AMATEUR WIRELESS, November 28, 1925.

TELEGRAPHONE THAT BOTTLED THE SPEECH

NOVEL MULTI-CIRCUIT RECEIVER

Amateur Wireless And Electrics

Vol. VII. No. 182. SATURDAY, NOVEMBER 28, 1925 Price 3d

PRINCIPAL CONTENTS

WELL ILLUSTRATED

Registered at G.P.O as a Newspaper.

A BROADCAST CONCERT FROM THE AIR

The photograph shows the saloon of the aeroplane from which a concert was recently broadcast whilst in the air.

SWITCHES

ALTHOUGH Switches are very necessary in wireless sets, they are among the "danger spots" where current may "get off the rails," as it were; they may cause the introduction of high resistance owing to faulty or dirty contacts, and in addition they may introduce very undesirable capacity effects between the opposing terminal strips.

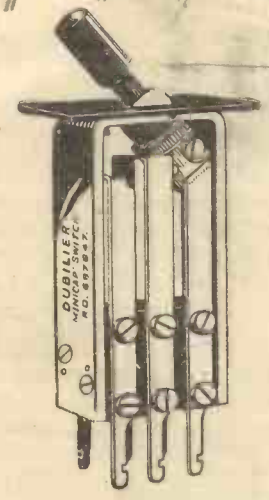
When the Dubilier Minicap Switch was designed, these particular problems were solved—the first by the use of definite self-cleaning rubbing contacts, the second by a special arrangement of the terminal strips, as shown in the illustration. The terminals have substantial tags for soldering, and the frame is solidly contructed of a special metallic alloy.

The Minicap is a double-pole double-throw switch useful in all circumstances for general purposes.

Manufactured by the Dubilier Condenser Co. (1925) Ltd., in addition to the following:—Fixed Mica Condensers, Variable Air Condensers, Anode Resistances, Grid Leaks, the Dubrescon Valve Protector, the Ducon Aerial Adaptor, the Mansbridge Variometer. The Company are also sole concessionaires for the products of the Mansbridge Condenser Co., Ltd.

Whenever any of these products are required, the wisest course is to

Specify Dubilier.



The Dubilier Minicap Switch.

8/-

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DUBILIER
CONDENSER CO (1925) LTD

Amateur Wireless and Electrics

The Leading Radio Weekly for the Constructor, Listener and Experimenter

Edited by BERNARD E. JONES

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Chief Contents

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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.

READY-MADE AERIALS

THERE are quite a number of freak or "stunt" aerials, mainly improvised and including such inapt objects as fenders and spring mattresses. It is astonishing how audible broadcast can be when picked up in this way with a simple crystal set, especially when a B.B.C. station is within a mile or so. More astonishing still is it to find that one's own body can act as a good aerial, the writer finding that, while his metal bed-frame gives quite useful results, his own body (whilst sitting on the self-same bed and holding the aerial terminal) is better still.

Importance of the Earth

Although at first thought remarkable (though, of course, not actually so), the "earth" is much more necessary, and so one gets an arrangement in which a wire comes up from some form of earthing expedient and there, at the elevated end of it, is the set. From the set there follows an aerial of sorts; but while the earth is so vital, any kind of aerial may suffice. But such an aerial, as generally happens, has to be somehow or other rigged-up with a certain amount of trouble.

Without doubt a wired aerial is much better than a stunt one, though there are occasions (apart from experimental or demonstration purposes) when such can be fallen back upon. A lengthy stretch of metal, however, is bound to be superior to a compact article of the domestic sphere. There are some who have been quite satisfied with results obtained from the gas-piping of the household, or from gutters and rain-pipes. These not only necessitate a really good earth, but naturally entail a certain dubious amount of insulation on the part of the walls, etc.

The writer has often had to extemporise wireless gadgets. On one occasion, being in "digs" where an aerial (even of an indoor type) was regarded by the powers-that-be as a direct invitation to lightning, it was necessary to rouse no suspicions or animosities. (Landladies must be treated with circumspection!) What the writer actually did may be interesting.

He discovered that although gas lighting was used, the house had years before been wired for electric purposes and was now, of course, isolated from the mains. Why not utilise the wiring? No sooner thought than tried! Very faint signals were at once obtained from the nearest switch, but the best effect was obtained from a ceiling rose in a bedroom.

Now in the wiring of a house one of the two main wires "loops-in" at all the switches, while the other "loops-in" at the ceiling roses and the like; the remaining wires, of course, run from switches to the respective ceiling roses. As a rule, all the lamps in a house are not fed via one particular fuse or pair of fuses, but are divided into a number of circuits. In the writer's case the upper floor of the house formed one circuit, and it will readily be seen how, by connecting-in at the suitable terminal on the now disused ceiling-rose, quite a length of fairly well insulated wire inside wooden casing and at a good height became available.

Results were, as previously indicated, good, but the 40-turn coil which the writer had invariably used had to be cut down to about 25. Tuning was very broad. This, then, was an aerial formed by the electric wiring of the house—not, of course, by any means a new expedient except that the wiring was in this unusual case "dead."

Another Attempt

Well, after a time there seemed to be a kind of disapproval in a certain quarter—not so much heard as felt. The writer thereupon cast about for another aerial—of wired type, if possible. The bell-push in his sitting-room caught his eye. Removing the cover, he connected the set. The local station came in well and better than an ordinary indoor aerial, though not quite so good as on the other arrangement.

One evening, by pure bad luck, the connection to one of the terminals on the bell-push pulled across, and to the writer's dismay the bell rang. The landlady first made her way to the front door. There was an interval (the landlady undoubtedly did some hard thinking), and then the room door opened. . . . G. E. MOORE.

WHERE SHOULD THE RHEOSTATS BE?

NEW LIGHT ON AN OLD TOPIC

A GOOD deal has been written at one time or another about the position of the rheostats; that is to say, whether they should be in the negative or the positive filament lead. In the majority of sets made at the present time the rheostats probably occupy the former position since this came into popularity some time ago for a very good reason.

Effect of Filament Potential

If you look at a circuit such as that shown by Fig. 1, which is a note magnifier added to a crystal detector, you will see that IS of the intervalve transformer is connected directly to the negative low-tension lead. If we regard the negative terminal of the accumulator as being at zero potential, then the grid will be at the same potential. If the accumulator is a 6-volt one and the valve a bright-emitter requiring 4 volts there will be a drop of 4 volts through the filament and of 2 volts through the turns of the rheostat that are in use. This means that the negative leg of the filament will be at a potential 2 volts above zero. Since grid potentials in valve receiving sets are always measured with respect to the negative leg of the filament, the grid in this case, being at zero potential, will be 2 volts more negative than the negative leg of the filament. That is, we have applied to the note magnifying valve a negative grid bias of 2 volts without the use of a special grid battery. This is about the amount required with a general-purpose bright-emitter valve working with its normal anode voltage.

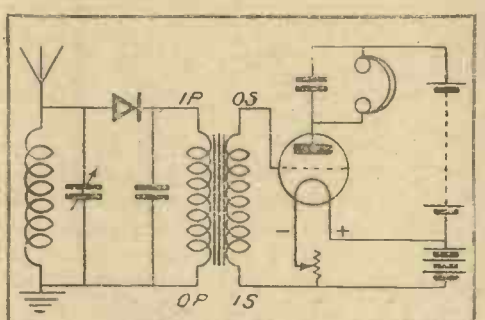


Fig. 1.—Grid Bias without a Grid-bias Battery

bias will be added should any of the resistance spiral be in use. Now the important point to note is this. If you brighten the filament by decreasing the resistance you bring its potential nearer to zero. Hence when you brighten the filament you reduce the difference between the potential of its negative leg and that of the grid; in other words, you reduce the negative grid bias.

Similarly by dimming the filament you increase the amount of negative grid bias. It is clearly desirable to be able to adjust the filament potential without varying the amount of grid bias. If you arrange your connections as shown in Fig. 3, with the rheostat in the positive low-tension lead of the note-magnifying valve, then the negative leg of the filament is always at zero potential, and the bias upon the grid remains unaltered, no matter what adjustments are made with the rheostat.

In Figs. 2 and 3 valves of the other two classes are also seen. V1 in both figures is a high-frequency valve, whilst V2 is in each case the rectifier. Do the same considerations hold good here? Let us take V1 first of all. Here again if the rheostat is in the negative leg the grid potential of the valve will be altered by any movement of its knob. But we already have in the potentiometer a means of adjusting the grid potential, and we cannot make the best use of the potentiometer if the rheostat also varies the grid potential.

If the potentiometer is provided, as most of them are nowadays, with a pointer and a scale marked off into divisions, it would appear that when a 6-volt accumulator is in use the setting of the pointer mid-way upon the scale means that we are tapping off a positive potential of 3 volts. But are we? Certainly we are making the grid 3 volts more positive than the negative filament lead; but if the rheostat is in this leg of the filament, and if there is a 2-volt drop in the rheostat, then actually we are making the grid only 1 volt positive when the slider is at the mid-point of its travel. Further, we can make no proper use of the potentiometer scale unless we know the potential drop across the rheostat.

Now look at Fig. 3. By connecting the negative leg of the filament to the negative low-tension lead we make its potential always zero. Half-way along its travel the slider of the potentiometer taps off a potential 3 volts above zero and makes the grid 3 volts positive with respect to the negative filament leg. If now we divide the scale into six divisions, each of them will represent 1 volt positive on the grid, whichever way the rheostat is turned.

The Rectifying Valve

The third and last case is that of the rectifying valve, and here I admit that the case for placing the rheostat in the positive lead is not so strong. If we do so we cannot vary the steady grid potential unless we make use of a variable grid leak or some similar contrivance. But by placing the rheostat in the negative leg, as seen in Fig. 2, the filament potential can be minutely adjusted by means of the rheostat. For ordinary purposes it is therefore probably rather better to place the rheostat of the rectifying valve in the negative filament lead.

J. H. R.

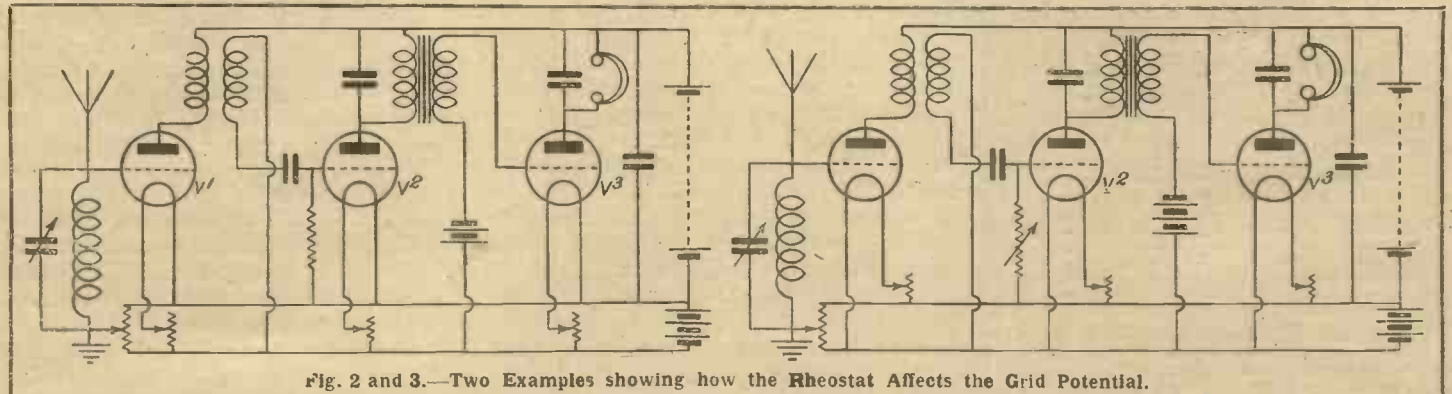


Fig. 2 and 3.—Two Examples showing how the Rheostat Affects the Grid Potential.

With the advent of the small power valve and of the grid-biasing battery the state of affairs in the note-magnifying side of the receiving set has considerably altered.

Look for a moment at the connections of the note-magnifying valve V3 in Fig. 2. Here the grid is biased by a special battery, and since the rheostat is in the negative leg of the filament, further

TOROIDAL COILS

An Ideal Type for H.F. Coupling

An Example of a Toroidal Coil.

IN this country very little work, if any, has been effected with toroidal coils, though they possess many inherent features of which advantage may be taken. This omission is probably due to the supposed difficulty of winding a coil of the type shown in Fig. 1. There are two simple methods of producing a toroidal coil.

According to the method of winding illustrated in Fig. 2, the wire for the coil is wound upon a needle comprising a strip of wood notched at the ends, which is passed through the former, or torus, as the winding proceeds. The applied turns should be radial, being close together on the inner side and more widely spaced on the outside of the core. This particular method of winding is now practically obsolete and has been superseded by the method shown in Fig. 3, which has the advantage over its predecessor in that it produces an air-spaced coil.

In the preferred method of winding (Fig. 3) the coil is wound solenoid fashion upon a former comprising a suitable length of 1¼-in. diameter fibre or other tubing having a longitudinal saw kerf therein. A piece of 16-gauge square busbar wire is inserted in the said kerf to expand the former to a slightly increased diameter, and is subsequently removed when the coil is to be taken from the former. Before proceeding with the actual winding of the coil the piece of busbar wire is inserted in the longitudinal slot for the purpose explained and a mounting strip of fibre ($\frac{3}{16}$ in. wide by 5-6 in. long) is placed on the former as shown in Fig. 3 and held *in situ* with india-rubber bands. The coil is to be cemented to the mounting strip, so a suitable adhesive, say shellac varnish, is applied thereto as the winding proceeds. For ordinary purposes No. 28 S.W.G. enamelled wire may be used for the coil, and for broadcast wavelengths 220 turns will serve. The coil, after removal from the former, is mounted upon a piece of $\frac{3}{16}$-in. ebonite or the like about 1 in. in diameter. This disc has its circumferential surface shaped to accommodate the coil and is provided with a radial slot (as shown in Fig. 4) to receive the ends of the binding strip, which are cemented therein.

From the foregoing brief explanation of the methods of making toroidal coils it will be patent to anyone that the supposed difficulties are mere myths and should not debar anyone from enjoying the advantages to be gained by using these coils.

The particular feature of toroidal coils is that there is no measurable external field. Due to the form of winding, all induced currents oppose each other and so no induced current flows. Hence interference is prevented and consequently distortion does not occur in tuned H.F. circuits owing to the elimination of any magnetic feed-back.

As the auto-transformer method of coup-

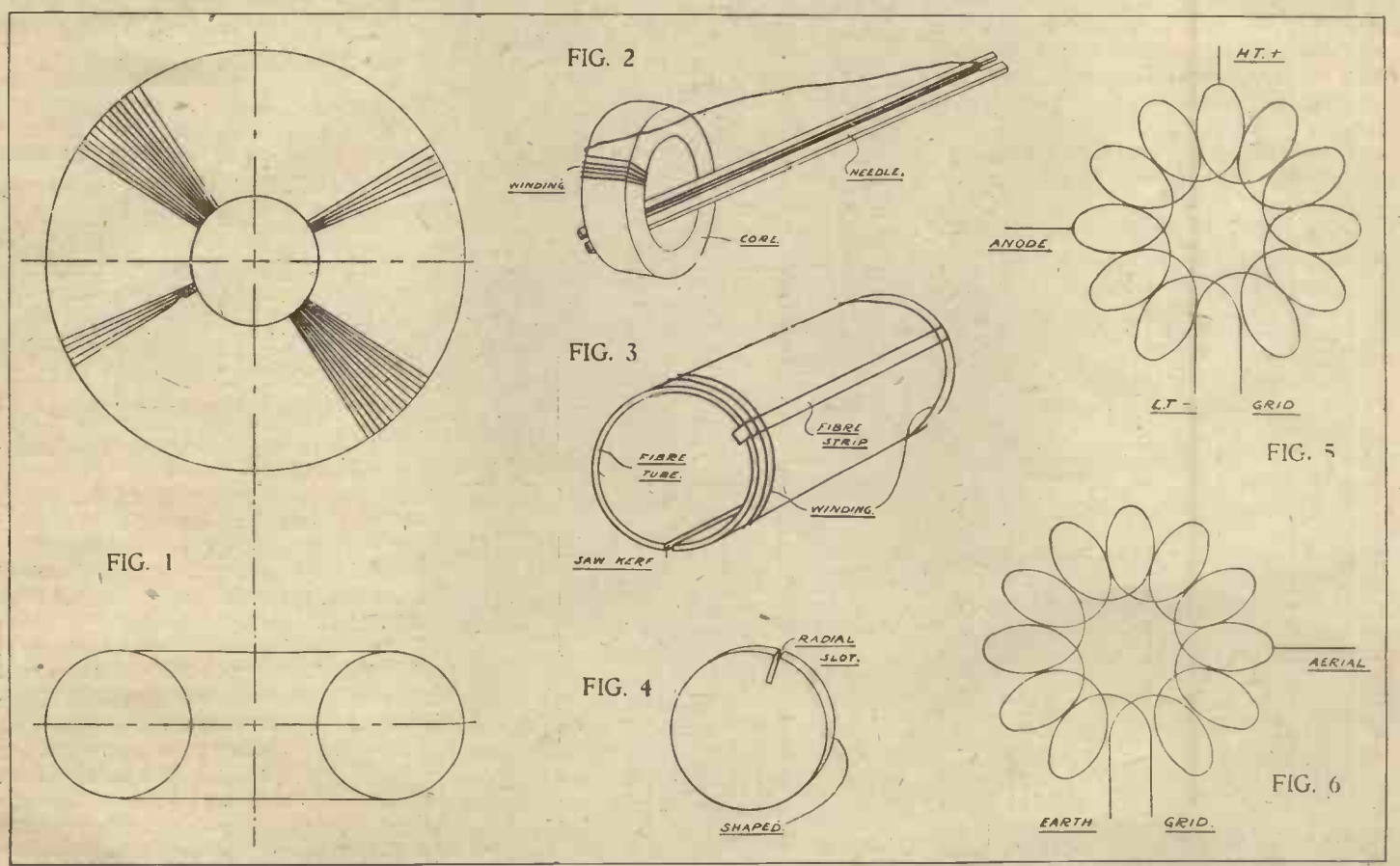


Fig. 1.—Ring-wound Toroidal Coil. Fig. 2.—Method of Ring Winding. Fig. 3.—An Improved System of Winding. Fig. 4.—Support for Coil. Fig. 5.—Toroidal Coil as H.F. Transformer. Fig. 6.—Application of Toroidal Coil to Aerial Circuit.

ling is used when toroidal coils are placed in H.F. circuits as H.F. transformers, it renders possible a higher degree of amplification in each stage with increased sensitivity and range. Furthermore, as the coils have no "pick-up" qualities of their own, only signals flowing in the aerial circuit are built up. It follows also that in suitably designed coils there is a maximum coupling with a high ratio of voltage increase, due to the concentrated field and zero leakage. The latter fact ensures a maximum transfer of energy to succeeding grid circuits. Another interesting fact is that when a number of toroidal coils are placed together and connected in series the effective inductance is the sum of the individual inductances. Inductive coupling is only possible with toroidal coils when the coupling turns are around the torus and intermeshed with the existing turns.

Fig. 5 diagrammatically represents a toroidal coil adapted to serve as an H.F. transformer having a ratio of 4 to 1, which forms a suitable basis at which to start experiments. To obtain maximum results in this way it is necessary to experiment with a view to balancing up properly the coil for a stipulated wavelength. It will be observed that in the specific example shown that the coil is tapped off for the anode lead at a quarter of the complete number of turns it possesses, and at half the number of turns for the H.T. + lead. Greater selectivity can, of course, be introduced by using a smaller proportion of the total number of turns in the anode circuit. This will increase the transformer ratio.

For those who propose making up some of these coils to suit their existing H.F. transformer sockets it is pointed out that apparently no standard connections exist for plug-in transformers. Text-books seemingly agree as to a suitable standard, but each manufacturer prefers his own method of making connections. So it would be wise to examine any H.F. transformers one may have, or contemplate using, before wiring up coils or other apparatus. In certain cases it may be advantageous to support the mounting disc directly upon a condenser terminal, for example, or place inductances close together. This may be done with confidence, for no interchange of energy will occur between the inductances.

The application of a toroidal coil to an aerial circuit is illustrated in Fig. 6, and here again a tapping is made to produce an auto-transformer coupling.

To obtain maximum results from toroidal coils they must be properly designed. To obtain maximum inductance a torus should have a large cross-sectional area rather than a large outside diameter. More than one layer of turns may be employed in the coil if necessary, but in such cases the formulæ given below will prove slightly inaccurate. Although a toroidal coil produced by the method shown in Fig. 3 appears as a plain cylindrical coil before taking its dough-nut formation, it should not be assumed that the formulæ for inductance and capacity of such coils apply to toroidal coils, for when solenoid coils are made toroidal the same laws do not apply.

For amateur wireless enthusiasts wishing to design their own toroidal coils, the following formulæ are given:

Inductance for a torus of circular cross-section.

$$L = 12.57\ n^2\ (R - \sqrt{R^2 - r^2}),$$

where L = inductance in cm.
n = total number of turns.
R = radius to centre of cross-section in cm.
r = radius of cross-section in cm.

Inductance for a torus of rectangular cross-section.

$$L = 4.606\ n^2\ h \log_{10} \frac{R}{r},$$

where L = inductance in cm.
n = total number of turns.
R = outside radius in cm.
r = inside radius in cm.
h = height of cross-section in cm.

The number of turns which can be wound in a single layer on a torus.

$$n = 3.1416\ d. \times t.p.i.,$$

where n = total number of turns.
d = inner diameter of torus.
t.p.i. = number of turns per inch.

Properly designed toroidal coils can be thoroughly recommended to the amateur as being a medium whereby a set may be improved to increase range and selectivity and produce more volume of good quality.

H. J. H.

MOUNTING VARIABLE CONDENSERS

IN many of the variable condensers the single hole fixing bearing is frequently a loose fit in the ebonite bush of the top plate. This results in making it almost an impossibility to fix the condenser so that it will not swivel as a whole round the bush.

To overcome the difficulty the writer adopted the plan of cutting a thin cardboard washer slightly smaller than the size of the top plate, shellacking both sides, and placing it between the condenser and the panel, when, with the shellac still tacky, the fixing nut is tightened up.

There is also another little point worth noting. Frequently the ends of the studs securing the end and fixed plates project beyond the top end-plate, so that the tightening up of the fixing nut causes distortion of this plate. This risk will be eliminated by filing the projecting stud ends flush with the surface of the plate, so bringing it flat against the panel.

A. G. H.

The Attraction of a Lesson by Wireless.

THE PIED PIPER OF EDUCATION

THERE can be no two opinions about the popularity of the British Broadcasting Co.'s transmission to schools in the light of the truly astonishing incident depicted in the accompanying photograph.

The children of a village council school in Bedford recently had a half-holiday. And the essence of a school holiday is its release from lessons! But rather than miss Mr. Kay Robinson's Nature talk, which in the ordinary way they would have heard in the class-room, a number of the scholars walked four miles into the town where they might listen to a loud-speaker. And, as the picture shows, these enthusiasts are not of the "priggish" order so abhorred by the average schoolboy and girl, but normal jolly children who appreciate their lessons by wireless.

A "WINDMILL" CRYSTAL SET

A crystal receiver incorporating a novel means of quickly changing from the local to the high-power station

THE windmill coil-holder introduced in the set about to be described is certainly a benefit to the amateur. By means of this two or more coils can be brought into the circuit separately merely by revolving the coil-holder. Whilst it is necessary, of course, to incorporate a simple type of switch operating between a fixed block and the revolving arm in order to insert the various coils in the circuit, the usual type of double-pole double-throw change-over switch that occupies valuable panel space is dispensed with.

This new coil-holder is shown in Figs. 1, 2 and 3 applied to a crystal set. On the panel at the back is secured a block of ebonite 3/8 in. thick, which carries two contacts A and a brass plate B, which functions firstly as a bearing plate for spring contacts on the arm that are not in use (so that the arm is always in an upright position) and also as a means of electrically shorting the last-mentioned coils. A separate view of the face of the fixed block is shown by Fig. 4.

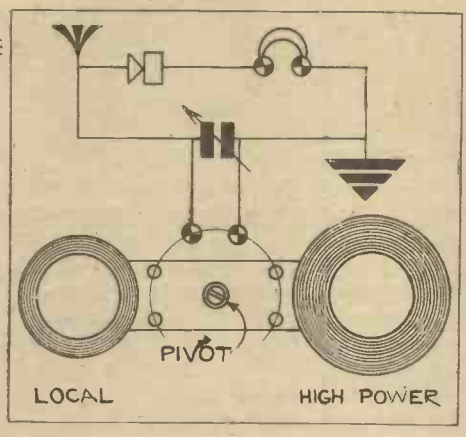
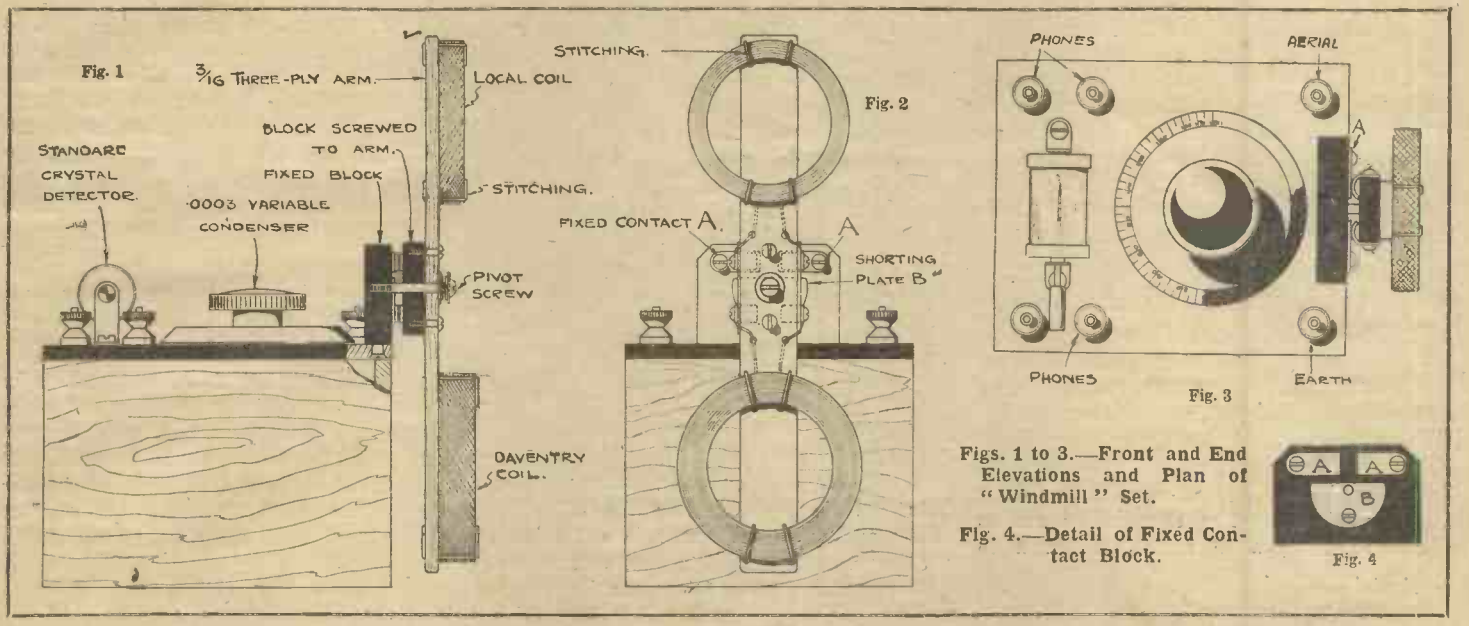


Fig. 5.—The Circuit Diagram.

Another block of ebonite is screwed centrally to the revolving arm and carries a pair of spring contacts for each coil. As each coil is brought to the upright position the contacts leading to that coil engage the fixed contacts A. The arm pivots on an axis screw, and pressure is applied for the contacts by a spring washer as shown. Home-made honeycomb coils are used, and in order to obtain minimum self-capacity they are merely stitched in four places to the three-ply wood arm.

Fig. 5 shows the circuit diagram from which it will be seen that each inductance coil is tuned by the .0003-microfarad variable condenser.

H.



Figs. 1 to 3.—Front and End Elevations and Plan of "Windmill" Set.

Fig. 4.—Detail of Fixed Contact Block.

Fig. 4

SNOW AND THE AERIAL

AT this time of the year when snow may fall any day, it is as well to warn the amateur of certain electrical disturbances which may occur.

Listeners have always been advised to include an aerial-to-earth switch in their wireless installation. "Earth your aerial when the set is out of use" has been a slogan since broadcasting began. The reason was apparent to all during the summer months when thunder-storms are prevalent. The habit of disconnecting the aerial, however, should be just as carefully practised during the winter.

It has been conclusively proved that in the case of snow-storms each flake brings with it a small electrical charge which, on contact, electrifies the aerial. The electrical discharge of the aerial may be demonstrated by curious crackling and rushing noises in the receiving set.

An instructive experiment was made by attaching a small fixed condenser to the aerial lead and, after a few hours, the latter, duly charged, brought forth healthy blue sparks. Such discharges might cause serious damage to a receiver.

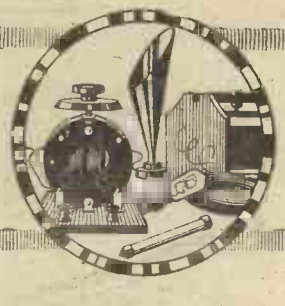
Should any readers wish to convince themselves of the truth of these statements, all that is necessary, providing weather conditions are suitable, is to disconnect the aerial from the set, allow it to become charged up and then place the aerial lead in close proxmimity to the earthing arrangements. A small but interesting "firework" display should be the result.

J. G. A.

PANEL MARKING

THE difficulty of engraving wireless panels may be easily overcome by the use of two very simple kinds of punches which can be made out of hardened steel. Two small punches are made, one with a chisel-like head and the other precisely the same, only with an edge half the length. The symbols used in wireless can easily be engraved with these tools, that is, to write "H.T.," two vertical strokes of the long chisel joined by a horizontal stroke of the smaller, and T is one vertical stroke topped with a stroke of the short chisel. The chisels should be used with a small mallet and the cuts afterwards filled in with white paine. Care should be taken to strike moderate blows in order to avoid cracking the panel.

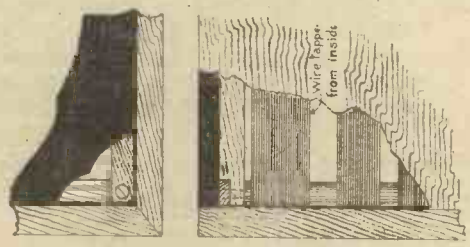
G. L.



PRACTICAL ODDS AND ENDS

Novel Coil Mounting

THE sketches show a novel method of fixing a solenoid type coil into a cabinet. Two light frames should be made of about ¼-in. by ¼-in. wood supported on four ebonite or wooden rods. The wire is wound on the frame, which is arranged to be a nice fit in the cabinet; the panel may, if desired, be arranged to



Arrangement of Coil Mounting.

rest on the frame instead of on special ledges. Tappings are taken from the interior of the coil to studs on the panel.

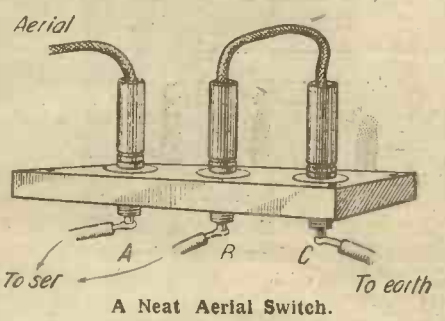
Losses will be considerably reduced by this method of mounting, but care must be taken that moisture in the wood of the cabinet does not introduce damping.

C. E.

A Neat Aerial Switch

THE switch shown in the accompanying illustration is superior to the ordinary D.P.D.T. type in that there are no losses introduced by bad contacts or capacity effects.

Three plugs and sockets of the usual type are required, together with two short lengths of flex. The connections are as follows: Plug A to aerial, socket A to



A Neat Aerial Switch.

aerial; plugs B and C are connected together with a piece of flex. Socket B goes to the earth terminal of the set, and socket C to earth.

When the plugs are in their respective sockets, as shown in the sketch, the set is ready for use. In order to "earth" it, plug A should be put in socket C, and plug C in socket A.

G. D. C.

Truing-up Panels

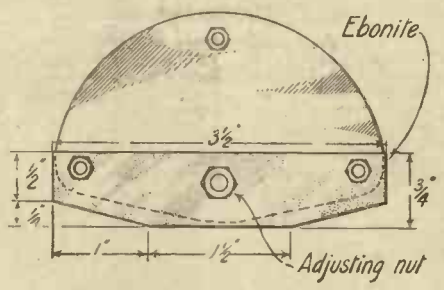
TO true up the edges of a panel the majority of constructors use a smooth file. A far better method is to use the back edge of a broken hack-saw blade in a manner similar to that of using a spoke-shave. A square or bevel edge can be obtained without showing any tool marks.

J. W.

Repairing Condensers

THE ebonite bush fitted to variable condensers with aluminium end-plates is apt to work loose as the threads become worn; the consequent result is that undue movement is set up between the plates and the capacity is not constant. A simple method of repairing condensers which have developed this fault is shown in the accompanying diagram.

A piece of ebonite 3½ in. by ¾ in. (approximately) should be drilled to fit the



Details of Repaired Condenser.

outer screws of the vanes. Next drill a hole a little smaller than the adjusting screw and force the screw into the hole, turning it so that it will tap its own thread. Unscrew the two nuts and place the ebonite strip in position, when it will be found that the moving shaft is firmly supported.

A. B. K.

Obtaining a Good Earth

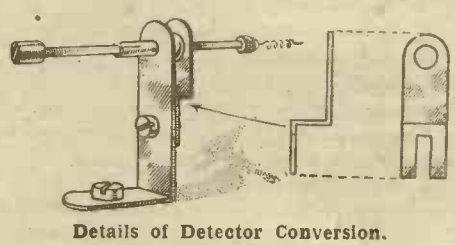
FREQUENTLY amateurs who are unable to erect outdoor aerials find it equally difficult to get satisfactory earth connections. A solution of the difficulty is to use a counterpoise. This should be placed as nearly under the aerial as possible to get the best results.

The insulation of the counterpoise must be as efficient as that of the aerial itself or the resistance of the earth connection will be greatly increased. As many wires as possible should be arranged in parallel and connected at one end to the set.

E.

A Detector Conversion

IN the average enclosed crystal detector a screw cup is fitted. In the writer's detector this cup was too small for a crystal which it was desired not to break. A larger cup, however, which fitted the crystal would not fit in the glass cylinder. To overcome the difficulty the glass was removed and a small piece of brass was cut and shaped as shown in the diagram.



Details of Detector Conversion.

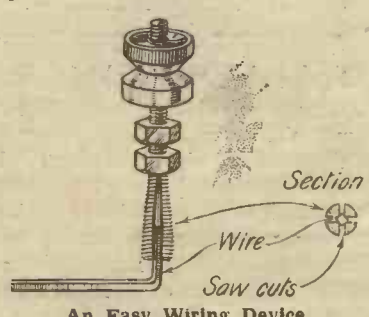
A hole (4 B.A.) was drilled in the stand bearing the catwhisker arm, and the brass strip was fixed by means of a small nut and bolt. This formed the necessary support for the moving arm.

The detector may easily be converted to the enclosed type by loosening the screw and nut, slipping off the added brass strip, and replacing the glass cylinder.

R. A.

An Easy Wiring Tip

A METHOD of terminal adaptation in order to facilitate the fixing of back-of-panel wiring is illustrated in the accompanying diagram. It will be noticed that the shank of the terminal is split in order to carry the end of the wire, a lock-nut being placed over the threads to form a clamp.

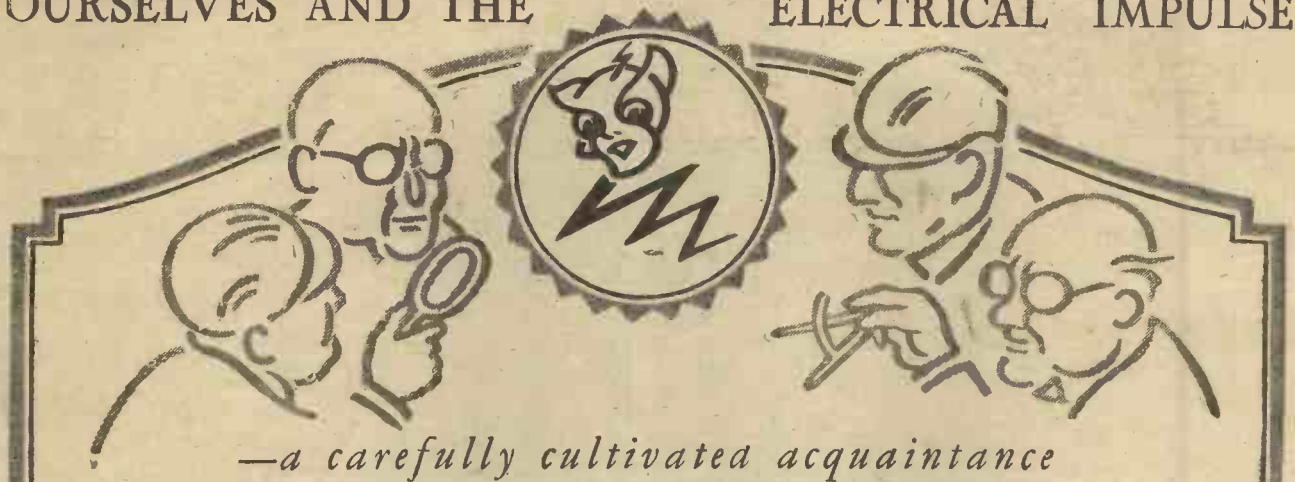


An Easy Wiring Device.

If all terminals which have sub-panel connections be replaced by those of the type shown there will be no need to use the soldering-iron. Cross-connections which do not meet at a terminal point may be joined by cutting short lengths of screwed rod and fitting lock-nuts as on the terminals.

W. G. A.

OURSELVES AND THE ELECTRICAL IMPULSE



—*a carefully cultivated acquaintance*

Certain of our technical experts, having foregathered in the sanctum of our chief-of-staff, did ponder with deliberation on the wisdom of his discourse. "Now gentlemen," he said, "you will have to exercise considerable mental brilliance and thoughtful friendliness in pursuit of the electrical impulse. We know that he is the electrical energy which quickens the radio receiver into pulsating life; our job is to tempt him just a little further without fraying his temper. That is, to transform him into voice and music with radio instruments having the correct scientific elements for a really natural transformation. Build, gentlemen," he added, "and remember, he is to be carefully cultivated." But that was long ago. After seventeen years' peaceful penetration in the Brandes laboratories, we are perfectly acquainted with the best methods of effectually harnessing the properties of this elusive spirit of radio sound. Get Brandes radio instruments, built by master craftsmen and scientists in the reproduction of radio sound.

Any good dealer stocks Brandes.

THE TABLE-TALKER
The new goose-neck design is the result of research in radio acoustics, which definitely establishes its value in relation to the diaphragm fitted. Patent material used in the construction of the horn eliminates metallic harshness. Volume and sensitivity controlled with small lever located at the rear of the base. Elegantly shaped, tasteful neutral brown finish, felt-padded base. Height 18 ins., bell 10 ins.
30/-

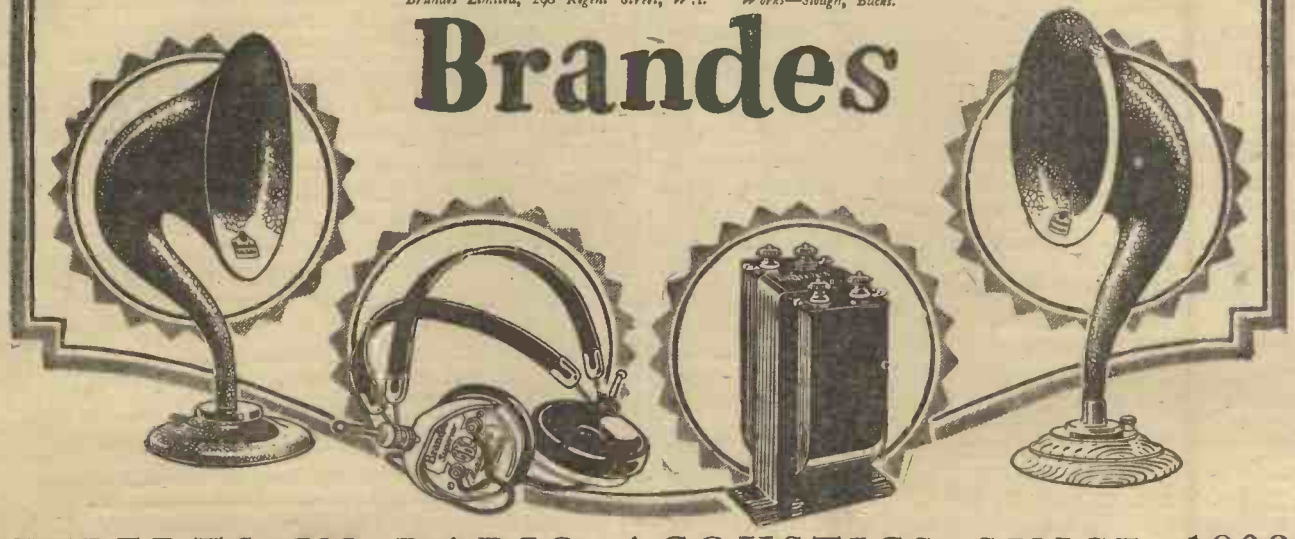
MATCHED TONE HEADPHONES
The whole secret of Matched Tone is that one receiver refuses to have any quarrel with its twin. Ably schooled in these generous sentiments by our specially erected Matched Tone apparatus, their synchronised effort discovers greater sensitivity and volume and truer tone. There is no possibility of the sound from one earpiece being half a tone lower than its mate.
20/-

THE AUDIO TRANSFORMER
Ratio 1 to 5. The main objects in view are high amplification of applied voltage, together with a straight line amplification-frequency curve. That is to say, for a given input voltage, the amplification is constant over a wide band of frequencies, thus eliminating resonance. Mechanically protected and shielded so that the transformers may be placed close together without interaction.
17/6

THE BRANDOLA
Specially built to bring greater volume with minimum current input and exceptional clarity over the full frequency range. A large diaphragm gives new rounded fulness to the low registers and new clarified lightness to the high. Reproduction controlled by a thumb screw on the base. Polished walnut plinth with electro-plated fittings. Height 26 ins., bell 12 ins.
90/-

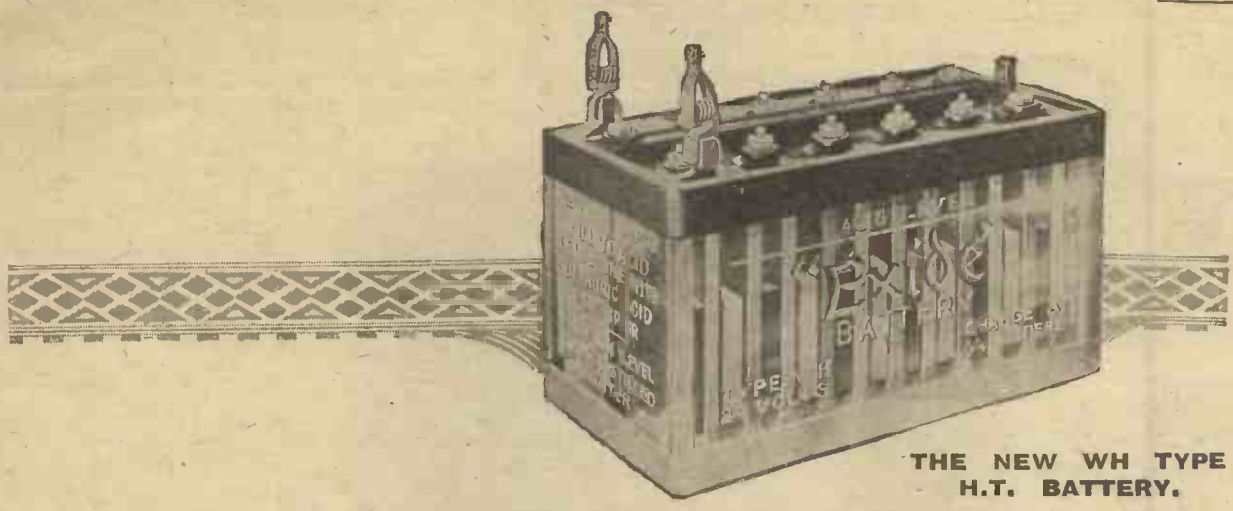
Brandes Limited, 296 Regent Street, W.1. Works—Slough, Bucks.

Brandes



EXPERTS IN RADIO ACOUSTICS SINCE 1908

28-234 *Service Advertising*



THE NEW WH TYPE H.T. BATTERY.

Exide
The Long-Life Battery

The table below gives the types of batteries recommended and the burning hours between charges.

If your requirements are not met here, ask for a copy of Catalogue "W."

Ordinary Bright Emitter (Filament Current, 0·7 ampere):

1 Valve 3 CZ 2-1 (6 Volts), 28 hours.	33/6	2 Valves 3 CZ 4-1 (6 Volts), 28 hours.	48/-	3 Valves 3 CZ 6-2 (6 Volts), 28 hours.	63/-

Dull Emitter (Filament Current, ·3 ampere) (Mullard "D.3," Ediswan "A.R.D.E." Cossor "W.1"-"W.2" and similar types):

1 Valve 1 DFG (2 Volts), 100 hours.	10/-	2 Valves 1 HZ 2 (2 Volts), 58 hours.	17/6	3 Valves 1 HZ 3 (2 Volts), 58 hours.	21/-

Dull Emitter (Wecovalve) (Filament Current, ·25 ampere):

1 Valve 1 DTG (2 Volts), 36 hours.	5/-	or 1 DFG (2 volts), 125 hours.	10/-	2 Valves 1 HZ 2 (2 Volts), 75 hours.	17/6	3 Valves 1 HZ 2 (2 Volts), 43 hours	17/6

·06 amp. Dull Emitter (Marconi-Osram "D.E.3," B.T.H. "B.5," Ediswan "A.R.·06," Mullard "D.·06"):

1 Valve 2 DGT (4 Volts), 290 hours.	10/-	2 Valves 2 DTG (4 Volts), 106 hours.	10/-	3 Valves 2 DTG (4 Volts), 60 hours.	10/-
		or 2 DFG (4 Volts), 320 hours.	20/-	or 2 DFG (4 volts), 190 hours.	20/-

WH High Tension Battery. Supplied in 24 volt units, sealed in moulded glass container.

TECHNICAL DATA.

CAPACITY.—The actual capacity of the battery is 5,000 milli-ampere-hours when used on very small discharge currents, such as are required in wireless apparatus.

VOLTAGE.—The battery is made up in 12-cell units, thus giving 24 volts per battery.

NORMAL CHARGE CURRENT.—¼ Ampere.

DIMENSIONS.—4⅛ in. W x 8⅛ in. L over glass container x 5¼ in. H. over lead terminals x 6⅜ in. H over take-offs.

WEIGHT.—15¼ lbs. including acid.

QUANTITY OF "ACCUMULATOR" SULPHURIC ACID. 1·240 specific gravity.—1¼ pints per 24-volt battery.

PRICE 24-Volt WH. Battery including 2 connecting clips but excluding acid **35/-**

Strap Carrier 2/6
Wire Carrier 1/6
Extra Connecting clips, each ..... 6d.

BIRMINGHAM: 58 Dale End
'Phone: Central 7629-30.

BRISTOL: 22 Victoria Street
Phone: 6460

THE Chloride ELECTRICAL STORAGE COMPANY LIMITED.
CLIFTON JUNCTION, Near MANCHESTER
LONDON: 219-229 Shaftesbury Avenue, W.C.2
Telephone: Regent 8070

MANCHESTER: 1 Bridge Street
'Phone: Central 2075-6.

GLASGOW: 40-44 Tureen Street
Phone: 985 Bridgeton

Ribbons of steel

—the same century-old principles of construction are employed in every Cossor Grid.

FROM bank to bank across a girder bridge a train speeds on its way. A hundred tons or more of living freight suspended in mid-air on a few ribbons of steel. Such is the skill of man. Rigidity is the Alpha and Omega of bridge construction. Without rigidity no bridge can withstand the devastating forces of Nature.

Rigidity, too, is the very essence of successful Valve construction. Without rigidity there must be distortion and microphonic noises. Compare the Cossor Grid with the ordinary spiral Grid and you'll instantly appreciate why the Cossor Valve has won such a unique reputation for purity of tone.

The Cossor Grid is a wonderful piece of miniature engineering. It is built up on a stout metal Grid band, and each turn of the wire is secured in three positions—35 places in all. Was there ever such rigidity?

Combine that with the Cossor electron-retaining systemof design and you'll readily recognise why the Cossor is by far the most popular British Valve.

Everywhere it is earning golden laurels for a mellowness of tone hitherto considered impossible.

Before choosing your next Valve ask your Dealer to show you the Wuncell — the Cossor Dull Emitter. Functioning at a dull red glow (almost invisible in daylight) it is, indeed, a super-economy valve with an abnormally long life. For the first time it is possible to obtain a low temperature valve in every way as sensitive as the best bright emitter. The secret of Wuncell success is to be found in its wonderful filament. Instead of a wire, whittled down to the point of fragility, the filament used in the Wuncell is built up layer upon layer under the Cossor patent process. Instead of weakness there is strength.

The Wuncell Dull Emitter
Voltage 1·8 volts. Consumption ·3 amp.
*W1 for Detector and L.F. 14/-
*W2 for H.F. amplification 14/-

The Cossor Loud Speaker Valve W3
Voltage 1·8 volts. Consumption ·5 amp.
Price 18/6

*Also in WR Series, with special switch and resistance in base to enable Valve being used with 2- 4- or 6-volt Accumulator:
WR1 for Detector and L.F. 16/-
WR2 for H.F. amplification 16/-

Cossor

Issued by A. C. COSSOR LTD., Highbury, London, N.5

Gilbert Ad. 4018

On Your Wavelength!

No More Jamming?

WE have heard a good deal recently about the new device invented by Capt. A. Roberts, which is stated to eliminate all possibility of jamming. Tests, so far as they have gone, appear to substantiate the claims of the inventor. I notice, though, that they have been made only over very short distances and that apparently the task allotted to the inventor was to cause lamps fixed to a small box to light up or be extinguished by means of his transmitting gear, whilst every effort was made by those supervising the test to spoil his efforts by jamming.

2 L O's Quality

I do not know what you think about it, but it has seemed to me for some weeks now that all is not quite well with 2 L O's transmissions. Some time ago, during one of his technical talks, Capt. Eckersley gave us a practical demonstration of what is meant by high-, medium- and low-pitched transmissions. It seems to me that 2 L O's broadcasts are at present rather too low pitched. I am using at the present time a set which in the ordinary way gives particularly pure and "clean" reception, yet I find that speech from 2 L O is often inclined to be throaty and a trifle indistinct. The result in fact is very much the same as that produced by shunting the loud-speaker with a condenser of large size when a high- or medium-pitched transmission is tuned in. I was particularly struck the other night when the Hallé Orchestra was being relayed from Manchester. The words of the announcer at 2 Z Y were clear and distinct with a natural pitch when he told us that the concert was now over and that stations would be transmitting their own programmes. The next moment London called, and the difference was extraordinary.

I find that I am not alone in noticing the lowness of the pitch; a great number of friends and acquaintances have commented upon it in the course of conversation. A rather low pitch is kind to bad receiving sets, since it makes their reproduction less harsh than it would otherwise be. It does not, however, give a well-designed set a good chance of doing itself proper justice.

The Aeroplane Concert

The concert given from an aeroplane flying over the Croydon district, which had to be postponed for the day on which it was originally announced to take place owing to the prevalence of fog, was successfully given at the second attempt. In the plane were members of the Savoy Orpheans Band, complete with instruments and music, a number of well-known artistes—and a piano. The concert was transmitted by means of a microphone specially slung so that it might be insulated as far as possible from the effects of vibration. The transmission was picked up at the receiving station at Keston and sent over the land-line to 2 L O, whence it was sent out in the usual way. This item no doubt opened the eyes of many of us to the wonderful load-carrying powers of a modern giant air liner. It was, too, a unique feat in the way of a transmission. Regarded, however, purely as a piece of broadcasting, it was not very successful, since owing to the noises in the cabin of the aeroplane even when the engine was switched off it was difficult to hear spoken words, and the music had a background that was anything but silent.

Wireless in the Rhineland

One of the fruits of the Locarno Conference may be that those who dwell in the Rhineland will be able to become "broadcatchers" at no very distant date. During the occupation by the Allies the possession of wireless receiving apparatus by inhabitants was prohibited. This meant that this little corner of Germany was about the one place in Europe where the benefits of broadcasting could not be enjoyed. It is expected that the restrictions will be removed any day now, and that when they are, aerials will spring up everywhere. Wireless is exceedingly popular in other parts of Germany, and there can be no doubt that it will make rapid strides in the Rhineland as soon as receiving sets are permitted.

Selling to America

One of our biggest distributing houses for wireless components reports that it is doing a considerable business in the sale of British parts in the United States. This may come as rather a shock to those who are always telling us that we are streets behind the Americans in the matter of wireless components. It seems to me that each country has its own strong points in this respect. British manufacturers excel in the making of low-frequency components and of valves, whilst the Americans are possibly a little in advance of ourselves with some of their high-frequency parts. There is not much of a sale in this country for complete sets made in the States, since, though they are selective without being unstable, their reproduction is not such as appeals to British ears. In the same way the average British set does not go down in America, because, though the quality obtainable from it is excellent, it is rather lacking in the selectivity which is essential in any country where broadcasting stations operating on near-by wavelengths are legion.

Local Talent

I am very glad to say that the B.B.C. is taking care to develop what we may call the local side of broadcasting. It seemed at one time that there was rather a risk that the local element might be swamped in the atmosphere of London owing to the wide use of simultaneous broadcasting. Recent announcements, however, show that the importance of fostering local talent and of developing the local side of programmes is fully realised by the company and that they have no intention of losing sight of these things. Each station should, I think, have its own particular characteristics, and you will find if you are able to tune in more than one that they have.

The Single-valver

Capt. Eckersley has had a good deal to say lately about the single-valve set. He brings out a point that I have frequently made in these notes: The majority of the interference by radiation that we experience nowadays is due to attempts by users of single-valve sets to get too much out of them. People still have the idea that a small set can cause only small interference, and that if they hear a loud howl it must be due to somebody using a powerful receiver with umpteen valves. This is by no means the case, for no matter how many valves you have in a receiving set it cannot produce more powerful interference than if it had only one.

The single-valve receiving set is a first-rate piece of apparatus if it is carefully and sensibly used. It has an enormous range for the reception of *telegraphy*, but for telephony its main use is to receive the local station. As soon as you endeavour to cover longer ranges with it you are practically bound to cause interference, and you cannot obtain anything like pure reception, since it must be operated too close to the oscillating point. It should be remembered, too, that there *are* limits to the loudness of signals obtainable from a near-by station with one valve. If you push reaction to its limit you may get a good deal of noise, but you will also get harshness and a background of crackles. No set, single- or multi-valve, is working properly unless it is slightly within itself. What I mean is that perfectly pure reception is obtainable only when signals are not quite so loud as they could be made if one tried. May I ask all valve users once more to remember this: *Every* squeak you make is audible to all of those receiving the station that you are trying to tune

On Your Wavelength! (continued)

in within a radius of at least two or three miles of your aerial.

Getting the Best Quality

For low-frequency amplification the resistance-capacity and choke-capacity couplings have become increasingly popular during the last year or so where more than one stage of note magnification is used. The reason, quite simply, is that it is seldom satisfactory to use more than one intervalve low-frequency transformer in a receiving set unless instruments of the very finest type are employed. Both choke-capacity and resistance-capacity coupling, if properly designed, give reproduction of wonderfully pure quality with a complete freedom from noise. A point that is not always appreciated is that the capacity of the grid condenser used is rather important. Recently I made up a five-valve set using a first-rate transformer for the coupling between the rectifier and the first note magnifier and the choke-capacity system between the first and second low-frequency valves. With only one note magnifier in use reproduction was excellent, but when the second was thrown in a certain harshness was noticeable. The grid condenser in this case had a capacity of .01 microfarad, this happening to be the largest available. Later I substituted a .15 microfarad condenser, with the result that all harshness disappeared and that even the loudest transmission came through to perfection and without a trace of harshness.

If you are not satisfied with the reproduction of a set in which choke-capacity or resistance-capacity is employed, try the effect of changing the present grid condenser for one of greater capacity. In theory perfect reproduction can be obtained only by the use of a very large capacity, such as 1 microfarad or 2 microfarad. There are, however, certain drawbacks to these large condensers, and as a rule the best results will be obtained with a condenser whose capacity is from .1 to .25 microfarad.

South-coast Conditions

I recently had the opportunity of studying at first hand broadcast reception conditions on the south coast of our country. A friend living at Eastbourne had installed a new five-valver, and as he was an absolute beginner he found himself rather at sea and so cast round for someone more experienced to lend a helping hand. Hence an invitation for the week-end, and a very interesting time spent with a wireless set in a locality hitherto strange to me.

On the Friday evening it was impossible to do any sort of wireless work, for there were thunderstorms about and atmospherics were worse than I ever remember hearing them before in this country. This state of affairs appears to have been pretty general, for I have had reports from many people living in different parts of the country to the same effect. This left only Saturday and Sunday for the work, and I was afraid that we might be able to do very little, as the low-hanging clouds and the uncertainty of the weather gave one the feeling that atmospherics might be pretty bad for a day or two. Luckily, on the following two days conditions improved immensely. During the daytime X's occurred only at infrequent intervals, whilst in the evening they were pretty well absent until about 10.30 p.m.

Sparks!

When I tried for stations on the broadcast waveband I was able to get many of them fairly easily. Even in the daytime one was able to tune in several of the more distant ones at decent loud-speaker strength, whilst London and Bournemouth came in very powerfully and could be separated without any trouble. But if I succeeded in getting broadcasting stations, I also succeeded in getting something else. This was spark signals in great profusion, many of them with no mean strength behind them. I had often read complaints from dwellers on the coast that they were worried by morse, but I had no idea until I sampled it for myself that reception could be so much interfered with by ships and coastal stations. The trouble appears to be due more to the French coastal stations than to our own, but not a little of it comes from ships.

Tuning Them Out

The worst of a powerful spark signal at short range is that you simply cannot tune it out. Some of these transmissions were of such strength that they were audible over a band of quite 200 metres. A spark signal of this kind appears to set the aerial vibrating by sheer shock just as atmospherics do. Spark transmissions can never be very sharply tuned at the best of times, and when they come from somewhere fairly near it is almost hopeless to attempt to elminate them. I was able to improve matters a little by using an indoor aerial—though this, of course, cut down signal strength—but no kind of wavetrap proved effective. It is, one imagines, only a question of time until the use of spark-transmitting apparatus is prohibited. This has already been done, I believe, in the United States, and it is to be hoped that steps will be taken in this country and in France before long. The spark method is, anyhow, an inefficient one, requiring great power behind it to ensure even a moderate range.

An Improvement

On Sunday evening conditions were very much better, for most of the spark operators appeared to be taking a rest. I was able to work a good many stations on the broadcast band without much interference. When our own stations had closed down I picked up at good strength Madrid, Barcelona, an experimental station in Paris, Bremen, Breslau, Stuttgart, Frankfort and a good many other foreign stations, all of which came in very well, though atmospherics began to grow rather bad as time went on. On the whole, Eastbourne seems to be a good place for wireless reception in that distant stations come in well, but a poor one in so far as interference upon the broadcast band from morse signals is concerned.

The Longer Waves

We found it far more satisfactory to work upon the longer waves. 5 X X comes in very well indeed and interference is very rarely experienced on this wave length. Radio-Paris is, if anything, rather stronger than 5 X X; we found four valves quite sufficient to give us good loud-speaker strength when he was tuned in at lunch-time. On this wavelength there is a little interference at times from the automatic stations, and occasionally from spark; though there is really not much more than one experiences at an inland receiving station. We were, however, troubled with a mysterious form of interruption of whose cause I am not quite certain. When Radio-Paris was coming in a curious noise would start quite suddenly at times. It began with a kind of whirring sound, rising in pitch, which suggested that it was caused by the switching on of somebody's generator. It was not, however, followed by readable signals. What happened subsequently was that a strange kind of mush came through for several seconds and then suddenly stopped. This process was not repeated at regular intervals; in fact there might be long periods in which its effects were not experienced at all.

I am inclined to think that it must have been due to induction from the telephone lines, of which there were several at no great distance from the aerial.

Musical Brevities

I like that idea of to-morrow night at Edinburgh with its performance of shortest musical compositions, poems and stories in existence. I wish the same idea could be applied to the talks, especially some of those who really sound too tired for their onerous task. The farce entitled *Affinities*, by Vernon Woodhouse, should also prove excellent fare, and I believe the majority of the artistes are to be drawn from local talent.

THERMION.

THE ABC OF MODULATION

An explanation of some simple systems used in transmission

IT is a useful analogy to consider the carrier wave in wireless telephony as taking the place of the conducting wire in line telephony. It is just as impossible to get speech across space, unless the intervening medium is first filled with a steady stream of "carrier" waves, as it is to hold an ordinary telephonic conversation in the absence of a connecting wire between the two instruments.

Once, however, a steady stream of carrier waves has been set up, the problem of wireless transmission simply resolves itself into ways and means of modulating or varying the amplitude of the carrier waves in such a way that they bear on their backs, so to speak, an impression of the voice frequencies, ready to be translated at the receiving end into corresponding sounds.

Aerial Modulation

The simplest, but by no means the most efficient, way of doing this is to place the microphone directly in the aerial circuit, as shown in Fig. 1. The effect of speaking into the microphone varies the resistance of the carbon granules, and as these form part of the aerial circuit, the resistance of the latter is also varied. The amplitude of the carrier-wave currents supplied to the aerial by the valve oscillator accordingly fluctuates in sympathy with the speech. In other words, the steady C.W. emission is now modulated.

One obvious disadvantage of this method is that it introduces unnecessary resistance into the aerial circuit (namely, that of the microphone), and thereby wastes a large proportion of the available energy. Another objection is that the microphone would be burnt out directly any appreciable power was used. At the same time, it is an instructive experiment for anything up to 5 watts, particularly if the microphone is shunted by a condenser as shown by the dotted lines.

Modulation by Absorption

Instead of inserting the microphone directly in circuit, it can be shunted across part of the aerial inductance, or, better still, coupled to it as shown in Fig. 2. In both these cases, however, the degree of modulation is not good except on very low powers; the danger of overheating the microphone is always present; and finally the frequency of the carrier wave alters considerably (as well as its amplitude) owing to the change in the effective inductance of the aerial circuit caused by the absorption or microphone circuit.

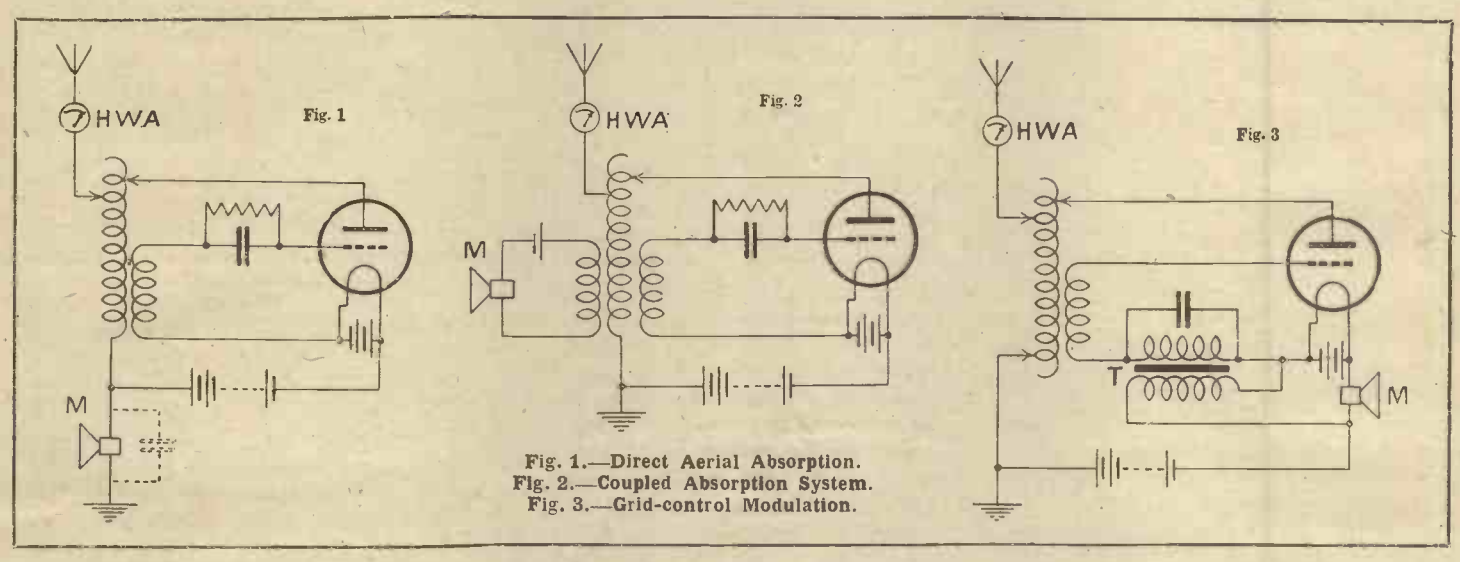


Fig. 1.
Fig. 2.
Fig. 3.

Fig. 1.—Direct Aerial Absorption.
Fig. 2.—Coupled Absorption System.
Fig. 3.—Grid-control Modulation.

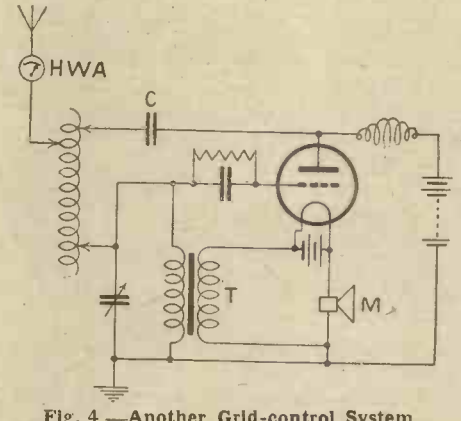


Fig. 4.—Another Grid-control System.

Grid Control

A more satisfactory plan is to employ grid control as shown in Fig. 3. Here the voltages across the transformer T, the microphone could be inserted directly in the grid circuit, in parallel with a condenser to by-pass the high-frequency currents. The effect on the grid is not, however, so pronounced, and the resulting modulation is less efficient than that obtained by the arrangement shown in Fig. 3. In both these examples of grid control considerably more power can be handled than in the arrangements of Figs. 1 and 2. It should be noted that in all the foregoing circuits the positive pole of the plate battery is earthed, so that special precautions must be taken to insulate the accumulators so as to prevent shorting to earth.

Fig. 4 shows an interesting type of grid-control transmitter, known as the Colpitt's oscillator, which is widely used, particularly in America, for long-distance C.W. signalling, although it is quite capable of giving good results on telephony up to 20-25 watts. It will be noticed that the high-tension supply circuit is now in parallel with the main oscillatory (aerial) circuit. A choke coil is inserted on the H.T. side to block out the H.F. currents, whilst a condenser C on the aerial side passes them on to the aerial, and at the same time prevents the H.T. supply from being short-circuited through the aerial inductance. This condenser must be able to withstand the full H.T. voltage.

Plate Modulation

Another simple method of modulation, not in itself very effective, but serving as an introduction to the modern form of transmitter is that shown in Fig. 5. Here the microphone is coupled directly to the plate circuit of the valve oscillator instead of to the grid circuit as before. The result of speaking into the microphone is to set up fluctuating voltages across the step-up transformer T, which in turn alternately increase or diminish the value of the normal plate potential derived from the H.T. battery B.

If, for instance, the steady voltage of the H.T. battery is 150, and the microphone voltages across T vary from + 20 to − 20, the resultant plate potential will fluctuate between 130 and 170 volts. This will, of course, create corresponding changes in the amplitude of the carrier were supplied by the valve oscillator to the aerial, and a modulated radiation results.

Direct Microphone Connection

As in the previous case, the microphone can be inserted across a condenser directly in the plate circuit instead of being coupled to it, but the voltage step-up across the transformer is then lost, and the effective modulation is reduced accordingly. In addition, it is obviously a disadvantage to place the H.T. potential directly on the microphone, where it is liable to cause injury to the operator.

Choke-control Modulation

Choke control is the ideal system to use with any power over 20 watts. As will be seen from Fig. 6, two separate valves are used, one A acting as an oscillation generator or power valve, and the second B as a modulator or control valve. The purpose of the control valve, as its name implies, is to regulate the amplitude of the steady carrier wave furnished to the aerial by the oscillator A. The source of the modulating influence is the microphone, as before, but in this instance the speech voltages are applied to the grid of the control valve and reappear in amplified form in the plate circuit of that valve.

In order to explain the operation of this system, let us suppose that a heavy negative bias is applied to the grid of the control valve, so that under normal circumstances very little current flows from the H.T. battery across the plate and filament of that valve even when the filament is lighted. The whole of the H.T. current therefore flows through valve A.

Now the effect of speaking into the microphone will be to apply a fluctuating voltage to the grid of the control valve, thereby causing it to become periodically conductive, and setting up corresponding surges of current across the choke coil K in the common plate supply. The steady potential (existing at the plate end of the choke under normal conditions) accordingly fluctuates in sympathy with the conductivity of the control valve, thus giving rise to corresponding voltage variations on the plate of the oscillator valve. As the power output from this valve is directly proportional to its plate voltage, the amplitude of the emitted carrier wave is in this way effectively controlled by the speech frequencies applied to the microphone.

B. A. R.

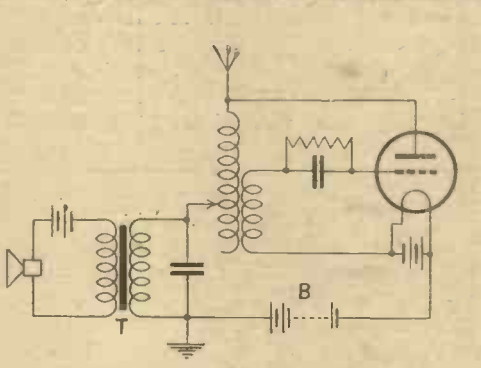


Fig. 5.—Plate Modulation System.

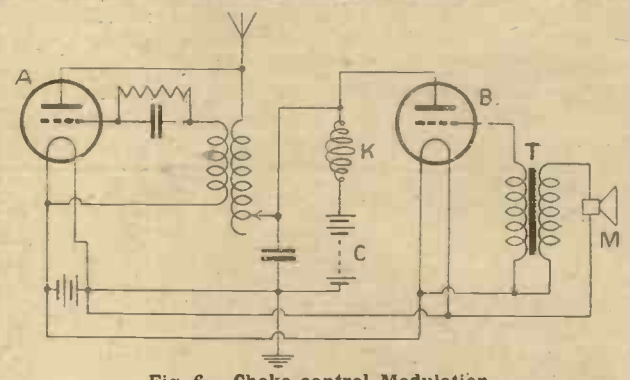


Fig. 6.—Choke-control Modulation.

A resident in Glasgow has informed the director of the British Broadcasting Co.'s station at Plymouth that he received Plymouth station at good loud-speaker strength on two valves.

ARTISTES YOU HAVE HEARD

Mr. Will Van Allen.

Miss Sidonie Goossens.

Mr. Cedric Sharpe.

A.J.S. Chokes and Choke Units are popular components, and will become increasingly popular, as constructors are beginning to realise that better radio reproduction is made possible by the use of chokes.

Publication No. 115 is a new leaflet which gives diagrams and data concerning A.J.S. Coils, Condensers, and Chokes. We will be pleased to send you a copy.

Inductance Coils

THESE inductance coils are wound in such a manner that the self capacity and high frequency resistance have been reduced to a minimum. The windings are enclosed in a well-finished moulded container, which protects them from damp, dust, and rough handling.

All coils have the same dimensions, 3¼ inches in diameter.

Each coil has its number clearly shown on a white ivorine disc on the side of the container.

The plug and socket fittings are nickel plated, and a smooth running, certain contact is obtained when used in conjunction with any standard coil holder.

A.J.S. VARIABLE CONDENSER

This is really a low loss condenser of sound construction, and sold at a reasonable figure.

.0002 Mfd. 10/6 | .0005 Mfd. 12 6
.0003 Mfd. 11/6 | .001 Mfd. 17 6

These coils, when used with the A.J.S. Variable Low Loss Condensers, provide a most efficient means of tuning. Each coil is securely packed in an attractive box.

Publication No. 115 contains particulars of the full range, together with tables showing wavelengths obtainable when used with all our Variable Condensers.

Coil No.	Price.	Coil No.	Price.
20	4/3	200	7/6
25	4/3	250	7/9
35	4/3	300	8/0
40	4/3	400	9/6
45	4/3	500	9/9
50	4/3	600	10/6
60	4/3	750	12/0
75	4/6	1000	13/0
100	6/0	1250	14/6
150	6/9	1500	16/6

WRITE FOR PUBLICATION No. 115

A·J·S

A. J. STEVENS & CO. (1914) Ltd.
RADIO BRANCH, WOLVERHAMPTON
Telephone: 1748 (7 lines). Telegrams: "Reception, Wolverhampton."

LONDON OFFICES: 122/124, Charing Cross Rd., London, W.C.2.
Telephone: Regent 7161/2. Telegrams: "Ajayessco, Westcent." London."

GLASGOW OFFICES: 240/250, Great Western Road, Glasgow.
Telephone: Douglas 3449. Telegrams: "Reception, Glasgow."

A. J. STEVENS (1914) LTD.,
Radio Branch, WOLVERHAMPTON.

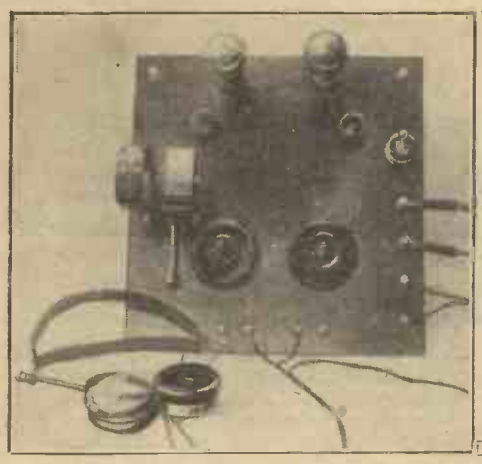
Please send publication No. 115.

Name .....

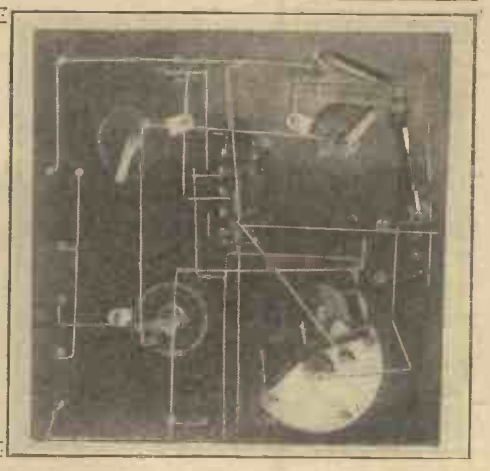
Address .....

A.W. 28/11/25.

A TWO-VALVE ULTRA-AUDION LOUD-SPEAKER RECEIVER



View of Top of Panel.



View of Under Side of Panel.

AS many amateurs know, a detector and low-frequency amplifier will work a loud-speaker ten to fifteen miles from a main broadcasting station satisfactorily, but at a farther distance it is a matter of luck. With the receiver about to be described the volume is as great as that of a detector and two low-frequency amplifiers, also the purity of tone and selectivity of tuning is all that is desirable. By using Marconi R valves, London at a distance of twenty-five miles may be heard on an Amplion loud-speaker 100 ft. away if a good aerial is used. The circuit (Fig. 1) will be found interesting by reason of the unique auxiliary reaction used.

The Panel

The measurements of the panel are 12 in. by 12 in. by ¼ in. Mark the panel by drawing a 1-in. margin round the whole of the four sides. The marking should be as in Fig. 2. It should be noticed how the valve legs are placed, filament legs vertical and the grid leg facing the aerial terminal.

The method of wiring will be apparent from Fig. 3.

Testing

A good 100-volt battery is essential for the H.T. supply and a 6-volt accumulator for the filaments. Connect the H.T. positive to the bottom terminal on the right-hand side, H.T. negative to its fellow terminal, and then the low-tension negative and low-tension positive. Place the coils in position, No. 75 in the aerial coil holder and No. 100 in the reaction coil holder. Next connect phones and aerial and earth. Wet two fingers and place them on the filament sockets; if no shock is felt, it is safe to place the valves in position, but before doing so temporarily disconnect the H.T.

Now commence to tune in. Turn the condenser dial and rheostat dial simultaneously, and on hearing a signal stop and slowly move the reaction coil.

R. G. E.

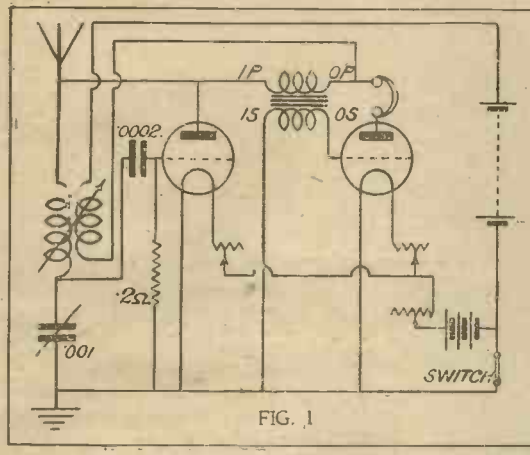


FIG. 1

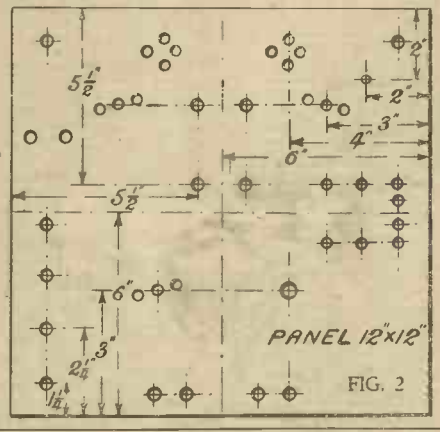


FIG. 2

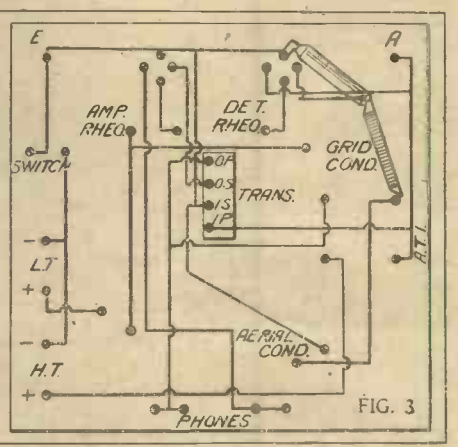


FIG. 3

Fig. 1.—Circuit Diagram. Fig. 2.—Layout of Panel. Fig. 3.—Wiring Diagram.

ECONOMY IN H.T.

THOSE users of multi-valve sets who have cause to complain of the amount of H.T. current consumed may find a cure for their trouble in the application of grid bias.

By the addition of the correct value of bias the grid-volts anode current of the valve is shifted to the left, with a corresponding decrease in the H.T. current. The quality of reproduction will also be improved in most cases, especially if general-purpose valves are being used in L.F. stages.

Grid bias may easily be added by breaking the lead from the secondary of the L.F. transformer to the negative L.T. and inserting a small dry battery, preferably variable in steps of 1½ volts. The positive end of the grid-bias battery should be connected to the negative L.T. terminal. Suitable values of bias are as follows: 1½-3 volts for the first L.F. stage, 3-4½ for the second stage, and 4½-9 for the last stage. No bias is necessary for the detector, while a slight amount of *positive* bias (that is with the battery reversed) is often necessary in H.F. stages to prevent oscillation.

M. C.

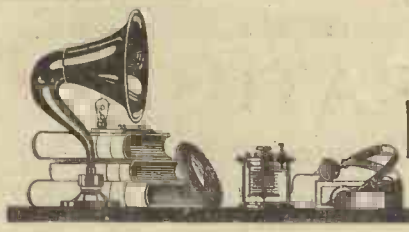
It is proposed to broadcast from Edinburgh entertainments in two halls in Dunfermline.

MAST PROTECTION

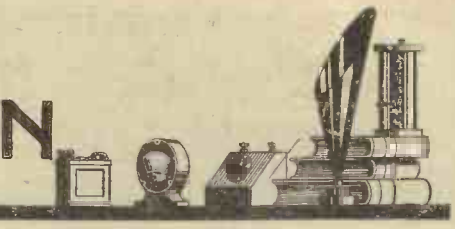
IT is surprising that more aerial masts are not provided with a truck or cap. The main object of this truck is to protect the top of the mast, where the end-grain of the wood very easily absorbs moisture and so encourages rotting and splitting. Another feature about a truck, however, is that it gives a more finished and workmanship appearance to a mast.

The truck need only be a circular flat piece of wood about twice the diameter of the mast at the top, and may be fastened with long nails or screws, and can be made at home or purchased from any marine store

A. W. X.



OUR INFORMATION BUREAU



RULES.—Please write distinctly and keep to the point. We reply promptly by post. Please give all necessary details. Ask one question at a time to ensure a prompt reply, and please put sketches, lay-outs, diagrams, etc., on separate sheets containing your name and address. Always send stamped, addressed envelope and attach Coupon (p. 852).

Parts for Super-het

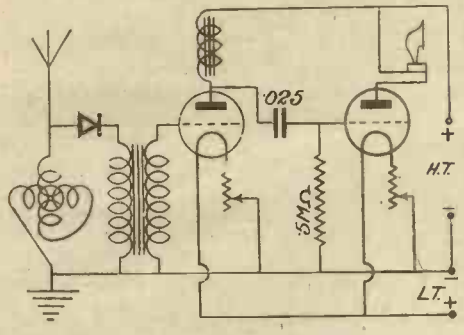
Q.—*Would you please tell me where the Silver-Marshall transformer-unit and oscillator-coupler, used in the super-het described in the issue for July 11, may be obtained.—T. N. B. (Bournemouth).*

A.—These parts may be obtained from Messrs. R. A. Rothermel, of 24, Maddox Street, London, W.1, or W. Sayer, 50a, Strand, W.C.—C.

Crystal and Two L.F. Stages

Q.—*I would like to build a set for loud-speaker reception from the local station and should be glad if you would give me a suitable circuit. I want to use a crystal detector, followed by two stages of L.F. amplification, the first being transformer-coupled and the second choke-capacity coupled.—L. F. D. (S.W.4).*

A.—The circuit is given herewith. Variometer tuning is shown, but any other efficient



A Loud-speaker Circuit.

method may be used instead if desired. If you would also like to be able to receive Daventry it would be better to use plug-in coils tuned by a .0005 variable condenser in parallel. The values of the coupling condenser and grid leak are not very critical, but the ordinary grid leak of 2 megohms resistance should not be used.—J. F. J.

A Simple Super-het

Q.—*Will the simple 3-valve super-het described in the issue for April 25 be capable of receiving British and foreign stations on head-phones, using three valves?—W. A. (Leicester).*

A.—Yes, on an outdoor aerial but not on a frame, though four valves would be more reliable. If you wish to make the set more powerful and suitable for use on a frame aerial, you merely add valves to the intermediate amplifier. This is the portion of the set immediately following the first detector.—A. J. C.

H.T. from the Mains

Q.—*I have been trying to use the system of obtaining H.T. from the mains, as described in* AMATEUR WIRELESS *for March 7. The apparatus will not work on a two-valve circuit (det. and L.F.) but sets up a terrific howl. Can you tell me what is wrong?—F. K. (Gravesend).*

A.—Without knowing the nature of the "terrific howl" you mention it is very difficult to advise you. It seems likely that your supply authorities are using a generator that causes an undue amount of ripple on the D.C. current. Perhaps the Gravesend supply is A.C. and not D.C., and if this is the case you will not be able to work this H.T. unit at all. You had better make sure that you are using D.C. in the first place.—A. J. C.

Connecting Phones

Q.—*Is it possible to connect four pairs of 4,000-ohm phones to a set in such a manner that the total resistance is still 4,000 ohms?—J. P. (Glasgow).*

A.—If the phones are connected in series-parallel so that there are two groups of phones in parallel, with two pairs of phones in series in each group, then the total resistance across the telephone terminals of the set will be the same as that of one pair of phones, assuming all the phones to be of the same resistance.—B.

OUR WEEKLY NOTE

ACCUMULATORS OR DRY BATTERIES

When dull-emitters were first introduced one of the principal advantages claimed for them was that they could be worked from dry batteries. However, experience has shown that, except in cases where only one or two of the most economical type of valve are used, dry batteries as a source of L.T. supply are far from being satisfactory.

The trouble is that the voltage of such a battery falls continuously during discharge, and the greater the current drawn from the battery the greater this fall in voltage.

Thus when dry batteries are used the rheotsats require to be constantly adjusted in order to maintain the same voltage across the filaments. This in itself is troublesome, but may be actually dangerous if the set is switched off and the rheostats left at their final adjustments. As soon as the current is cut off the voltage of the battery will begin to rise again so that when the set is next used a greater voltage than is advisable may be applied across the filaments.

The real advantage of using dull-emitter valves is that a very small accumulator will last for a long time, and it is strongly recommended that this source of supply should be used whenever the total current required by the valves exceeds about ¼ amp.

THE BUREAU.

The Tropadyne Super-het

Q.—*With reference to the Tropadyne super-het described in a recent issue of "A.W.," (1) Does the transformer core finish flush with the end cheeks or is the coil enclosed as with an L.F. transformer? (2) Would d.c.c. wire of the same gauge be satisfactory in place of the s.s.c. wire specified?—D. B. (Bournemouth).*

A.—(1) The core is placed flush with the cheeks, and not closed as with an L.F. transformer; (2) D.c.c. coil would not be satisfactory for the windings, as it would take up too much space and would vary the inductance.—C.

Counterpoise

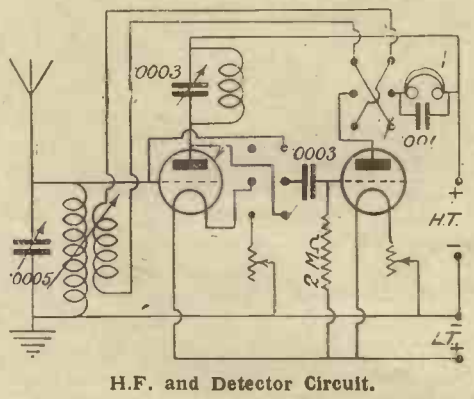
Q.—*I am using a single-wire counterpoise 14 to 16 ft. above the ground coupled to my earth. Would it be better to use two wires and if so should they be parallel or spread out fan-wise?—P. C. (E.5).*

A.—In the first place, the counterpoise should not be connected to earth. It should be insulated just as carefully as the aerial itself if the best results are to be obtained. Two shell-type insulators should be used at either end between the supporting ropes and the yokes of the spreaders. The lead-in from the counterpoise should be brought into the house through an insulated tube and care must be taken to keep resistance down by using heavy gauge wire. It does not, as a rule, matter whether the wires of the counterpoise are parallel or arranged fan-wise, though in some cases one method may give better results than the other.—S. H. R.

H.F. and Detector Circuit

Q.—*Please give me a two-valve circuit consisting of an H.F. valve followed by a detector. I wish to use tuned-anode coupling and would like to be able to cut out the H.F. valve when required.—K.C. (Eastbourne).*

A.—The circuit you require will be found on this page. A D.P.D.T. switch is used to



H.F. and Detector Circuit.

cut out the first valve, one side of this switch connecting the grid condenser either to the aerial or to the plate of the first valve, and the other side cutting in and out the filament of the first valve. Another D.P.D.T. switch is employed to enable the polarity of the reaction coil to be reversed at will. It will be necessary to do this whenever the H.F. stage is cut in or out.—B.

Mica Condensers

Q.—*Could you oblige me with a list of the materials required to make the variable mica-dielectric condensers for the Tropadyne super-het, and also a brief description of the methods of construction?—R. H. (N.19).*

A.—The making of this type of variable condenser requires much skill, and it is not possible to carry out the job without the use of a lathe. We recommend you to purchase four Baty .0005 mica-dielectric condensers for this receiver.—A. J. C.

Crystal Loud-speaker System

Q.—*Can a 6-volt accumulator be used instead of dry cells in the "A.W." crystal loud-speaker system?—P. R. (Essex).*

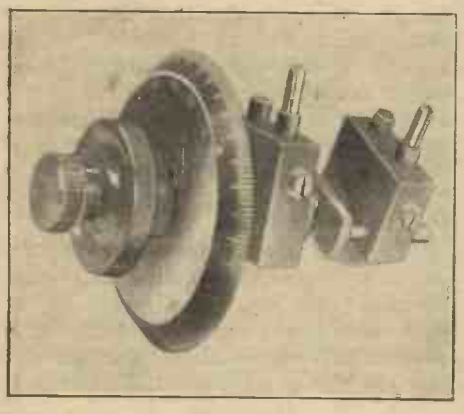
A.—An accumulator could, of course, be used, but the current drawn from it would be so small that it would be difficult to keep the battery in good condition. Dry cells, on the other hand, can easily supply the small current required by the microphone and, as they will last for a considerable time, will be quite economical besides being less trouble than an accumulator.—B.

"A.W." TESTS OF APPARATUS

Conducted in the "Amateur Wireless" Research and Test Department

A Neat Coil-holder

MESSRS. THE LONDON ELECTRIC STORES, LTD., of 9, St. Martin's Street, London, W.C.2, are the producers of a



The L.E.S. Coil-holder.

panel-mounting two-way coil-holder incorporating a novel vernier device. The component, which is illustrated in the accompanying photograph, is mounted by a one-hole fixing device, which clamps one of the coil-holder plugs firmly to the back of the panel. Through this fixed holder passes a shaft, at one end of which is attached the engraved dial and knob, whilst the moving coil-holder is fixed to the other end. This shaft is hollow and down its centre passes another smaller shaft which by a screw thread imparts a fine adjustment to the moving coil-holder. The vernier knob operates this motion.

The component is extremely well made and finished, whilst by means of a special clamping collar the friction is obtained necessary to prevent heavy coils from falling once they are out of the vertical position.

The Honeytone Loud-speaker Adaptor.

A Loud-speaker Adaptor

A GRAMOPHONE loud-speaker adaptor of unique design and construction has been sent to us for test by Messrs. C. G. Vokes and Co., of 38, Conduit Street, Regent Street, London, W.1.

Known as the Honeytone, it is only necessary to place the gramophone needle in the groove of the reed projecting from the centre of the instrument to convert a gramophone into a loud-speaker. The reed is rigidly fixed at one end to a metal strip and passes up through the centre of a solenoid. The impulses from the receiving set pass through the solenoid, setting up a strong magnetic field and temporarily transforming the reed into a magnet. According to the strength and form of the impulse received from the set the reed is vibrated between the poles of the permanent magnet.

An adjustment is provided to move the reed either towards or away from one of the poles. This adjustment takes the form of a small milled wheel fixed to the side of the instrument. The whole is covered in a metal case with a pleasing brown crystalline finish.

The results obtained with the Honeytone were exceeding good, the volume obtainable being exceptionally great. The reproduction of speech and music was very life-like, whilst a uniform response to all the audible frequencies was shown when used in conjunction with a good table-grand gramophone.

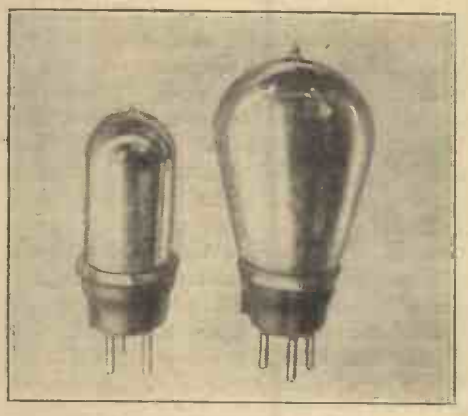
New Marconi Valves

THE Marconi Valve Co., Ltd., of 210-212, Tottenham Court Road, London, W.1, have submitted to us for test samples of their new valves, types D.E.2 H.F., D.E.2 L.F., D.E.8 H.F. and D.E.8 L.F. All the four valves are of the dull-emitter type, each consuming .12 ampere. The D.E.2 type require a 2-volt accumulator for filament-heating purposes, whilst the D.E.8 is supplied by 6 volts. A tabulated list of the properties of these valves tested by ourselves is given above.

In construction the valves are very robust and are fitted with good-quality ebonite caps.

Both the L.F. valves when used in conjunction with a suitable transformer give tremendous volume free from distortion. With the D.E.2 type, when a high-ratio transformer (greater than 3 to 1) is used as a coupling, it was found better to use a D.E.2 L.F. also as the detector. For lower-ratio transformers, resistance-capacity or choke-couplings the D.E.2 H.F. gave better results as a detector.

We can recommend these valves from the points of economy and efficiency.



Two New Marconi Valves.

Type of Valve	*Fil. Volts*	*Fil. Current*	*Amplification Factor*	*Impedance (ohms)*	*Best results obtained*	
					Plate Voltage	*G. B. Voltage*
D.E.2 H.F.	2	.12	12	45,000	30	—
D.E.2 L.F.	2	.12	7	22,000	80 (5-1 transformer coupling)	— 4
D.E.8 H.F.	5.6-6	.12	16	25,000	45	—
D.E.8 L.F.	5.6-6	.12	7	8,000	80 (5-1 transformer coupling)	— 4

A Variable Mica Condenser

A VARIABLE condenser which makes use of mica as a dielectric is manufactured by Messrs. Peter Curtis, Ltd., of 75A, Camden Road, London, N.W. The fixed and moving plates are made in two sets, each moving set connected to one of the fixed sets. As the dial is rotated to the position of maximum capacity the moving plates of each set interleave with the fixed plates, to which they are not connected.

On test it was found that the maximum

A Mica Variable Condenser.

capacity (sample submitted was rated .0003 microfarad) was approximately .00034 microfarad, whilst the minimum lay between .0001 and .00012 microfarad.

By E. BLAKE

PETER THE PARTICLE.—VII

Being Episodes in the Career of an Electron from Mars

Report of a speech delivered by the Chief Electron (Peter the Particle) at the Weekly Dinner of the Free Electrons (Copper Lodge), Fordville Branch, Panhandle State, U.S.A.

HOW I SERVED A TERM IN "QUOD"

"I AM not aware whether the word *quod*, as employed by the unlettered as a synonym for durance vile, is identical with that which was so frequently on the lips of your twopenny-ha'penny geometrician Euclid. Perhaps it does not matter. However, so far as I am concerned, *q.e.d.* means 'quod demonstrated it.' I understand that Darwin, the noted bug-hunter, showed that a decrease in elderly spinsters caused a decrease in the clover crop; his reasoning was erroneous but humorous. Less spinsters, fewer cats. Fewer cats, more field-mice. More field-mice, fewer bees. Less bees, less clover. *Q.E.D.* Now what quod demonstrated to me was—the more pigeons and the fewer corks, the more free electrons.

"I like pigeons. I like them in the same way that many people like cocktails; not for themselves intrinsically, but because of what they can do for one. Where do the corks come in? Well, I'd better begin where I left off last week, as the P.O. Wireless Inspector said when he tackled the T.I.P. Super-hetero-neutro-metro-puro-uni-oxo-dinkie-dyne set for the fourth time.

"I Am Stolen"

"After I saved the Lead atom from destruction at the hands of Dr. Juffle, I, the atom, and in fact the whole chunk of lead, were cast into the laboratory sink, whence we were retrieved by one Thomas Trapp, the bottle-washer, who took us to his house in a coat-pocket defiled by particles of shag. Thomas was not interested in metal fatigue, like Dr. Juffle. No, he was the Home Constructor *par excellence* and had received Rio de Janeiro on a piece of—home-constructed—'Whatasite' and two note mags.

"We were deposited in terrible company, on a rough bench in a thing called 'the shed,' a wooden structure at the bottom of the Trapp backyard in Southwark devoted to—I believe Mrs. Trapp said 'muckin'.' Whenever Mrs. Trapp had occasion to gird at Mr. Trapp she said—more in Southwark than in anger—'Wastin' time an' money on all that muckin', 'stead of takin' 'ome the blinkin' manglin'.'

"Trapp was, however, a persevering fellow and used to spend hours in the shed. For some weeks I had a holiday, broken only by a sharp set-to with the negative terminal of a—home-constructed—accumulator which was far too near for my comfort. The nearest positive charge on which I could rest my lines of force was on the window, which Trapp sometimes cleaned with a piece of old silk petticoat.

Trapped

"Then Trapp began to make another accumulator. He seized my bit of lead and pounded it brutally with a nasty knobby lump of porcelain. I think he was trying to flatten out the lead, but as I was shanghai'd, so to speak, I did not see the end of the business. He had given us only about a dozen blows, when I was forcibly transferred to the enemy. In a word, I was—er—seconded to the porcelain.

"I have remarked before that I can tolerate no backchat from calcium compounds. I am no snob, but there are limits. As my old Proton on Mars used to say, 'Peter, once an electron associates with Calcium he is beyond the pale of decent Charges.' Judge of my dismay, then, when I found myself actually doing work for a shilling insulator. I was hobbled like an Army elephant and anchored like a Portsmouth hulk. I was bumped by all manner of vulgar particles and deprived of the power to retaliate in kind.

"At the conclusion of some weeks of misery I was hoisted up to the high-potential end of Trapp's aerial, from which position I had a good view of the surrounding ether and saw for the first time the asymmetry and stark ugliness of the Southwark aerials. I believe it is no better in Surbiton. Immediately we were up the torture began. Scores of undisciplined E.M.F.'s shoved me this way and that, and I had no resilience. Consequently I was badly strained. There I experienced for the first time the dreaded 'fizzly' or continuous X, which keeps one on the rack for 10×10^{1000} cycles at one time.

Deliverance

"Truly, I ate the bread of affliction, brothers. My orbit dwindled. My energy declined. My ergs were numbered, and they were few. My mass—well, let me draw a veil over that. I was not fit to ring the bell of a pawnbroker's side door! And then——

And then that Pigeon came and broke his blessed little neck on the aerial. In the dark he came, with never a cork to warn him. A Deliverer, a Garibaldi, a Bolivar, a—all the rest of 'em. Down we went with a Mark Four Star crash, spreading destruction among the Trapp Sweet Peas. The prison doors opened, for the shilling insulator burst like a bomb, and I shot, with a special wriggle I learned in Mars, clean into a glorious drop of positive H_2O called Rain. It was slightly impregnated with Calcium, but a little thing like that didn't worry me—not even when we shot down a drain. Down with corks on aerials!" E. B.

(To be concluded)

MASS TELEPATHY BY WIRELESS

The photograph shows the party of "receivers" in the locked room at the Savoy Hotel on the occasion of the recent attempt at mass telepathy.

Left to right (sitting).—Miss Zena Dare (Hon. Mrs. Brett), Mrs. Twigg, Lady Tree, Miss Dorothy Warren. *(Standing).*—Commander Kenworthy, Mr. R. H. Eckersley, Mr. James Agate, Sir Alfred Robbins, Capt. C. A. Lewis and Mr. J. C. Stobart.

"BOTTLING" THE PRINCE'S SPEECH

The Date of Broadcast Must Wait on the B.B.C. Experiments

IN our last issue we gave a brief description of the Telegraphone, a recently-invented instrument with which it is possible to "bottle-up" speech or music, and we stated that the first public use of this apparatus was to be the recording of the speech of H.R.H. the Prince of Wales, on the occasion when the Lord Mayor is to congratulate the Prince on his recent tour. The Press has taken enormous interest in the proposal. At the time of writing (the day prior to the Friday—November 20—on which His Royal Highness is to make the speech), the engineers of the B.B.C. have not concluded their experiments for the necessary arrangements for amplifying the speech, and it is therefore still impossible to state the precise date on which the "bottled" broadcast will be made; it is extremely likely that by the time these lines appear in print it will have taken place.

It will be remembered that we made special reference to the amount of experiment necessary on the part of the B.B.C. engineers and the need for a satisfactory conclusion in order that the broadcast would be true to life, and it is just this matter which has made it impossible to determine the date.

A fully illustrated article describing the Telegraphone appears in the Christmas Number of the "Wireless Magazine" now on sale. Readers will be interested in the photographs of the apparatus in use which are reproduced on this page. Briefly, the apparatus consists of a microphone and a means of amplifying the variations of current, which are then converted into mechanical vibrations and recorded permanently on a "wax" cylinder, which later may be used for reproduction either direct or for broadcasting at some future date.

It is obvious that the instrument has some wonderful possibilities, among which are its use as a dictaphone, the reproduction of high-speed morse at low speeds, and many applications for broadcasting purposes.

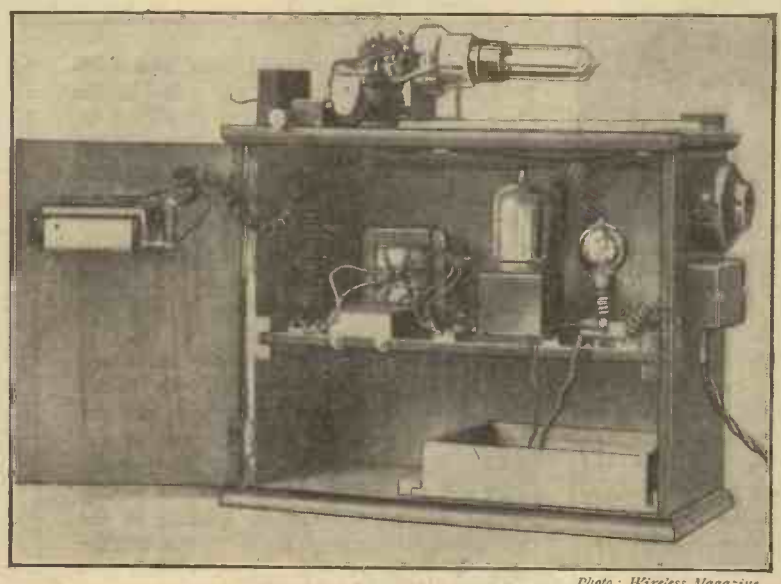
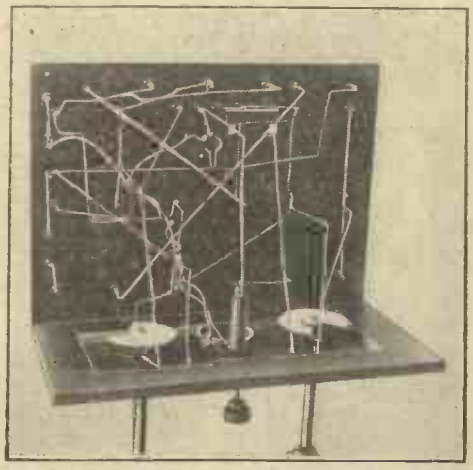


Photo: Wireless Magazine

Amplifier for Use with the Telegraphone.

The Telegraphone Records Everything Said and Heard in a Telephone Communication.

A Novel Switch is Part of the Telegraphone Equipment.



View of Backs of Panels.

A NOVEL MULTI-C

In the receiver described below use is made of movable co fixed circuit. The design is such that the wires are well s capacity and unde

THE experimental receiver about to be described is the result of some months of experimenting with a view to obtaining a panel on which a large number of different circuits may be wired up and tried without the use of switches. The result can, of course, be obtained by using fixed components with leads taken to separate terminals; but this involves the use of lengths of flexible insulated wire which cross and re-cross and which by their very nature render very difficult the avoidance of stray capacities and interaction between various leads with their consequent disadvantages.

The top panel, as will be seen from Fig. 1 (see page 830) and photographs, is fitted with valve sockets evenly and symmetrically disposed, into which the various components to be used in the particular circuit can be plugged. The components are adapted for plug-in connection by fitting them with valve pins at a uniform distance apart. In selecting the spacing of the pins, regard was had to the fact that the components to be moved consist chiefly of inductances and fixed and variable condensers. The fixing holes in the Dubilier fixed condensers are exactly 2 in. apart, and this was the separation decided upon. Not only is the distance convenient in this respect, but the capacities between the sockets are negligible.

The valve sockets on the panel are numbered consecutively 1 to 18, and these numbers correspond to those in the diagram of the wired circuit (Fig. 2). If the panel and the diagram are examined together it will be seen that the aerial circuits are on the extreme right and the anode circuits on the extreme left of the panel. The photograph of the back of the panel clearly shows the method of wiring the set and also the wide spacing of the various wires. Bare No. 16 square-section bar is used throughout except for the negative filament lead to and from the rheostat, which is of rubber-covered flex.

The Top Panel

The top panel is a piece of ebonite 12 in. by 9 in. by ¼ in. The drilling of the panel is simple and calls for nothing but an inspection of the drilling diagram. The five terminals at the top centre of the panel are the large pattern fitted with 2 B.A. shanks, whilst the remaining terminals have 4 B.A. shanks. Valve sockets are unfortunately not standardised and are sold with 4, 5 or 6 B.A. shanks indiscriminately. The holes to accommodate these, therefore, must be drilled of the required size. The two sockets X and Y, which will be seen between E2 and A2,

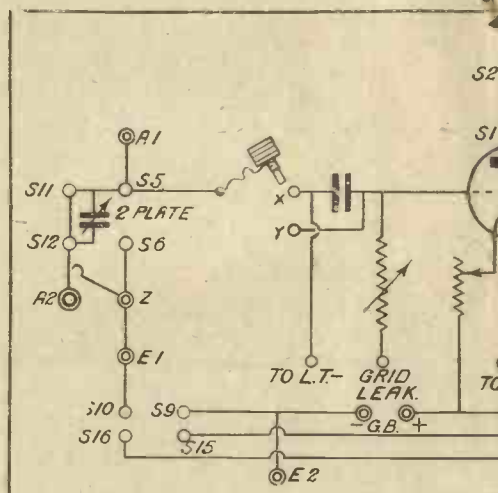
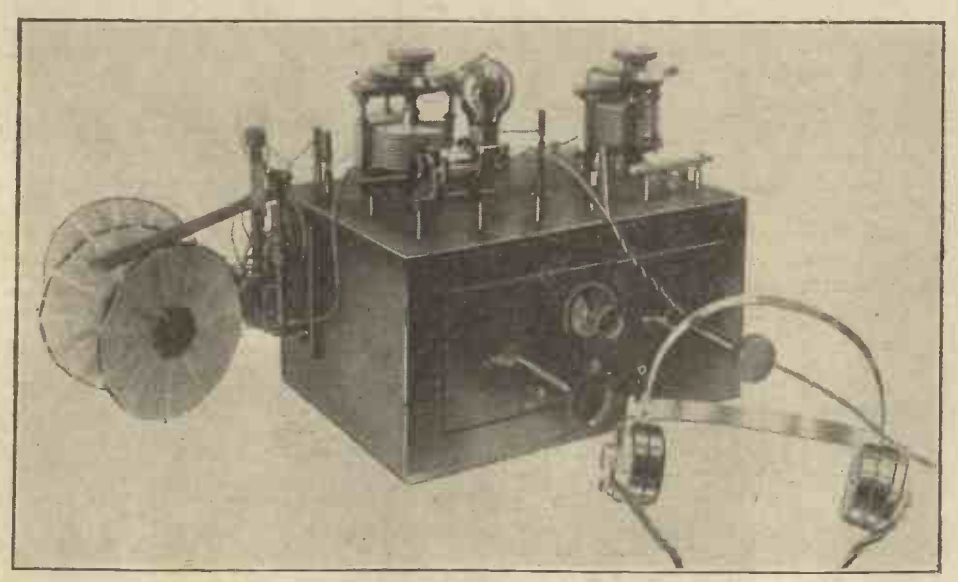


Fig. 2.—The V

are Clix sockets. The Clix plug shown is connected to A1 by a short length of flex passed through a small hole in the panel, the end below the panel being soldered to the shank of A1. This flex should be sufficiently long to enable the plug to be inserted into the plate socket marked P. This will be found very useful in wiring up crystal circuits. The terminal A2 is connected to the fifth of the large terminals marked Z by a length of square bar bent as shown. The two grid-bias terminals may also be shorted in a similar way.

The Front Panel

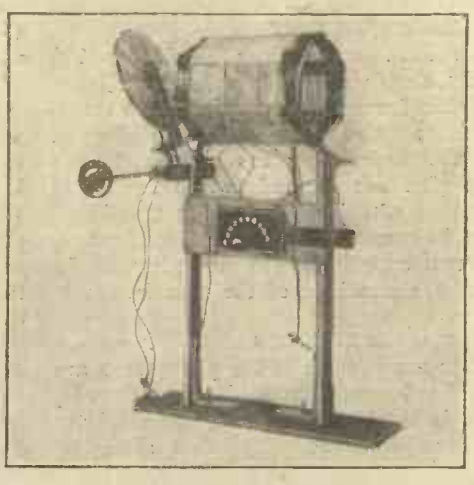
The front panel (Fig. 3) is 9¾ in. by 4 in. and may be of ⅛-in. ebonite. On it are mounted the two vernier condensers, the rheostat and the variable grid leak. The condensers used are the Colvern, the rheostat a Peerless and the variable grid leak a Bretwood. As the writer employs the .06 type of dull-emitter, the rheostat has a total resistance of 30 ohms. The sockets shown below the grid leak are again Clix sockets, the two middle ones being connected together and to the top end of the grid leak. The use of four sockets instead of three was adopted so



The Complete Receiver.

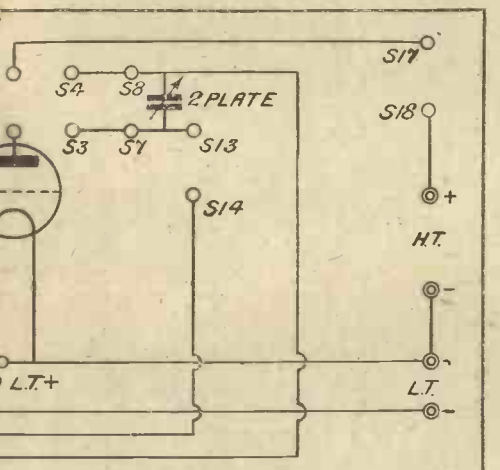
CIRCUIT RECEIVER

mponents, which may be inserted in various positions in a paced, and precautions have been taken to avoid unwanted sirable interaction.



A Tuning Coil.

that the connecting plugs might in either case be free of the knob operating the leak; when the two left-hand sockets are joined, the grid leak is across the grid condenser, and when the two right-hand



Vired Circuit.

sockets are joined, the leak is connected direct from the grid to L.T. positive. The panel itself is fixed to the wooden side of the containing box, which has a portion cut away to accommodate it.

The Wired Circuit

The points calling for comment in the circuit are four: (1) the Clix connection from A1, (2) the terminal A2, (3) the two terminals E1 and E2, (4) the sockets 1, 2, 3 and 4. With regard to (1), it will be observed that when the Clix plug is in X the connection from aerial to grid is via the grid condenser. This is the only fixed condenser which is permanently wired into the circuit; its capacity is .0003 microfarad. When the plug is in Y the connection from the aerial is to the grid direct and the grid condenser is "out." (2) the terminal A2 enables the A.T.C. to be placed in series. To obtain this position the shorting bar between A2 and Z is removed and the lead-in from the aerial connected to A2; when A2 and Z are shorted and the aerial connected to A1, the A.T.C is in parallel. (3) E1 and E2. These two terminals provide alternative earths with respect to the sockets 9 and 10. This is of importance when considering the position of the L.F. transformer in reflex circuits. (4) The sockets 1, 2, 3 and 4. The provision of these four sockets enables either tuned anode or tuned H.F. transformer to be used. The tuned-anode coupling is obtained by shorting 1 to 3 and 2 to 4. A small component for effecting this is described later.

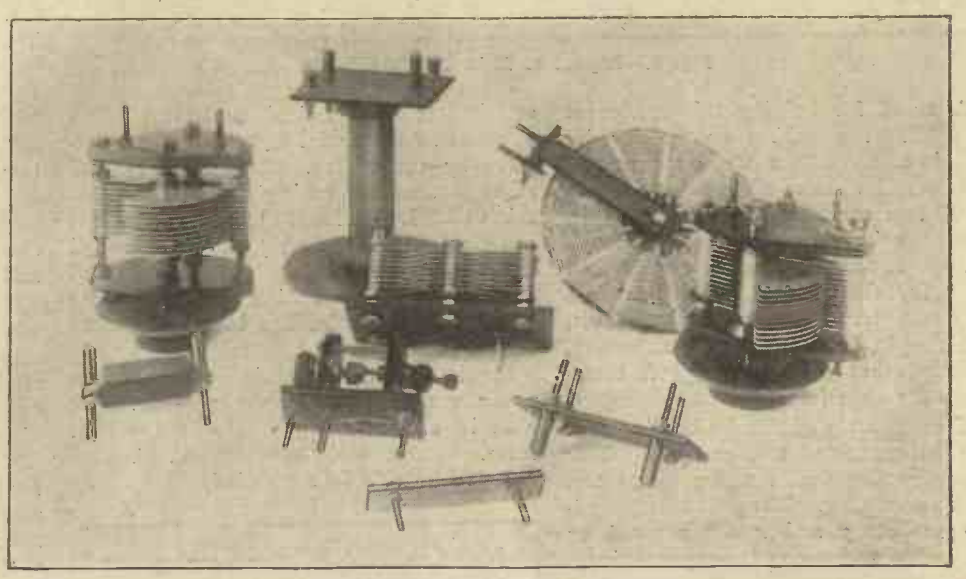
The Components

The condensers (fixed and variable) will first be dealt with. The mounting of the fixed condensers is interesting and very efficient. Two valve sockets and two valve pins are necessary for each condenser. The threaded shank of the socket is first removed either with hack-saw or file and the base filed square with the sides. The base of the socket is then drilled and tapped to take the threaded portion of the valve pin. The drilling can best be done from above because the socket itself forms a guide for the drill. The pins are inserted through the fixing holes of the condensers and the sockets screwed down. A short length of wire is soldered at one end to the soldering tag and at the other secured under the socket when screwed down.

This method of mounting enables condensers of various capacities to be plugged in one over the other until the best value of the capacity has been ascertained for the particular position in the circuit. The variable condensers, for ease of adaptation, should have ebonite end-plates. Two holes to take valve pins are drilled and tapped 2 in. apart in the base of the condenser. The fixed vanes should then be connected to one pin and the moving to the other. Two ways of making the connections are shown in the photograph of the components. It will be evident that not only can the fixed condensers be plugged in one over the other, but a variable condenser can be plugged in over a fixed condenser so that any capacity above the minimum of the variable condenser can be obtained. This is also extremely useful.

The Crystal Detector

The crystal detector may, of course, be of any type. That shown in the photograph of components is a Mic-Met, which was the writer's final choice after many experiments. The detector is shown mounted on ebonite strip with three valve pins. Two of these are 2 in. apart, the third (between them) is spaced for plug-



A Group of Some of the Components.

ging into the grid and plate sockets of the valve holder.

The Transformer

The L.F. transformer (a Lissen T3) merely stands on the panel. Flex leads are taken from the terminals on the transformer to valve pins, which are plugged into the sockets on the panel. If the valve pins are secured to the flex leads by means of drilled sockets as mentioned above in connection with fixed condensers, different capacities can be plugged in across the windings of the transformer.

Other Components

Other components in the photograph are (1) a fixed condenser with air dielectric, which is built up of ordinary fixed plates to the required capacity; that shown is .0003 microfarad. This condenser is used between the aerial lead-in and the terminal A1 and will be found—in valve circuits—to give increased signal strength in many cases and less reaction demand.

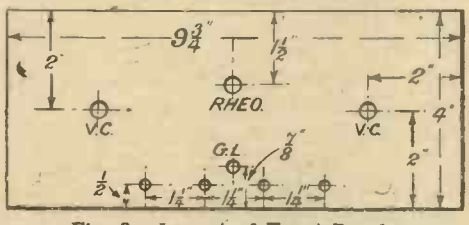


Fig. 3.—Layout of Front Panel.

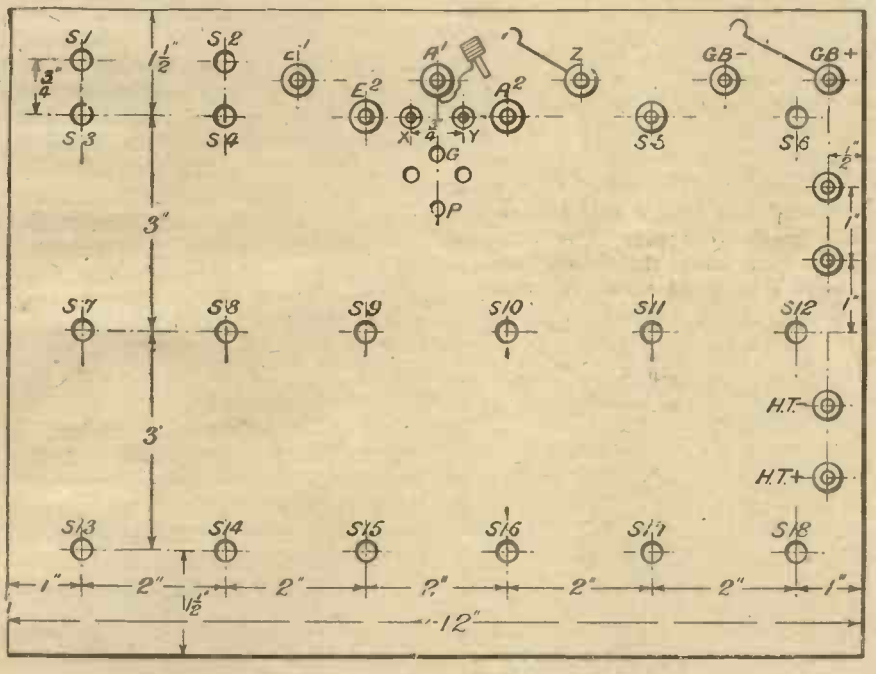


Fig. 1.—Layout of Main Panel.

(2) A stand for holding this condenser (constructed of a bobbin on which wire is sold) is screwed to a wooden base and bears a small ebonite slab on which are mounted two sockets and two terminals, the latter being connected one to each socket. A variable condenser can also be plugged in, the connection in this case being made from the terminals. This, though simple, is an invaluable accessory, and many other uses will suggest themselves to the experimenter.

(3) A small strip of ebonite bearing four valve pins connected two and two. This is for connecting socket 1 to socket 3 and socket 2 to socket 4. The pins corresponding to sockets 3 and 4 are secured by tapped valve sockets as before explained. The use of this enables tuned-anode coupling to be employed. It can be seen in the left-hand side of the photograph of the receiver.

(4) A shorting plug. This is a strip of ebonite or wood holding two valve pins, which are connected together by copper strip.

(5) A tuner consisting of a low-loss coil wound with No. 18 d.c.c. wire on a skeleton former, the turns being separated by string loosely wound on the ebonite strips over which the wire is wound. Tappings are taken to the studs on the switch shown. A lead from the switch arm goes to a terminal on a small piece of ebonite strip shown on the right. The aerial is attached to this terminal, and the number of turns in the aerial circuit can be regulated by the switch. Auto-coupling and other methods of tuning can be tested on this coil. Leads from the end of the coil are plugged into sockets 5 and 6. Although not shown, variometers can be mounted on ebonite strips having the usual two valve pins, the windings being connected to the pins.

Some of the circuit arrangements possible with this receiver will be dealt with in a concluding article in the next issue.

C. C. P.

(To be concluded)

CONCERNING THE SUPER-HET

IT will be readily agreed by most wireless enthusiasts that the super-heterodyne promises to be the set of the future. Its advantages over other circuits and receivers are enormous; no other set has such a tremendous range and, what is equally important, the ability to pick out a remote station in spite of local interference. It is independent of an outdoor aerial, and the small frame practically eliminates atmospherics and mush generally.

The purpose of this article is not to explain the theory of the super-het, but to describe the best and most economical method of working the set. The initial cost is, of course, heavy. The valves, the oscillation coupler, and the intermediate transformers are all expensive items; and it is inadvisable to cut down the number of valves used or the chief advantages of the set will be lost. The many fixed condensers and the grid leaks required in various parts of the circuit must be of the highest quality; poor components will only lead to disappointment and indifferent results.

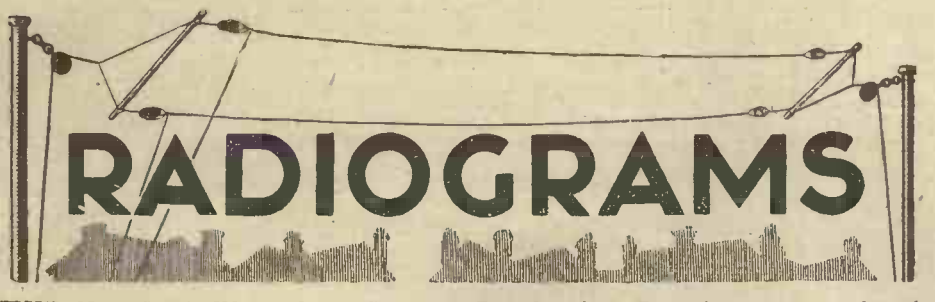
Then there is the question of valves. Now that the average bright-emitter only costs eight shillings, many amateurs will be strongly tempted to lay in a stock of these valves for their super-het. But this is the worst possible policy. A bright-emitter consumes .7 of an ampere; eight such valves will consume more than 5 amperes, which is a heavy strain on the accumulator. Moreover, the owner will be faced with a heavy charging bill every month.

The alternative is to buy the dull-emitters of the class which only require .06 ampere at a pressure of 3 volts. Such valves cost about sixteen shillings and are therefore very expensive when purchased in large quantities. But think of the saving in filament current; eight such valves will take less than .5 ampere, which a large dry battery can comfortably supply. While the cost of maintaining eight or more bright-emitters will run into pounds, the running of the low-temperature valves will be only a question of shillings.

To sum up, the owner must be prepared to spend a fair amount of money in the installation of this luxurious receiver; the upkeep, however, he can keep within reasonable limits if he choses his valves and batteries carefully.

The dull-emitters will last for years without replacements. If treated gently, they are practically everlasting. A moderate-sized accumulator recharged every four months will give excellent service at a very low cost. A large and heavy high-tension battery will feed the valves for nearly a year. Hence the running expenses of a super-heterodyne receiver are not alarming; the total upkeep will work out at roughly forty shillings a year, which is not very much more than the

(Concluded on third column page 834)



THE New South Wales State Government proposes to establish a State wireless broadcasting station on similar lines to that now in operation in Queensland. The scheme will provide for the establishment of relay stations in various country centres.

The wireless station at Colombo (Ceylon) has been experimenting with a new and up-to-date C.W. plant in order to explore the possibility of establishing direct wireless telegraphic communication with Perth, Western Australia, 3,120 miles away.

To give the spice of variety to the programmes it is the intention of the B.B.C. to introduce this winter many other dance bands in addition to those already being regularly broadcast.

The recent thought-reading experiment organised by the B.B.C. did not produce any accurate answers from the thought-readers.

Between London and Leeds four special lines have been set apart by the Post Office for the use of the B.B.C. Thirty amplifiers automatically feed the lines with the London programmes.

A special Kentish programme is to be provided from 2 L O on December 2. It is hoped to introduce a radio version of Chaucer's Pilgrimage and broadcast a peel of bells from Canterbury Cathedral.

The Director of the Bourges Observatory, France, puts forward the theory that birds are guided in their journeys by electro-magnetic currents.

At a meeting of the Dundee station's "Sports Corner" a presentation was made to Mr. W. F. Campbell, the well-known referee, who is leaving for London. Mr. Campbell was one of the originators of the "Sports Corner," and its success has been largely due to his initiative and enthusiasm.

A new system of amplifiers that will improve reception and correct distortion is being used in connection with the B.B.C.'s simultaneous broadcasting system.

It is claimed that the very last word in wireless apparatus has been installed on board the liner *Transylvania*. It consists of a 1½ kilowatt Siemens quenched spark and C.W. set, and is so powerful that the operator is able to get into direct touch with New York when off Greenock, on the Clyde.

It is probable that the Radio Society of Great Britain will give evidence before the Broadcasting Committee set up by the Government.

A wireless installation is the latest device employed by a dentist in London to soothe the apprehensions of his patients.

Manchester's contribution to the series of "Radio Revels" organised by the B.B.C. will be held at Belle Vue on December 15. Two dance bands have been engaged, and music will also be relayed through London from Continental stations.

Fire insurance companies in Canada are endeavouring to ascertain the part played by wireless as a factor in increasing fire losses. American fire insurance companies have already made a slight increase in premium.

The world's largest loud-speaker is being built in Germany. It will be used experimentally to supply music over an area of about a quarter of a mile, though the makers anticipate that it will be heard at a much greater distance. The giant instrument will have three bell mouths, each 40 ft. across and 110 ft. in height.

In common with all stations of the B.B.C., 5 X X will hold a "Radio Revel" on December 15 at the Patti Pavilion. The financial results of these revels will be devoted to charities.

On Sunday, November 29, after the evening studio service, unaccompanied singing by the choir of the New College Chapel will be relayed from Oxford.

The last act of *Carmen* will be relayed from the B.N.O.C. performance at the Prince of Wales Theatre, Birmingham, on Wednesday, December 2.

The Hallé Orchestra, under the direction of Sir Hamilton Harty, playing at the Free Trade Hall, will open the evening programme on Thursday, December 3. A village concert at the 2 L O studio, under the presidency of Vivian Foster, the "Vicar of Mirth," will provide the light fare of the day's broadcast.

The Chinese actress, Rose Quong, will broadcast from the London station on Sunday, November 29.

A conference of European broadcasting stations will be held at Brussels in the course of next month, when the final wavelengths will be definitely allotted to all transmitters.

It is proposed to incorporate in the new Frankfort-on-Main broadcasting station, now in course of erection, the appliance invented by the Scribi-Vox Co., of Berlin, by which both speech and music can be registered on a magnetised steel band and reproduced by means of amplifiers at any later date.

The Western Electric Norsk Aktieselskapet at Oslo has now finished the construction of the new Helsingfors transmitter. This station is testing daily between 18.00-21.00 G.M.T. on 522 metres. Power is 500 watts.

A new protean burlesque entitled *The Park Keeper* will be broadcast by Louis Hertel from the London studio on Friday, December 4. A "Round the Stations" programme will conclude the entertainment on that evening.

In commemoration of the anniversary of Puccini's death a special programme composed of his works will be broadcast from 2 L O on November 29. Mr. Percy Pitt will give a short descriptive talk on the famous Italian composer's operas, and an attempt will be made to pick up via Keston a message which is to be broadcast from Rome on this occasion.

The Radio-Belgique station has concluded a contract with the Théâtre du Marais, Brussels, by which the broadcasting station will be empowered to relay dramatic performances from that theatre during the coming winter.

The Evensong from Durham Cathedral is to be relayed to the Newcastle station on November 29. An address will be given by Bishop Weldon, Dean of Durham.

The Berlin amateur transmitting station of the Funktechnische Verein now works regularly every Wednesday and Friday evenig from 21.30 to 22.30 G.M.T., and on Sundays from 01.00-02.00 G.M.T. Further irregular transmissions are made on Sundays between 13.00-14.00 G.M.T. The club has two transmitters in operation, one of 200 watts on 750 metres, the other of 10 watts on 43 metres. The call-sign is now K C 8.

St. Andrew's Day, November 30, will not only be celebrated at all the Scottish stations but at the London studio as well. A recitation of "Guddlen," from the pen of Ian Maclaren, and interpreted by Mr. Augustus Beddie, will be relayed from the Edinburgh station.

The Potsdam (Prussia) authorities have decreed that all aerials are to be registered with the local police. Would-be licence-holders are compelled to submit plans, measurements, diagrams and other sundry details, and so many conditions must be fulfilled that many wireless enthusiasts will be deterred from purchasing apparatus.

The wireless transmitter erected at the military aerodrome at Soesterberg (Holland), utilising a power of only 10 watts, has established two-way communication with Nijni-Novgorod, Spain and Jugo-Slavia. Experiments have been carried out on various wavelengths between 16 and 42 metres, but for the present transmissions are being regularly sent out on 40 metres.

(*More Radiograms on page* 838)

EXPERIMENTS WITH "THE CRYSTAL EXPERIMENTER'S DUAL RECEIVER"

The constructional details of this receiver appeared in our last issue

THE following are some experimental circuits which may be tried on the dual receiver, constructional details of which appeared on page 761 in No. 181. The theoretical circuit diagram is shown in Fig. 1. For purposes of convenience and identification the various terminals, plugs and sockets are numbered to correspond with the diagrams already given of the front and back of the panel (Figs. 2 and 3, page 761). Each circuit about to be described will be marked in accordance with the front-of-panel diagram, which will show clearly how they are obtained on the actual receiver. Having studied the few examples given, it is assumed that the experimenter will be able to proceed to work on his own lines.

Six suggested test circuits are shown in Figs. 2 to 7.

Circuit No. 1.—The first example chosen (Fig. 2) has only a coil for the aerial-tuning inductance and a detector and phones. Reference to Fig. 2, page 761 (front of panel), will immediately show which plugs are used and their relative positions. Tuning is effected by means of the condenser C1.

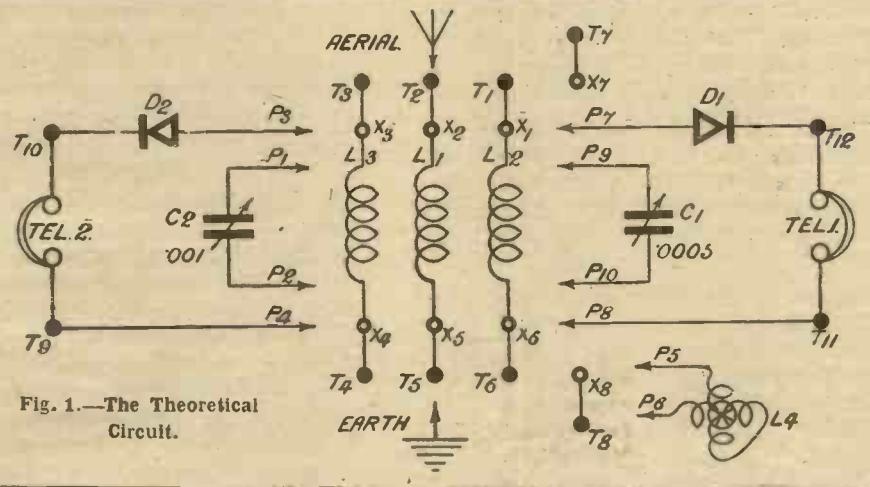


Fig. 1.—The Theoretical Circuit.

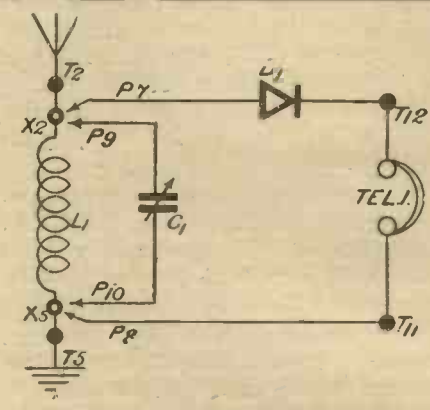


Fig. 2.—A Simple Circuit.

Circuit No. 2.—This employs the variometer L4 with the addition of a loading coil L1 in series. A small loading coil should be used for local reception where the variometer fails to cover the wavelength range, the .0005 condenser C1 tuning in parallel across the whole of the condenser C1 is used in parallel with the secondary coil L2.

Circuit No. 4.—Here is an auto-coupled circuit using two plug-in coils L1 and L2. The condenser C1 is in parallel across the aerial-tuning industance (see Fig. 5).

Circuit No. 5.—Fig. 6 shows an arrangement which takes the form of a wave-trap. This circuit is particularly good on small indoor aerials. Tuning is first effected by means of condenser C2 and finally by means of the variometer L4.

Circuit No. 6.—Fig. 7 is a special dual circuit in which coils L1, L2 and L3 are coupled, and both detectors D1 and D2 used, thus enabling rapid test to be made to discover the relative merits of each. Also, one person may listen-in on one pair of phones while another is experimenting with crystals, at the same time listening-in on the other pair of phones (see Fig. 7).

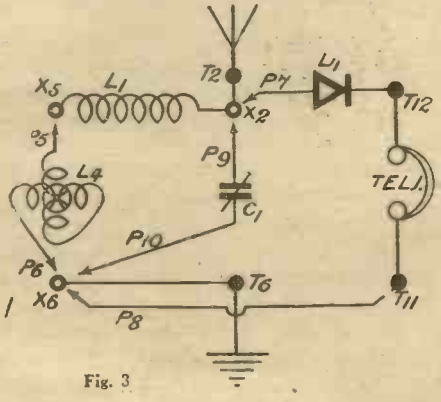


Fig. 3

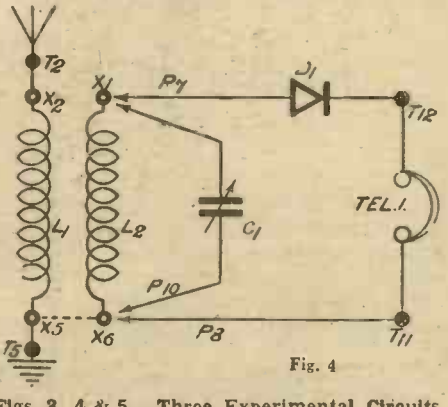


Fig. 4

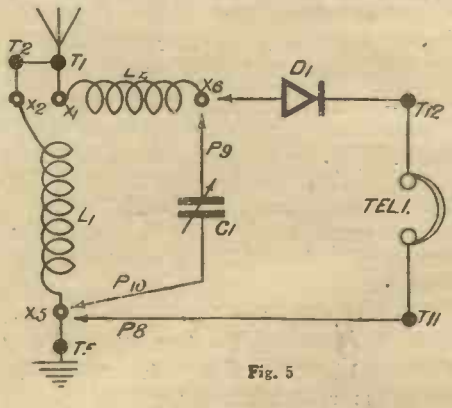


Fig. 5

Figs. 3, 4 & 5.—Three Experimental Circuits.

(Concluded on page 834)

"EXPERIMENTS WITH THE CRYSTAL EXPERIMENTER'S DUAL RECEIVER" (*continued from page* 832).

One of the advantages of this arrangement is that there is no loss of signal strength which is usually due to the use

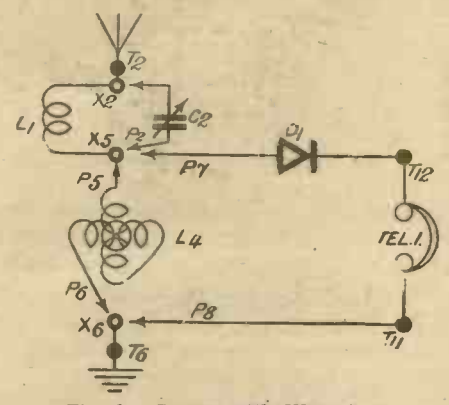


Fig. 6.—Circuit with Wave-trap.

of more than one pair of phones being used in series or in parallel in one circuit.

Combinations

Crystals.—Some brief notes on crystals obtainable and suggested combinations to try may not here be out of place. Detector 1 may be permanently equipped with a good piece of hertzite, which seems most reliable for continuous use. A fine gold or copper catwhisker is most satisfactory. All experiments *re* crystals are therefore carried out on detector 2. The following is a list of crystals obtainable, together with notes on contacts, etc.

Crystal.	*Contact*
Carborundum	Steel.
Galena	Silver, brass, copper or magnesium ribbon.
Silicon	Gold or steel.
Iron pyrites	Gold.
Molybdenite	Silver.
Zincite	Tellurium.
Zincite	Copper pyrites.
Galena	Tellurium.
Galena	Graphite.
Tellurium	Arzenite.

These are the most common crystal com-

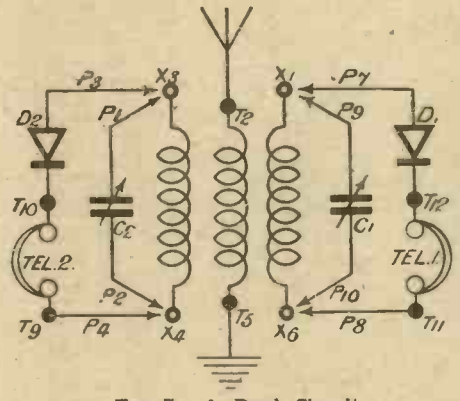


Fig. 7.—A Dual Circuit.

binations, although many other less familiar crystals are obtainable.

To assist in memorisation, this article is concluded with the explanatory key below.

KEY.

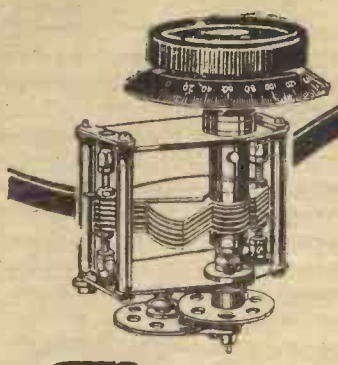
X1	aerial side of coil	L3
X2	aerial side of coil	L1
X3	aerial side of coil	L2
X4	earth side of coil	L2
X5	earth side of coil	L1
X6	earth side of coil	L3
X7	aerial series to	T7
X8	earth series to	T8
P1	fixed vanes of condenser	C C2
P2	moving vanes of condenser	C2
P3	crystal side of detector	D2
P4	earth side of phones	Tel. 2
P5	stator input of variometer	L4
P6	rotor input of variometer	L4
P7	crystal side of detector	D1
P8	earth side of phones	Tel. 1
P9	fixed vanes of condenser	C1
P10	moving vanes of condenser	C1

"CONCERNING THE SUPER-HET" (*continued from page* 830)

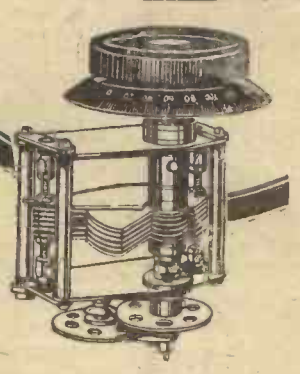
maintenance of a three- or four-valve ordinary set.

If the tuning seems difficult at first, don't blame the set. The knack is difficult to acquire, and the best results are obtained after a few weeks' practice. Also remember that if L.F. stages are used they must be carefully designed or distortion will occur. The writer is strongly in favour of one or more stages of resistance-capacity amplification, which is pure and noiseless.

G. J. M.



More Opinions of Famous Amateurs



Mr. A. Garrett.

Station 5 R B.

"I find it really excellent. The absence of any possible backlash and quietness in working are two great points, especially for short-wave work. I shall have no hesitation in recommending to my friends, and other amateurs."

Captain Percy Baker.

Tewkesbury.

"You are too modest in your advertisements. I can tune in Continental stations as easily as Daventry, with good sharp tuning. If only your condenser had been invented earlier I should have saved pounds, for I have tried about 14 different kinds. You cannot miss a station on it."

Mr. D. McAteer.

Dublin.

"I can report quite shortly that it is better than any of the well-known makes on the market. The smooth action makes tuning to the low wavelengths, such as KDKA, quite a simple matter."

YET more impressive tributes to the GECoPHONE Condenser are reproduced here. Fit a GECoPHONE Condenser in your own set to-day!

Mr. John Sadler.

President Aberdeen Radio Society.

"Your advertisements in no way exaggerate the superior quality and tremendous advance in variable condenser design. My own practical appreciation has taken the form of ordering two more."

Mr. Louis J, Wood.

Hon. Sec. Halifax Radio Club.

"A combination of the finest condenser features which has yet been manufactured in this country. The reduction gear is as near perfection as it is possible to get—the fixing, simplicity itself. You are to be congratulated."

Mr. T. McNamera.

Swansea.

"The slow-motion mechanism is the most ingenious that has yet come to my notice. Another point which impressed me was the increase of one's tuning range . . . the efficiency of the receiver in which the condenser is has gone up 50 per cent."

Mr. Maurice Child.

Director London Telegraph Training College.

"I have considered it sufficiently accurate to form a unit in a Heterodyne wavemeter which is being constructed in our students' workshop. You are to be congratulated on having produced such a really practical article."

Mr. J. A. Partridge.

Station G2KF.

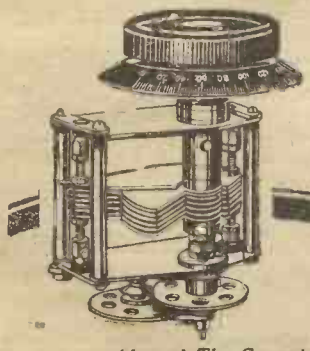
". . . the slow-motion device was found to be an ideal arrangement. The entire freedom from backlash and the smoothness of movement were very agreeable. There was a complete absence of . . . hand-capacity."

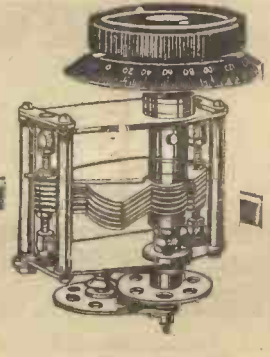
GECoPHONE

LOW LOSS-SLOW MOTION VARIABLE CONDENSER

GECOPHONE Components are fully described in Booklet B.C. 3759.

Full particulars of GECOPHONE Sets are given in Booklet B.C. 3772.





Sold by all GECOPHONE Service Depots, Wireless Dealers & Stores

Advt. of The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.

Fog-signalling Apparatus

SIR,—Among the Radiograms in No. 179 I note it is stated that "the first fog-signal apparatus on the Spanish coast is being installed at Cape Silleiro." Is this correct, as the 1923 "Year-Book of Wireless Telegraphy and Telephony" mentions fog-signalling apparatus at Cabo Villano and Cabo Finisterra, and the 1925 Year-Book adds Cabo Prior and Isla de Salvora? All work on 1,000 metres.—B. D. (Stock).

"Building a Permanent H.T. Battery"

SIR,—With reference to the article on construction of a battery which appeared in No. 159, as I have constructed a 168-volt battery on the same lines mentioned therein and have only seen one letter of appreciation in your Correspondence column from readers, I would like to let you know my great appreciation of the above tip in view of the strong need at the present time for a really permanent and reliable H.T. battery.

I find the battery to be well up to the requirements of my nine-valve super-heterodyne receiver (incorporating three power valves). For ordinary purposes I use three valves, H.F., detector (tuned-anode) and L.F. Using a maximum plate voltage of 120 volts for the last-named receiver, I find that reception is all that can be desired in way of purity. The volume and clarity is simply amazing for so simple a construction.

In the ordinary course of events I can never keep an H.T. dry battery for any longer than three months, but I have had the wet battery in use now since June 20 last.

I can thoroughly recommend the battery to all readers of "A.W." and would like to avail myself of this opportunity of making known my very great appreciation of the article.—H. W. T. (London, N.).

Super-regenerative Receivers

SIR,—I am afraid I do not agree with J. F. J.'s answer to L. A. M. (Bedford) in No. 173, since I am able to receive the high-power station, about 150 miles away, louder than London, only 27 miles away, both stations coming in at good strength. My circuit is the simplified Flewelling, and, of course, this receiver requires a larger reaction coil than the single "straight." However, I find the most suitable coil to use in the reaction for Daventry is the same reaction coil used for the lower B.B.C. station. My reaction coil consists of 100 turns of No. 36 silk-covered wire in a basket coil. Being a Flewelling enthusiast since the circuit was first published in this country, in my humble opinion it is the best and most interesting of the outdoor-aerial single-valve receivers.—S. E. W. (Holmwood).

Other Correspondence Summarised

J. M. (Glasgow) finds that reception is far better when no metal, tinfoil or screws are used for securing the crystal in the cup.

J. W. J. (50, King Street, Cambridge) has been allotted the call-sign 5 J O, and would welcome reports.

E. W. (190, Liverpool Road, Irlam, near Manchester) wishes readers to note that the call-sign 2 U A belongs to him and not to an amateur in London, as is erroneously supposed.

Help yourself!

TAKE your choice of any part of the world. With an Ormond Condenser station after station can be tuned in quickly and sharply, no matter how closely the wave lengths approximate. Paris, Madrid, Rome, Breslau—any part of Europe, any part of America. With an Ormond Condenser nothing is simpler. But it must be an ORMOND—the result of 25 years' British Manufacturing experience.

Ormond Low-Loss Condensers

SQUARE LAW (Patent applied for.)

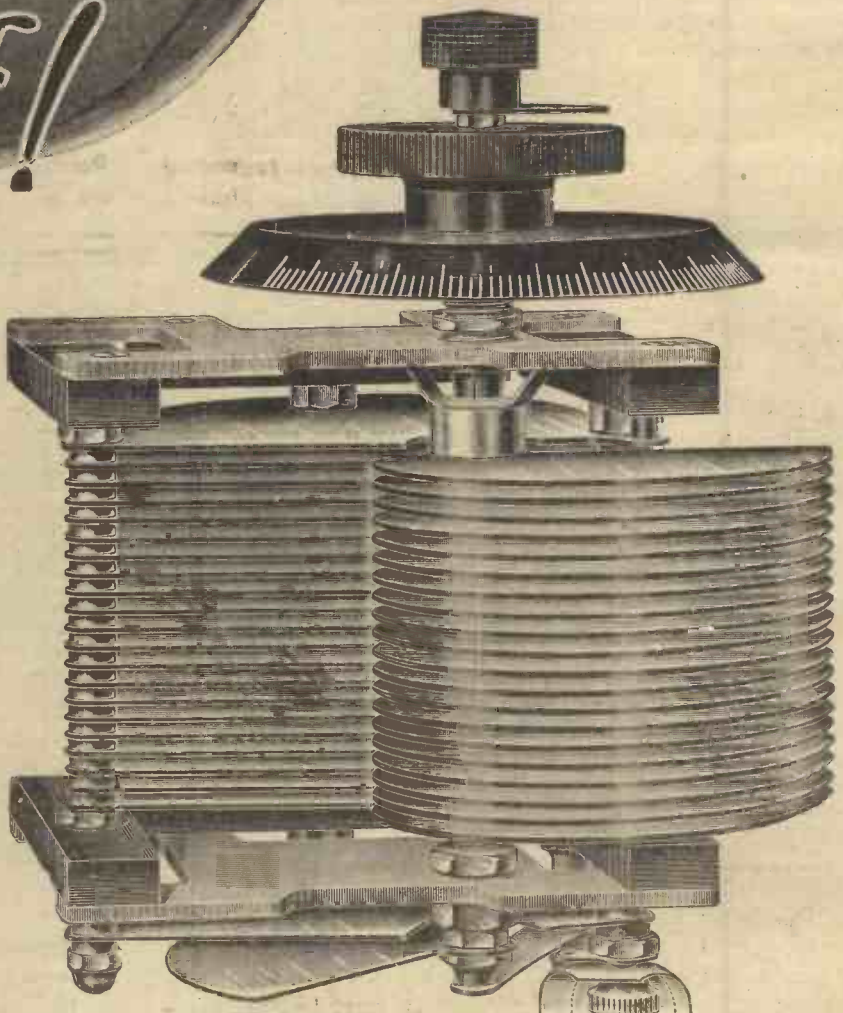
Supplied in the following sizes:

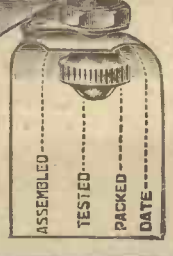
Size.	Price with Vernier.	Price without Vernier
.00025	8/-	6/6
.0003	9/-	7/6
.0005	9/6	8/-
.001	10/6	9/-

Complete with knob and dial.

We specialise in turning Brass and Steel Screws and Machined Parts and Accessories of all descriptions.

Ask your dealer to show you these Ormond Condensers—the best dealers stock all Ormond products.





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25 YEARS' BRITISH MANUFACTURING EXPERIENCE

MORE RADIOGRAMS

BOTH in Berlin and Vienna experiments are being carried out with a view to testing the advantages of wireless communication between motor fire-hydrants and brigade headquarters. The aerial of the Berlin fire brigade is being installed on a high building in the centre of the city. The supporting masts are 315 ft. high.

The Radio Club Sénégalais, founded at St. Louis (Senegal) in December, 1924, has obtained permission from the French Colonial Ministry to erect a small broadcasting station for the purpose of disseminating news bulletins and weather reports in the Colony.

At an early date the Glasgow station hopes to broadcast a story in which the author himself will be the reader at the microphone. The suggestion is that a story of ten or twelve chapters, by a well-known writer, should be broadcast at the rate of a chapter or two each night.

A novel wireless competition is being run in Scotland, in which the first prize is a free scholarship at a wireless college. The competition, which is for the purpose of encouraging study of the technical side of wireless, consists of twenty simple questions.

By the destruction by fire of the Kelvin Hall, the West of Scotland was deprived of a wireless exhibition this autumn. Many of the manufacturers, however, agreed to take part in a week's display in private premises in the city.

The working of the new amplifiers in the House of Lords will be watched with interest. Three microphones have been put in, one on each side of the table for the use of front-bench peers, and one for the Lord Chancellor. Headphones are provided for back-bench peers, who have complained of the acoustics of the chamber. The Press Gallery will also be able to listen in with the aid of phones.

Lord Queenborough, president of the Miller General Hospital, Greenwich, recently acknowledged the gift of a wireless installation for the use of the inmates. The apparatus is an eight-valve set, capable of serving 290 pairs of headphones and 30 loud-speakers.

The first broadcasting station in the Irish Free State has been erected by Marconi's Wireless Telegraph Co., Ltd., in the McKee Barracks, in the outskirts of Dublin. The studio will be in Denmark Street, off Henry Street. The transmitter, which will operate on a wavelength of 390 metres and will use the call-sign 2 R N, is a Marconi 6-kilowatt type-Q set. As this is the same type as the majority of the British main broadcasting stations, and also of a large number of foreign stations which are well received in this country, British listeners may anticipate good reception of the concerts from the Dublin station. It is expected that tests will begin shortly and that the service will be inaugurated during December.

The Carnarvon Town Council has decided to support an appeal to be made to the British Broadcasting Co. for the establishment of a station in North Wales, with the addition that its location should be Carnarvon.

"**A Model Goods Depot for a Railway**" is the subject of an illustrated article appearing in the current issue of "The Amateur Mechanic and Work" (3d.), and will be of interest to model-railway enthusiasts, as it helps in giving the system a realistic appearance. Other articles in the same number are: "Some Simple Wooden Stools," "Keeping Tools in Good Order," "Two Old-time Candlesticks," "The 'A.M.' Reflecting Telescope: Making the Mirror," "The Water-seal: Hygienic Hints," "Pre-ignition in Motor-cycle Engines," "Making a Honeycomb-coil Winder," "A Combined Plug for Current Supply," "A Coat and Trousers Hanger," "Home Boot-repairing: Sewing the Sole," "Removing Dents from Motor-car Radiators," "Practical Photography: The After-treatment of Holiday Negatives," etc.

Barnsley and District Wireless Association

Hon. Sec.—MR. W. PEACOCK, 28, Park Grove, Barnsley.

THE association held their second annual dinner on October 20, when a wireless menu was one of the features.

Newcastle-on-Tyne Radio Society

Hon. Sec.—MR. N. HENDRY, Hertford House, Sanderson Road, Newcastle-on-Tyne.

THE annual general meeting was held at 5, Charlotte Square, on November 9, when new officers were elected for the coming year and a very hearty vote of thanks passed to the retiring officers and committee. Any who are interested in wireless are cordially invited to attend a meeting as visitors.

Berlin is broadcasting a talk on "Travelling in Winter." It leaves us cold.

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

GREAT BRITAIN

The times given are according to Greenwich Mean Time.

London (2LO), 364 m. 1-2 p.m., con. (Tues., Thurs., Fri.); 3.15-3.45, transmission to schools; 3.30-5.30, con. (Sun.); 4-5 p.m., con.; 5.15-5.55, children; 6 p.m., light music; 7-8 p.m., time sig., news, music, talk; 8.0-10 p.m., music; 9.0, news (Sun.); 10.0-10.30 p.m., time sig., news, talk; 10.30-11 p.m., special feature (Mon., Wed., Thurs., Fri.). Tues. and Thurs. the Savoy Bands are relayed until 11.30 p.m., and on Sat. until midnight.

Aberdeen (2BD), 495 m. **Belfast** (2BE), 440 m. **Birmingham** (5IT), 479 m. **Bournemouth** (6BM), 386 m. **Cardiff** (5WA), 353 m. **Glasgow** (5SC), 422 m. **Manchester** (2ZY), 378 m. **Newcastle** (5NO), 404 m. Much the same as London times.

Bradford (2LS), 310 m. **Dundee** (2DE), 331 m. **Edinburgh** (2EH), 328 m. **Hull** (6KH), 335 m. **Leeds** (2LS), 346 m. **Liverpool** (6LV), 315 m. **Nottingham** (5NG), 326 m. **Plymouth** (5PY), 338 m. **Sheffield** (6FL), 301 m. **Stoke-on-Trent** (6ST), 306 m. **Swansea** (5SX), 482 m. **Daventry** (25 kw.), high-power station, 1,600 m. Special weather report 10.30 a.m. daily; 11.00 a.m., light music (exc. Sat. and Sun.); relays 2LO from 4 p.m. onwards, own con. on Thurs. Dance music daily (exc. Sun.) till midnight; on Fridays until 2 a.m.

IRISH FREE STATE.

Dublin (2RN), 390 m. Testing.

CONTINENT

The times are according to the Continental system; for example, 16.30 is 4.30 p.m., and 08.00 is 8 a.m. G.M.T.

AUSTRIA.

Vienna (Radio Wien), 530 m. (1.4 kw.). 10.00, con. (almost daily); 14.30, con.; 18.25, news, weather, time sig., con., lec., news; 19.00, con.; 21.00, dance (Wed., Sat.).

Graz, 404 m. (1 kw.). Relay from Vienna. Also own con. (Tues., Wed., Fri.), 19.10.

BELGIUM.

Brussels, 265 m. (1½ kw.). 17.00, orch. (Tues., Thurs., Sat. only), news; 20.00, lec., con., news (opera, Mon. and Wed.).

Haeren (BAV), 1,100 m. (150 w.). 13.00, weather.

CZECHO-SLOVAKIA.

Strasnice (AD), 546 m. (1 kw.). 10.00, con.; 16.00, con; 18.15, lec., con.

Brunn (OKB), 730 m. (1 kw.). 09.00, con., news (Sun.); 18.00, lec., con. or dance (daily).

Kbely, 1,150 m. 17.45, daily, German transmission.

DENMARK.

Copenhagen (Radioraadet), 340 m. (2 kw.). Sundays: 14.30, lec.; 16.30, children; 19.00, play; 20.15, news, con.; 20.5, news, Esperanto (Mon.), silent night. Weekdays (Tues., Fri., Sat.): 19.00, lec., con., news, con.; 20.30, dance (Sat.).

Ryvang, 1,160 m. (1 kw.). Sundays: 08.00, sacred service; 16.30-20.30, same as Copenhagen; 19.00 (Wed., Thurs.), lec., con., news, orch.

ESTHONIA.

Reval, 350 m. (500 w.). Testing.

FINLAND.

Helsingfors, 370 m. (1 kw.). 09.00, sacred service (Sun.); 11.00, weather report; 18.00, time sig., weather, news, opera (Tues., Thurs., Sat.).

FRANCE.

Eiffel Tower, 2,650 m. (5 kw.). 06.40, weather (exc. Sun.); 11.55, markets (exc. Sun. and Mon.); 12.14, time sig., weather; 14.45, 15.30, 16.30, Stock Ex. (exc. Sun. and Mon.); 18.00, talk, con.; 18.55, news; 19.00 and 23.10, weather; 19.30, con. (2,200 m.); 20.30, con (on 2,200 m.), irr.

Radi-Paris (CFR), 1,750 m. (about 3 kw.). Sundays: 12.45, con., news; 16.30, Stock Ex., con.; 20.15, news, Esperanto, con. or dance. Weekdays: 12.30, con., markets, weather, news; 16.30, markets, con. (Mon., Tues., Thurs., Sat.); 20.15, news, con. or dance. *Le Matin* gala con. every Sat., 20.30.

L'Ecole Sup. des Postes et Télégraphes (PTT), Paris, 458 m. (800 w.).* 14.00 or 15.00, studio con. or outside relay; 20.00, Esperanto (Thurs.); 20.30, lec. (almost daily); 21.00, con. (daily).

"Le Petit Parisien," 345 m. (500 w.). 21.15, con. (Tues., Thurs., Sat., Sun.).

Radio-Toulouse, 441 m. (2 kw.). 12.30, con., time sig. (daily); 17.30, news (exc. Sun.); 20.45, con.; 21.25, dance (daily).

Radio-Lyon, 280 m. (2 kw.). 20.15, con. (daily).

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

*Lyon-la-Doua, 480 m.
*Marseilles, 350 m.
*Toulouse (PTT) 310 m.
* Grenoble, 875 m.
* Relays of PTT Paris.

GERMANY.

Berlin, on both 505 and 576 m. (4 kw.). 08.00, sacred con. (Sun.); 10.00, con. and tests;

(Continued in second column of page 842)

"BROADCAST TELEPHONY" *(cont. from page 840)*

11.55, time sig., news, weather; 14.00, educ. hour (Sun.), markets, time sig.; 14.30, children (Sun., Wed.); 15.30, children (Tues.); 16.00, orch.; 19.30,* con., weather, news, time sig.; 21.30, dance (Thurs., Sat., Sun.). * Relayed on 1,300 m. by Königswusterhausen.

Königswusterhausen (LP), 1,300 m. (20 kw.). 10.30-11.50, con. (Sun.); 19.30, relay of Berlin (Vox Haus) con. (daily); 2,525 m. (5 kw.), Wolff's Buro Press Service: 05.45-19.10; 2,900 m.: Telegraphen Union: 07.30-18.45, news. 4,000 m. (10 kw.): 06.00-20.00, news.

Breslau, 416 m. (1½ kw.). 11.00, con. (daily); Divine Service (Sun.); 11.55, time sig. (Sun.), weather, Stock Ex., news; 15.00, children (Sun.); 16.00, con.; 18.00, lec.; 19.30, con., weather, time sig., news; 20.45, dance (Sun., Thurs.).

Cassel, 273.5 m. (1½ kw.). Relays Frankfort-on-Main.

Dortmund, 283 m. (1 kw.). Relays Munster.

Elberfeld, 259 m. (1 kw.). Relays Munster.

Frankfort-on-Main, 470 m. (1½ kw.). Relay by Cassel (275 m.). 07.00, sacred con. (Sun.); 10.55, time sig., news; 11.55, Nauen time sig.; 15.00, con. (Sun.); 15.30, con.; 16.00, children (Sun.); 17.00, markets, lec.; 19.00, lec., con., news, weather, dance.

Gleiwitz, 251 m. (1 kw.). Relays Breslau.

Hamburg, 395 m. (3 kw.). Relayed by Bremen (279 m.), Hanover (296 m.). Sundays: 06.25, time sig., weather, news, lec.; 08.15, sacred con.; 12.15, con.; 14.15, Esperanto, con.; 17.00, con.; 18.15, sports, weather, con. or opera, dance. Weekdays: 05.55, time sig., weather; 06.00 and 06.30, news, weather; 11.55, Nauen time sig., news; 13.00, weather, con.; 15.15 and 17.00, con.; 18.00, lec., English (Tues., Sat.), Spanish (Mon., Thurs.); 18.55, weather, con.; 21.00, dance. Tests are also being effected on various wavelengths.

Kiel, 233.5 m. (1½ kw.). Testing shortly.

Königsberg, 463 m. (1 kw.). 08.00, sacred con. (Sun.); 11.55, time sig., weather, news; 15.30, con.; 16.00, con. (Sun.); 18.30, lec.; 19.00, con. or opera, weather, news, dance (irr.).

Leipzig, 452 m. (700 w.). Relayed by Dresden (294 m.). 07.30, sacred con. (Sun.); 10.00, educ. hour (Sun.); 11.00, con. (daily); 11.55, Nauen time sig., news; 15.30, con., children (Wed.); 19.15, con. or opera, weather, news, cabaret or dance (not daily).

Münich, 485 m. (3 kw.). Relayed by Nuremberg (340 m.). 10.30, lec., con. (Sun.); 13.00, time sig., news, weather; 15.00, orch. (Sun.); 15.30, con. (weekdays); 17.30, con. (weekdays); 18.15, lec.; 18.30, con. (Sun.); 19.30, con., news, weather, time sig.; 21.00, late con. (irr.).

Munster, 410 m. (2½ kw.). Relayed by Elberfeld (259 m.); Dortmund (288 m.). 10.45, Radio talk, Divine Serv.; 11.00, news (Sun.); 11.30, news (weekdays); 11.55, Nauen time sig.; 14.30, news, time sig.; 15.00, con.; 16.00, children (Sat.); 18.40, news, weather, time sig., lec., con.

Stettin, 241 m. (1½ kw.). Under construction.

Stuttgart, 446 m. (1½ kw.). 10.30, con. (Sun.); 15.30, con. (weekdays); 16.00, con. (Sun.); 17.30, time sig., news, lec., con. (daily); 20.15, time sig., late con. or cabaret.

HOLLAND.

Amsterdam (PCFF), 1,955 m. (1 kw.). Daily: 07.15-16.10 (exc. Mon. and Sat., when 10.10-11.10), news, Stock Ex.

Hilversum (HDO), 1,050 m. (2½ kw.). 09.40, sacred service (Sun.); 19.50, con.; 21.40, news, etc.

HUNGARY.

Buda-Pesth (Csepel), 588 m. (2 kw.). 19.10, con., news., lec. (Tues., Thurs., Sat., other nights irr.).

ITALY.

Rome (1RO), 425 m. (2½ kw.). 09.30, sacred con.; 12.15, official communiqué; 16.00, children; 16.30, relay of orch. from Hotel di Russia; 16.55, news, Stock Ex., Jazz band; 19.30, news, weather, con.; 21.15, late news, Jazz band.

Milan, 327 m. (2 kw.). 22.00-24.00, tests.

JUGO-SLAVIA.

Belgrade (Rakovitza) (HFF), 1,650 m. (2 kw.). 17.30, con., news, weather (daily).

LETTLAND.

Riga, 488 m. (2 kw.). Testing.

NORWAY.

Oslo, 382 m. (1.2 kw.). 10.00, Divine service (Sun.), Stock Ex. (weekdays); 12.15, markets; 18.15, news, time, lec., con.; 21.00, time, weather, news, dance relayed from Hotel Bristol, Oslo.

Aalesund, 515 m. Testing.

RUSSIA.

Moscow (RDW), 1,450 m. (12 kw.). Weekdays: 12.30 and 17.55, news and con.

(Popoff Station), 1,010 m. (2 kw.). 10.00, 11.00, lec.; 23.00, con. (Tues., Thurs., Fri.).

Radio Peredacha, 375 m. (6 kw.).

Trades Union Council Station, 450 m. (2 kw.). 18.00, con. (Mon., Wed.).

Leningrad, 940 m. (2 kw.). Weekdays: 15.00, con.

UKRAINE.

Kiev, 1,000 m. (2½ kw.). 18.00, con.

SPAIN.

Madrid (EAJ6), 392 m. (1½ kw.). Con.: 17.30-19.30 (Sun., Mon., Thurs.); 21.30-24.00 (Tues., Fri.); 15.30-17.30 (Wed., Sat.).

Madrid (EAJ7), 373 m. (4½ kw.). Con.: 14.30, 16.30 (Sun.); 14.30-21.00 (Tues., Fri.); 22.00-24.00 (other days).

Madrid (EAJ4), 304 m. (1 kw.). Con.: 21.00-24.00 (Sun., Mon. and Thurs.); 15.30-17.00 (Tues., Fri.); 17.30-19.30 (Wed., Sat.).

Barcelona (EAJ1), 324 m. (650 w.). News, lec., con., 17.00-21.00 (Sun.), 18.00-22.00 (Mon., Wed., Thurs., Sat.), 18.00-23.00 (Tues., Fri.).

Barcelona (Radio Catalana) (EAJ13), 460 m. (4½ kw.). 19.00-24.00, weather, news, lec., con., dance (weekdays); 21.00-23.00, con. Sun.).

Bilbao (EAJ9), 415 m. (1 kw.). 19.00, news, weather, con.

Bilbao (Radio Vizcaya) (EAJ11), 383 m. (2 kw.). Daily: 21.00-24.00, con.

Cadiz (EAJ3), 360 m. (550 w.). 19.00-21.00 con., news. Tests daily (except Sat.), 24.00.

Seville (EAJ5), 350 m. (1½ w.). 21.00, con., news, weather.

San Sebastian (EAJ8), 348 m. (500 w.). Daily: 18.00, con.

SWEDEN.

Stockholm (SASA), 428 m. (1 kw.). 10.00, sacred service (Sun.), 11.30 weather; 13.00, con. (Sun.); 16.00, children (Sun.); 17.00, sacred service; 18.00, lec., con.; 20.15, news con., weather. Dance (Wed., Sat.) S.B. from Stockholm to Gothenburg (SASB), 286 m. Malmo (SASC), 270 m.; Sundsvall (SASD), 545 m.; Boden (SASE), 1,350 m. (1½ kw.); Falun (SMZK), 370 m.

Eskelstuna, 243 m. (250 w.).

Gefle, 325 m. (250 w.). **Joenkoeping** (SMZD), 265 m. (250 w.). **Linkoeping,** 467 m. (250 w.). **Norrkoeping** (SMVV), 260 m. (250 w.).

Karlstadt (SMXC), 221 m. (250 w.).

Trollaattan (SMXQ), 345 m. (250 w.).

Karlsborg, 1,250 m. (25 kw.). 19.00, news, weather (weekdays).

SWITZERLAND.

Lausanne (HB2), 850 m. (700 w.). 19.00, lec., con., daily.

Zurich (Höngg), 515 m. (500 w.). 10.00, con. (Sun.); 11.00, weather; 11.55, Nauen time sig., weather, news, Stock Ex.; 12.30, piano soli; 16.00, con. (exc. Sun.); 17.15, children, women; 19.15, lec., con., dance (Fri.); 20.45, news, weather.

Geneva (HB1), 1,100 m. (2 kw.). 19.15, con. (daily).

Berne, 302 m. 09.30, organ music (except Sat.); 15.00, 19.30, con.

CHIEF EVENTS OF THE WEEK

SUNDAY, NOVEMBER 29

London	3.30	Puccini Programme.
Birmingham	9.20	Special Concert by the Station Orchestra.
Cardiff	9.15	A Symphony Concert.
Newcastle	9.30	"The Land of Heart's Desire" (W. B. Yeats).
Aberdeen	9.15	Bach Programme.

MONDAY

London	8.0	St. Andrew's Day.
Birmingham		
Manchester	8.0	Light Symphony Concert.
Newcastle	8.45	The Coaching Days.
Aberdeen	8.0	Scottish Programme.
Belfast	8.0	St. Andrew's Day.

TUESDAY

London	8.0	Symphonic Syncopated Music.

WEDNESDAY

London	10.0	*Carmen* (Act IV). Performed by the B.N.O.C. Relayed from the Prince of Wales' Theatre, Birmingham.
Bournemouth	9.0	Puzzle Feature Programme.
Cardiff	8.0	The Spirit of Welsh Music.
Manchester	8.0	The Station Dramatic Company in *John Rutherford & Son*
Newcastle	8.0	Harlequinade.
Glasgow	8.0	Ballad and Instrumental Programme.

THURSDAY

London	7.30	The Hallé Orchestra relayed from Manchester.
London	9.0	Eric Fogg Programme.
Birmingham	8.15	Community Singing Concert relayed from Stourbridge Town Hall.
Newcastle & 5XX	8.0	"A Border Foray."

FRIDAY

Birmingham	8.30	An Hour of Humour by John Henry and Blossom.
Bournemouth	8.0	Herbert Bedford Programme.
Glasgow	8.0	Variety Night.
Dundee	8.0	"Rob Roy."

SATURDAY

Birmingham	8.0	Choral Humour, "John Gilpin."
Cardiff	8.0	"Footlight Favourites."

TRADE NOTES AND CATALOGUES

THE Reliability Wireless Guide, issued by Messrs. J. H. Taylor and Co., of Macaulay Street, Huddersfield, is a most complete list of wireless components, embodying practically all the goods of the principal manufacturrs.

A new low-frequency transformer, type AF3, has been introduced by Messrs. Ferranti, Ltd., of Hollinwood, Lancashire. The transformer, which is shielded in a compact pressed-steel casing, has a ratio of 3½ to 1. A particularly novel feature is that a by-pass condenser (across the primary winding) is incorporated in the transformer itself.

Attractive showcards, relative to the Marconiphone Ideal and Ideal Junior transformers, have been issued by the Marconiphone Co., Ltd., of 210, Tottenham Court Road, W.1.

An interesting publication dealing with A.J.S. receivers has been issued by Messrs. A. J. Stevens and Co., Ltd., of Wolverhampton. A novel accumulator tag, warning users of the necessity of treating a new accumulator with respect, is also being issued.

Constructors of the McMichael seven-valve supersonic receiver can now obtain blue-print diagrams, showing the exact lay-out and best positions for each of the components, from Messrs. L. McMichael, Ltd., of Wexham Road, Slough, Bucks.

A new 26-page catalogue (No. 315E) has been issued by Messrs. Fuller's United Electric Works, Ltd., of Woodland Works, Chadwell Heath, Essex. This, in addition to dealing with the well-known Sparta loud-speakers and general accessories, embodies three new features—anode supply filters resistance-capacity couplings and anode reaction units.

New premises at 9, St. Martin's Street, Leicester Square, W.C.2, have been taken by Messrs. the London Electric Stores, Ltd., formerly of Oxendon Street, Haymarket, S.W.1.

A recently installed wireless set at the Dumfries and Galloway Royal Infirmary, which provides headphones and loud-speakers for each of the wards, was inaugurated recently by the Duchess of Buccleuch. Immediately afterwards a special message of congratulation was received from the Glasgow B.B.C. station.

At the Csepel (Budapest) high-power station one of the engineers inadvertently came into contact with a high-tension cable, with the result that he was instantly electrocuted.

Music broadcast from Daventry has been heard by a wireless amateur in Hobart, Tasmania, more than 12,000 miles away.

The Carlisle Rotary Club has presented Cumberland Infirmary with a wireless set.

THE PROBLEMS OF TELEVISION

IT was only natural that the first efforts to develop a system of television should have been made in the direction of land-line transmission. Wireless was undeveloped when—over fifty years ago—the peculiar properties of selenium were first revealed, and the problem of television which this discovery at once suggested seemed more likely to be solved by a system of transmission analogous to that of land-line telephony than by any other means. The methods originally suggested for the achievement of this purpose, however, were subjected to a good deal of hostile criticism, and even ridicule, on the grounds that they would involve insuperable financial difficulties. It was computed, for instance, that it would be necessary to lay a ten-inch cable, containing over one hundred wires, between the transmitting and receiving ends of the system. Subsequent developments—or, rather, non-developments—justified the criticism.

Two Problems

The problems of television are essentially dual in character, of course, as are those of telephony—whether land-line or wireless. That is to say, they comprise quite distinct problems of transmission and reception. During the latter part of the nineteenth century, and the early years of this century, a certain amount of spasmodic attention was accorded to these problems by enthusiastic individuals, but none of the results achieved were of sufficient importance to attract any wide degree of interest. A few years before the war, however, a number of ingenious proposals were put forward for dealing with the main problems involved, and interest in the subject revived considerably. The war, unfortunately, brought experiment in this direction to a dead stop. Had television been developed to a degree even approaching practicability when war broke out it is quite certain that the four years of international strife would have provided the necessary fillip for bringing it to completion.

A useful analogy can be established between telephony and television by comparing the functions of (1) the microphone, as used in telephony, and (2) the selenium cell, as used in television. As the reader is aware, a common form of microphone consists of a small flexible "cup" which contains a quantity of crushed carbon. The air waves set up by the speaking voice impinge upon one of the surfaces of this cup, causing it to vibrate. As the result of these vibrations the pressure of the carbon particles within the cup is altered constantly. At one moment the particles are pressed tightly together (thereby decreasing the electrical resistance of the microphone), and at another they are only loosely connected with one another (thereby increasing the resistance of the microphone). Finally, the changes thus produced in the resistance of the microphone are reproduced as current-changes in the transmitting aerial. It may therefore be said that the microphone reproduces sound vibrations as current vibrations.

Light Vibrations

In television we are not concerned with sound vibrations, of course. In this case the particular kind of vibrations with which we have to deal are *light* vibrations, as reflected from the objects which we wish to "transmit." What we require, therefore, is *not* a substance which can be affected by sound waves, but a substance which can be affected by light waves. Selenium is such a substance.

(*Concluded on page* 848)

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"THE PROBLEMS OF TELEVISION" (*continud from page* 846)

When light waves fall on selenium they decrease the electrical resistance of the latter. This decrease in resistance is proportional to the *intensity* of the light. If the selenium be connected to an electric cell, therefore, the current flowing from the latter will vary in strength as the light on the selenium varies in intensity. When the light is strong the current will be strong, and when the light is weak the current will be weak. The analogy between the functions of the microphone and the selenium cell thus seems to be complete, from which it would appear to follow that television should not be so far off as we are customarily given to believe. But there is another aspect of the problem.

Variable Factors

What "variable factors" are involved in the transmission and reception of sound over a telephone (land-line or wireless)? We employ, in the first place, different syllables, and, secondly, different ranges of pitch. It is estimated that about eight syllables per second can be transmitted and received intelligibly. On the other hand, it takes only about one two-hundredth of a second to detect a change in pitch. The operation of a telephony equipment, therefore, only involves the transmission and reception of sound variations at the rate of about two hundred per second. How does this compare with the variations involved in television?

Before we can answer this question we must recall, briefly, certain characteristics of the phenomenon of "sight." When the human eye receives an impression of an external object, this impression is not a very detailed one, however closely we may look at the object. The retina of the eye is composed of millions of minute nerve endings, each nerve being connected separately to the brain. The sensation of sight consists in these sensitive nerve endings being stimulated by the light waves which reach them from the observed object. One fractional part of the object stimulates one nerve, another minute part of the object stimulates another nerve, a third fractional part of the object stimulates a third nerve, and so on. The retina of the eye may therefore be described as a screen on which the observed object projects itself in numerous little fragments or dots—each dot representing a nerve ending.

If the reader will take the trouble to observe closely any of the photographic illustrations in this journal, he will notice that it can be analysed into conglomerations of small dots; it is not a continuous illustration; it is composed solely of dots.

An Analogy

This is a fairly accurate analogy of the manner in which an impression is produced on the retina of the eye. It is never a continuous impression, though, for various reasons, we are constantly deluded into believing that it is.

So far as the phenomenon of sight is concerned, therefore, every external object may be regarded as being composed of a number of dots. The larger the number of dots that can be detected when observing any object, the clearer will be the impression received from that object. For cinema work it is computed that pictures should be analysable into about 10,000 dots if clear images are to be received at normal range. As these pictures are "moving," the dots are constantly changing, of course—usually at a rate of about fifteen changes per second. Moreover, each dot varies continuously between two maximum values of light and shade.

An Enormous Frequency

Allowing for all these factors, therefore, it may be estimated that a successful television equipment will have to deal with variations at the rate of about 300,000 per second—a very different matter from the two hundred per second with which telephony has to deal! It is definitely established that selenium can deal with thousands of variations per second, but whether it can be made to respond to hundreds of thousands of variations per second is a question which only the future can answer.

M. E.

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PARS AND PERSONALITIES

By "THE LISTENER"

A CLEVER musician was heard from Bournemouth on Sunday, and will be heard again on December 6, in Gilbert Stacey, the well-known conductor, composer and vocalist, at present directing the Royal Bath Hotel String Orchestra. He was a solo chorister at Lichfield Cathedral prior to his studying in Paris under the famous Vincent D'Indy. Among his numerous compositions the slow movement of his symphonic suite was broadcast on Sunday, as well as a violin and 'cello duet entitled "Do You Remember."

At Birmingham on Sunday next will be heard the well-known vocalist Madoc Davies. Amongst his many interesting experiences are reckoned the appearances made before their present Majesties, when Duke and Duchess of York, at Llandudno.

Miss Winifred Davis, who has been heard at most of the stations this last week, has had wide experience, one of her earlier parts being the Lady Fiametta in *Decameron Nights* at Drury Lane. Fellow members of the cast were Miss Ellis Jeffreys and Miss Gladys Ancrum.

Some Interesting Talks

Mr. Keble Howard, the well-known novelist, who is arranging a series of talks at 2LO, is a clever actor, and has written many plays, the first of which I think was *Compromising Martha*. Equally clever is *The Girl Who Couldn't Lie* and *Charles His Friend*.

An Old Favourite

Listeners who hear that old favourite *The Belle of New York* on December 14 will recall Edna May, who played the original Belle when produced in New York in 1897. Many people, however, seem to think this was her first appearance on the stage. As a matter of history, she made her debut at the mature age of five as Little Willie Allen in *Dora* (no, not *East Lynne*), and two years later was in a children's opera company playing *H.M.S. Pinafore* and the *Pirates of Penzance*.

String Music

The Music String Society Quartet, who play again at Cardiff on December 2, comprises four famous soloists: Andre Mangeot, the French prodigy violinist, H. Berly, Boris Pecker and John Barbirolli, the latter a famous student of the R.A.M.

Mr. Herbert Tjorpe, who was one of the artistes at the Boosey Ballad Concert last week, will be heard on December 3 at Aberdeen and later Glasgow. He is an "Old Vic" star, well known throughout the country for his oratorio work.

Mr. Frederic Ranalow, the well-known baritone, whose name was announced for the special Folk Song programme of Sunday, is noted for his oratorio work. A pupil of Alberto Randegger, he amply justified the early promise shown, and his most recent successes were with *The Beggar's Opera* at the Lyric, Hammersmith.

Frederic Lamond has made Beethoven's music peculiarly his own, and it is more than appropriate, therefore, that he will be the soloist on December 16, which is Beethoven's birthday anniversary, and for which a special programme will be conducted by Sir Landon Ronald.

IS AN INTERNATIONAL LANGUAGE NECESSARY?

DURING the past few months considerable stress has been laid on the advisability of using a universal language, such as Esperanto or Ido, for the purposes of international wireless communication. Several of the American and Continental technical papers are devoting a weekly column or so to the tuition of either one or other of these languages, and this has been followed by the broadcasting of lessons and lectures by some of the stations.

At first sight there would appear to exist for the wireless listener a necessity to learn either several foreign or one of these universal languages—at least for the possessor of a multi-valve set who tunes in at will many distant transmissions.

Much has been, is, and still can be said for both sides of the question, as in view of the daily increase in the number of European broadcasting stations, failing the knowledge by the listener of several foreign tongues, recourse must be made to an international code, easy of acquirement and sufficiently developed to allow of news items of general interest being understood by subjects of all nations.

The average wireless amateur knows that when he has succeeded in picking up a foreign transmission, it is particularly galling if the item listened to happens to be an unintelligible speech.

The choice of suitable means of international broadcast communication is admittedly a difficult one, as the majority of the first-class nations of a certainty would vote for the adoption of their individual language; it might, as a matter of fact, reduce itself to the selection of either English or French, these being the two mostly taught in schools.

The drawback, however, is that, to a foreigner, English pronunciation is far from easy; neither is French a simple language to learn.

For this reason, perhaps, Esperanto or Ido might be said to lend themselves well for the purpose for which they were invented, the words being composed of sounds used in most European languages and the grammar simplified to the greatest possible limit. But against this we have the fact that both these artificial languages, to the non-linguist, are *absolutely new*, and would have to be studied in exactly the same manner as any other; many potential students might be discouraged after a few attempts to memorise the words. To the man who is already proficient in one Latin and one Teutonic language, the acquirement of either Esperanto or Ido requires but little effort; but how many of us fulfil this condition?

English has been adopted by both professional and amateur wireless transmitters all over the world, and in the writer's opinion there is very little likelihood that any artificial language will replace it. Of all languages, English is the one most understood in Europe, and thousands of travellers who at different times of their life have found themselves at a loss will bear witness to the fact that where their total ignorance or even slight knowledge of the local tongue has failed them, English has in every instance come to their rescue. English offers many advantages in the simplicity of its grammar and in the logical formation of its sentences, and the writer, personally, can see no reason why it could not be adopted by all countries for international broadcast communications.

J. G.

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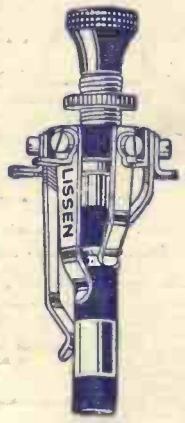

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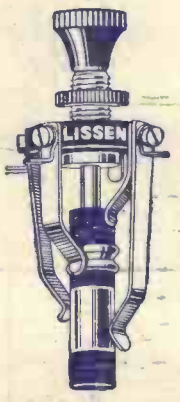

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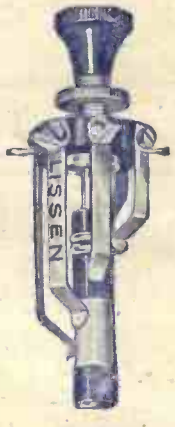

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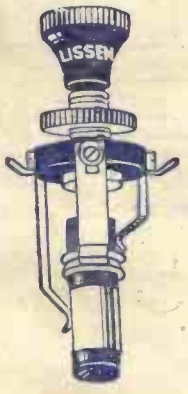

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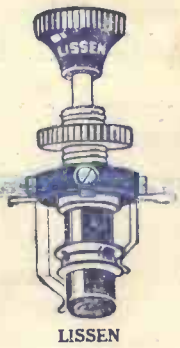

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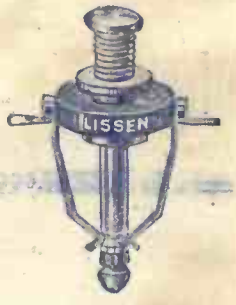

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