd" crystal, a new specimen of the fused-galena family.

Four Phones in One

A device called the "Procophone," supplied by Spencer's Stores, Mason's Avenue, Coleman Street, E.C., consists of a tube, over the ends of which are clamped a pair of phones, provided with four pairs of ear tubes, as used in medical stethoscopes. If desired eight pairs may be used, and thus a number of persons can listen with only one pair of ordinary phones.

The Peto-Scott Company's Address.—Many thousands of our readers know that the address of the Peto-Scott Co., Ltd., is 64, High Holborn, London, W.C.1. That is where their head office is situated. There was a misprint in their advertisement in our issue of last week, but fortunately AMATEUR WIRELESS readers are so familiar with the address of this company that few, if any, letters went astray.



Direction Finding and Receiving Apparatus at Croydon Aerodrome.

Position and Direction Finding :: IV.—The Maximum Method

AS was shown in the previous articles on this subject, two outstanding characteristics are to be observed in connection with loop aerials. These are: (1) When the plane of the aerial is in line with, or at right-angles to, the direction of the transmitting station, maximum or zero signals respectively will be received. (2) Whilst it is possible, with an ordinary frame aerial, to ascertain the minimum, or zero, position within one degree of accuracy, an error of ten degrees might easily be involved in finding the maximum position.

Two Systems Compared

This latter characteristic is not necessarily a disadvantageous one in all cases. In an ordinary ground direction-finding station, for instance, where silence can be maintained in the operating-room through the agency of sound-proof doors, etc., excellent results can be obtained by using the minimum method. This is only so, of course, when the important thing is to get "bearings" and there is no need to read the actual message which the signals convey.

Under certain conditions, however, it is not possible to eliminate external noises; for example, on board aircraft. Other examples (of more direct interest to certain amateurs, no doubt) would be: when the operating-room happens to be situated next to the nursery, or when there is no available means of holding up neighbouring traffic (trains, buses, trams, etc.) at critical moments. Also, apart altogether from the desire to be able to get accurate bearings, most amateurs will dislike having to miss a portion of the message whilst taking a bearing at the minimum point.

Maximum Device

These difficulties are surmounted by means of a special device which combines all the advantages of maximum strength of signals with maximum sensitivity. This device consists of two loop aerials fixed at right-angles to one another, as illustrated diagrammatically in Fig. 1. Suppose that these two coils are joined in series, the loose extremity of each being connected up to a receiver in the usual way. Suppose also that we adjust the position of the joined coils so that the portion CD is pointing towards the transmitting station X, that is, so that its plane is in line with the transmitter. CD is now in a position to receive maximum signals from X. AB, on the other hand, should be picking up no signals from X, since its plane is at right-angles to the direction of the latter. Therefore, if we suddenly switched AB out of the circuit (automatically connecting up both ends of CD to the receiver as we did so), there should be no alteration in the strength of signals

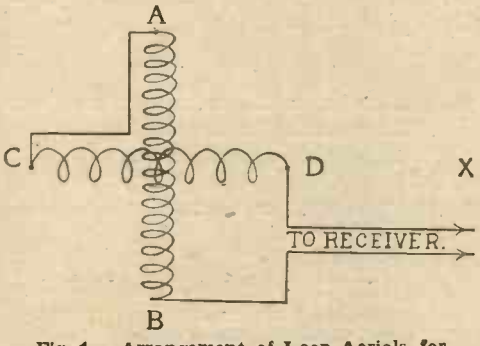


Fig. 1.—Arrangement of Loop Aerials for Maximum Method.

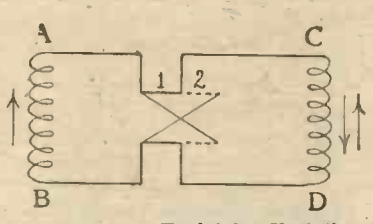


Fig. 2.—Diagram Explaining Variation in Signal Strength.

heard in the telephones. This, then, would be one way of telling whether CD is in the exact maximum position with respect to X or not. If there is any change of signal strength on switching AB out of the circuit, CD cannot be in the exact maximum position. If the plane of CD is not exactly in line with the direction of X, either of two things may happen when AB is switched out of circuit: signals will get weaker or stronger.

Advantages of Maximum Method

This is an important point which needs to be understood clearly before the advantages of this system can be fully appreciated. The nature of the variation in signal strength will depend on the manner in which the two coils are connected to one another. Reference to Fig. 2 will make this clear. AB and CD are two coils of wire, both of which are connected to a double-pole switch, as illustrated. If a current is passed through the coil AB in the direction indicated by the arrow, it will flow *down* through the coil CD (as shown by the left arrow) when the switch is in the left-hand position, and *up* through the coil CD (as shown by the right arrow) when the switch is in the right-hand position.

Or, again, if two currents were flowing simultaneously in, say, an upward direction through both coils they would oppose one another when the switch is put in the first position, and assist one another when the switch is thrown into the latter position. The same would happen, of course, in a reverse order, if the two currents flowed in opposite directions through the coils in the first instance, that is, upwards in AB and downwards in CD. The thing to note in either case is that the resultant current flowing in the circuit will be represented by the sum of the individual currents in the one instance, and by their difference in the other. This effect can be utilised to great advantage in the maximum method.

Difficulties

Instead, therefore, of joining the two aerials directly in series, as shown in Fig. 1, we must have some means for reversing them similar to that shown in Fig. 2. With such a system it would be a simple matter accurately to determine the direction of a transmitting station, once the approximate maximum position of the coil CD had been found.

This introduces another difficulty. If we could be sure that the loudest signals were being received on this coil alone in the first instance, the matter would be quite easy. But we might actually be receiving on AB, whilst CD remained at right-angles to the transmitter, in which case the resultant bearing would be 90 degrees out! Even when more turns of wire are used in one aerial coil than in the other it is by no means a simple matter, in practice, to distinguish between two "maximums," apart from the inconvenience of such an arrangement.

It is necessary, therefore, to commence operations by excluding the coil AB from the circuit while the approximate maximum position of CD is being found. When this is done, and not before, AB is brought into the circuit. If AB is now picking up any energy this will be manifested by the increase or decrease in the strength of the signals being received. If

the alteration in strength is very slight it may not be detected at once. By throwing the reversing switch backwards and forwards, however, even the smallest difference will be detected as the energy in the coil A B is alternately added to and subtracted from the energy in the coil C D.

AERIAL NAVIGATOR.

(To be continued)

2 L O

2 L O has evidently been thoroughly put on his mettle by the heckling of the Press and the questions asked in the House of Commons. He is passing through yet another stage, from which he will no doubt emerge with honours. Don't forget to send your postcard and state the kind of programme you like. Everyone cannot get exactly what he wants, but the majority will be satisfied. Tastes vary greatly, but the Englishman has as a rule good taste, so take heart and don't forget your postcard. There is no doubt but that the quality of the programmes issuing from that station is improving as time goes on. It is obvious, however, that jazz tunes are not so well suited to broadcasting at present as the more classical material.

The announcer at 2 L O on June 30 referred to the dance items as "spasms." According to my dictionary the word spasms means "a convulsive and involuntary muscular contraction, a sudden or convulsive act, movement, etc., a violent and generally fruitless effort"! Well—I ask you?

On June 29 Mlle. Lenglen made a delightful little speech from 2 L O. I wonder how many readers noted how the personality of that famous tennis champion was wafted over the ether? To me it seemed that the lady was actually in the room; probably it reminded our ex-service men of their *parlez-vous* with many French damsels concerning many things. When she laid stress on the correct pronunciation of her name, I felt truly sorry for the gallant announcer, but nevertheless I believe that he enjoyed the joke against himself as well as any of us. I was inclined to be antagonistic to another talk encroaching on the musical items, but when she had finished I found that I had enjoyed the talk and the spirit of France conveyed with it!

CRITICUS.

Proposed Society of Transmitting Licence Holders

A MEETING of the transmitting-licence holders in the London area is to be held at King's College, Strand, at 6 p.m. on July 20 to discuss the formation of a society of transmitting-licence holders in the London area.

RADIOGRAMS

BELL-SYSTEM telephone engineers have discovered that there are a particularly large number of "blinds spots" in New York. For instance, W E A F can be heard only very faintly in northern New York. The explanation offered is that the natural wavelength of the office buildings, which are largely constructed of steel, intervening is 500 metres, this being the wavelength of the station referred to, and on this account absorption takes place.

We hear on good authority that a number of "reaction fiends" are ruining the wireless concerts in Sefton Park district, Liverpool. Those responsible are certainly not "wireless amateurs," as a local paper states.

A crime for which the wireless amateur is held responsible is the stealing of telephone apparatus from call-boxes. The Post Office state that they are "not prepared to quote figures" as to the number stolen.

Mr. J. T. C. Moore-Brabazon, M.P., has written to the *Times* concerning the wreck of the *Trevessa,* urging that the Board of Trade should insist on lifeboats, as well as the mother ship, being fitted with wireless apparatus.

It is rumoured that what is to be the most powerful broadcasting station in the world is being erected secretly in Detroit (U.S.A.). Mr. Henry Ford, of car fame, is said to be responsible for the building of the station, and that he will use it in his campaign for the presidency of the U.S.A. next year.

A new system of secret telephony is being tested by Bell-system telephone engineers in America over a 30-mile stretch of water between Los Angeles and Catalina Island. The device used confuses the conversation at one end and puts it into order at the other.

A party of M.P.'s visited 2 L O, and inspected the studios and plant on Thursday, July 5. All expressed a very high opinion of the value of broadcasting. One member, also a member of a County Education Committee, discussed with a B.B.C. representative the probable cost of fitting schools with loud-speakers.

The high-power wireless station to be erected at Hillmorton, as we announced last week, is to be the British end of the Imperial wireless chain. Constructional work will be started in about a month's time. Masts 820 ft. high are to be erected for the aerial.

The report of the Marconi International Marine Communication Co., Ltd., just issued, states that the gross revenue for 1922 amounts to £1,103,970 15s. 5d., as compared with £1,084,460 6s. 8d. for the preceding year. The net profit amounts to £171,848 4s. 2d. This is an increase as compared with 1921, due in part to additional business consequent upon the return of ships to commission after the period of great depression in the shipping trade and also to economies in the methods of working and control.

The Aberdeen and Bournemouth stations are progressing "as fast as an icebreaker through a floe of ice," as a B.B.C. official put it.

On Friday, July 13, 2 L O has arranged a novel competition for listeners-in. Three B.B.C. officials will commit a "crime," and a description will be broadcast from 2 L O. All listeners-in within a radius of 40 miles from London will be able to participate, and have the chance of winning one of three prizes. The "criminals" will most likely escape in cars, and listeners will be required to furnish a description of the car and the occupants

Mr. Tyrwhitt Drake, F.Z.S., one of the very few people who own a private zoo, will speak on his wild animals from 2 L O on July 13.

Crystals and the Loud-speaker

SIR,—With regard to crystal reception, I should like to say that I can receive 2 L O on a home-made loud-speaker using a crystal set. My aerial (which is a twin 50-ft. and only 25 ft. in height) is very badly screened by a tree. As I am situated about twelve miles from 2 L O, I consider these results good. I should also like to add that I can get 2 L O on the phones using an iron bedstead as an aerial and also an indoor aerial 15 ft. long.—F. M. (Ealing).

SIR,—We beg to inform you that we have carried out experiments as per your article on page 908, using the "Unisector" crystal circuit in conjunction with the "Maxsig" crystal. The experiments were certainly very successful in reproducing speech and music on a loud-speaker. This was quite clear at 10 ft. away from the apparatus. We are pleased also to add that we have tested nearly every crystal and crystal circuit that is known, but this is by far the best. The loud-speaker used was our new "Ultra," which we intend placing on the market shortly.—EDWARD E. ROSEN AND CO. (London).

A Reader's Opinion

SIR,—I feel it my duty to tell you how much I appreciate AMATEUR WIRELESS and also the exceedingly prompt manner in which you supply technical information.

I am a reader of several wireless publications, but I can truthfully say that in no case have I had such prompt and courteous attention to my inquiries as you have given me.—A. S. (Dornoch).

American Valves

SIR,—Allow me to take exception to the remarks on the above in Mr. J. Hartley Reynold's article on "Dull-emitter Valves" in No. 56 AMATEUR WIRELESS. This sentence: "The most satisfactory dull emitter made up to the present is the WD11," is certainly very sweeping and misleading. I propose to describe two others made by the Radio Corporation of America, or rather marketed by them and made by the G.E.C.

The first is the UV199, only recently placed on the market. This valve operates on 60 milliamperes (.06 amperes) filament current, and can be operated from an ordinary flash-lamp battery. The wattage is .18 or 3/50 of the energy used by the standard R valve. In spite of this the valve gives better results than the UV201.

The filament, which is extremely fine, is known as the XL tungsten filament, and has all the advantages of the coated filament, and the strength and long life of the tungsten type. A curious feature of this valve is that if operated at too high a temperature it becomes inoperative, but by operating at the rated voltage of 4½ volts it again becomes normal. The length of time required is proportional to the time misused and the operation is carried out with the plate current off. Although the UV199 is an ideal valve for many purposes, it cannot compete as an amplifier with the powerful UV201, which takes 5 volts at .25 ampere, and has an electron emission five times that of UV201. This is not accomplished at the expense of a high temperature, it being much lower than the UV201. The high degree of vacuum, coupled with the electron emission already described, make it ideal for power amplification. Although I have made extensive inquiries, I cannot find any agent in this country.

In case any of your readers would like to make inquiries, the name and address of an American firm of retailers are The Sunbeam Electric Co., 71, Third Avenue, New York. The prices of the valves are UV201, $6.25; UV199, $6.25.—D. P. (Sheffield).

The Price of Parts

SIR,—We have read with interest the letter from W. J. E. (Hornsey) in your issue of June 30, and as retailers perhaps you will allow us a few remarks.

The letter raises several questions which are of interest to retailer and buyer alike. There always will be two classes of traders: those who are out to make a large profit at the first opportunity, without a thought for the future, and those who are satisfied with a small profit and hope for repeat business with their customers.

It seems unfortunate that so many retailers with little or no knowledge of wireless have taken up the selling of parts and accessories, as many, by their lack of knowledge both of the buying and selling side of the business, have driven local people to make their purchases away from their own local shops.

With regard to the great divergence of prices, though "300 per cent." profits may be asked by some retailers, no one is forced to buy from them. The buying public should also remember that there are tremendous differences in the quality of wireless goods on the market.—RADIO STORES (Epsom).

[We have received several other letters of a similar nature to the above.—ED.]

Repair Your Own Valve

SIR,—Having accidentally burnt out an X-traudion valve and which I could not mend by the usual method as the distance between the ends of the broken filament was about $\frac{1}{32}$ in., I solved the problem in another way. I heated the glass near both filament supports with a small blowlamp so that it softened, and the air pressure then pushed the legs closer together. Then I put 6 volts across the filament and welded it together. The valve has been used on the H.F. panel constantly for three months since the repair.—C. M. (Great Yarmouth).

Broadcasting and the Retailer

BELOW we give some points from a letter addressed to Captain Lewis, of the British Broadcasting Company, Ltd., by Mr. C. J. Close, manager of Harrod's wireless department. The letter refers to the alteration in the time of the afternoon broadcasting from 5 P.M. to 5.30 P.M., and Mr. Close says:

"Before the change, when the children's hour commenced at 5 P.M., those who desired to get an impression of what broadcasting was really like were usually advised that 'five o'clock was a good time.' Now the programme does not commence until 5.30 P.M., and the microphone is occupied by voices which may or may not be suitable for broadcasting."

Mr. Close continues: "I fully understand that you have many opinions with which to contend, but both your good selves and those of us who are interested in the sale of wireless apparatus must realise that unless the opportunity is available of giving really popular demonstrations during business hours we shall suffer financially. I therefore ask your company to consider seriously reverting to the original time of 5 P.M.; and also please let us have the 'Uncles' with their jolly talk to the kiddies."

ANNOUNCEMENTS

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

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

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

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

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

Some of these transmissions are commercial or official. Wavelengths and times are liable to alteration without notice. The times given are according to British Summer Time.

London B.B.C. Station (2 L O), 369 metres. Weekdays, 11.30 a.m. to 12.30 p.m., concert; 5.30 p.m. to 6 p.m., women's half-hour; 6 p.m. to 7.30 p.m., children's stories and concert; 8 p.m. to 11 p.m., concert and news. Sundays, 3 p.m. to 5 p.m., concert; 8.30 p.m. to 10.30 p.m., concert and news.

Manchester B.B.C. Station (2 Z Y), 385 metres. Weekdays, 3.30 p.m. to 4.30 p.m., concert; 5.30 p.m. to 6 p.m., women's half-hour; 6 p.m. to 6.45 p.m., children's hour; 6.50 p.m. to 7 p.m., talk on "Current Events," etc.; 7.20 p.m. to 7.45 p.m., concert and news, etc.; 8.15 p.m. to 10.25 p.m., concert, news, men's hour, weather forecast, etc. Sundays, 8.30 p.m. to 10.25 p.m., concert and news, etc.

Birmingham B.B.C. Station (5 I T), 420 metres. Weekdays, 3.30 p.m. to 4.30 p.m., concert; 5.30 p.m. to 6 p.m., women's half-hour; 6 p.m. to 6.45 p.m., children's hour; 7.30 p.m. to 8.15 p.m., concert and news, etc.; 8.45 p.m. to 10.30 p.m., concert, news, men's hour, weather forecast, etc. Sundays, 8.30 p.m. to 10.30 p.m., concert and news; etc.

Newcastle B.B.C. Station (5 N O), 400 metres. Weekdays, 3.30 p.m. to 4.30 p.m., concert; 5.30 p.m. to 6 p.m., women's half-hour; 6 p.m. to 6.45 p.m., children's hour; 8 p.m. to 11 p.m., concert, news, men's hour, weather forecast, etc. Sundays, 8.30 p.m. to 11 p.m., concert and news, etc.

Cardiff B.B.C. Station (5 W A), 353 metres. Weekdays, 5.30 p.m. to 6 p.m., women's half-hour; 6 p.m. to 6.45 p.m., children's hour; 7 p.m. to 8 p.m., concert and news; 8.30 p.m. to 10.5 p.m., concert, news, weather forecast, etc. Sundays, 8.30 p.m. to 11 p.m., concert and news.

Glasgow B.B.C. Station (5 S C), 415 metres. Weekdays, 3.30 p.m. to 4.30 p.m., concert; 5 p.m. to 5.30 p.m., women's half-hour; 5.30 p.m. to 6 p.m., children's hour; 8.15 p.m. to 10.45 p.m., concert, news, men's hour, weather forecast, etc. Sundays, 8.30 p.m. to 10.45 p.m., concert and news, etc.

Croydon (G E D), 900 metres. Daily.

Eiffel Tower (F L), 2,600 metres. **Daily,** 5.40 a.m. and 11.15 a.m., weather forecast; 3.30 p.m., Stock Exchange news; 6.20 p.m. to 7 p.m., concert, and 10.10 p.m., weather forecast.

The Hague (P C G G), 1,050 metres. Sundays, 4 p.m. to 6 p.m., concert. Mondays, 9.40 p.m. to 10.40 p.m., concert. Thursdays, 9.40 p.m. to 10.40 p.m., concert.

Paris Concerts Radiola (S F R), 1,780 metres. Daily, 12.45 p.m. to 1.45 p.m., concert and news; 5.5 p.m. to 6.15 p.m., concert; 8.45 p.m. to 10.30 p.m., concert; also concert from 2 p.m. to 3 p.m. on Sundays.

Rome (I C D), 3,200 metres. Daily, 11 a.m.

Königswusterhausen (L P). 2,800 metres. Daily, 8 a.m. to 9 a.m., Stock Exchange news; 12 noon to 1.30 p.m., Stock Exchange news; 5 p.m. to 6.30 p.m., Stock Exchange news.

Amsterdam (P C A), 1,800 metres. Daily, 2.20 p.m.

Haren (O P V H), 900 metres. Daily weather report on 1,100 metres at 1 p.m. and 5.50 p.m.

Ecole Supérieure des Postes et Télégraphes, 450 metres. Tuesdays and Thursdays, 7.45 p.m. to 10 p.m., concert. Saturdays, 2.30 p.m. to 7.30 p.m., educative lectures and concert. Daily, at 11 a.m., 5.5 p.m., and 9.10 p.m., news and concert.

"A Transmisson Board or Chart" (*cont. from* p. 36.)

and white respectively on the reverse sides (see the detail illustration). These could be changed in a moment exactly as required.

An amateur might possibly feel it worth his while to construct a chart for his own use. Once he had taken his time to produce a list of the names of the stations of a good readable size, he could draw in the thick black lines, and the occasional alterations required could be made by adding lines or by cutting out lines by means of white paper pasted on; but probably he would regard the affair as not worth the trouble involved, and we should be rather inclined to agree with him; in the case of a club meeting the objection would not apply. In any case, we present the idea for exactly what it is worth.

An Interesting County Court Action

A CASE of considerable importance to users of receiving sets came before Judge Crawford at Southend County Court on Friday, July 6. According to the report in the *Daily News*, a Westcliff electrician, Henry Lee, sued Albert Bird, a wholesale tobacconist, for the value of a receiving set he had installed.

It bore, it transpired, no British Broadcasting Company stamp, and counsel for the defendant argued that the set in the absence of this stamp was useless. If used by the defendant he would be guilty of a misdemeanour.

In evidence Mr. Bird said that he told Mr. Lee this, and was advised to take out an experimenter's licence. "When I got the form," said Mr. Bird, "I saw I had to certify that I wanted the licence for some scientific object or an object of general public utility. I could not conscientiously sign that."

His Honour agreed that had he signed he would have perpetrated a fraud. He said he supposed Mr. Bird knew about as much of the science of wireless as a newly-born babe, and would have had a lot of difficulty in persuading anyone that he had an object of public utility in view. Without the "B.B.C." stamp the set was useless, and therefore, as plaintiff had failed in his contract, he could not recover.

On the understanding that Mr. Bird would return the set, judgment was given for him with costs.

The Mullard Radio Valve Company, of Nightingale Lane, Balham, S.W.12, have notified us that the Mullard R valve is now selling at 15s. (fifteen shillings), instead of at 17s. 6d. as previously.

A Great Domestic Number is this week's issue of "Work" (price 3d.), containing special articles on "Making Wooden Stair-rods," "Distempering a Room," and "Making Living-room Furniture: The Chairs." Many other subjects are treated.

(From Our Own Correspondent)

ASKED in the House of Commons last week by Sir Harry Brittain whether he had received any complaints as to the efficiency of the present system of broadcasting, the Postmaster-General said he had received very few complaints. The whole question of broadcasting was, of course, being considered by a committee appointed by his predecessor in April last.

In answer to Mr. D. G. Somerville, the Postmaster-General said he understood that the committee, although alive to the urgency of the matter, could not yet say when they would be able to present their report.

Replying to Mr. Frank Gray, Sir L. Worthington-Evans said there was no censorship of news transmitted from this country. The only official bulletin transmitted from the Leafield wireless station was that prepared by the Foreign Office. Press messages were also forwarded from the station on behalf of the correspondents of Canadian, American and Indian newspapers, as well as to ships at sea. They all bore specific addresses and were dealt with entirely as private telegrams.

In answer to a number of questions, Sir L. Worthington-Evans said he hoped to lay the agreement with the Marconi Company as to the licence for the Empire wireless chain on the table of the House as soon as it was completed, but he could not undertake that an opportunity for discussion would arise before it became operative. The company at present held no licence covering wireless communication with any countries outside Europe except the United States and Canada. The licence which was now under negotiation with the company would cover the erection of stations in Great Britain only, and would not be exclusive. It was not proposed to give the Marconi Company a monopoly of wireless communication within the Empire. The proposed licence would certainly contain no provisions precluding the Government or other companies from establishing similar wireless communications.

Sir L. Worthington-Evans informed Sir Burton Chadwick that the capital expenditure in connection with the Post Office wireless stations was approximately as follows:

Leafield	£115,000
Cairo	136,000
Northolt	43,000
Stonehaven	31,000

Buying Ebonite.—In the advertisement of P. H. Boys and Co., of 187, Goswell Road, London, E.C.1, appearing in our June 30 issue, the thickness of ebonite was given as "3/6"—a very obvious printer's error (oh, those printers!)—for "$\frac{3}{16}$" in.

CLUB DOINGS

Bath Radio Club.

Hon. Sec.—G. J. B. CURTIS, 6, Pierrepont Street, Bath.

AT two recent meetings of the Bath Radio Club members welcomed the return of Mr. L. E. R. Boxwell, whose lectures had proved so popular at the commencement of the year. The subject of Mr. Boxwell's first lecture was "Aerials and Earths," during the course of which the lecturer emphasised the importance of high aerials and short earth-leads. Frame aerials were also discussed. Mr. Boxwell's second lecture was an exhaustive exposition on batteries.

Sydenham and Forest Hill Radio Society.

Hon. Sec.—M. E. HAMPSHIRE, 139, Sydenham Road, Sydenham, S.E.26.

AT a recent meeting of the above society a lecture and demonstration on dual-amplification was delivered by Mr. Voight. The possibilities of getting loud-speaker strength out of one valve and a crystal was an eye-opener to many of the multi-valve merchants; and with one extra valve as an ordinary L.F. amplifier the signal strength was sufficient to satisfy all those who delight to see listeners-in congregate outside their houses. Circuits drawn on large size drawing paper were pinned on the blackboard, and by an ingenious system of smaller sheets of paper, on which were drawn parts of circuits, an ordinary two-valve circuit was gradually transferred into a dual-amplification circuit in much the same way as a jigsaw puzzle is built up. A few remarks on crystals convinced many of the advantages of crystal detectors, one advantage being their absolute silence (this does not refer to a "dud" crystal).

Proposed East Ham Radio Society.

Hon. Sec.—C. BULL, 26, Keppel Road, East Ham, E.6.

WILL amateurs interested in the formation of the above society commuuicate with the secretary (pro tem.).

North London Wireless Association.

Hon. Sec.—J. C. LANE, Northern Polytechnic Institute, Holloway Road, N.

ON June 25 Mr. E. H. Robinson gave his lecture on "The Armstrong Supersonic Heterodyne." The composition of the set is as follows. A separate heterodyne is coupled to the A.T.I. of an ordinary detector circuit.

Inserted in the place of the phones is a coil of large inductance value to which is coupled another coil of similar value and leading on to a four-valve high-frequency choke-coupled amplifier tuned to a finer beat.

The signals received are heterodyned and the beat passed through to the amplifier.

The lecturer explained that by this method of reception loss in strength of signals resulted as compared with a two-valve set, but this loss was replaced and signals greatly increased in volume and strength, in comparison, after having passed through the amplifier.

Kensington Radio Society.

Hon. Sec.—J. MURCHIE, 33, Elm Bank Gardens, Barnes.

AT the June meeting of the above society Mr. P. Voight delivered a lecture and performed several successful experiments on "Dual Amplification." The lecturer, by means of an ingenious method of his own, constructed the various diagrammatic circuits as he required them for the purposes of explanation.

(*Continued on page 58*)

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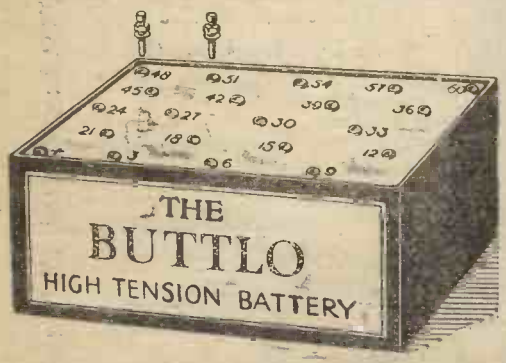

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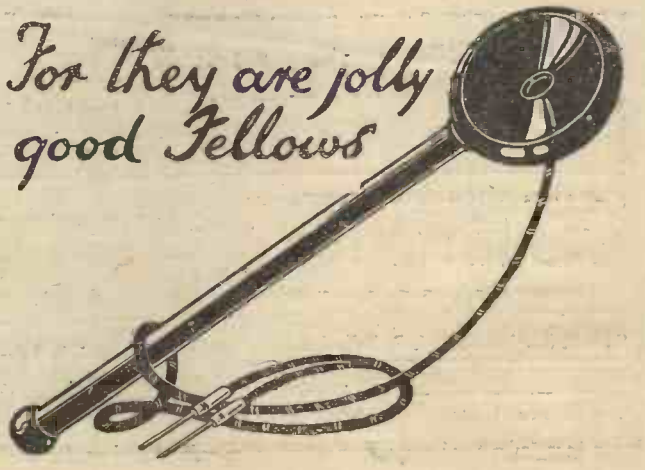

CLUB DOINGS (*continued from page 56*)

Southampton and District Radio Society.

Hon. Sec.—P. SAWYER, 55, Waterloo Road, Southampton.

AT the meeting of the above society held on June 14 Mr. Bateman gave a lecture on the "Flewelling Circuit," and successfully received broadcasting on an indoor aerial.

A very interesting discussion was opened by Dr. McDougall in connection with the persistent crackling disturbances which for some weeks have been seriously interfering with the reception of broadcasting, and various theories were advanced as to the cause and origin of the annoyance.

A party of members recently paid a visit to the R.M.S. *Majestic*, by kind permission of the local manager of the White Star Line, and spent a very interesting and instructive time inspecting the wireless apparatus.

Leeds and District Amateur Wirelass Society.

Hon. Sec.—D. E. PETTIGREW, 37, Mexborough Avenue, Chapeltown Road, Leeds.

AT the 37th general meeting Mr. H. F. Yardley lectured on "Some Experiences with the Non-radiating Receivers." The lecturer described the difficulties that beset the manufacturer of radio receivers for broadcast traffic, and closely considered the stringent tests as conducted by the G.P.O. with regard to aerial excitation in autodyne receivers. He also spoke about the relative efficiencies of various intervalve H.F. couplings having magnetic regeneration. The need of tuned-anode coupling with magnetic retroaction included at that point was advocated. Mr. Yardley described a three-valve set using a H.F. valve coupled in the above manner to a cumulative rectifying valve, following upon which was a stage of L.F. amplification. The set was demonstrated using a 4-ft. frame and Western power equipment. The lecturer described many very interesting cases of good and bad reception in different parts of the country. As regards Leeds, it is now generally approved that the city is "in clover" as regards broadcast reception, there being very little jamming and no difficulty as regards picking up any of the B.B.C. stations on two- or three-valve sets.

Hall Green Radio Society.

Hon. Sec.—F. C. RUSHTON, Robin Hood Lane, Hall Green, Birmingham.

RECENTLY the society had a most instructive and interesting gathering, the occasion being the visit of Mr. F. H. Amis, engineer-in-charge of the Birmingham Broadcasting Station. Mr. Amis gave a most interesting account of the broadcasting station, outlining the apparatus in use there from the studio to the aerial, and explaining that less power was used when loud singing was transmitted as against the spoken voice. Great interest was manifested in the lecturer's explanation of the difficulties now experienced in broadcasting from Witton and the improvement which was likely to result when a removal could be effected to the centre of city.

Tottenham Wireless Society.

Hon. Sec.—S. J. GLYDE, 137, Winchelsea Road, Bruce Grove, Tottenham, N.17.

ON June 20 Mr. T. Vickery gave an interesting lecture on "Grid Leaks, Fixed Condensers, and Coils."

The lecturer demonstrated several types of leaks and tested their resistances on his megger. The method of building condensers was then shown, followed by detailed instruction in coil winding. Coils in all stages of completion were passed round, and the lecturer gave a practical demonstration of their manufacture. Mr. A. G. Tucker then gave the formula for calculating the inductance of coils.

On June 23 a party visited a ship station. The operator kindly explained his set—a ½ kw. rotary spark transmitter and crystal receiver. The members were greatly interested to hear the ranges over which communication had been established.

Radio Society of Highgate.

Hon. Sec.—J. F. STANLEY, 49, Cholmeley Park, Highgate, N.6.

ON June 22 a lecture entitled "Why Oscillatory Circuits Oscillate" was given by Mr. J. F. Stanley. By means of various mechanical analogies it was shown that the properties of inertia and elasticity are essential for the production of any kind of oscillatory or wave motion. The meaning of these two properties was carefully explained in a simple manner, and mathematics were studiously avoided. The properties of inductance and capacity were then explained, and it was shown that inductance corresponds to electrical iuertia, while capacity corresponds to electrical elasticity. A combination of inductance and capacity is therefore capable of sustaining electrical oscillation, and the lecturer explained how the rate and duration of a free oscillation in such a circuit can be controlled and calculated.

Burnley and District Radio Society.

Hon. Sec.—W. H. THORNTON, 16, Bridge Street, Burnley.

THE above society held their usual fortnightly meeting on June 21, when the members heard a lecture on "The Care of Accumulators" by Mr. F. Drinkwater, of the Hart Accumulator Company.

The lecturer explained in detail the many and varied causes of trouble likely to be encountered when accumulators are carelessly handled. The many explanations were attentively received by those present.

South Dorset Radio Club.

Hon. Sec.—E. B. CARTWRIGHT, 18, Newberry Terrace, Weymouth.

THE first of a series of lectures on wireless and allied subjects drew a large attendance of members on June 5, when Capt. Hobs (2 O Y) discoursed on "The Practical Application of Theory."

The company subsequently "listened-in" on a fine two-valve set made by one of the members.

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

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Variometer Formers, specially hardened, 12 pairs, 6s. Special quotations larger quantities.—Pinn, 21, Amersham Road, S.E.14.

Agents Wanted.—Electricians, etc., to collect burnt-out wireless valves for repair. Good commission.—Apply Minson and Goman, 60, Churchfield Road, Acton, W.3. [1 s

Frame Aerials.—Prov. patent; folds and unfolds in one second; wires always in position; made in oak, and packed in box, 21/- post free. Write for list.—Beresford, manufacturer, Stoke-on-Trent. [4 s

Your Burnt-out Phones rewound in 3 days; up to 1,000w., 5/-, 2,000w., 6/-; 4,000w., 7/6. Best work and quickest service.—Harrison, 289, Weston Street, Southwark, S.E.1. [8 r

Variometers.—Highly efficient, 5/- each. Post paid.—Haskard, 53, Burton Street, Nottingham. [3 s

Morse Instructor.—Teaches by ear, gives signals anywhere, any speed, repeats as desired, durable, cannot go wrong. Goes easily into pocket, not electrical. "Shipping World" says, "distinctly novel, should be invaluable." 7/6, post free.—The Standard Engineering Tools Co., Ltd., 25, Laurence Pountney Lane, London, E.C.4. [2 s

Agent Wanted for Patent Wireless Speciality. Sole selling rights in the various broadcasting centres throughout the country. Also agent to handle exporting rights.—The Harrison Manufacturing Co., 35, Paradise Street, Birmingham.

Radiocite Crystal.—Mr. Blake, A.M.I.E.E., writing in the *Daily Mail*, says: "It is wonderful stuff." "Sensitive practically all over." Obtainable at all Malone Radio Depots. Post free, 2/4.—West End Depot, 17, Piccadilly Arcade; City Depot, 7, Hart Street, Mark Lane, E.C.3. [6 s

3-Valve Low-Frequency Amplifier for sale; mounted in cabinet and guaranteed perfect. Cost £16; will accept £8.—Woolmer, 34, Studley Rd., Luton, Beds. [8 s

Great Wireless Discovery!—The New "Tut-Tut" Amplifying Detector. Always set; fool proof. The detector which requires no adjustment; obtains louder and clearer reception; post free, 3/—Patentees, D.W.S., 241, Park Rd., Aston, Birmingham. Agents wanted in all towns. [2 s

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