OPERATING LOUD-SPEAKER ON CRYSTAL

Amateur Wireless

And Electrics

Vol. III. No. 61. SATURDAY, AUGUST 4, 1923 Price 3d.

PRINCIPAL CONTENTS

WELL ILLUSTRATED

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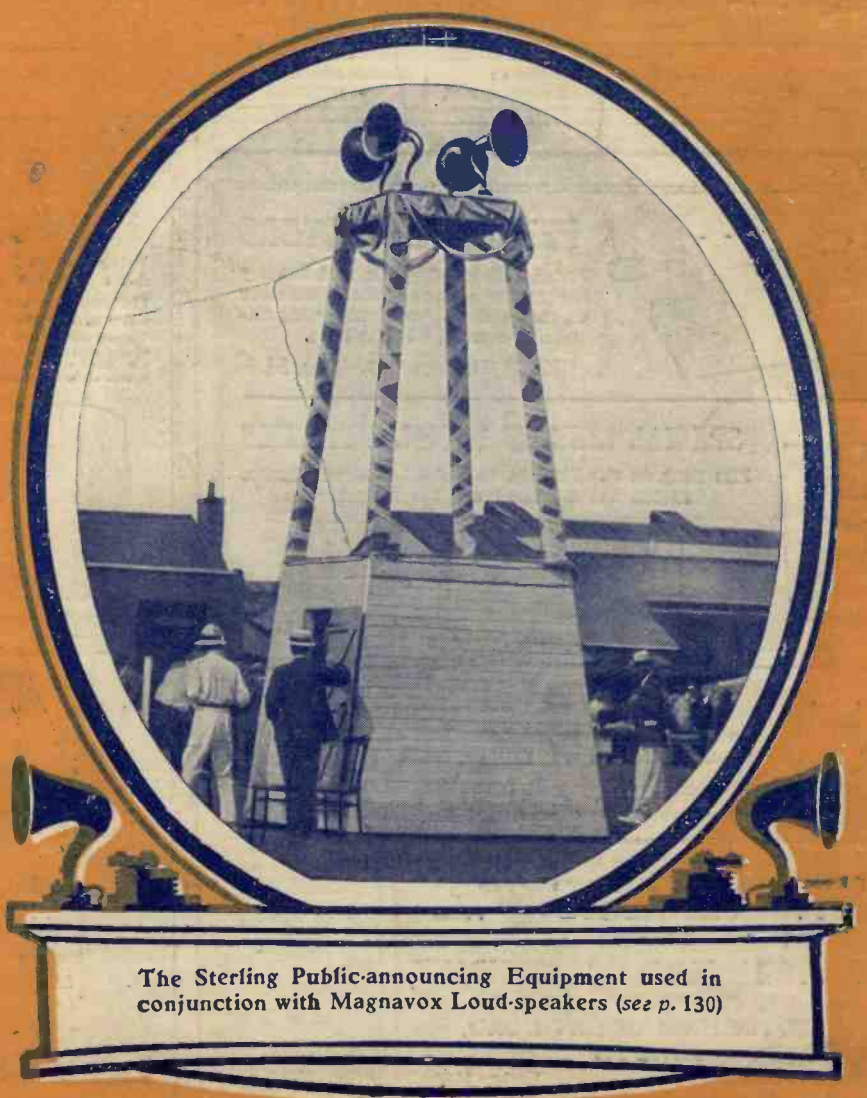

The Sterling Public-announcing Equipment used in conjunction with Magnavox Loud-speakers (*see p.* 130)

Amateur Wireless and Electrics

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POINTS IN PANEL PLANNING

Not to be gainsaid, of course, that the first requirement of a set is that it should work. But its appearance is of importance, too. Start right by designing the panel on simple, convenient and well-balanced lines. This article shows how to set about the job.

IN all probability you have seen in this journal a diagram of a circuit which has commended itself to you by reason of its simplicity, its economy, or its super-efficiency, and you have duly tried it out upon your bench.

Despite the jumble of wires, condensers, coils, valve-holders, transformers and what not, the results have justified your efforts in deciphering the diagram, and you long to see that circuit built up into a nice, neat panel which will take up only a fraction of the room and look much better.

Here the diagram is not very helpful in suggesting how to lay out your panel, for a variable condenser which looks so small in the diagram is going to take up quite a respectable piece of space on the panel, while such a thing as a grid leak may be represented at life size. The following suggestions will doubtless be found of use to the amateur when he comes to plan his panel.

In the first place, assemble all your other components first and the panel last. Then outline the latter on a large sheet of paper, or if by chance the sheet of ebonite is larger than you would like, draw the desired dimensions of the panel instead. Now picture to yourself where you would like to have your condenser dials, filament rheostats, valve-holders, coil-holders or whatever other apparatus your panel must carry.

Setting-out the Panel

Having settled this, place the condenser dials flat on the drawing where you desire them on the panel, and draw around them with a heavy black pencil, afterwards doing the same with the coil-holder. Measure off the distance you want your filament resistance from the bottom of the panel and mark in the screw-holes. Valve holders and other apparatus may now be marked in, taking care to measure off each one separately so as to maintain the balance and symmetry of the whole, and thus produce a neat panel.

Work as carefully on this paper drawing as you would on the ebonite itself, then when your plan is finished it will help you to visualise the appearance of the completed panel. If you wish to change any of the positions of the apparatus you can do so on the paper plan, whereas if you had already drilled the panel it would mess up what might have been a good piece of work if you had first drawn it out on paper.

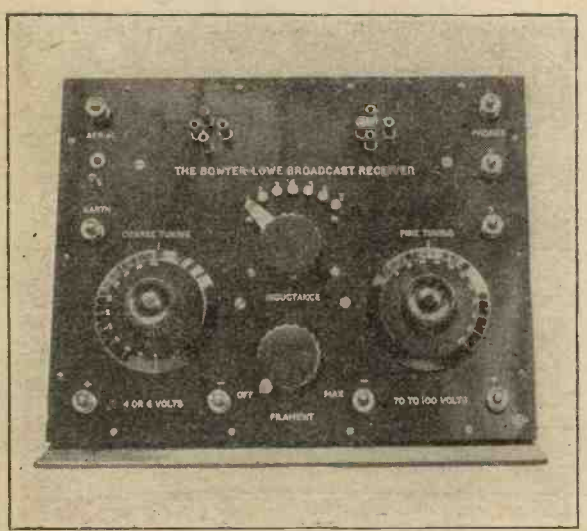
Concerning the dimensions of the panel, there is no fixed rule; possibly what one man would like another would not, therefore use your own judgment as to this. Then, again, the positions of the aerial and earth terminals vary considerably in different sets. Here again you will have to use your own judgment and work them out with consideration as to the position of your lead-in wire and of the set when finished. Possibly the aerial lead may come in at the right-hand side of the panel and the earth wire be taken from the left, or vice versa, therefore place these terminals in the best positions so as keep the aerial and earth leads as short as possible.

These rules apply, of course, to the other terminals on the set, L.T., H.T., phones, etc. Place them where they will be most handy, and now work from the paper plan on to the ebonite panel.

By this method you will feel more satisfied with your finished work and the panel will assuredly look better for the extra amount of care you took over the lay-out.

Glossy ebonite panels should be rubbed down with fine emery paper and treated with turpentine to produce a matt finish.

A. J. B.



Examples of Well-planned and Nicely-balanced Panels

A Couple of Two-valve Sets.

On the Left:
The Bowyer-Lowe.

On the Right:
The Gambrell.

More About Freak Aerials

SO many text-books dealing with the elementary principles of wireless telegraphy insist on the utmost care being taken to insulate the aerial efficiently and to keep it as high and long as possible that the novice is rather surprised when he reads of excellent reception with little or no aerial at all.

Aerials, good, bad or indifferent, are useful enough in their way, yet without one at all it is still possible to "listen-in."

The writer's first experience in the use of freak aerials was in 1914. With a single wire stretched along a landing in the upper part of the house, passing into the bedroom and having a total length of 35 ft., Paris time signals were received daily with a loose-coupled crystal set, using a zincite-bornite combination and a pair of Sullivan 4,000-ohm phones. In addition, several local amateur stations transmitting "spark" came in quite loud enough to be easily read.

The outbreak of war put a stop to further experiments until the advent of direction-finding apparatus, using frame aerials in conjunction with multi-valve receivers.

The writer also had an opportunity of examining an original method of reception devised by an army signals officer. The aerial consisted of a length of rubber-covered cable laid along the ground, the earth being made by means of the usual earth plates.

Strange though it may seem, this method of reception proved exceedingly good.

It will interest readers who are motorists to know that the chassis and body of their cars (if metal) will provide quite efficient aerials for use with valve sets. The tyres will form the necessary insulators, providing they are dry and the car is standing upon dry ground. A more efficient arrangement may be obtained with a small frame aerial on the roof of a closed car, but this can hardly be said to constitute a freak arrangement in view of the fact that quite a number of cars are now so equipped.

Returning to the question of indoor aerials, the "spring-mattress" aerial is often quoted. This, as a matter of fact, has been proved many times to be most effective, even with a simple crystal set, the earth being made to the gas bracket.

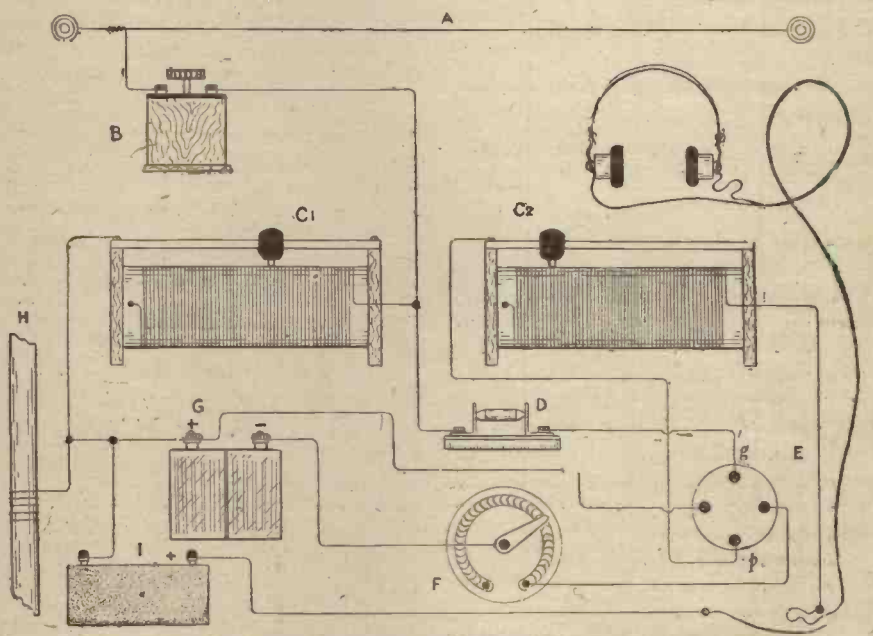
The ordinary domestic bell system may be utilised to advantage as an aerial, while the "Ducon," a small attachment fitting into any electric lampholder, makes it possible to use the house lighting system as an aerial, this being particularly useful to flat dwellers who have no means of erecting an outside aerial. A case was reported in a technical journal recently of the metal trumpet of a loud-speaker being utilised in place of a frame or other form of aerial, but the writer has no first-hand information as to the success or otherwise of this arrangement.

In conclusion, he would like to suggest that those using valve sets should try the experiment of disconnecting the aerial entirely and using the body as an "earth," making contact by touching the earth terminal on the set with the finger. Any broadcasting station within fifteen miles should come in clearly, using phones.

Although freak aerials such as described in this article are interesting from the experimental point of view, they have the disadvantage that the tuning is very critical, and on this account alone it is desirable to use an efficient outdoor aerial for reception whenever possible. A. W. H.

The Simplest Regenerative Circuit

ANY single-valve receiver may be converted into a regenerator by employing a second inductance coil as shown in the accompanying diagram. The feed-back effect is obtained by inserting in the plate circuit the second coil C2. This should be constructed on the same lines as the existing coil C1 and wound with wire of the same gauge. The coils shown in the diagram are simple single-slide inductances made continuously variable by means of the usual slider and rod, with one dead-end to each winding.



Method of Connecting-up Apparatus for Single-valve Regenerative Receiver.

The reference letters in the diagram are explained by the following particulars: A, aerial; B, .00075-microfarad variable condenser (43 plates); C1 and C2, simple single-slide inductance coils; D, grid leak and condenser; E, valve (*g* indicates grid, *p* plate); F, filament rheostat; G, accumulator; H, water-pipe earth; I, high-tension battery.

The voltage of the accumulator and dry battery depends on the type of valve used.

The exact position of the coil C2 can only be determined by experiment, and it may be found necessary to turn the coil completely round to find out which end should be nearest the other coil and whether the coils should be in exact alignment or not.

Fasten the first coil in position, tune in, and adjust the second coil until maximum results are obtained; then fasten the second coil permanently in position.

A little difficulty may be experienced at first, as the tuning will naturally be somewhat critical, but the extra efficiency obtained well warrants the comparatively small amount of patience involved. This regenerative circuit is probably the most simple yet devised, but should not be used for broadcast reception, as it may cause interference. O. J. R.

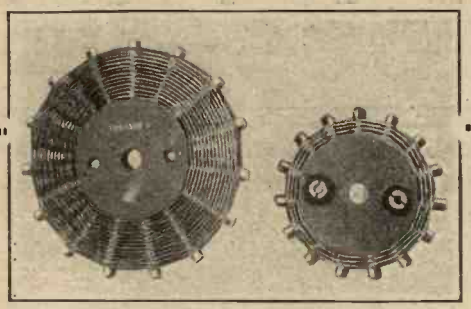
Something New in Basket Inductances

The windings are of stout, flexible silk-covered copper wire

Ohmic resistance is very low and tuning consequently sharp

THANKS to the kindness of a reader of AMATEUR WIRELESS I have recently been able to try out a set of inductances made on entirely novel lines. These coils, which are made by Messrs. Pye, the scientific instrument manufacturers of Cambridge, may be described as basket coils brought to perfection.

The central core, which is the same for all sizes, is cut from a piece of ½-in. ebonite. Inserted radially into its circumference are fifteen hardwood pegs $\frac{5}{16}$ in. in diameter which act as supports and separators for the windings. The ends of the wires are taken through two of the spokes to a pair of sockets which fit plugs such as those used for mounting honeycomb coils. The windings are of double-silk-covered flexible wire, very stout in the case of those calibrated for the shorter wavelengths but thinner in the larger sizes. This brings the ohmic resistance down to a remarkably low figure, which has a beneficial action upon the selectivity of the coils, making their tuning particularly sharp; it also aids in the reception of very weak signals.



Pye Coils, large and small, showing opposite faces.

The Method of Winding

But the outstanding point about these inductances is the way in which the windings are put on. The turns pass on the same side of two pegs, then across, then past two pegs, and so on. Fig. 1 will make this plain. The wire is wound on under considerable tension, hence the turns have no tendency to sag down on to one another. In fact, so good is the spacing between successive turns that if one holds one of the coils up to the light one can see right through it.

The provision of air spacing of this kind and the fact that neither shellac nor wax is used to bind the windings in place reduce the self-capacity of the coils to an almost negligible figure. Even in the case of ordinary baskets impregnated with such a good dielectric as shellac it is very low; but when we have turns lying $\frac{1}{16}$ in. apart, as in the 700 to 1,300 metre Pye coil, with nothing but air between there is very little capacity. The coils are thus suitable for the shorest wavelengths, whose high frequencies make any large amount of self-capacity particularly undesirable in the tuning inductances.

The coils are so robustly made that they may be subjected to rough handling without taking any harm, which, as most of us have discovered by painful experience, is far from true of ordinary baskets.

The coils are a pleasure to use. When I tried them on broadcasting stations signal strength was appreciably greater than with ordinary baskets, tuning was sharp, and the set showed no tendency to fall into self-oscillation.

The full range of coils, with their inductance values and wavelengths, is given below. The figures are for a .001-microfarad condenser in parallel:

Coil	Inductance (Microhenries)	Wavelength (Metres)
1	27	170-350
2	70	250-500
3	90	360-750
4	160	480-920
5	387	700-1,340
6	560	850-1,600
7	1,050	1,200-2,300
8	1,800	1,500-2,800
9	4,600	2,400-4,800

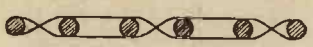
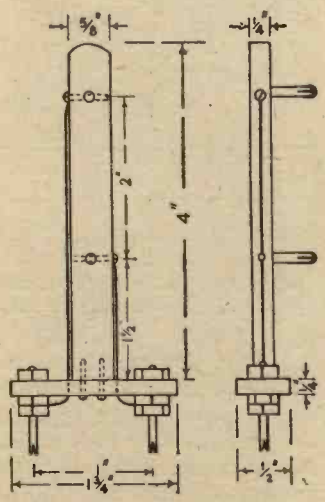


Fig. 1.—Section through Coil.



Figs. 2 and 3.—Coil Mount.

The Wavelengths Covered

It will be seen that all wavelengths from 170 to 4,800 metres can be covered by the use of the odd-numbered coils with a condenser of the size mentioned. If one has the complete set a much smaller condenser can be used, which naturally adds to the selectivity of the set and to the fineness of the tuning, since a greater movement of its knob will be required to produce the same increase in capacity than is the case with the .001-microfarad condenser. A further advantage of these big overlaps is that one can always tune in a signal sharply with the very small condenser used on the tuned-anode units. With ordinary basket coils there are gaps that a .0002-microfarad condenser fails to bridge.

A Neat Mount Described

As readers who become possessed of these coils may have difficulty in designing a neat mounting for them, I give particulars of the one that I have made up for my own set. It has the advantages of being simple to make and most satisfactory to use. The upright member is of ¼-in. ebonite 4 in. long and ⅝ in. wide. In it are drilled, as shown, two ¼-in. holes to take standard coil plugs, which can be purchased for a penny apiece from advertisers in AMATEUR WIRELESS. The plugs will be a driving fit for the holes. They are driven in until the shoulder is just level with the surface of the ebonite. A 4 B.A. hole is then drilled and tapped right through both ebonite and plug. The screws which are passed through them serve both to keep the plug firmly in place and as attachments for the wires. The protruding base of the plug is cut off flush with a hacksaw.

The cross member is a piece of ¼-in. ebonite 1¾ in. long by ½ in. wide. It is secured to the upright by two ¾-in. 6 B.A. screws. In Figs. 2 and 3 valve prongs are shown for fixing the mounting to the stand, but the reader can substitute a plug and a socket to adapt it to the ordinary three-coil holder. In this case the distance from the bottom of the upright to the first coil plug must be increased to 2½ in. in order to allow room for the largest coils.

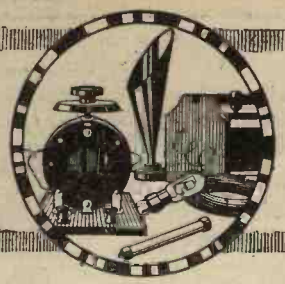
The wires are taken from the screws mentioned, down the sides of the upright, and through holes in the cross piece to the valve pins.

M.A. OXON.

Stripping Insulation

THE baring of cotton- and silk-covered wire ends by means of a knife is often a tedious operation. If the length of wire to be bared is gripped tightly in a piece of folded glasspaper and pulled out once or twice the insulation will come away quickly and cleanly.

T. W. H.

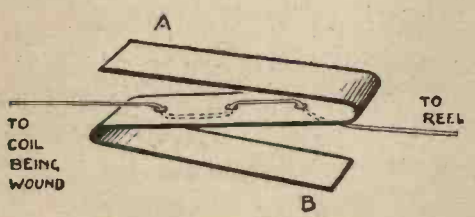


A PAGE OF ODDS—AND—ENDS

A Coil-winding Hint

THE illustration shows a simple and easily-made device, which has been found very successful in keeping insulated wire taut and free from kinks during coil-winding operations.

The material used should be thin vulcanised fibre or presspahn, but alternatively cardboard may be employed if only a small amount of work is to be done with the device.



Tool to Simplify Coil Winding.

A strip about ½ in. wide by 6 in. long is cut and folded into three parts like the letter Z, as shown. Three small holes through which the wire is to be passed are then drilled through the centre portion.

In use the holder is taken between the thumb and first finger of the hand, the top and bottom leaves A and B preventing the wire or insulation from coming into contact with the bare skin; the absorption of moisture from the hand by the cotton or silk covering of the wire used is thus entirely counteracted. The device will also be found of use in straightening lengths of old or bent wire. P.

Making Detectors Dustproof

ANY kind of dust or dirt on a crystal greatly reduces its sensitivity. Since this method of making a horizontal detector dustproof is very simple and efficient, it is well worth the time spent in making one. All that is needed is a small piece of celluloid about 2 in. long and ¼ in. broader than the external diameter of the crystal cup. A clean piece of old film serves admirably.

Bend the celluloid round to make a tube 2 in. long and with diameter the same as the crystal cup. Then stick the two edges in position with acetone, or, better still, glacial acetic acid. You will then have a tube which will just slide over the crystal cup.

Holes to correspond with those in the side of the crystal cup are then bored in the celluloid with the point of a knife or a nail, the tube being pushed on the cup and the screws put in. For the horizontal type of detector this serves admirably in keeping out dust, and furthermore it in no way interferes with adjustment of the contact.

J. K. H.

Tool for Making Catwhiskers

THE making of a neat and professional-looking catwhisker is one of those jobs which test the patience of the amateur to the utmost. The illustration, Fig. 1, shows a simple and easily-made device with which neat and well-shaped catwhiskers can be made in a few seconds from any of the finer gauges of wire.

The dotted lines, Fig. 1, show the direction of winding, the start being made by bending the wire at right-angles round the projection A, the thumb being pressed on the wire at B while winding the whisker and forming the double-angle bend for the contact round the slotted projection C. Fig. 2 gives all necessary details for constructing the parts for the tool.

The only materials required are a piece of sheet brass and a small rod of ebonite, wood or metal for the handle. A. P.

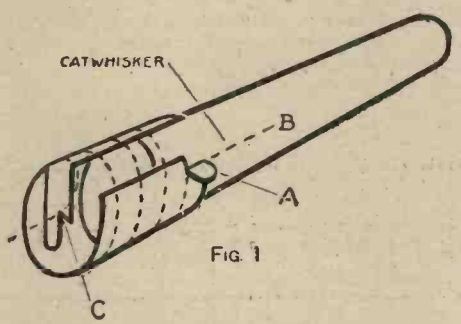


FIG. 1

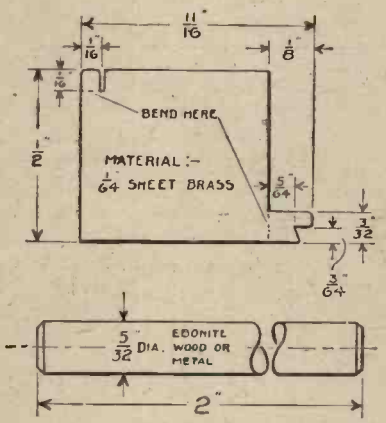
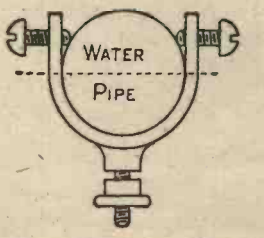


FIG. 2

Fig. 1.—The Completed Tool for Making Catwhiskers. Fig. 2.—Details of Parts.

A Simple Earthing Device

MUCH has been written about earthing the wire from the receiving to the water pipe and many excellent methods advocated. The cycle-clip style of terminal is hard to beat provided the pipe is readily accessible, but if lying close to the wall, or even partly embedded in plaster, the device here suggested will probably be appreciated, as it is easily made, attached and detached for contact cleaning, and even if a portion of the wall has to be removed very little will be sufficient.



A Simple Earthing Device.

There is no need to damage the pipe, even if of lead, by putting too much tension on the binding screws, as even a little pressure ensures a good contact. The device is made from strip brass about ⅛ in. by ¾ in., and length according to the size of pipe. The figure shows how it is bent round a wooden or other roller the size of pipe.

Mark off, drill, and tap the holes above the centre (dotted) line and round off the ends of the binding screws. Drill a hole, tapped if desired, for the terminal and rivet in, the hole on the under side being chamfered for this purpose; file off the surplus to give a smooth bedding surface. If a flat surface, the width of the terminal base, is filed on the top of the pipe the instrument will set better. In any case a little solder may be run round.

C. H. L.

Printing on Panels

TO write on an ebonite panel first clean it with wood alcohol to remove all films of grease, then write the necessary titles with a stiff steel pen and the white ink used for altering blue prints. When the ink is dry the writing should be covered with a transparent varnish.

If at any time it is desired to remove the writing it should be rubbed with wood alcohol, which dissolves the varnish and removes the ink, thus leaving no unsightly marks on the panel. F. C. L.

Letters to Anode.—III

The Wail and : Other Matters :

MY DEAR ANODE,—Your wail about atmospherics reached me when I was myself struggling with that demon of the air or ether, or if there be no ether, whatever it is.

Well, we have the comforting assurance, if there is any comfort to be derived from the misfortunes of others, that we benighted amateurs are not the only sufferers, for I notice that a commercial line in the East has had to be closed owing to atmospherics. This sort of thing we must leave to such men as Marconi, who may be relied upon to produce a remedy in due time, if, indeed, any remedy is possible.

Your other complaint that dwellers in desert places far removed from the broadcasting Elysia are not well catered for is, I think, a just one, but capable of instant remedy.

This journal, as you probably know, did endeavour to solve the problem by initiating a competition that had for its object the improvement of apparatus with a view to assisting the enthusiast who lives outside the normal range of the various broadcasting stations, and it would, I think, surprise the amateurs of London and its vicinity if they were adequately to realise the hideous struggles of the thousands of hard-up amateurs who live some sixty or seventy miles or more from any transmitting centre. It's not so much the hearing of music, etc., but the making it possible for others to hear that counts.

There are circuits a-plenty, but the vast majority are suited to fat purses or skilled brains and fingers. This is where, as I have had occasion to remark before, the local wireless society should come in if there is one. If there isn't, then there ought to be one and at once. Failing this, the local wireless dealer; but local wireless dealers, even if their existence is not merely a tentative offshoot of the ironmongery department, are not as a rule of that altruistic type that will show the would-be purchaser the merits of cheap efficiency as opposed to efficiency accompanied by extravagant finish and glossiness.

Unfortunately, too, many budding enthusiasts are so apt, in all seriousness, be it said, to magnify the results obtainable on their own particular apparatus out of all proportion to their merits. I know of one who got phenomenal results by piling on the H.T. until the valves "blued up" and the transformers burnt-out and the telephones ceased to telephone.

I think it would be an excellent idea if a competition were held at some place sixty miles from London and a substantial prize awarded to the amateur who could produce the best results with the minimum of expense. A great deal of useful information could be gathered in this way.

Summer's here. Let the prize be worth winning, and we, you and I who live beyond the pale of 2 L O, and the rest will turn up in our hundreds to watch, appreciate and applaud. Hasn't the Wireless Society of London become the Radio Society of Great Britain? If it has, let England, country England, have a little of what London has in plenty.—Yours ever and hopefully, CATHODE.

A Vest-pocket Receiver

THE sketch (Fig. 1) gives a general idea of the appearance of a vest-pocket receiver contained in a safety-razor case. The instrument has only one adjustment, the small tuning knob in the centre of the panel.

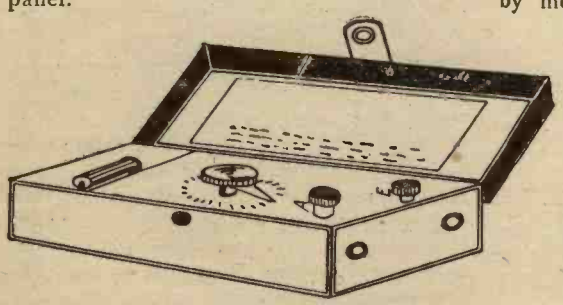


Fig. 1.—The Finished Receiver.

Briefly, the receiver consists of a variable tuning inductance, a cartridge crystal detector, a blocking condenser, aerial and earth terminals, and two plug sockets, to which are connected the telephone leads.

Fig. 2 gives a plan view of the panel and position of the crystal detector, while Fig. 3 is a diagram of connections. The cartridge containing the crystal is shown in Fig. 4, and the tuning inductance in Fig. 5.

The first item requiring consideration is the containing case. The ordinary safety-razor case is ideal for this purpose, and it is assumed that one has been obtained. An ebonite panel is now cut to fit tightly into the case, leaving a small partition in which the crystal is housed. The ebonite panel must be securely supported, either by means of a small strip fixed in the inside of the case or by means of small countersunk screws passing through the sides. To the under side of the ebonite panel is fitted the tuning inductance, which consists of No. 32 enamelled wire wound on an ebonite former $\frac{3}{16}$ in. thick, 2 in. deep, and as wide as can be got into the case, that is, a shade smaller than the ebonite panel itself.

A small contact finger is now made up, soldered to a short spindle, and arranged to make contact on the bared portion of the inductance

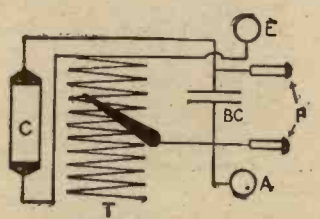


Fig. 3.—Circuit Diagram.

winding, as shown in Fig. 5. This contact finger is moved by means of the tuning knob T on the top of the panel. A pointer may be fitted to enable comparative tests to be made, a scale being engraved on the panel, as indicated in Fig. 2. Two small terminals are fitted at one end of the panel for the purpose of connecting the aerial and earth wires to the set.

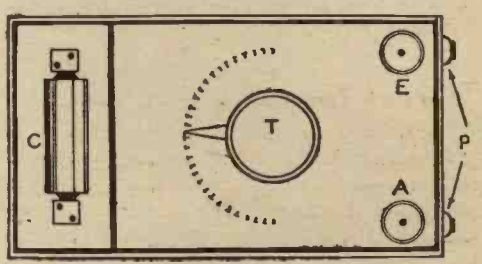


Fig. 2.—Plan View of Panel.

At the end of the containing case two small holes are drilled to take two ordinary valve sockets. These must be securely mounted in position. The holes through which they pass should preferably be bushed with ebonite to increase the insulation efficiency of the set.

A pair of valve legs, corresponding to the sockets, should be soldered to the phone, which, for compactness sake, may consist of a single 4,000-ohm receiver without a head-band.

The cartridge detector is very simple in construction: a short length of ebonite or fibre tube is obtained and two small metal

caps made to fit tightly into each end. One cap should be filled with Wood's alloy, and a good sample of a galena crystal mounted therein. The other cap is fitted with a metal rod ⅛ in. in diameter, to the end of which are soldered several wires of about No. 26 gauge copper wire. Hard-drawn wire should be used on account of its springiness.

With regard to the metal end caps, these are best turned out of solid brass rod, the ends being pointed in the spring-clip holder provided. This holder may con-

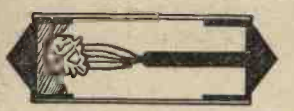


Fig. 4.—Section of Crystal Detector.

sist of two right-angled brass strips screwed to the bottom of the containing case. It is, of course, understood that the cartridge is assembled so that the bunch of copper wires makes contact with the crystal in several different places.

The blocking condenser consists of eleven sheets of tinfoil, 2 in. by 1½ in., interleaved with waxed paper and mounted underneath the panel on the bottom of the case.

The diagram of connections is given in Fig. 3. The telephones are connected to the plug sockets P, the aerial and earth to A and E, B C being the blocking condenser, T the tuner, and C the crystal.

Using an aerial of the regulation length

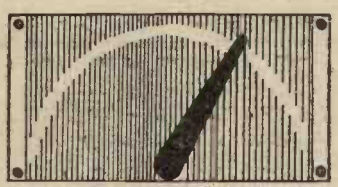


Fig. 5.—Tuning Inductance.

and height the broadcast concerts come through very clearly, while a certain amount of Morse and amateurs' transmissions may be picked up under good conditions.

Quite sharp tuning can be obtained with the wiring as given in Fig. 3, and considering the very limited size of the instrument the results will be found to be highly satisfactory. A. W. H.

Protect the Valve

THE following idea if carried out will make it almost impossible for an amateur to make such a mistake in connecting up as to cause the destruction of a good valve by shorting the H.T. battery across the filament.

The terminals on the valve panel should all be of the telephone pattern, except one of another type which is the terminal for the H.T. positive. The H.T.-positive lead should be fitted with a tag which will fit this terminal but will not fit any other. J. H. L.

Hints on Case Making.—I

THIS article is written to assist those readers who, though possessing a little skill in woodwork, are not competent to make, say, a box with dovetailed joints. Fig. 1 shows such a box in plan and Fig. 2 shows a hinged box with flanged lid.

To ensure that the opposite sides are the same length, set them out together, that is, in pairs.

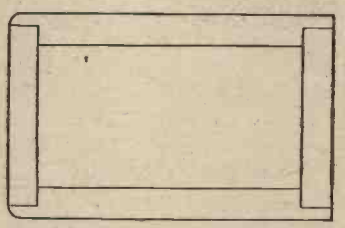


Fig. 1.—Plan of Dovetailed Box.

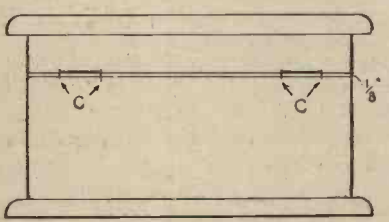


Fig. 2.—Elevation of Flanged-lid Box.

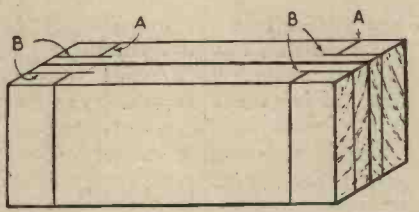


Fig. 3.—Setting-out Dovetailed Joint.

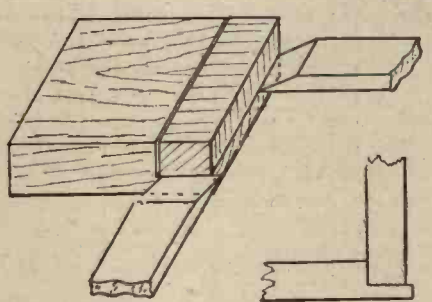


Fig. 4.—Removing Waste.

Fig. 5.—Projecting Portion to be cut off

Set out the inside dimensions correctly, then, providing the wood is planed up accurately, the outside dimensions will take care of themselves. If the parts are the correct length, then the framework, although it may not be quite rectangular when nailed together, can be drawn into correct shape when nailing on the bottom by first nailing one side and then pulling or pushing the other—till the angle fits the try-square—and holding it in position while a nail is driven in to fix it.

A Case without the Flanged Lid

The wood for the framework might be planed up in two pieces, each long enough to make a side and an end, as short pieces are difficult to plane well.

Saw off pieces for the sides ⅛ in. longer than required. Place the outside faces together, as shown in Fig. 3, and clamp them in the vice. Square the shoulder-lines A A right across, using a striking-knife or a penknife, so that their distance apart is equal to the inside length of the box. Gauge the lines B B so that the piece which will lap over the end is only about $\frac{3}{16}$ in. wide for ½-in. wood, and about ⅛ in. for ⅜-in. wood. Remove the wood from the vice, square the lines across the inside faces and bottom edge, and complete the gauge-lines on the ends and edges. (By adopting this method you can hardly go wrong with the setting-out.) The pieces of waste can be removed by two saw cuts, or by one saw cut, and then chiselled, as shown in Fig. 4.

In getting the ends the correct length remember to add to the inside width of the box, twice the depth of a recess. In testing if the ends are equal in length place them together, as Fig. 3, and feel if they are equal. The parts can now be glued and nailed with panel-pins—thin nails like pins, but with a smaller head—and clamped in the vice to set, noting that the angles are square.

After setting for twenty-four hours the portion projecting beyond the end, Fig. 5, can be planed off, and, if desired, the ends rounded, as shown at the left in Fig. 1. The bottom can then be nailed (or screwed) on as before mentioned.

A Case with a Flanged Lid

In making a case with a flanged lid the process would be the same up to this point, the only difference being that the wood would be wider by the depth of the flange plus ⅛ in. of waste, as in Fig. 2.

Having made the framework as above, gauge a line round to give the depth of the flange and another line ⅛ in. beyond this; the object of this ⅛-in. space is to allow for sawing, but less will do if you are fairly expert.

After gauging, the position of the hinges should be indicated by short cuts C C across the waste. The top can now be glued on and left to set, and after this the lid can be separated from the body with a fine saw. Trim the sawn edges carefully with a fine-set plane or on a sheet of glasspaper, and the lid should fit perfectly. J. A.

(To be continued.)

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Fixed Condensers. Guaranteed to 5% accuracy. Our own make throughout. In ebonite cases, ·0002, ·0003 or ·0005, 1/3. ·001, ·002, ·003 or ·004, 1/6.

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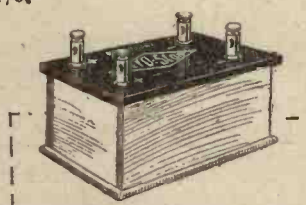

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On Your Wavelength!

Shocking!

ONE never knows quite what the phones are going to bring in when one switches on. A friend had a devastating experience some time ago. He was showing his set to an elderly and austere maiden aunt from whom he had expectations. "Now let's see what music they've got for us," he said brightly, as he turned over the switch. . . . "Hello, darling!" cried an attractive feminine voice, "I just wanted to say good night and send you a kiss." He switched off instanter, and spent a hectic ten minutes in trying to explain how induction from telephone lines takes place; but nothing would persuade the aunt that he was not carrying on a discreditable intrigue, and she has cut him out of her will. The other night when I turned on 2LO I was amazed to hear a charming voice saying with a delightful French accent: "I weell now tell you 'ow I kip my stockings up. De shentlemen weell pliz not listen." Luckily my maiden aunt was not present, or the incomparable Suzanne Lenglen might have done me out of a badly needed legacy.

* * *

Off the Deep End!

Some of our popular writers are inclined to go in off the deep end with the most resounding of splashes when they come to tackle wireless. One of them has recently been examining in a periodical, which shall be nameless, the statements made by certain cranks that their health is affected by broadcasting. On the whole he is inclined to think that there is something in it! "May it not be," he queries, "that our bodies play the part of aerials, the nerves acting as tuning coils and our brains as condensers?" M'yes; I should guess the capacity of that fellow's brain as somewhere about .000000000000001! But the value of his imagination expressed in units of credulity must closely approach infinity.

* * *

Long Waves in Summer

Have you tried to get either Radiola or the Eiffel Tower recently? If you have you have probably suffered no small annoyance from atmospherics on most occasions. They were so bad a little while ago that I gave up the long-wave stations entirely, deeming it pretty well useless to go to the trouble of fitting on inductances such as would reach them, for it was ten to one that as soon as one switched on, the cracklings and sizzlings were too constant and too loud to allow one to enjoy telephonic transmissions even if they permitted one to hear them at all. Those who run the home broadcasting stations are a little envious at times of the big wavelengths upon which these two French stations work. A long wavelength may help a transmitting station to obtain distance—though in view of what American broadcasting stations and amateurs are able to do on round about 400 metres the short waves are living down the old idea that they could not travel—but in summertime, when Nature is taking a hand in broadcasting, the lower bands have a distinct advantage. Thus one can often hear 2LO or Birmingham with very little interference on nights when atmospherics are distinctly bad higher up the scale.

* * *

Atmospherics and Short Waves

The reason, I think, is that though atmospherics which originate close at hand are so powerful that they set our aerials vibrating through sheer shock, those which come to us from distant centres of disturbance are not nearly so effective. Powerful atmospherics cause the aerial to oscillate at its own natural frequency, but those which journey to us from farther afield set up vibrations nearer to those of their own wavelength, and as this is a high one we are less affected by them when we are receiving short-wave transmissions. One thing is quite certain, and that is that if atmospherics are really strong the set should not be used at all. With high resistance phones, which are, of course, in the plate circuit of the last valve, one can easily receive a shock that is far from pleasant owing to the fact that the head is at earth potential. Nor is it good for the set's health to have to deal with the powerful oscillations that such atmospherics produce. If you care to try a simple experiment you can readily obtain an idea of the effects that they produce.

* * *

An Experiment

Place a milliammeter in series with the positive lead from the H.T. battery. With a five-valve set the normal steady current shown will be about 10 to 12 milliamperes. Now tune in to a powerful telephonic transmission at short range and note the effect of the modulation. A very loud note may cause the needle to dip two or three milliamperes. Make a note of the maximum dip read. On an evening when atmospherics are bad switch on again—you need not wear the phones—and watch the needle. You will be surprised to find it moving as much as 8 or 10 milliamperes when a bad crackle comes along. The danger when atmospherics are bad is that they cause the aerial to become charged up at times to comparatively high potentials. Your set is designed and constructed to deal with very tiny voltages indeed. In fact, when a powerful transmission is coming in the potential brought by the lead-in to the grid of the first valve is something like plus or minus *half a microvolt,* an E.M.F. so small that it is hardly conceivable. If, then, we allow big voltages to come in we are subjecting the set to a big overload.

* * *

Thunderstorms

During the great thunderstorms that swept over the country in the early part of July a number of sets suffered badly even though they were not situated actually in the track of the storms themselves. They were left connected up, with the result that condenser discharges between aerial and earth took place via the inductances. These could not stand the pressure and were burned out. A few foolish people who tried to work their sets under these conditions sustained burns on the hands and shocks, either electrical or nervous. They were lucky to escape so lightly. A properly earthed aerial is a protection to a house, provided that lead-in and earth wire are stout, since it acts as a lightning conductor. If atmospherics grow stronger and stronger in hot weather, then you may feel pretty sure that there is a storm about. Switch off, connect the down lead to the earth wire, and you can feel perfectly safe.

* * *

The Frame

With the indoor frame aerial conditions are quite different. There is not the faintest chance of its being struck, and the set may be used with perfect safety even when storms are in the neighbourhood. If a storm is right overhead it may be desirable to disconnect it from the set, since a fairly high potential may be induced in its windings. But otherwise one can do some very interesting experimental work without feeling that one is taking foolish risks. We don't make half enough use of the frame in this country. All round big broadcasting centres, at ranges of from one to five miles, one sees a forest of outdoor aerials, though in most of these cases a frame would do all that is wanted. Its greatest advantage is that owing to its directional qualities you can cut out almost all interference from other stations. It should always be used when trying out new circuits with reaction on broadcast wavelengths.

THERMION.

Loud-speaker Used with a Crystal Set

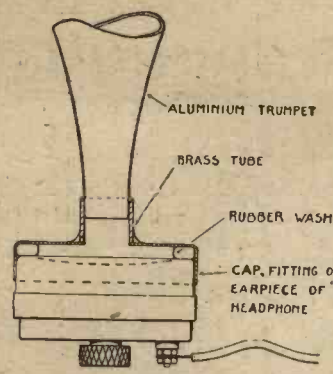
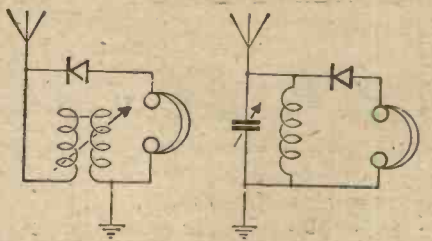


Fig. 1.—The Loud-speaker.

Three weeks ago we published a letter from the author of this short article, and the facts he now gives are in response to a number of requests for further particulars.



Figs. 2 and 3.—Suitable Crystal Circuits.

THE set about to be described is similar in every respect to ordinary crystal receivers. The crystal detector is of the vertical-adjustment variety, the cat-whisker being pushed on to the crystal. It is not very efficient, as the pressure cannot be regulated easily without the catwhisker breaking up the crystal. If the reader makes his own detector let him make it small and rigid, with micrometer adjustment; it saves crystals and results in much louder signals.

Tuning was accomplished by means of a basket coil and variable condenser (a very inefficient method for a crystal set), but it was afterwards found that variometer tuning is far superior, as it increases signal strength a little, and also sharpens the tuning to a surprising degree.

The loud-speaker (Fig. 1) is of a very simple design, and from the results which are obtained it is thought that it works as well as a more expensive instrument. The actual sound-producing part is an earpiece taken from a pair of adjustable phones. A metal cap was fitted over the phone so that a tight fit was made, and a thin rubber washer placed on the inside of the former to prevent the sound waves from escaping.

In the original loud-speaker an earpiece from an ex-army phone was used as a cap, but probably the cover of an electric-light switch would answer admirably. The next difficulty was how to fix a small aluminium trumpet to the cap. This was overcome by fitting a piece of brass tube over the end of the trumpet, then soldering that to the cap. The result was an air-tight joint and a moderately good loud-speaker.

The set is connected in the usual manner, as shown in the diagrams (Figs. 2 and 3), the connections being made with bell wire. In order to get good results from a crystal set, it is necessary to insulate every part with ebonite, and also to keep the crystal free from dust. It can be kept clean by putting a thimble over the cup. If these points receive careful attention one cannot help getting good results.

F. M.

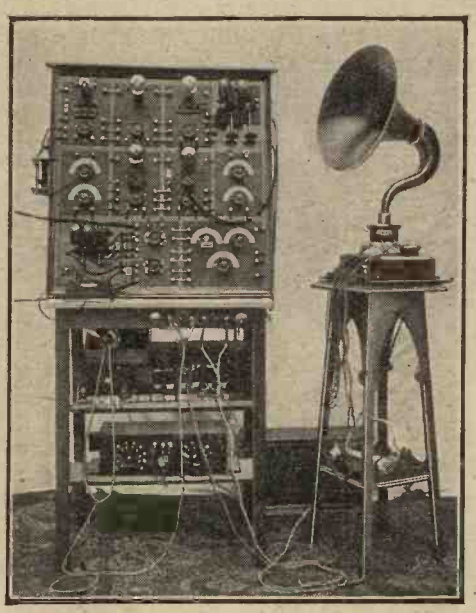
A Five-valve Experimental Receiver

THE five-valve receiver shown in the accompanying photograph originated from Peto-Scott units, though they have been much altered, several refinements added, and an extra condenser fitted.

The two H.F. valves are controlled by the 1,500-ohm potentiometer seen on the side of the cabinet. The writer finds that such a large resistance lengthens the life of the accumulator and permits of finer adjustment. On the rectifier panel the grid leak is so arranged that it can be placed across the grid condenser to L.T. positive or L.T. negative without altering the wiring. The switch on the last L.F. panel, when in "low" position, applies the same potential to the plates of all the valves through the tapping switch on the left of the battery box. The phones are then switched in by means of the switch on the front of the table. When in "high" position the right-hand tapping switch is brought into circuit, and voltages up to 120 can be applied to the plates of the L.F. valves for operation of the loud-speaker, which is mounted on a cabinet that holds three L.R. phones connected in series with it. When not required they are placed inside.

A 2.5-volt flash-lamp bulb is connected in series with the H.T. battery as a fuse and a 2 microfarad condenser is connected across the terminals of the H.T. supply.

Any of the following couplings can be used between the H.F. valves: resistance-capacity, tuned-anode or transformer; all are adapted to plug into valve sockets



A Five-valve Experimental Receiver constructed from a Peto-Scott Unit Set.

The attachment seen on the second H.F. panel is connected to the top coil holder, so that reaction on the anode coil can be used during broadcast hours, the reaction coil being removed from the bottom coil holder and placed in the top one. Double-reaction and magnification circuits can be tried out with the least possible alteration of wiring.

On the second H.F. and rectifying panels are brass clips which connect or disconnect the grid condensers when tuned-anode or transformer couplings are used.

The terminal to the left of the bottom coil holder is used for the easy connection of a frame aerial. The switches on the first panel are series-parallel, stand-by and tune.

The voltmeter on the table is of the double-reading type, and H.T. or L.T. can be tested by simply placing the pin in each socket. Below this is an airtight box large enough to take a pair of phones.

A crystal is adaptable to the valve sockets and can be used for rectification by plugging in and cutting out the grid condenser and leak by means of the brass clip.

The plug hanging on the right side fits a socket in the wall connected to the accumulator.

With this set all broadcasting and Continental stations are heard on the loud-speaker with an aerial at an average height of 28 ft.

A. T.

150 Receiving Circuits in Diagram and Picture

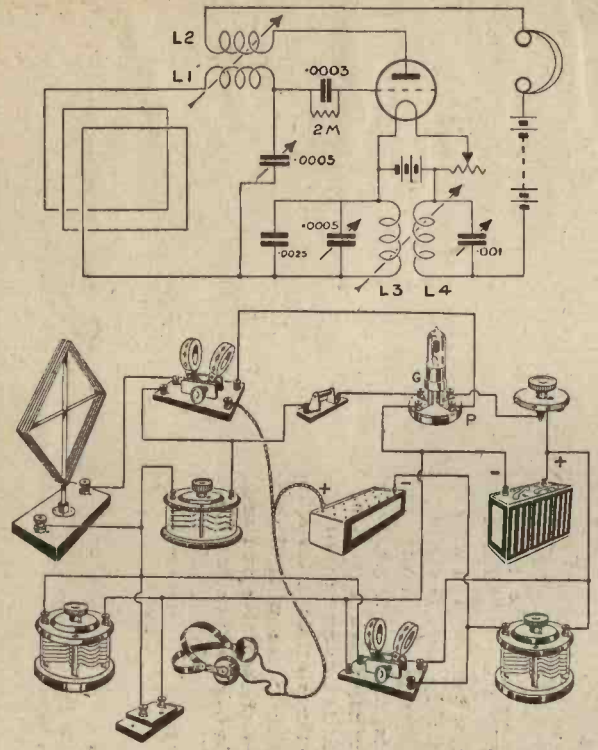


Fig. 31.—A one-valve super-regenerative circuit, which tends to oscillate violently, so must be used on a small frame aerial. L1 and L2 may be small baskets. L3 and L4 should be four times larger than would be required to tune to the wavelength desired if placed in the aerial circuit. The condensers across these coils are of large capacity. A small transmitting valve, with 200-volt H.T. battery, will give best results.

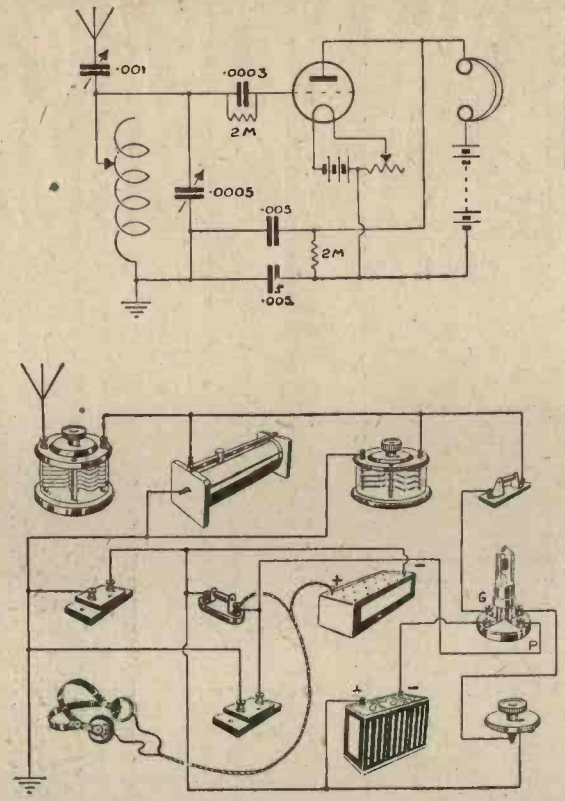


Fig. 32.—Another circuit of American origin. The two blocking condensers in the lower part of the diagram should have a capacity of about .005 microfarad, the leak across them being of a resistance of 1½ to 2 megohms.

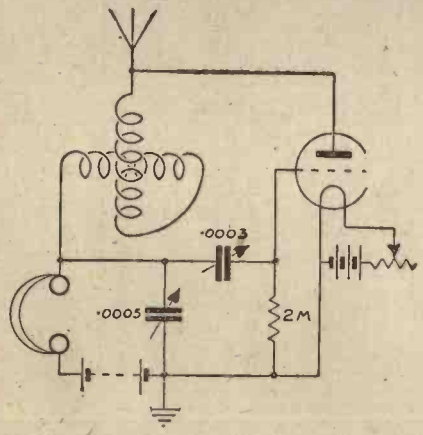
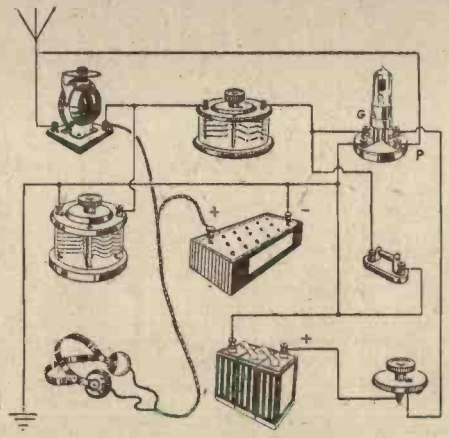
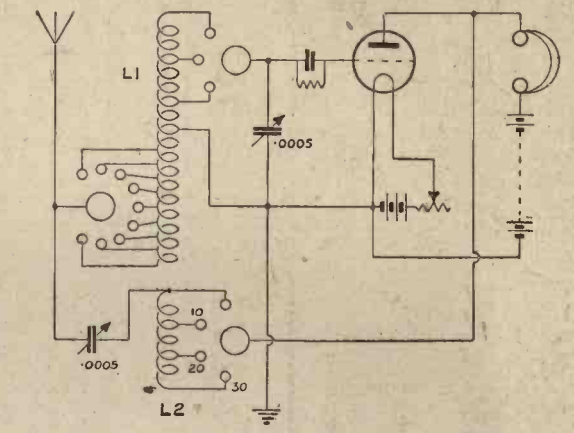


Fig. 30.—A circuit of American origin especially designed for short wavelengths. For best results the grid condenser should be made variable, as shown in the diagram.





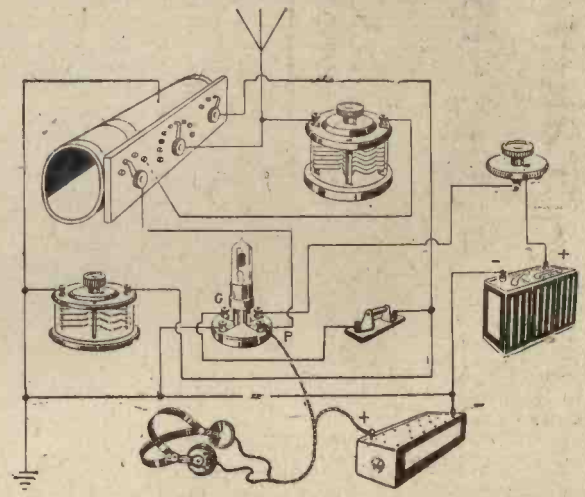


Fig. 33.—The Reinartz tuner, excellent for short wavelengths. The two coils L1 and L2 may be wound on the same former, reaction being obtained by varying the number of turns in L2 by means of the switch as shown. The upper coil L1 should be tapped at every turn from the first to the ninth, counting from the bottom, the remainder of the coil being divided into a further three tappings, any of which may be connected to the grid of the valve by means of the top tapping switch. L1 should consist of about 80 turns on a former 3½ in. in diameter. The connection from earth to L1 should be made about midway on the coil.

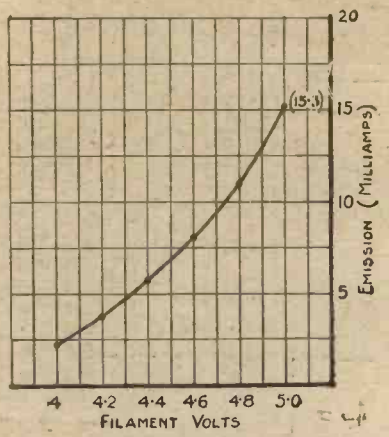


Fig. 1.—Emission Curve (Plate Volts, 50).

THE Cossor "Pink-top" P.2 valve is one of the most interesting of those that have come my way, for it is a further development of the original design which this firm embodied in its well-known general-purpose valve, the P.1. In the P.2 we have the same bowed filament entirely covered by the hat-shaped grid and plate; but as their P.2 is a valve specially designed for high-frequency amplifying the grid itself has been slightly modified, and the distance between it and the filament is a little different.

The valve was subjected to thorough and severe tests, as a glance at the curves given on this page will show. It emerged triumphant from them, and may be described as an extremely efficient radio-frequency amplifier, robustly made, and not over-exacting in its demands upon the accumulator. It should be explained that only one valve was received from the makers for testing purposes, and that any criticisms that may be made are necessarily based on its performances when under trial. It would of course have been more satisfactory to be able to give average values for a series of, say, two or three; but as valves of the same type made under the conditions that are found in an up-to-date and well-equipped factory do not differ greatly from one another, this single specimen may be taken as fairly representative of Cossor P.2 valves in general.

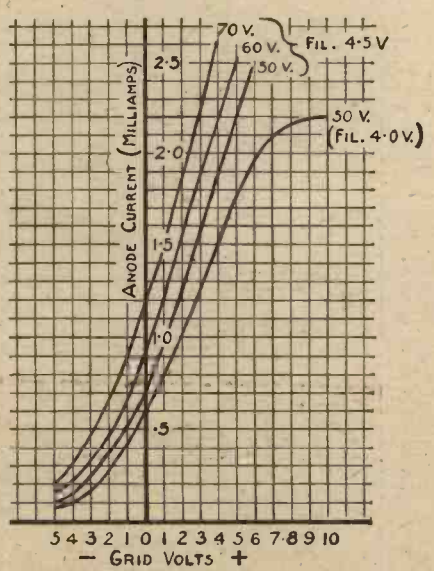


Fig. 3.—Grid-volts and Anode-current Curve.

Volts, Current Consumption, etc.

When the valve was first tried out on the set it was found that it seemed to need more than the 3.5 to 4 volts which the makers give as its working E.M.F. To make quite sure, an emission test was made. This is done by connecting grid and plate together, and varying the filament voltage whilst keeping that on the plate constant. The total emission from the filament can then be taken at different voltages from the low-tension battery.

The curve obtained is shown in Fig. 1. At 4 volts the total electronic emission is 2.26 milliamperes. When the filament voltage is increased to 4.2, it rises to 3.67. At 4.5 volts, which was found to be the most satisfactory figure for actual work on the set, the emission is 6.8 milliamperes.

In order to see what the current consumption of the valve was another curve, shown in Fig. 2, was taken. This curve shows the exact demands made upon the accumulator at different voltages. It will be seen that at 4 volts the consumption is .71 ampere, rising, when 5 volts are applied, to .8. At 4.5 volts the current passed is .736 ampere. The wattage at the best working point is therefore 3.31, which compares favourably with that of other specialised amplifiers, such as the M.O. Valve Company's V.24. The latter needs .75 ampere at 5 volts, or 3.75 watts.

P.

The "PINK-T

"Amateur Wireless
Cossor Valve special
frequency

Grid Volts, Anode Current

The next curves taken were the familiar grid-volts—anode-current plottings. These serve to show, amongst other things, the way in which the plate current is affected by varying potentials upon the grid, and the effects produced by raising or lowering the anode voltage. What is wanted in a high-frequency valve is a steep, straight curve. Though the valve is stated to work with anode voltages of from 20-80 volts, the one under test did not perform well with less than 50 volts.

A glance at Fig. 3 is instructive. The lowest curve shows the results produced by a filament E.M.F. of 4 volts and a fixed potential of 50. It will be seen that the lower part of the curve is pronouncedly

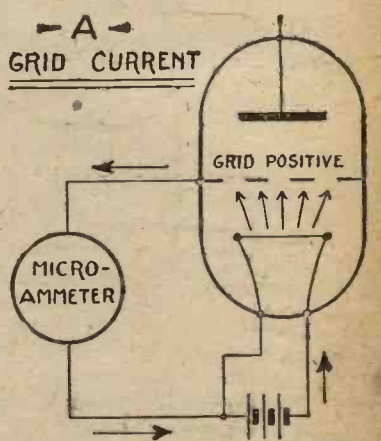


Fig. 4.—Measuring Reverse Grid Current.

hollow, that at zero grid volts the anode current is only .58 milliampere, and that the upper part of the curve bends sharply. At a little over 8 volts positive on the grid the saturation point is reached; the curve, if produced, would continue for some way towards the right as a horizontal straight line, the plate current having reached its maximum.

Now if we increase the filament voltage

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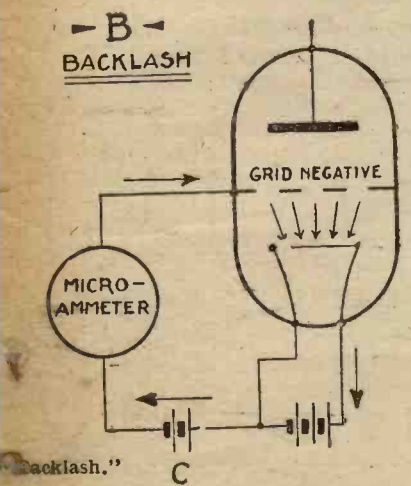
)P" COSSOR

Tests of the new
designed for high-
plification

4.5 an immediate improvement is seen. The second curve from the right shows what happens in this case. Here we have a curve that is much flatter at its lower end. It rises more steeply, and even at 10 volts positive on the grid the saturation point is not reached. With the same filament voltage, anode voltages of 60 and 70 give still better results, as can be seen from an examination of the last two curves. The left-hand curve is about as good as could be wished for in a high-frequency amplifying valve, and 70 volts was found to be the most suitable anode potential when the valve was in use for receiving purposes.

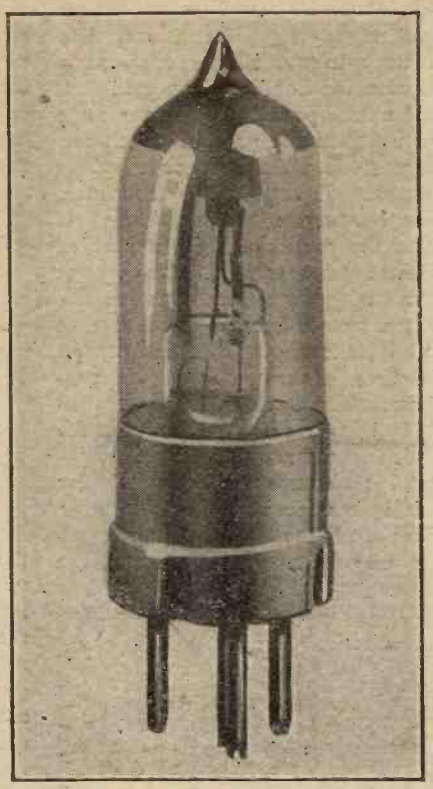
The internal impedance between filament and plate works out at 75,000 ohms and the magnification factor at 11.25. Both of these are satisfactory figures, the latter especially comparing well with the "M factor" shown by most amplifiers, which ranges generally from 6 to 10.



acklash."

Degree of Hardness

The next process was to discover the degree of hardness to which the valve had been pumped, for it is most important that in a high-frequency amplifier there should be only an almost infinitesimal amount of air remaining in the bulb. The test for this is to measure what is called the reverse grid current or "backlash." Here perhaps it may be as well to explain what



grid current and reverse grid current are, for the benefit of those who do not know.

When the grid is positive with respect to the negative end of the filament it exerts a strong attractive force upon the electrons emitted by the glowing filament. The vast majority of these are moving at such speeds by the time that they reach the grid that they pass through its meshes and travel onwards until they reach the plate. A few, however, are caught by the grid. These pass by way of the closed-circuit coil, the secondary of a transformer, or the grid leak back to the low-tension battery; their movement sets up a tiny current in the grid circuit, a current *from* filament *to* grid (Fig. 4 A).

If now we make the grid negative with respect to the negative end of the filament, as we can by inserting a small biasing battery (C, Fig. 4 B), it should exercise such a repelling effect upon filament emissions that no current flows in either plate or grid circuits. If the valve were pumped absolutely free of air, a condition which cannot be produced by any process known to us at present, this would actually happen. As it is there is always a small residuum, for the vacuum is never quite complete, and its presence leads to "backlash" when the grid is made slightly negative.

In this case there is a tiny flow of current in the opposite direction, electrons passing from the grid to the filament. In the case of either grid current or "backlash" current the flow is very small indeed, being of the order of microamperes. With

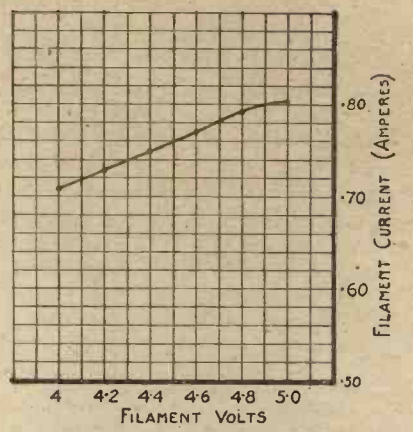


Fig. 2.—Filament-volts and Filament-current Curve.

the Cossor P.2 the maximum reverse grid current is only .02 microampere (Fig. 5), which shows that the valve is as hard as could be desired.

The grid current, however, is rather high. It begins to flow, as Fig. 5 shows, whilst the grid is more than one volt negative, and at zero grid volts (that is, when the grid circuit is connected direct to the negative leg of the filament without any biasing cells) it actually reaches a figure as high as .17 microampere. This, though passable, is certainly on the high side for a high-frequency valve.

Grid Current

Grid current is not normally a desirable feature on the high-frequency side of the set, for its presence produces damping, and may give rise to distortion. So long as valves are transformer-coupled, and show a very small tendency towards allowing grid current to pass, we can control it to some extent by means of the potentiometer, which enables us to adjust the grid potential to any valve between zero and 6 volts positive. But if a grid potential of o

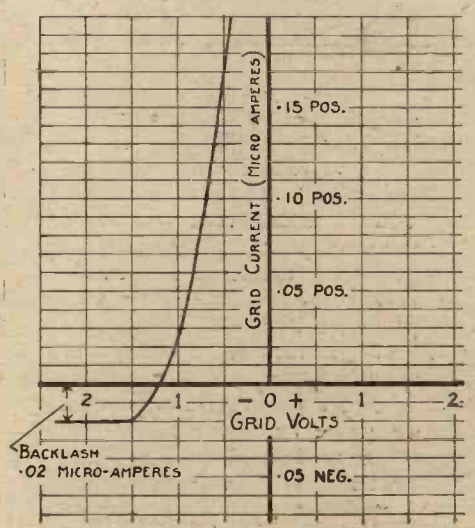


Fig. 5.—Grid-current and Grid-volts Curve (grid current at zero volts = 1 microampere).

volts gives rise to a fairly large flow the potentiometer is not able to help us very much. Matters become worse if we use such a valve as the second of two with tuned-plate coupling, for there the grid leak must be connected to the positive low-tension lead in order to prevent oscillation.

These are really small matters, for there can be no doubt that the valve when actually used on the H.F. side of the set is a really good one. A few slight improvements would make it almost an ideal valve for the purpose. The design might be slightly modified in order to cut down the grid current, and in addition to this two other alterations suggest themselves, and are put forward with due diffidence.

The first is that the grid should be made slightly more open. This would have the effect of throwing the grid-volts anode-current curves (Fig. 3) rather more to the left. The valve would thus work well with a lower plate voltage. The second concerns the distance intervening between filament and grid. If this were reduced a little there might be a considerable improvement in the magnification factor, which would add greatly to the valve's efficiency.

The valve has been thus severely tested and criticised simply because it is worth it. To the uninitiated reader it may seem that many faults have been found with it. But those who are used to examining valves closely will realise that very few valves on the market could have come so well through an ordeal of this kind. Messrs. Cossor are to be congratulated on having produced a valve that will give its users great satisfaction, and one that is a worthy partner for their excellent P.1.

R. W. H.

Around the Showrooms

Adhesive Valve Templates

THE difficulty of drilling a panel, especially for correct fixing of the valve legs or a valve-holder, has been experienced by nearly all wireless enthusiasts. Using moist adhesives with ordinary printed-paper templates there is a tendency to stretch the latter and unconsciously distort the diagram. We have received from the Bay-Brooke Company, Limited, of Harborne, Birmingham, samples of an improved form of template. These consist of a printed template stuck on a cotton gauze by means of adhesive plaster, such as used for medical purposes. In use the template is stripped off the gauze and stuck on the panel, centering lines being provided to get it in the correct position. With each template is given a leaflet of directions and some useful valve data (measurements, etc.).

An Anti-capacity Grid Leak

A novel form of variable grid leak just placed on the market, and shown in the accompanying illustrations, has a new feature in the shape of an anti-capacity extension handle. The grid leak consists of a lead-pencil leak in the form of a semicircle, in the path of which are fitted brass studs which act as tappings for the purpose of varying the resistance.

A phosphor-bronze switch arm is mounted in the centre of the base, which is constructed from erinoid. To protect the surface and generally to preserve the instrument a square base is fitted so that the actual leak is sandwiched in between the main base of erinoid and the subsidiary base. The switch arm terminates in a polished knob of erinoid, across the top of which is cut a milled slot.

The total resistance of the particular instrument in our possession is just over 8 megohms and the minimum approximately 2 megohms. In operation the

An Anti-capacity Grid Leak

grid leak proved quite effective and permitted of sensitive control of the rectifying valve. For the benefit of those who have not yet experimented with a variable grid leak it might be as well to explain that the great advantage of using one is that by careful manipulation it is possible to cut out, or at any rate greatly reduce, "gramophonics," surface noises and cracklings; in short, to ensure purity of conversion from radio to audio frequency.

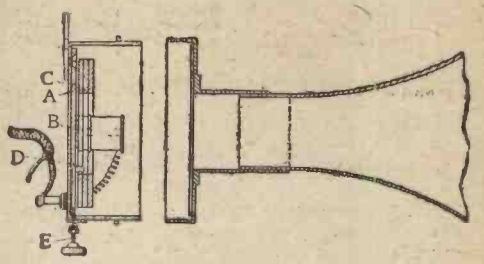
The extra handle consists of a rod of erinoid terminating at one end in a polished knob and at the other there is a small brass pin, driven in at right-angles, and so arranged that it fits into the slot cut in the top of the knob on the switch arm. The overall length of the extension handle is 4¾ in., this having been found quite sufficient. This accessory is manufactured by Messrs. A. H. Hunt, Ltd., of Croydon.

A. W. H.

Progress and Invention

A Loud-speaker

THE figure shows a loud-speaker described in Patent No. 199,651/23 (E. Shipton, of London, W.C.2). It has an adjustable non-magnetic metallic plate fitted behind the pole-pieces at the other side of the coils to the diaphragm. The case contains three ring-shaped electro-magnets A, to which magnetic cores and exciting coils are fixed. Beneath the pole-pieces B, according to the invention, is a brass plate C held at one end. The other end is provided with a conical hole D. This hole and the adjusting screw E are so arranged that the brass plate may be moved towards and actually pressed against

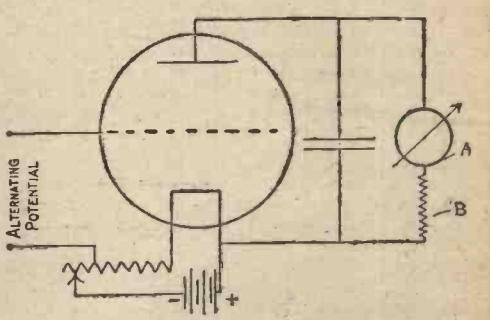


A Loud-speaker (199,651/23).

the pole-pieces. A locking nut is provided to enable the adjusting screw to be locked in the best position. It has been found that by using a plate such as that described not only can the sensitivity be adjusted to give the best results, but also the best results can be obtained for different frequencies of the exciting currents.

A Sensitive Volmeter

HOW an ordinary hard valve may be used for measuring small differences in alternating-current potentials is described in Patent No. 199,483/23 (E. B. Moullin, of Cambridge). It is particularly useful for magnitudes up to about three volts. The anode is connected through a galvanometer A and a high resistance B to the + side of the filament. A is calibrated in volts, and in order to produce a uniform scale. B is included to make the anode potential decrease as the alternating



A Sensitive Voltmeter (199,483/23).

potential difference is increased. The galvanometer is of such sensitivity as to give a full-scale deflection for a current of about 20 microamperes, and B is about 20,000-50,000 ohms. The condenser is of the order of 1 microfarad. After the filament current has been adjusted to get a steady reading any alternating potential across the grid and filament will cause an increase in anode current. When correctly calibrated this increase can be read directly as volts.

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. 133).

Telephone Terminal Board

Q.—I wish to connect five pairs of telephones to a valve receiver having only one pair of telephone terminals.—T. C. C. (London, S.W.).

A.—Construct a terminal board, consisting of a strip of ebonite about 10 in. long by 2 in. wide, on which are mounted five pairs of terminals. Take a connection from the telephone terminals of the receiver to the two outside terminals of the terminal board, making the connections to the under side of the panel. The second terminal is connected to the third, the fourth to the fifth, the sixth to the seventh, and the eighth to the ninth underneath the panel. If less than five pairs are used at any time, the blank pairs of terminals must be short-circuited.—B.

H.F. and L.F. Transformers

Q.—What is the difference between high- and low-frequency transformers?—B. McD. (Newcastle).

A.—High-frequency transformers are usually wound on an air core in order to offer as little impedance as possible to oscillating currents of very high frequency. Low-frequency transformers, which step-up voltages between low-frequency valve stages, are wound on an iron core. The impedance of the core in low-frequency circuits is not a disadvantage, and any high-frequency oscillations which may be flowing in the circuit can be passed across the transformer windings by small fixed condensers.—B.

Home-made Loud-speakers

Q.—Is there any method of using a phone in conjunction with an air-column to make a loud-speaker?—R. C. F. (Twickenham).

A.—Yes, this experiment can be tried in a number of ways. An ordinary loud-speaker is, of course, constructed on this principle, the air column being enclosed by the horn. A temporary loud-speaker can be made by holding a phone over a variety of hollow objects, such as bowls, glasses, jugs, and plates.—R.

An Experiment and the Probable Result

Q.—What would be the effect of connecting the grid of a valve to high-tension positive and the plate to the aerial terminal?—I. C. S. (Chelmsford).

A.—You would get a steady flow of current from the high-tension battery through the telephones on account of the grid being positively charged, thus attracting a steady flow of electrons from the filament. The plate, being connected to the aerial terminal, would be charged positive and negative alternately. In theory, the electron flow from the filament would be increased at each positive half-wave of the incoming oscillations, resulting in a variation in the flow of high-tension current through the telephones producing signals or telephony as the case may be. When the negative half-wave of an incoming oscillation reached the plate, charging it negatively, it is very doubtful if this negative charge on the plate would have any effect on the electron stream flowing between filament and grid, owing to the positions of the plate and grid with respect to the filament. In practice, this arrangement, which consists simply of reversing the connections to the grid and plate, would probably be found to give no sounds in the telephones.—B.

Broadcasting via Land-line

Q.—I have heard that it is sometimes possible to hear broadcasting on the ordinary land-line telephone. Is this so?—W. E. (Rye).

A.—Although in one or two cases persons living very near to a broadcast station have heard the programmes on the ordinary telephone, this performance is not general, and the results must be regarded as something in the nature of a freak. A possible explanation is that the telephone wires are functioning as an aerial, and somewhere in the circuit there is a faulty connection, or partial short circuit between two wires formed by dirt or other substance which acts in the same manner as a crystal detector. Or it may be that the broadcast programmes are carried to the telephone system by powerful earth currents. It may be of interest to record that the writer has overheard a conversation between two people using the telephone nearly a mile away while listening-in on a valve receiver.—P.

Connecting Valves to Mark III Tuner

Q.—Please give particulars regarding the adding of H.F., detecting, and L.F. amplifying valves to the ex-W.D. Mark III tuner.—A. M. S. (London, E.C.2).

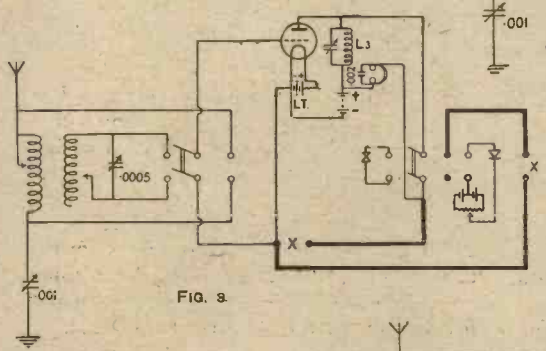


FIG. 3.

A.—Fig. 1 shows the method of adding a valve detector to this receiver, making use of the "valve" position of the right-hand change-over switch, and the valve terminals on the right-hand side of the panel. This figure refers to the reply to a question on page 858 of AMATEUR WIRELESS, June 23rd. The whole of the circuit within the dotted lines constitutes the valve detector circuit, which may be suitably mounted on an ebonite panel to fit into the telephone compartment of the case at the left-hand side. Fig. 2 shows the method of adding a one-valve low-frequency amplifier, to magnify signals received on either of the crystals. The telephones, which are shown joined in the circuit of the receiver at X, are placed in the diagram merely to show to which terminals the primary winding of the low-frequency transformer is connected, and these telephones must be removed when operating the circuit as a valve amplifier. The secondary winding of the low-frequency transformer is connected to grid of the valve and negative of the filament battery as shown. The amplifying panel within the dotted lines may be suitably mounted in the telephone compartment as mentioned above. Fig. 3—in this figure the valve is used as a high-frequency amplifier, followed by either of the two crystals as the detector. It will be seen that the right-hand switch enables either crystal to be used at will. In this circuit, one or two changes in the existing circuit are necessary, but the connections may be easily followed in the diagram. The plate of the valve is joined to one side of a honeycomb coil (L_3) of about size three, counting the smallest of this type of coil as number one. The other side of this coil is connected to positive of the high-tension battery, and also to one side of the telephones. The other side of the telephones is joined to the lower arm of the right-hand change-over switch. The upper arm of this switch is connected to the plate

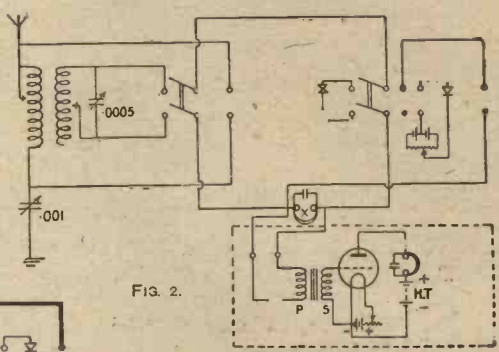


FIG. 2.

Fig. 2.—Circuit Diagram of Addition of Valve to Crystal for Low-frequency Amplification.

Fig. 3.—Addition of Valve as High-frequency Amplifier with Crystal Rectification.

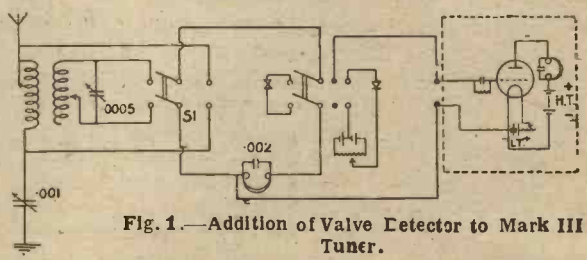


Fig. 1.—Addition of Valve Detector to Mark III Tuner.

side of the valve. It should have been mentioned above that the plate coil (L_3) is tuned by the small variable condenser of about .0003 microfarad. The two pairs of terminals marked X must be left disconnected, and the thick lines in Fig. 3 represent circuit connections which should be omitted if the receiver is re-wired.—B

Other Wireless Waves.—I

LET us consider these waves in the order of their discovery. That ordinary light consisted of waves was first realised by the Dutchman Huygens in 1690, but Sir Isaac Newton withstood him so strongly, maintaining that light was flying particles, that for a long time the truth was hidden. Then, a hundred years ago, Dr. Young showed that Newton's theory could not be correct, and he found the true lengths of the light waves—from 43 millionths of a centimetre for deep violet up to 75 millionths for dark red. (It was later still before Clerk Maxwell showed that the waves were electro-magnetic.) When the colours are spread out into a rainbow or a spectrum there are waves on both sides of it which our eyes cannot see. Those beyond the violet, the ultra-violet rays, can be easily photographed, needing actually a shorter exposure than is necessary for similar visible light. They cannot be made visible, but one of their effects can be seen, for if they strike upon a fluorescent screen made of substances like sulphate of quinine or of crushed horse-chestnut bark, then the screen shines blue. The shortest of them cannot go through glass, although the ones very near to the violet can do so, and these were found to be most useful in war-time for secret signalling. Dr. Bell and Professor Wood, of America, invented a kind of glass called *nickel glass,* which is quite dark and opaque to light, but these ultra-violet rays can pass through it. They can be seen through ordinary field-glasses if a special screen is fixed inside the glasses, and so secret, invisible messages can be sent, which the observer sees as "a little green moon blinking in the darkness the unseen code."

These waves have important medical uses too, and as an example the cures effected by the Finsen light may be remembered. When they shine on ordinary skin in the darkness the skin shines out, particularly if a little grease is present, and it slowly dries up. Even if no visible effect remains the part once shone upon can be detected for months afterwards by its refusing to fluoresce when the ultra-violet rays again shine upon it. For these and other scientific purposes the rays can easily be obtained, very strongly, by electric-arc lamps, which are quite safe if enclosed in glass, but send the rays out strongly if they are surrounded by quartz or simply by air.

Still shorter waves were first discovered in 1889 by Schumann, who brought to his physical experiments all the skill of a long-practised engineer, and retired from his profession in order to carry them out. His mechanical technique was wonderful. His rays will not pass through glass or quartz, or even air; the gelatine of a sensitive photographic film absorbs them, and he had to invent new kinds of plates to record them and to arrange for the manipulation of plate-changing within a vacuum. The rays were produced by electrical discharges in a gas, and the only substance which could form a transparent window for them was a very thin plate of fluorite. With such devices he succeeded in detecting waves as far down as 10 millionths of a centimetre in wavelength. This remaind unsurpassed for twenty years, when Lyman, in America, carried similar principles further and detected waves of half the length. At this stage the photographic plate loses its value as a wave-detector, and use is made of the fact that ultra-violet light is powerful in liberating electrons from metals, and the number set free is an index of the "colour" of the light used. This is embodied in the photoelectric cell, and this new "eye" for seeing invisible light is admirably sensitive—it can detect the ultra-violet light from one candle at three miles distance!

Further down our scale X-rays are marked. There was formerly much dispute as to whether these rays are really waves and not tiny particles: but the chief upholder of the opposite idea is now our leading authority on their properties as waves—Sir William Bragg, of London. The most penetrating X-rays have the shortest wavelengths, but radium gives off a still more powerful kind called gamma-rays, and the length of these is only one hundred-millionth of a centimetre, which is about the same length as a small atom. There is a strange break in the properties of these waves as they diminish in length; the ultra-violet rays are refused transmission by almost every substance known, and the X-rays will go through almost everything. They are different in other ways from wavelengths, it is true, and we hope to understand this difference later on, but the gap between them has only just been bridged. Professor Millikan announced in 1921 that the invisible light waves from certain electric sparks are identical with soft X-rays, and they are about two millionths of a centimetre long. How amazing that such waves should be possible, and also those other waves, two million centimetres long, are both carried by the same all-pervading medium!

The wide gap between the shortest electric waves and the longest light waves will be inquired into in the next (concluding) instalment. R. L.

THE FULL STORY OF ETHER WAVES is a chapter of science yet to be written. From the huge waves of modern wireless down to the minute ripples of X-rays their sequence can be traced in outline, but not yet in full detail. The transmitting apparatus for all of them is probably within our reach, but we cannot yet devise the receiving sets. For one small section of their vast range we all possess a very efficient receiving set—the human eye, which corresponds admirably to all waves tuned to between 16 and 30 millionths of an inch. Many shorter waves than this can easily be found, for the ordinary photographic plate will receive down to seven-millionths, and also some of the very much smaller ones. Then for the long waves we now have the ordinary wireless receivers, and by special and ingenious methods which we shall describe all the remaining waves of the series have been detected except those of lengths between a twentieth and a two-hundredth part of an inch. The story of the search of these inaccessible waves is one of thrilling interest for students of physical science, and we may now at any time hear that the explorers have reached the goal. Then the scale will be complete. Its present state is shown in the figure. This is drawn in a special way in order to accommodate such vastly different figures: each division represents a wave ten times as long as the next division on the left.

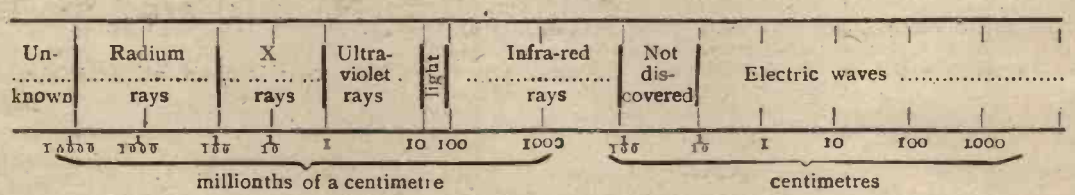


Table showing Properties of Various Waves

Loose Bearings in Condensers

IN variable condensers in which the connection to the spindle is made by a brushing contact at upper or lower bush, both spindle and bush wear in time, and the results are a complete disappearance of all signals at certain points when the knob is rotated, and a series of deafening clicks in the phones as the spindle wobbles round, making and breaking contact as it goes. To remedy this, insert grub-screws to tighten up the bearings. H.

You are destroying your Valves— Spoiling your Tuning—DO YOU KNOW IT?

Why LISSENSTAT Control has been introduced—

The filament of a valve most often breaks at the moment of cooling. Switch off with your wire rheostat—see how suddenly your valve goes out. This jerky, violent effect of your wire rheostat results in the sudden cooling and contracting of the delicate valve filament—very bad for the valve. And if the filament of your valve happens to be jarred ever so slightly at the instant you switch off with your wire rheostat the filament will break ninety-nine times out of a hundred, even though the valve be brand new. Apart from its inefficiency, the wire rheostat RUINS VALVES.

The alternative is the new LISSENSTAT control, which, apart from its efficiency, allows the delicate filament to adjust itself to finely graduated temperature change. LISSENSTAT CONTROL LENGTHENS THE LIFE OF VALVES OFTEN ONE-THIRD TO ONE-HALF. The LISSENSTAT is smooth, stepless, noiseless—such a fractional current can be passed through the valve filament that it is impossible to trace a glow in the metal. Yet control is in one knob. The LISSENSTAT should be used for long distance work always.

Control the Detector and each H.F. valve with a separate **LISSENSTAT.** One **LISSENSTAT** may be used to control three stages L.F. (although individual control is better even here). REPLACE ALL EXISTING FILAMENT CONTROL DEVICES WITH LISSENSTAT CONTROL—LISSENSTATS should certainly go into every new receiver to SAVE VALVES AND IMPROVE TUNING.

Length under 2", diameter ⅞"—LISSEN ONE HOLE FIXING 7/6

IT SAVES ITS OWN COST.

Use also the LISSEN TUNER

150 to 4,000 metres with a '0005 condenser (preferably use the LISSEN MICA VARIABLE CONDENSER) complete with 11-point switch already mounted and connected—4" long, diameter also 4". LISSEN ONE HOLE FIXING ... 22/3

WATCH FOR LISSENAGON (P. Pat.) AIR SPACED COILS

DO NOT USE A REJECTOR CIRCUIT!

Choose any station and bring it nearer—with LISSEN REGENERATIVE-REACTANCE (P. PATENT). A rejector circuit depends upon the use of an extra inductance and variable condensers. It may make tuning out possible, but the variable condensers damp down signal strength so much that tuning in becomes extraordinarily difficult. This muffling effect makes a rejector circuit practically useless for long distance work. It is certainly most unsuitable for English Broadcasting conditions. Obviously it is the negative way of achieving selectivity.

The LISSEN REGENERATIVE-REACTANCE (P. PATENT), on the other hand, is in itself highly selective, and at the same time it actually builds up signal strength. It is possible to cut out **2 LO** from close in—Birmingham, for instance, will come through loudly on two valves without a sign of **2 LO.** The other Broadcasting stations also come in, and the tuning in of Paris and the higher wavelength stations is extremely easy—at FULL BUILT-UP STRENGTH. The LISSEN REGENERATIVE-REACTANCE (P. Patent) is the constructive method and very much the better.

Always tune the LISSEN REGENERATIVE-REACTANCE (P. Patent) with a vernier (preferably the LISSEN VERNIER, barely 1" diameter, designed for fine tuning in H.F. circuits, price **12/6**).

Range, 150-4,000 metres—WITH REGENERATION OVER THE WHOLE RANGE WITHOUT A BREAK. **£2 12s. 6d.** ONE KNOB CONTROLS TUNING AND REACTION.

All good Radio Dealers will show you these — if any difficulty, take no substitute, send direct to Factory, and goods will be immediately despatched, Post Free.

Dealers should please order a few days ahead — ask your factor, or order direct if any difficulty.

Make sure you are given the genuine LISSEN.

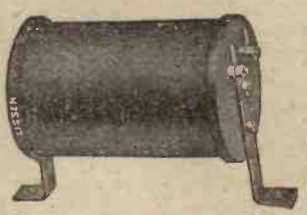
Where this LISSEN REACTANCE (Prov. Patent) should be used.

This LISSEN REACTANCE (Prov. Patent) can be used by itself for one or two stages H.F. The best combination is LISSEN REGENERATIVE REACTANCE for the first stage and this LISSEN REACTANCE for the second stage. Either unit can be purchased first, and the other added in the appropriate position when the second stage of H.F. is desired.

Range, 150 to 600 metres **27/6**
Range 150 to 10,000 metres **32/6**

Blue prints sent out show the easy connecting-up of the LISSEN radio frequency units—there is no switch to connect—everything is complete—no soldering even, although soldering tags are provided—no complications—and LISSEN ONE HOLE FIXING makes fitting a matter of 2 minutes.

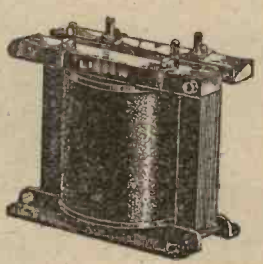
AUDIO FREQUENCY.



The Transformer behind the Detector Valve should have a high primary impedance, but not a high ratio. A ratio of 4 or 5 to 1 is **not suitable.** The LISSEN Type T1 DISTORTIONLESS TRANSFORMER is the only transformer whose design and windings make it ideal for the exacting conditions of the first stage of L.F. amplification. No other transformer has the correct ratio or a sufficiently high primary impedance for this purpose. The LISSEN T1 has a beautiful coil—the most expensive of any. It weighs 8 ozs. Every turn of its many thousands is wound by patent process. Use it (particularly) for the first or any stage... ... **30/-**. Tests prove that it is better than any other to have a LISSEN Type T1 behind the detector valve.

For 2nd and 3rd stage L.F. the Transformer need not have such a high primary impedance, and the ratio may be higher. The LISSEN Type T2 Transformer should therefore be used **25/-**

POPULAR LISSEN TYPE T3



This is the transformer described in "Amateur Wireless" as one of the best light transformers made. Amplifies equal to many much more expensive transformers. No trace of distortion. Carries the LISSEN name guarantee, and is really an excellent transformer **16/6**

LISSEN COMPANY

16-20, Woodger Rd., Goldhawk Rd., Shepherd's Bush, London, W.12

'Phone: 1072 *Hammersmith.*

N.B.—Close to Goldhawk Road (Met.) Station, Shepherd's Bush (Central London) or Hammersmith Tube. 'Buses 11 and 32.

LISSEN APPARATUS—WELL THOUGHT OUT, THEN WELL MADE

Public-announcing Equipment

OUR front-page photograph shows the first public appearance of the new Sterling public announcing equipment, used in conjunction with "Magnavox" loud-speakers, on the occasion of the sports held by the Sterling Social and Athletic Club on July 14.

This equipment has been developed by Mr. Ward-Miller, the firm's radio engineer, and his assistants. The photograph gives a good idea of the way in which the loud-speakers were arranged. The whole of the amplifying apparatus was accommodated in the room at the base of the tower.

In the evening the input of the amplifying system was connected to one of the Sterling two-valve wireless receivers, and the large crowd present was entertained with the concert and dance music broadcast from 2 L O.

This apparatus proved itself invaluable to the success of the sports, which took place on the club's own ground at Dagenham, the competitors being called to the positions promptly by means of it. The spectators were informed of the results a few seconds after the decision of the judges. In addition it assisted the ambulance, made announcements regarding lost property, and was instrumental in restoring a lost child to a distracted parent.

The results were particularly good. It was reported that the announcements during the afternoon and the concert in the evening were heard clearly at a distance of three miles.

Number of Licences Issued

SPEAKING before the Committee of Supply on the Post Office Estimates in the House of Commons on Tuesday of last week, the Postmaster-General, Sir L. Worthington-Evans, announced that until he had had an opportunity of considering the report of the Committee set up by his predecessor he could not be expected to make any announcement of policy. He said that the number of licences issued were as follows: Experimental receiving licences, 52,264; broadcast receiving licences, 111,905; transmitting licences, 843.

Music Publishers and Wireless

"ONE word on the attitude of publishers towards wireless music," says Feste in "Ad Libitum," a feature of our contemporary *The Musical Times*. "For the life of me," he continues, "I cannot understand the publishers' hostility. When concerts are broadcast regularly there may be a slight loss in performing fees on biggish works, but this loss should be counterbalanced a hundred times over by the increased sale of popular music. At present a valuable means of advertising new and popular songs is the ballad concert. Now a ballad concert reaches, say, a thousand hearers. But get these same songs broadcast and you have an audience of a million. Set a million hearers nightly listening to a good performance of *Rose o' my Heart, Heart o' my Rose, Comrade o' Mine, Friend o' Mine, Mother o' Mine, Baby o' Mine, Pal o' Mine,* and all the other *o' mines,* and the sales will leap a hundredfold. The same holds good, of course, with popular pianoforte and violin music. The publisher who first gives up abusing wireless and lays his plans to make skilful use of it will leave his rivals standing."

Australian Notes

[FROM OUR AUSTRALIAN CORRESPONDENT.]

Sydney, N.S.W.,
June 9, 1923.

A MEETING of wireless amateurs holding transmitting licences was held in Sydney some few nights ago when it was decided to form the Australasian Radio Relay League. This body has been formed under the auspices of the Wireless Institute of Australia (an official and technical body), and its object is to organise a system of wireless communications throughout the entire length and breadth of Australia and New Zealand by means of the relaying of messages from one station to another.

It is hoped to create a chain of stations from New Guinea via the Queensland coast to Sydney, thence via Melbourne, Adelaide and Albany to Perth. Such a chain of stations would be invaluable in time of war. In many quarters the view is expressed that the Pacific will be the theatre of operations in the next conflict, and if such is the case the Australian amateurs will have formed, at no cost to the Government, a chain of stations which can be used for defence purposes.

It is not intended to confine the operations of the League to Australia and New Zealand, and once its organisation is working smoothly it is the hope of the experimenters who have promoted it to try and arrange for a relay system of communications between Australia and England, either via New Zealand and America or else via the North Coast of Australia.

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, 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 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, 6.40 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.

OUR IMPROVED type AII. CONDENSER

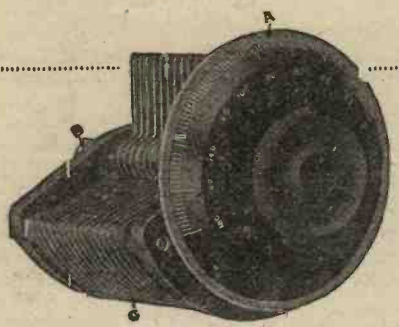
—for Panel Mounting—

SPECIAL FEATURES:

A. Aluminium Screening Disc, which besides enhancing the appearance of the Dial as it lies flush with the Panel, prevents the hand of the operator producing capacity.

B. Metal to metal adjustable bearings, of which we were the originators, as applied to Condensers.

C. 22 Gauge hard Aluminium Vanes.



Complete in every respect, and exactly as illustrated, to the following specification :—

Rotary, Air Dielectric, 22 Gauge Aluminium Vanes, Metal to Metal Adjustable Bearings. Spacing between plates sufficient for pressure up to 1,000 volts. Engraved Ebonite Dial. Is suitable for mounting on any panel up to ⅜" thick by drilling 3 holes. Supplied with screws for fixing.

PLATES		PRICES:		
57	...	·001	...	10/-
29	...	·0005	...	8/6
19	...	·0003	...	6/9
13	...	·0002	...	5/6

Postage and Packing: 1. 1/-; 2, 1/3; 3, 1/6.

If more than 3, kindly include ample for packing and carriage.

Don't allow our low prices to prejudice you. They are no criterion whatever of the value we offer. Our motto is QUALITY FIRST, and every Condenser carries our money-back guarantee.

—is unsurpassed for workmanship, quality of materials employed, efficiency and PRICE, which, by the way, has NOT been INCREASED

TESTIMONIAL—ONE OF HUNDREDS :—

Gentlemen, *23a, Old Bond Street, W.1.*

With reference to the Condenser ·001 which you supplied to our order yesterday. This was fitted to an H.P.R. Tuner and amplifier last night with the most satisfactory results. The tuning of the Paris concerts has been made infinitely easier. We consider your instrument the most wonderful value and a model of what workmanship should be. You can make any use of this letter you like.

All originals can be inspected. Yours truly, A. O. FRENCH BREWSTER.

REPUTATION

Your Condenser is not a "FALLON" unless the name "FALLON" appears on same

WARNING!

Don't buy shoddy sets of Condenser parts which are well nigh impossible of assembly, or half assembled Condensers, which are merely thrown together. BUY OURS. We specialise in Condensers. Complete in every respect and exactly as illustrated.

In response to numerous enquiries we beg to state we manufacture Variable Condensers only.

FALLONS

THE CONDENSER PEOPLE,

230a, HERMITAGE ROAD, LONDON, N.4.

Finsbury Park, near the Manor House.

Prompt Delivery.

Cash with Order.

FALLON CONDENSER MFG. CO., LTD., Makers of Half the World's Variable Condensers.

Agents: London, W.C.2—VANSTONES Ltd., 61, Chandos Street. Cardiff & District—WESTON RADIO CO., 52, Bedford Street, Cardiff.
Sole Trade Distributors—Messrs. G. W. T., Ltd., Shanklin Rd., Crouch End, London, N.8, to whom all trade enquiries should be sent.

FELLOWS

A 2-Valve Set of superior quality mounted in a highly-finished case, that will receive any British or Continental telephony even though the nearest Broadcasting Station is working.

PRICE: COMPLETE WITH H.T. BATTERY, ACCUMULATOR, 100 ft. 7/22 STRANDED COPPER WIRE, 2 INSULATORS, 1 pair 4,000 ohms HEADPHONES.

£15

Plus B.B.C. tax, £1 15s.; Marconi tax, £1 5s.; and 2 Valves. A new 2-valve amplifier mounted in cabinet uniform with super 2 set, **£6**, plus B.B.C. tax, £1, plus 2 Valves.

FELLOWS MAGNETO CO., Ltd., LONDON, N.W.10.

Telephone: *Willesden* 1560-1. *Telegrams:* "*Quixmag,*" *Phone, London.*

EPS 16

AMUSEMENT ALWAYS.

Wherever you are, under whatever conditions, the Fellows Super 2-Valve Set will bring the real pleasures of good entertainment produced in the best possible form to your door.

Imperial Wireless

THE following statement regarding the Imperial wireless chain was made in the House of Commons last Tuesday week by the Postmaster-General:

The Government's policy regarding wireless communication with the Empire was announced in March last, since when two applications from private undertakings had been received, one from the Marconi Company for a general licence covering the whole of the British Empire, as well as foreign countries, and the other from the Eastern Telegraph Company for a licence to erect stations for a service between India and Great Britain. The Eastern Telegraph Company had made a similar application to the Government of India, who had not reached a decision.

In the event of the Government of India granting the company a licence for an Indian station, the arrangements to be made for the provision of the communicating station in Great Britain would be discussed with the company. Negotiations had been proceeding with the Marconi Company as to the basis upon which the services conducted from the Government station and the company's stations should be organised. Referring to the general lines of the agreement which might be made with that company, he said that of three possible courses unrestricted competition could be dismissed at once. The Government station in this country would have the advantage of the Post Office collecting organisation and would therefore secure the unrouted outward traffic. On the other hand, the Marconi station in the Dominions would probably obtain the whole of the unrouted traffic to Great Britain. The Government station would therefore have a great preponderance of outward traffic, but very little inward.

The second possible course, a regional allocation, had many attractions. The various services would be divided between the company and the Government, and each party would be left to conduct its own business without interference or restriction. The Marconi Company, however, preferred the third possible course, some form of pooling arrangement, and the principal terms had been agreed with the company, subject to certain outstanding points which were still the subject of discussion.

It was proposed that the agreement should include the following conditions: (1) The wireless telegraph services with the British Empire to be conducted through stations provided by the company and the Government respectively in agreed proportions, the company at the outset to provide two stations and the Government one, apart from the existing stations at Leafield and Carnarvon. (2) The stations to be maintained at the cost of the party providing them. (3) The revenue of the stations to be pooled and divided between the company and the Government in agreed proportions based upon the effective power of the stations contributed by each. (4) The whole of the services to be worked from the General Post Office by Government operators. A proportionate part of the cost, including overhead charges, to be charged against the company. (5) Unrouted traffic to be allocated as between cables and wireless on the principle of the least delay at the transmitting point. (6) The rates charged to the public to be settled by mutual agreement; when possible the rates to be lower than the cable rates. (7) The Government to have power to admit other parties to the pooling arrangement provided they are satisfied that they are able to provide a station of substantially equal efficiency, and to retain its right to license other parties to conduct wireless services without admitting them to the pool. (8) The Government to have the power of expropriation at specific intervals and on terms to be agreed, probably at the end of the first ten years, and subsequently at suitable periods.

RADIOGRAMS

REPLYING to a deputation concerning the Empire wireless scheme from the Empire Press Union at the beginning of last week, the Postmaster-General said that as far as the Post Office was concerned, they had secured land near Rugby, had given the order for the masts, and it might be expected that within twelve months or a little more the Government high-power station would be in operation.

■ ■ ■

2 Z Y (Manchester) are to inaugurate a Morse code lesson every Monday evening for ten minutes. The speed of transmission will be quite slow at first, gradually getting faster as the listeners-in become more proficient.

■ ■ ■

We hear that in the report of the Broadcasting Committee, which may be expected any moment now, the term "listener-in" has been abolished, and "listener" substituted.

■ ■ ■

Recently Mr. Allan Walker, whilst broadcasting from 2 L O a lecture on Southwark Cathedral, and forgetting the size of his audience, invited any of those interested to come and be shown over the cathedral on the morrow. More than 600 people responded to his invitation.

■ ■ ■

An international association of florists has arranged, so the story goes, that bouquets ordered in one country can be delivered in another within a few hours. An up-to-date system of wireless communication has been devised, so that the florists' orders can be interpreted with the minimum of delay.

The following resolution was passed unanimously at a recent meeting of the Authors' Society: "That this meeting recommends members of the Authors' Society not to give permission for their works to be broadcast without payment of a fee, and that in cases where they give permission or payment of a fee members should notify the secretary of the society of the terms on which they are dealing with the British Broadcasting Company or other companies."

■ ■ ■

Bermondsey Board of Guardians have sanctioned the expenditure of £53 on a wireless receiver for the workhouse.

■ ■ ■

We have definite information that the new Manchester station will be opened on Friday, August 3, at 9 p.m., the Irish Guards Band supplying the greater part of the musical programme on this occasion. The Birmingham station will be opened on Saturday, August 11, at 9 p.m., the Royal Air Force Band taking the leading part in the inaugural programme in this case.

■ ■ ■

Five thousand members of the cast in a big American film were recently given their orders by the director via wireless.

■ ■ ■

"Whilst a fleet of cars were going through the country one night in Germany, it is reported, they suddenly stopped and could not be started. It appeared afterwards that a secret station had been transmitting special waves, which put the magnetos out or order." Perhaps!

Two lofty peaks of the Alps in Bavaria are the proposed towers for an aerial. The wires will be anchored to heavy devices like wagons. Water power will supply the necessary current for transmitting.

▪ ▪ ▪

American police may have motor-cycles and side-cars fitted with frame aerials and receiving apparatus, so that they may be kept informed of the movements of criminals by transmissions from head-quarters.

▪ ▪ ▪

A control panel, similar to an ordinary telephone switchboard, is used at the Washington naval station to connect operators to any one of several aerials used.

▪ ▪ ▪

2 L O is trying to standardise the type of programme transmitted on certain nights, so that listeners-in will be able to judge beforehand whether they are likely to enjoy the programme on any definite night. The suggested scheme would be on the following lines: Sunday afternoon and evening, miscellaneous programme, with organ recitals, etc.; Monday, a popular orchestral evening; Tuesday, a classical evening without the orchestra; Wednesday, a popular orchestral evening; Thursday, a general evening; Friday, a special orchestral (composer and symphony concerts) evening; while Saturday would be, as it is now, for dance and other popular music.

▪ ▪ ▪

Providing the Sheffield relay station, still in the experimental stage, is successful, the B.B.C. would like to build similar stations in the towns named below, if permission for a wider wavelength band could be obtained: Liverpool, Leeds, Bristol, Hull, Bradford, Nottingham, Portsmouth, Stoke-on-Trent, Leicester, Plymouth, and, of course, Sheffield. These towns cover a wide area, and would enable all to listen-in to the local station with crystal or one-valve sets, while the high wavelengths used by the relay stations would still allow the owners of multi-valve sets to receive the distant stations.

Catalogues Received

WE have received from G. Davenport (Wireless), Ltd., of 99-105, Clerkenwell Road, E.C.1, the second issue of their "Wireless Bulletin," a catalogue of components and accessories.

The firm of M. Raymond, 27, Lisle Street, Leicester Square, London, W.C.2, has issued a bargain-price list, which many readers would like to have. We see special lines in variable condensers, French valves, coil-holders, basket coils and potentiometers, but the mention of these few articles does not in any sense exhaust the list. Readers who would care to have a copy of this list should apply to M. Raymond, and in their application should mention AMATEUR WIRELESS.

2 L O Without Crystal or Valve

SIR,—It may interest your readers to know that I can hear 2 L O plainly on my crystal set without using a crystal at all.

Clean the crystal cup, so that no pieces of crystal are left, break a needle in half to replace catwhisker, and search all round the cup until the loudest signals are heard. I should not advise this where you have a good piece of crystal, but it comes in handy if you happen to lose your crystal and it is too late to get another.—A. S. (West Ham).

Atmospherics and Fading

SIR,—While listening-in on July 25 I was interested in the following experience with atmospherics. I noticed that just prior to the clap of the atmospheric that the signal strength faded, and after the clap had taken place the signals came in louder than normally. This occurred on the amateur wavelengths after broadcasting had finished. Is it possible that atmospherics have some connection with the problem of fading?—H. E. G. (Macclesfield).

"Repair Your Own Valve"

SIR,—Being a keen reader of AMATEUR WIRELESS, I should like to make a reference to your issue No. 58, July 14, p. 53. Under correspondence there is an item, "Repair Your Own Valve," C. M. (Great Yarmouth).

I have done a fair amount of glass work in my time, being an analyst in the G.W. laboratory. I tried C. M.'s idea, but whoever tries to do it, *please be careful,* or bang goes the valve, with a piece of glass probably in someone's eye.—W. J. C. P. (Swindon).

Retailers and Valves

SIR,—As I have no doubt that AMATEUR WIRELESS does everything possible to improve the position of all amateurs and experimenters, I should be greatly obliged if you could give publicity to this proposal, which affects all users of valves. The adoption of this idea would protect amateurs from unscrupulous dealers.

Some dealers use stock valves for demonstration purposes. The result frequently is that when one buys a valve it has been used for some days, and possibly weeks, on a demonstration set. This means that many of its useful hours of life have been used up before it reaches the amateur. You will, I think, agree that this is bad for both the amateur and the wireless trade generally.

My suggestion, briefly, is this, namely, that each valve should be supplied by the manufacturers in a sealed box. The seal could then be broken in the presence of the buyers and tested in the usual way. Thus there would be no possibility of the valve having been used previously, except during the factory tests. A refinement of this idea might be to leave two small holes in the box near the valve-leg end and a larger one at the top. Two pieces of wire could be inserted through the holes to test the filament, and the light would show from the top. This would save opening the box to test each valve.

I am afraid that I have taken up a lot of your valuable space, but I think that this is a matter of immediate interest to all connected with wireless in any way, and that it would be a good thing if manufacturers were to adopt some such plan. At present no protection whatsoever is afforded to the amateur.—R. F. M. B. (West Kensington).

Hackney and District Radio Society.

Hon. Sec.—C. C. PHILLIPS, 57, Highfield Avenue, Golders Green, N.W.11.

ON June 28, Mr. A. Valins gave an instructive lecture on "Variometers and Variometer Winding." He exhibited a large number of variometers of all kinds, in various stages of completion, and wound several kinds before the members. Special mention was made of the winding of a stator, with wire internally wound—a very tricky operation, and one which requires the utmost of patience.

Tottenham Wireless Society.

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

ON June 27, Mr. J. Kaine-Fish lectured on "Continuous Waves." The lecturer explained the form of continuous waves, and fully discussed the various wave forms obtained by super-imposing one set of oscillations on another of different frequency or amplitude. Among the advantages of C.W. in reception the lecturer mentioned the greater selectivity, and the consequent absence of jamming. These points were made evident by demonstration on the society's set.

Honor Oak Park Radio Society.

Hon. Sec.—G. J. PRICE, 22, Honor Oak Park, S.E.23.

AT a meeting of the society held on June 27, a lecture on "Dual Amplification," followed by a demonstration, was given by Mr. J. C. MacVey. The lecturer laid great stress on the fact that dual amplification circuits could be easily understood and worked by even a beginner. After giving a clear explanation of the combination of high- and low-frequency amplification with one valve when using a crystal detector, Mr. MacVey gave a detailed explanation of the method of connecting up the instruments.

The lecturer's own two-valve dual set was used for demonstration purposes. Reception when using valves only was compared with that when using the dual circuit.

Beckenham and District Radio Society.

Hon. Sec.—J. F. BUTTERFIELD, 10, The Close, Elmers End, Beckenham.

AMONG the most interesting features at the fête held on June 27 was the entertainment provided by this society, which ran a continuous series of demonstrations from 6 p.m. onwards. With the aid of a six-valve set and two loud-speakers, it was not only possible to hear everything loudly in a tent, but also for a distance of fifty yards away.

Southampton and District Radio Society.

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

ON June 28 Mr. Chester gave a lecture on magnetic testing. He subsequently dealt with various questions arising out of his subject. Mr. G. Sutton, secretary of the Dulwich Wireless Experimental Association, who was present, expressed appreciation of the lecture, and also exhibited an ingenious variometer rotor constructed from an ordinary rubber ball.

Ipswich and District Radio Society.

Hon. Sec.—H. E. BARBROOK, 46, Foundation Street, Ipswich.

BY the courtesy of the Ipswich postmaster, the members of this society were enabled to spend a very interesting and instructive afternoon on June 23, when the Ipswich Telephone Exchange was inspected. Special interest was taken in the new apparatus in the test room.

Apart from the regular meetings for lectures and practical work, this society has arranged for further visits to Pulham aerodrome, the Parkeston wireless station, and several field days are to be held in the district.

Walthamstow Amateur Radio Society.

Hon. Sec.—H. J. SARSON, Belle Vue House, Beacontree Avenue, Walthamstow, E.17.

ON June 16 the club held its first field day of the season. Although the weather was dull, the rain held off throughout the outing. An aerial was erected in a dry spot, without damage to either person or property, and after an interval for tea experiments were the order of the evening. Several sets and arrangements of circuits were tried, ranging from well-made and efficient waistcoat-pocket crystal sets up to the club's multi-valve set. Crystal-valve circuits were included.

The experimenters found themselves handicapped by lack of an efficient earthing system, the loose, well-drained soil of the high ground proving a poor conductor under the circumstances. It is hoped to repeat the tests at an early date, making use of the knowledge gained. It is also proposed to include the use of kite-aerials in future proceedings.

Radio Society of Highgate.

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

ON July 13 Messrs. H. Andrews (2 T A) and F. G. S. Wise (5 C F) gave a lecture and demonstration of direction-finding. The theory of the use of a frame aerial, and the methods of connecting such an aerial to various types of receivers, were fully explained, and practical details for the construction of a frame aerial to tune to a wavelength of 200 metres were given.

On July 15 an interesting test was carried out by means of a mobile transmitting set fitted to a motor-car. Members of the society listened-in to the transmissions by means of frame aerials in an endeavour to follow the course of the car. The results are not yet available, but are awaited with interest.

Gramophones are in the possession of most readers, and in the current issue of *Work* (price 3d.) will be found a well-illustrated article describing the construction of a cabinet to contain one of these instruments. Other articles in this number deal with: "Surface-hardening of Copper and Gunmetal," "Practical Notes on Flash-boilers," "Hinges: Their Varieties and Uses," "Two Catapults and an Air-gun," "Crystals for Wireless," "Novel Method of Bending Small Mouldings," "Practical Upholstery: An Ottoman Couch in Tapestry," "That Exposed Door!" "Repairing an Iron Gate," "Stringing Tennis Rackets with Steel Wire."

ANNOUNCEMENTS

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

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

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

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

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

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

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Complete Set Parts for constructing full-size crystal set, guaranteed for 25 miles, 7s. 6d.; Plastic metal for mounting crystals, 6d. Agents wanted. —Telradio Co., 26, Leather Lane, Holborn.

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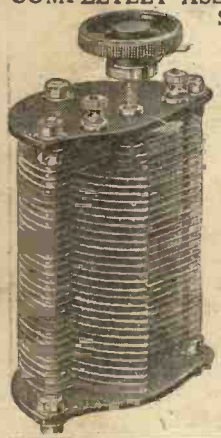

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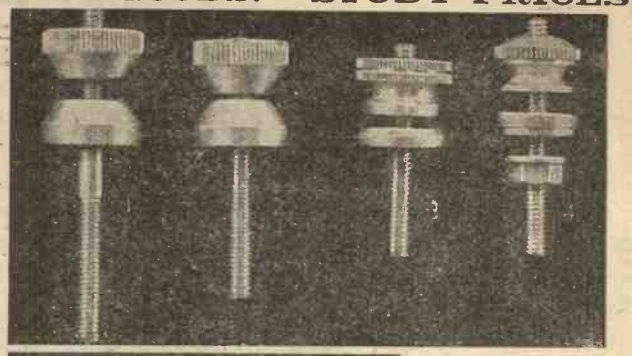

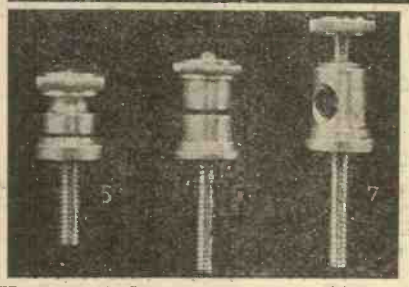

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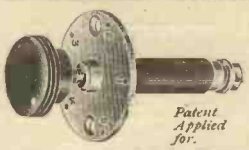

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Printed and Published in England by CASSELL & COMPANY, LIMITED, Ludgate Hill, London, E.C.4. Sole Agent for South Africa, CENTRAL NEWS AGENCY, LIMITED. Saturday, August 4, 1923.