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Popular Wireless

and Wireless Review

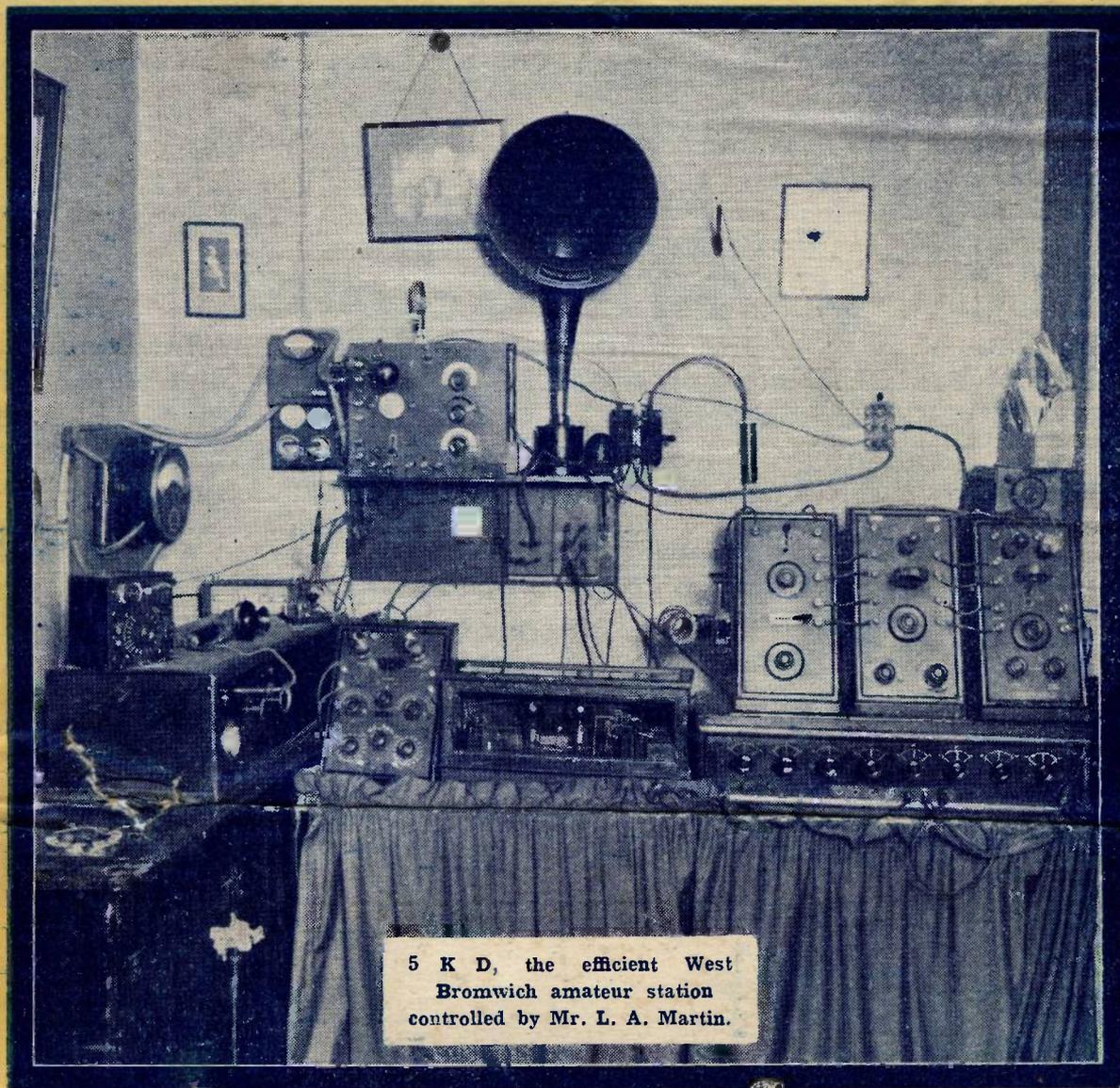
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EVERY FRIDAY.

No. 91. Vol. IV.

SCIENTIFIC ADVISER: SIR OLIVER LODGE, F.R.S., D.SC.

February 23rd, 1924.



5 K D, the efficient West Bromwich amateur station controlled by Mr. L. A. Martin.

FEATURES IN THIS ISSUE.

How 5 I T "Relayed" America.
Tapping Basket Coils.
Broadcasting in Germany.

One Valve Loud Speaker Circuit.
Neat Crystal Receiving Set.
The Request Programme.

The Construction of a Two-Valve Receiver.

Thoroughly BRITISH

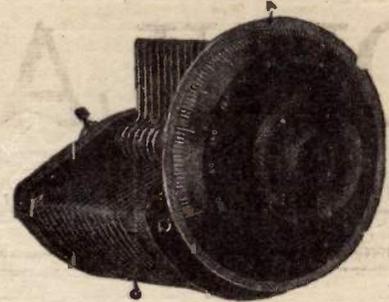
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I used no valves; my aerial is 32 feet high and my set is of the basket-coil type.
Thanking you, yours faithfully,
(Signed) J. W. COLE.

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7/1/24.

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POPULAR WIRELESS

AND WIRELESS REVIEW.

February 23rd, 1924.] THE RADIO WEEKLY WITH THE LARGEST CIRCULATION. [Every Friday, Price 3d

Technical Editor :
G. V. DOWDING, A.C.G.I.

Editor :
NORMAN EDWARDS, A.M.I.R.E., F.R.G.S.

Scientific Adviser :
Sir OLIVER LODGE, F.R.S.

TOPICAL NOTES AND NEWS.

A Funeral by Wireless.

THE service at the ex-President Wilson's funeral was followed by millions throughout the country by means of wireless. The ex-President was very interested in wireless, and was one of the first public speakers to make use of the microphone.

Radio Play Boom.

THERE seems to be plenty of evidence to support the belief that wireless plays are "catching on," and quite a number are in the course of preparation by the "Play Production Department." 5SC seems to be producing more plays in their studio than any other provincial station.

5SC's Birthday.

BY the way, 5SC will celebrate its first birthday on March 6th. I understand that a special birthday programme will be broadcast. There is no doubt that the 5SC staff has made big strides since the inception of the station a year ago.

The Latest.

THE development department of 2LO, under the supervision of Captain West, has an amazing way of turning the dreams of yesterday into the facts of to-day. The latest is that it is a practical possibility for 2LO to relay Australia, and thus enable crystal users to hear from the other side of the world.

Via America.

OF course, there are great technical difficulties still to be overcome, even more than when we relayed KDKA. The only possible way to relay the Australian programme is via America, and this would, of course, increase atmospheric troubles. But the B.B.C. believe the trick can be done.

New B.B.C. Appointment.

A SCOTTISH controller, Mr. Miller Craig, has been appointed by the B.B.C. His duties will be to co-ordinate the work of the Glasgow station, the Aberdeen station, and the new relay stations. Mr. Miller Craig is well-known in Edinburgh, and has a wide knowledge of musical and educational affairs.

Gilbert and Sullivan.

I HAVE noticed several letters in the daily papers recently calling on D'Oyly Carte to broadcast Gilbert and Sullivan operas. I have it on good authority that it is not the fault of D'Oyly Carte or the B.B.C. that these operas are not broadcast. It seems that permission is not obtainable from those who possess the copyright of Gilbert and Sullivan's operas.

New Call Signs.

THE B.B.C. tell me that the call signs for the new relay stations will be as follows: Plymouth 5PY; Edinburgh 2EH. It is hoped that within a short-time other relay stations will be erected in this country, and call signs have been

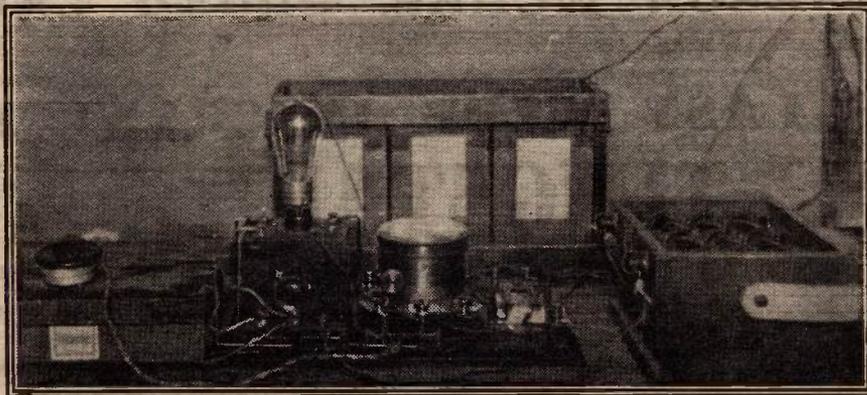
have been broken by the earth wire of the wireless installation. She was not injured or even bruised.

More from America.

IT has been decided by Captain West, the chief of the Development Department, to continue the experiments of relaying America from the North Downs. It is hoped that this will eventually be a permanent feature with the B.B.C. At the moment the possibilities are limited to winter months, as the summer has a bad effect on broadcasting work. A representative of the engineering department has set sail for America, to make arrangements to broadcast special programmes and to study American methods of transmission.

The 2ZY Fund.

THE Manchester station announcer recently broadcast that he had received complaints from listeners concerning two well-dressed men who have been calling on them for money on behalf of the "2ZY Hospital Fund." Mr. Dan Godfrey, 2ZY's director, states that there are no official collectors of the 2ZY Fund. As far as is known, these men were quite unauthorised collectors.



The apparatus employed at 2LO for broadcasting the Greenwich time signals.

allotted to the following proposed stations: Leeds 2LS; Liverpool 6LV; Hull 2HU.

The Woman's Hour.

THE committee has now come to the conclusion that domestic talks do not interest housewives. It has been decided that talks on Law, hints on making extra "pin-money," and a little poetry should be broadcast in the Woman's Hour. I have not the slightest idea why they prefer law and poetry to cooking, etc. I can, of course, understand that talks on "Pin-money" will be universally acceptable.

Saved by an "Earth."

A READER of "P.W." has written me stating that his earth wire recently saved the life of his daughter. His little girl is only eighteen months old but looks forward to listening-in. On the night of her escape, she climbed on to a table and fell out of the window to a concrete yard twenty feet below. Her fall must

Effects of the Radio Craze.

THE juvenile court has been busy of late with "wireless cases." The judge at one of the London Courts recently stated that boys seemed to be possessed of a craze for wireless work, and some apparently decided to steal sufficient parts to make a set for themselves. Five boys were summoned at the court for this offence. Three of them confessed to the crime, and were put on probation for twelve months. The others were fined a small sum for damaging various component parts which they had stolen. The judge stated that if they were brought before him again they would be flogged.

Another Mill Hill Record.

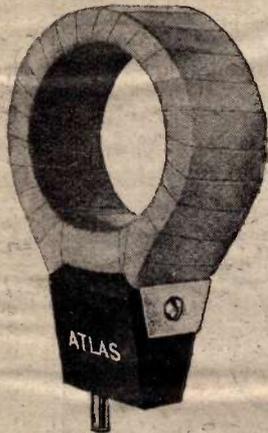
IN a recent issue of "P.W." there appeared an article by 2SZ, of Mill Hill school, describing the transatlantic tests made with the school set. The author of the article, Mr. W. H.

(Continued on page 950.)

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65	140	475	680	1000	5 6	600	1200	4750	7000	12100	11 0
75	170	620	800	1120	5 6	750	1500	6000	8000	15000	11 10
100	230	850	980	1520	7 0	1000	2000	8100	9800	20000	12 8
150	340	1000	1520	2300	7 10	1250	2200	9750	15000	22000	14 0
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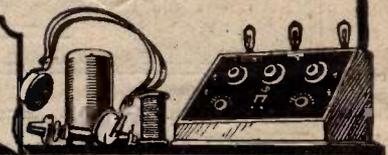
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Artistes of the Aether

BY "ARIEL"

Some of the artistes who have given you pleasure while "listening-in"

PROBABLY no stranger combination in the entertainment world could be imagined than that of cinema and radio! It has taken ten years at least to establish the cinema artiste on the same footing as the opera singer or the stage player, ten years in which we have seen the biggest plays acted out, like the old woman

who declared that she had never realised how deaf she was, because "she couldn't hear a word they said." Now we have had the unique experience of hearing two of the best-known stars of the screen without being able to see them.



Miss Betty Balfour.

Both Miss Betty Balfour and Miss Alma Taylor have

been seen by more people than could be counted, and when these two artistes agreed to speak before the microphone at 2 L O last week, they were heard by more people still. The subject was, of course, British films, and the occasion, the preliminary days before the British Film Week, which has just concluded.

Popular Screen Artistes.

There is a peculiar appropriateness in the juxtaposition of these screen favourites, for Betty Balfour has long held the public in the hollow of her hand, by her sheer "joi de vivre" and gift for creating laughter, while Miss Taylor, the Hepworth star, has held their heartstrings by her wonderful impersonations. Miss Betty is the heroine, in addition to a long list of other plays, of the Welsh Pearson films. "Squibs," and "Squibs, M.P.," and "Squibs' Honeymoon," which brings the series to an end, have made Miss Betty one of the best-known figures in film history.

Miss Alma Taylor has created probably more parts than any other British film actress. Just recently she has been scoring triumphs with "The Pipes of Pan," "Lily of the Alley," and now at the Scala Theatre is drawing all London to see "Coming Thro' the Rye," the novel of Helen Mathers, for the production of which, it may be remembered, that a



Miss Katie Goldsmith.

whole field of rye was specially sown, so that Mr. Hepworth could get exact detail. It has been called the "sweetest love story in the world." It is certainly one of the finest of British productions, and thus both

these actresses are authorities on their subject.

It might be considered that the last thing to be affected by the late deceased railway strike would be the aether, but, as it happened, the B.B.C. had arranged to broadcast Act III. of "Siegfried" from Covent Garden. At the critical moment, Miss Florence Austral, the Brunnhilde, was "somewhere up the line," and accordingly listeners-in who donned their headphones a little late, as did the writer, spent a hectic ten minutes trying to find out what had gone wrong, not with the set this time, but with the music, for the Siegfried of the new Yorkshire singer, Mr. Walter Widdup, had undoubtedly turned into the Siegmund of Mr. Walter Hyde. But the arrival of Hunding set all doubts at rest; here was Act I. of "The Valkyries," and with Robert Radford in one of his best parts.

Broadcast Plays.

This well-known singer has one of the best bass voices in the British National Opera Company, and is also a director. He has probably sung more rôles than any other operatic singer. He is widely known on the concert platform, and for his choral and oratorio work, and his voice radios well, because it has a perfect range, and is free from roughness in the lowest register.



Mr. Kenneth Ellis.

Though every encouragement should be given to the B.B.C. for the writing of plays especially suited to the needs of radio, frankly one cannot entirely praise their efforts from a literary or dramatic standpoint as displayed in "The Dogs of Devon." Burlesque, of course it was, but of the crudest type at times. Much vocal talent was spent on it, the artistes including John Huntingdon, Sydney Coltham, Rex Palmer, and David Openshaw, with Mesdames Ethel Kemish, Stella Hackman, and Gladys Palmer as principals.

World's Largest Audience.

Round the provinces it is obvious that a better selection has been made for the broadcasting of wireless drama. At Glasgow was announced Louis Parker's famous old play "The Man in the Street," and one of R. C. Carton's plays, "The Ninth Waltz." "Lady Huntworth's Experiment" would also radio well, we fancy, for more depends on the wit of the dialogue than in the action. Another well-chosen play was "The Maker of Dreams" (Oliphant Down).

January 25th being the anniversary of Robert Burns' birth, it was only to be

expected that a Scottish element should prevail, and most Scottish citizens probably enjoyed the special "Burns Night" programme simultaneously broadcast from Glasgow.

At a recent concert, the non-arrival of the vocalist might have led to disastrous effects, if it had not been for the presence of Mr. Kenneth Ellis. Not only is he one of the best-known singers on the principal concert halls, but he is one of the oldest also of radio artistes, and to him fell the honour, at the first New Year in "wireless," of singing "Auld Lang Syne" at the turn of the year. Mr. Ellis relates that he has sung before many audiences in the Albert Hall, and before the troops in France, Italy, and on the Mediterranean, during the war, in which he took an active part, but that no other experience had been so vivid as that when he stepped before the microphone and sung to the largest audience in the world.



Miss Alma Taylor.

Entirely Successful.

The afternoon concerts continue to prove entirely successful, especially at 2 L O, where the instrumental part is safe in the hands of the Wireless Trio (Messrs. Kelley, Robinson, and Hook). Mr. Robinson is the well-known member of the London Symphony and Philharmonic orchestras, and his tone is easily recognisable in the full orchestra at 2 L O. The violoncello is one of the few instruments that radios perfectly, and the various 'cello solos of Miss Edith Lake, Mr. Charles Hambourg, and Mr. John Barbirolli are all illustrations of this point.

Another favourite artiste is the well-known violinist, Miss Katie Goldsmith, and her recent playing with Miss Hilda Dederich, best known as "Auntie Hilda," testified to her wide reading and abundance of tone. Gaining the Sainton Scholarship at the Royal Academy of Music, she studied under Mr. Rowsby Woof. She is an Associate of the R.A.M., and has given several recitals at Wigmore and Aeolian Halls, and in orchestral concerts at the Queen's Hall. She has played also at the Promenade Concerts.

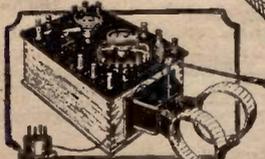


Mr. E. B. Robinson.

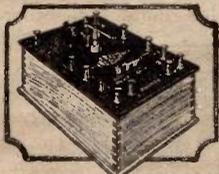
Illustration shows Mr. Keith Jopp and his Peto-Scott Units



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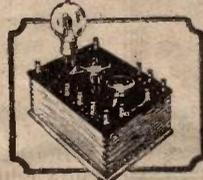
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Tuner Unit No. 1

Mr. Keith Jopp gets W H A Z so well that the Boston (U.S.A.) papers give an account of his results.

ALTHOUGH so many users of Peto-Scott Units have written to us about their regular reception of U.S.A. Broadcasting, one of the most interesting achievements has been that of a young Broadstairs amateur, Mr. Keith Jopp. Writing to W H A Z (Troy, New York) for confirmation of his report, the authorities there were so struck by its completeness in the face of poor conditions that they sent it to the *Boston Post* for publication.

As a result of this, Mr. Keith Jopp has been the embarrassed recipient of a large number of letters from American radio enthusiasts asking

him how he manages to get American Broadcasting just whenever he likes on two Valves only (four Valves on the Loud Speaker).

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THE GERMAN BROADCASTING SERVICE.

BY DR. ALFRED GRADENWITZ.

Some interesting and authentic information concerning the first German broadcasting station.

THE development of wireless in Germany has occurred on decidedly different lines from the normal course of events in other countries. While being quick to realise its possibilities for the transmission of messages otherwise handled by wired telegraphy and telephony, and availing itself thereof to the full, the German Postal Department has, mainly for economic reasons, until quite recently clung to its rigid monopoly of news transmission.

We have, therefore, in Germany been witnessing an unparalleled growth of the transatlantic and transcontinental wireless telegraph services, the working inside of Germany of a special scheme of "light-



The control room of the new Voxhaus broadcasting station.

ning" telegraphy, by which the interval between the posting and receiving of a message is reduced to 10-15 minutes, and the adoption of an elaborate economic news broadcasting service, while private broadcasting for purposes of amusement and education is a quite recent addition, only reluctantly made by the postal department.

The Berlin Station.

Everybody paying a yearly licence of 60 gold marks and obtaining a receiver of licensed make (for a range of wave-lengths between 250 and 700 metres), is now allowed to participate in the general broadcasting service, the programme of which is provided by private companies. One such company, the "Deutsche Stunde" ("German Hour"), with its Bavarian counterpart, the "German Hour in Bavaria," is in control of the service so far provided from wireless transmitting stations in Berlin and Munich respectively.

Amateurs in this country who, since the beginning of November, should more and more frequently have come into touch with the Voxhaus Broadcasting Post, might be interested to learn something more about that station and how it works.

The first German broadcasting station has been installed below the roof of the Vox Building, Potsdamer Strasse, Berlin, on plans by Mr. F. Weichart, of the German Telegraph Engineering Offices, who practi-

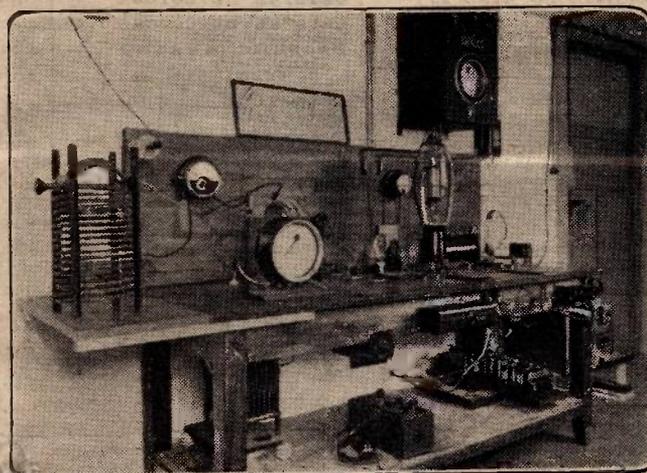
cally at a moment's notice, in fact, within a couple of weeks, had to provide a transmission station covering a range of at least 150 kilometres around Berlin.

Two tubular masts totalling 80 feet high were built into the roofs of the Vox Building and the Esplanade Hotel respectively, so as to leave a clear height of about 58 feet above each roof.

400 Metres.

The two masts are situated at a distance of about 100 feet apart, and constitute the two supports between which an antenna 100 feet long is hung up. This is of hexagonal cross-section, the feeding point being in the centre.

The effective height of the antenna accordingly should be about 48 feet, its capacity with regard to the earth being 600 mms., and its own wave-length about 400 metres. Earthing is so far being used, though the possibility of operating with a counterpoise has been provided for as well. Experience alone will show which alternative is preferable. A wave of 400 metres has been adopted for the broadcasting service, which was not started before an



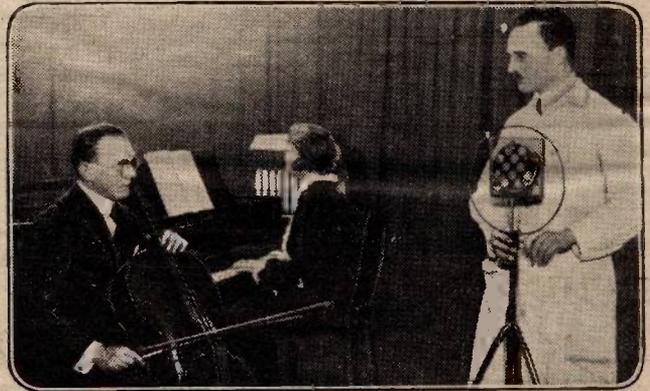
A section of the transmitting gear employed at the Voxhaus station.

intensive series of tests had shown the reliability of the station.

A valve transmitter of the Telefunken type, supplying 1.5 kw. in the aerial, is used to generate the waves, a modulator tube connected up in parallel altering the wave emission in accordance with microphone currents.

A continuous current converter of 220/36 volts, the generator of which is able to supply a maximum of 28 amperes (1 kw.), is used to provide the heating of the tubes arranged with their incandescent filaments in series. The two valves require 16-17 amperes each with 16 volts tension, the excitation of the generator being derived from the mains. A choking coil in the L.T. circuit reduces fluctuations of the filament voltage to a minimum.

The anode current is supplied by a 1,000 cycle alternating current generator of 3 kw. driven by a 4 kw. direct current machine. This current goes to a step-up transformer, raising its pressure from 150 volts to about



The station's announcer introduces Conductor Urack to German listeners.

3,500 volts, and is rectified in a vacuum tube filled with a rare gas, providing a direct current of 3,000 volts, and an intensity of 1 ampere.

The rectifier comprises an incandescent cathode coated with calcium oxide, its heating energy being likewise derived from the alternating generator by means of a special compensating connection.

The transmitter at present works with an anode pressure of 2,500 volts, the anode current being about 0.6 amperes, and the antenna current about 5 amperes. The antenna resistance being estimated at 15-20 ohms, this would correspond to an antenna output of about 0.4-0.5 kw. The antenna current can readily be increased to 8.9 amperes by raising the anode pressure to 3,000 volts, though the smaller figure is likely to prove fully sufficient.

Times of Transmission.

The microphones are installed in a studio situated two stories below the transmitting station.

The week's programme of the broadcasting station comprises a light concert by a string band, between 4.30 and 6 p.m., lectures (not daily, but on dates announced by broadcasting), at 6.30 p.m., a concert by artistes between 8.10 and 9.10 p.m. (on Sundays and holidays between 6 and 7 p.m.), latest news at 9.15 p.m., and (on days announced beforehand) dance music between 9.30 and 11 p.m.

The quality of performances is being rapidly improved and, as the broadcasting service by loud speakers installed in cafés and elsewhere is made accessible to a large public, it enjoys growing popularity.



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The latest type of B.T.H. Headphones, as illustrated, is much lighter and more comfortable than the original pattern. The headband is of plated wire covered with leather and is constructed so as not to disarrange the hair, while the earpieces can be instantly adjusted to the head without any manipulation of nuts or screws.

B.T.H. Headphones have achieved a remarkable reputation for their wonderful sensitiveness and tonal quality. They perfectly reproduce speech and music and give maximum amplitude of sound. In many cases the substitution of B.T.H. Headphones for other makes has enabled listeners to hear distinctly broadcast programmes which had previously been inaudible.

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Cat's Whiskers, Silver, each 1d.; doz.....		9d.
Packets Mixed Whiskers.....	each	3d.
Hertzite Crystal & 5 Whiskers.....		7d.
Condenser Scales, 0.180.....	each	2d.
Aerial, Earth & Phone Name Tabs, ea.....		1d.
2 B.A. and 4 B.A. Nuts.....	doz.	2 1/2d.
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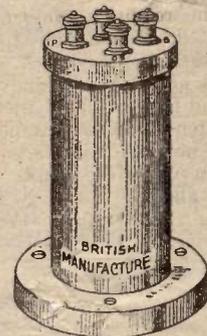
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THE "P.W." LONG RANGE BROADCAST RECEIVER.

BUILT AND DESCRIBED BY THE TECHNICAL STAFF.

This article completes the description of the construction of the condenser tuned receiver. In an early issue the variometer tuned set will be dealt with.

THE high-frequency chokes should next receive attention. These require to be coils with a very high inductance and a low self capacity. If high-capacity coils are used they will pass the high-frequency currents, and, as their sole purpose is to form a block to the passage of the high-frequency currents, it will be appreciated that a low self capacity is essential.

The simplest type of coil, from a constructional point of view, having these characteristics is that known as the lattice. To construct these coils a wooden cylinder, say, 1½ in. in diameter, will be required, into which two radial rows of pins are driven. The first row of pins (say, 12 in number) should be driven in at points equi-distant from each other round the circumference of the cylinder.

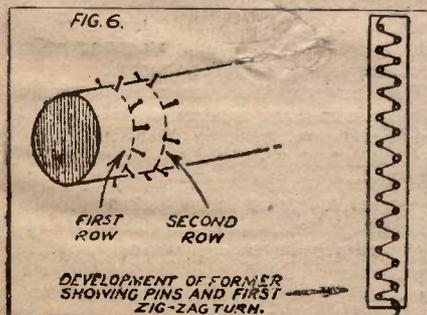
The second row, of the same number, should be driven in at a distance of ¼ in. from the first, and should be "staggered"—that is, the pins in the second row should be immediately opposite the centre of the space between two pins in the first row. Fig. 6 will show how the pins should be arranged.

Making the Choke Coils.

One end of the wire, which should be No. 36, should be twisted round one of the pins, and the first turn should be a zigzag turn round the outside of the pins, as shown in Fig. 6.

On the completion of this turn the wire is wound on between the rows of pins in a single layer across the former, then another zigzag turn is put on, followed by another layer, and so on, alternating with layers and zigzag turns until the required number of turns are put on. Two thousand turns will give the necessary impedance, although this number is not very critical.

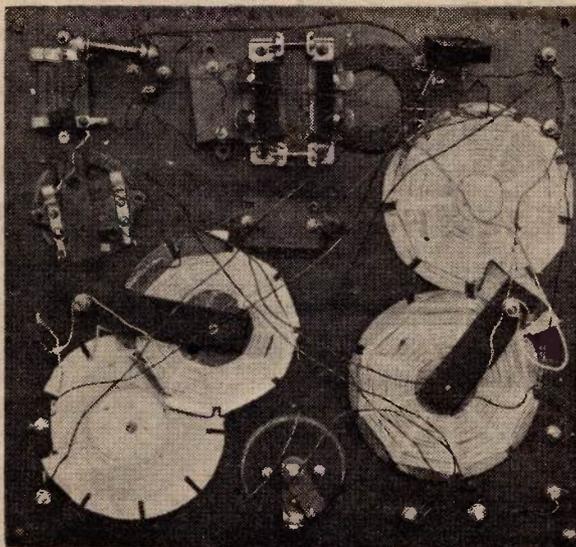
The coil and former should then be immersed in molten paraffin wax, and allowed to stand until no more bubbles arise, when it should be removed and carefully drained, and allowed to cool. The pins should then be removed from the former,



and the first zigzag turn carefully pulled out, when the coil will be easily removed from the former.

The L.F. Transformer.

The fixed condensers required are made by clamping pieces of copper foil between mica sheets. For the '001 mfd. condensers six pieces of foil 2 cm. by 1 cm. and seven pieces of mica '002 in. thick and 3 cm. by 2 cm. are required.



This photograph shows the wiring of the variometer tuned receiver as it was carried out for experimental purposes. Subsequently the set was carefully re-wired, and the components arranged more permanently and neatly.

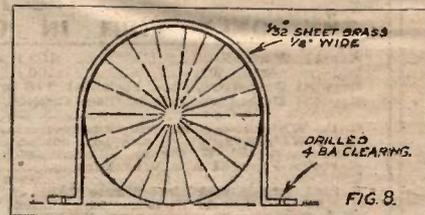
For the '0003 condensers three pieces of foil and four pieces of mica of the foregoing sizes, and for the '0002 mfd. condenser two pieces of foil and three pieces of mica, will be required. Condenser cases can be obtained at a moderate cost, and these can be utilised, or the usual method of forming the cases from pieces of ebonite can be adopted, taking care that the mica and foil are kept in intimate contact.

The low-frequency transformer should next receive attention. Two pieces of ebonite 2½ in. square by ¼ in. thick are required for the end pieces. A circle 2 in. in diameter should be marked on each piece, as shown in Fig. 7, and by a judicious use of saw and file the ebonite should be cut to this shape.

The edge should be rounded as shown in the section in Fig. 7. A hole ⅝ in. in diameter should be drilled through the centre for the core wires, and two ¼ in. holes (which should be given rounded edges)

drilled as shown for the leads to the primary and secondary.

The core wires, which should be of No. 22 S.W.G. iron wire, perfectly straight and 9½ in. long, should then be laid up until a tight core ½ in. in diameter is produced. The bobbin cheeks should be fitted to a paper tube 2⅞ in. long and ¼ in. thick, and care-



fully secured by shellac. This tube should be thoroughly dried and shellacked.

Short leads of No. 30 S.W.G. about 6 in. long should be cut, and one soldered to the No. 46 S.C.C. used for winding the transformer. About 5 oz. of this wire will be required. This short end is inserted through the hole in the end cheek nearest the core, and winding commenced.

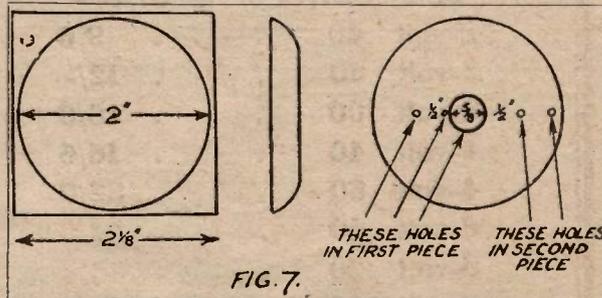
For a man with a lathe the winding is a comparatively simple matter, but by an exercise of ingenuity it is usually possible to arrange some means by which this winding can be done by those not so fortunately situated.

The utmost care must be exercised in winding to prevent the breakage of the wire; no sudden jerks must be given to it, and the bobbin from which it is being unwound should be mounted so that it will revolve easily.

Arranging the Core Wires.

The primary is wound on over the whole length of the tube to a diameter of 1⅞ in. Another short length of No. 30 S.W.G. should then be soldered to the wire (which is, of course, broken from the bobbin) and pushed through the second hole

on the same side as the commencing wire. The secondary is wound on in the same way, to a diameter of 1⅞ in., after the primary has been carefully covered with three layers of Empire cloth. The same size wire should be used, and the No. 30



S.W.G. soldered to its ends should be brought through the holes in the opposite end cheek to that which the primary was brought.

Two layers of Empire tape over the

(Continued on page 960.)

THE "P.W." LONG RANGE BROADCAST RECEIVER.

(Continued from page 959.)

secondary windings complete the winding of the transformer.

The core wires should now be inserted in the tube until they project equally from both ends. They should then be spread out from a point at the centre of each end, and bent down evenly all over the windings and interlaced.

Care should be taken to get the wires evenly spread out all round the bobbin, and carefully interlaced. A brass band slipped over the core wires will hold them securely in position. A further band, as shown in Fig. 8, should be made for securing the transformer to the panel.

A Vertical Panel.

The panel on which the items are mounted consists of a piece of ebonite, 12 in. by 12 in. by $\frac{1}{4}$ in. or $\frac{3}{8}$ in. It should be carefully squared on the edges, and may, if desired, be given a matt surface by rubbing with emery cloth.

A drawing giving dimensional details of all the holes and lay-out is not given, as it is much safer to lay out all the items on a sheet of paper and mark out all the holes on this paper.

The sizes of the holes can be pencilled on the paper, which can then be secured to the ebonite panel by gum or bulldog clips. A vertical panel, 12 in. by 5 in., is also required, which is secured to the main panel by brackets cut out of sheet brass, $\frac{1}{2}$ in. thick, as shown in Fig. 9.

The anode coil should be fixed to this vertical panel by a brass screw in the position shown, the two H.F. choke coils being secured in the marked positions by a clamping strip of ebonite and a brass bolt and nut. The .0002 mfd. condenser in the grid circuit of the first valve and the .0003 mfd. condenser in the plate circuit of the first valve should also be fitted to this panel.

Prevents Capacity Effects.

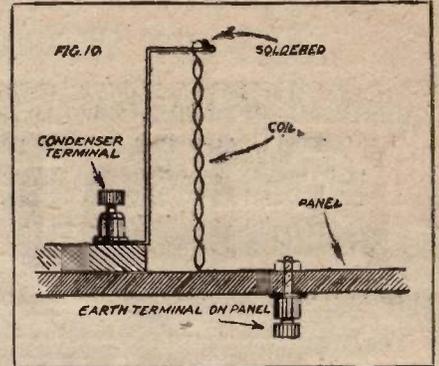
The aerial tuning inductance is carried on a piece of No. 18 copper wire, connected to the condenser terminal, as shown in Fig. 10. This piece of wire also forms the connection between the condenser and the inductance, one end of the basket coil being soldered to it as shown.

The grid condenser and leak may be fitted in the position shown in Fig. 9.

Wiring should be carried out with No. 20 enamelled wire. A length of wire should be fixed to a nail in the wall, and stretched by pulling heavily on it; by this means it will be found that the wire can be made to lay straight, and take whatever sets or bends are given to it. Particular care should be taken to keep the wires spaced as far as possible to prevent trouble from capacity effects.

Connecting the Chokes.

The method of connecting the H.F. chokes to the wiring adopted in this set is to bore a hole through the vertical ebonite panel of such a size that the No. 20 wire in it; this wire left projecting as



by a brush or by using rubber stamps, if the paint is properly thinned by turpentine.

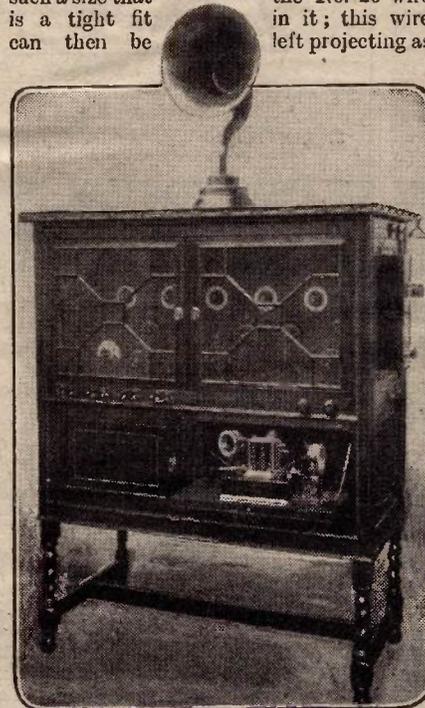
Short Wave Work Only.

The wave-length range of this set is of course limited by the aerial tuning inductance and the anode coil, but if a greater wave-length is desired, it may be obtained up to a certain limit by fitting a pair of terminals or sockets in series with both these coils, or coils may be connected.

It will, of course, be realised that this set cannot be used for long wave-lengths, as the high-frequency choke coils cease to perform their functions of choking back the high-frequency currents when the frequency of the incoming waves has fallen below a certain limit, as their impedance is a function of the frequency.

A SUBSTITUTE FOR EBONITE

EBONITE is an expensive item, but a very efficient substitute for it is to be found in the material of an ordinary gramophone disk. This consists of a mixture of insulating substances and contains about 30 per cent of an excellent insulator, shellac, which moreover comes to the surface during the process of manufacture, and forms an insulating coating. It was



A handsome 5-valve set constructed by Capt. John E. White, of "Brooklyn," Billerica, Essex.

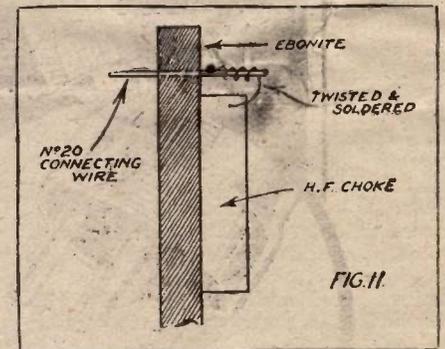
shown in Fig. 11, to form a tag to which the leads from the H.F. chokes can be connected.

It is not proposed to give any further details of the methods of fixing the various components to the panel, as the methods which would be adopted in each individual case depend to a great extent on the mechanical skill of the experimenter.

The only thing left to consider is the case, and this should be built of $\frac{3}{4}$ in. hardwood, dovetailed or pinned together, as the skill of the experimenter may permit. The case is provided with corner fillets, $\frac{1}{2}$ in. by $\frac{1}{2}$ in., to give a firm hold for the screws holding the panel.

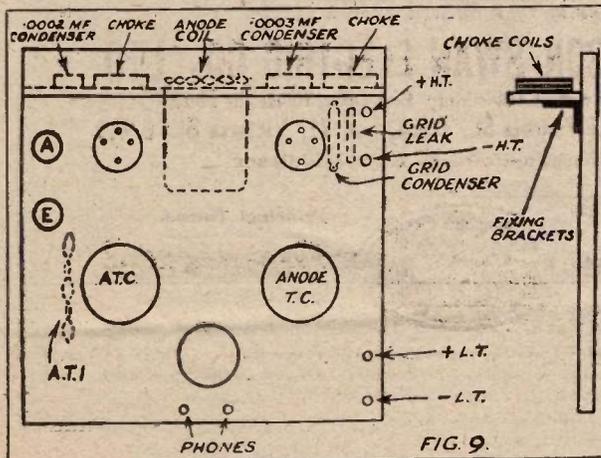
It should be finished by staining and varnishing or French polishing, as may be desired.

When the set is completed, the various terminals should be labelled. Either bought labels may be screwed to the panel, or the lettering can be done

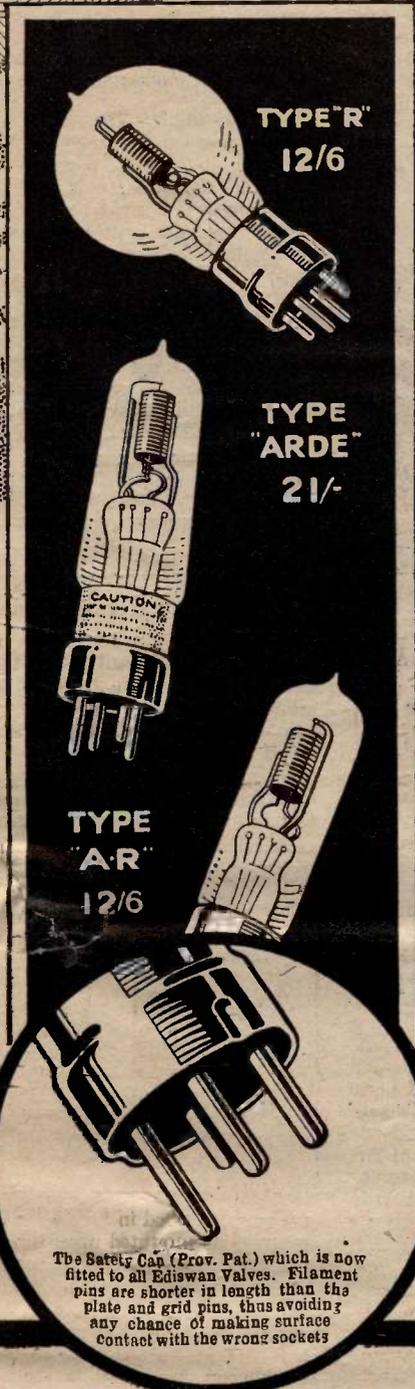


recently described in "P.W." how a crystal set could be mounted upon a circular panel consisting of a gramophone record.

This material, however, may be readily cut or sawn into squares or other rectangular pieces, and may then be secured to a wooden panel at the parts where the highest insulation is required. It is easily drilled (care being taken not to proceed too fast, in case of a crack developing), and may be readily bent or shaped, if previously held before a fire or above a flame (high enough to be out of direct contact with the flame).



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 W.M.A.L. Trenton Hardware Co., Trenton, New Jersey.
 W.G.Y. General Electric Co. Schenectady, New York.
 W.M.A.F.
 I.J.W.

In all 18 American transmissions, all taking place on an inside aerial, W.M.A.L. could be plainly heard 2 ft from the phones, the last being an amateur station calling A.R.R.L.

As I do a lot of experimental work, especially long-distance receiving, I have tried many makes of valves, and I have always had best results with your A.R. Type. The advantage I have found is that they are superior to the others that I have experimented with in the following ways: their action being very stable (a great advantage in long-distance receiving), they are good H.F. and L.F. Amplifiers as well as good Detectors, and clear speech is a special feature.

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 (Extract from letter to us.)

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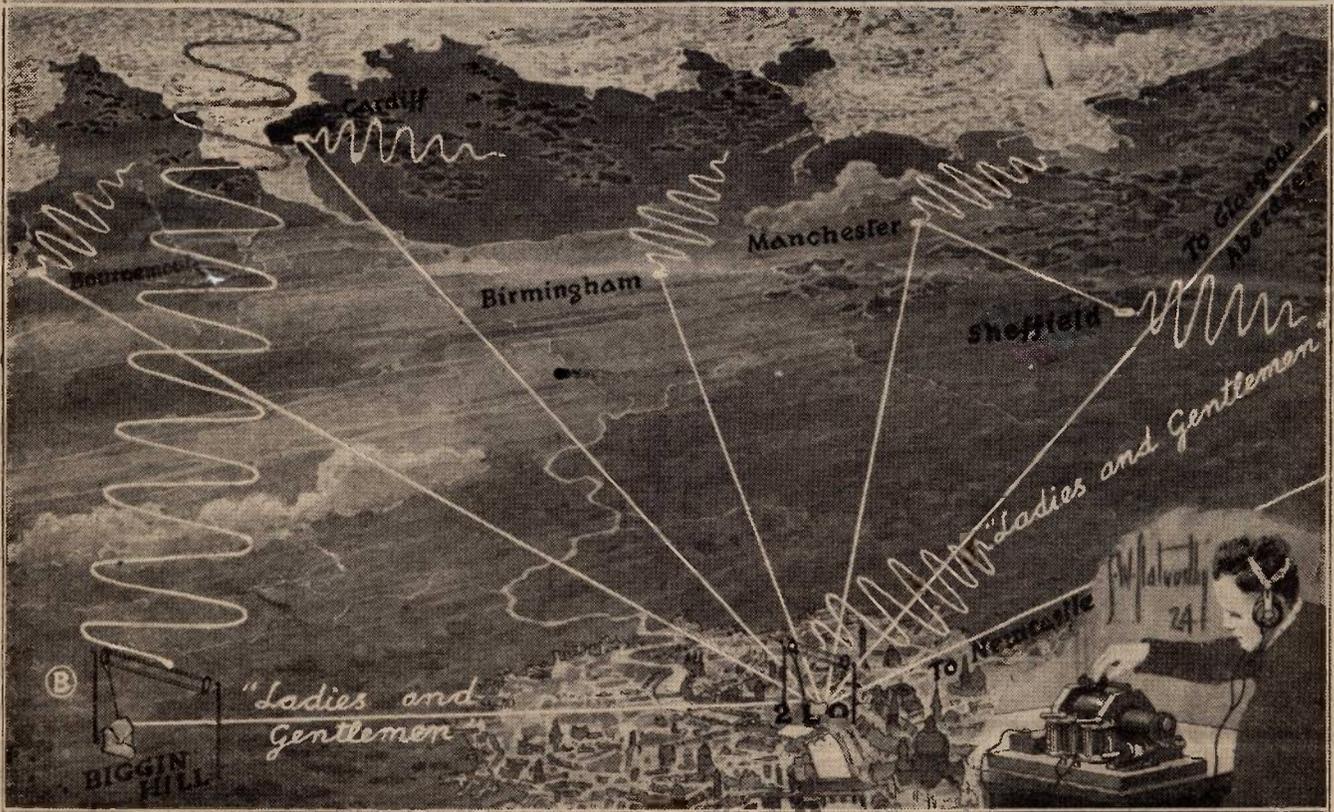
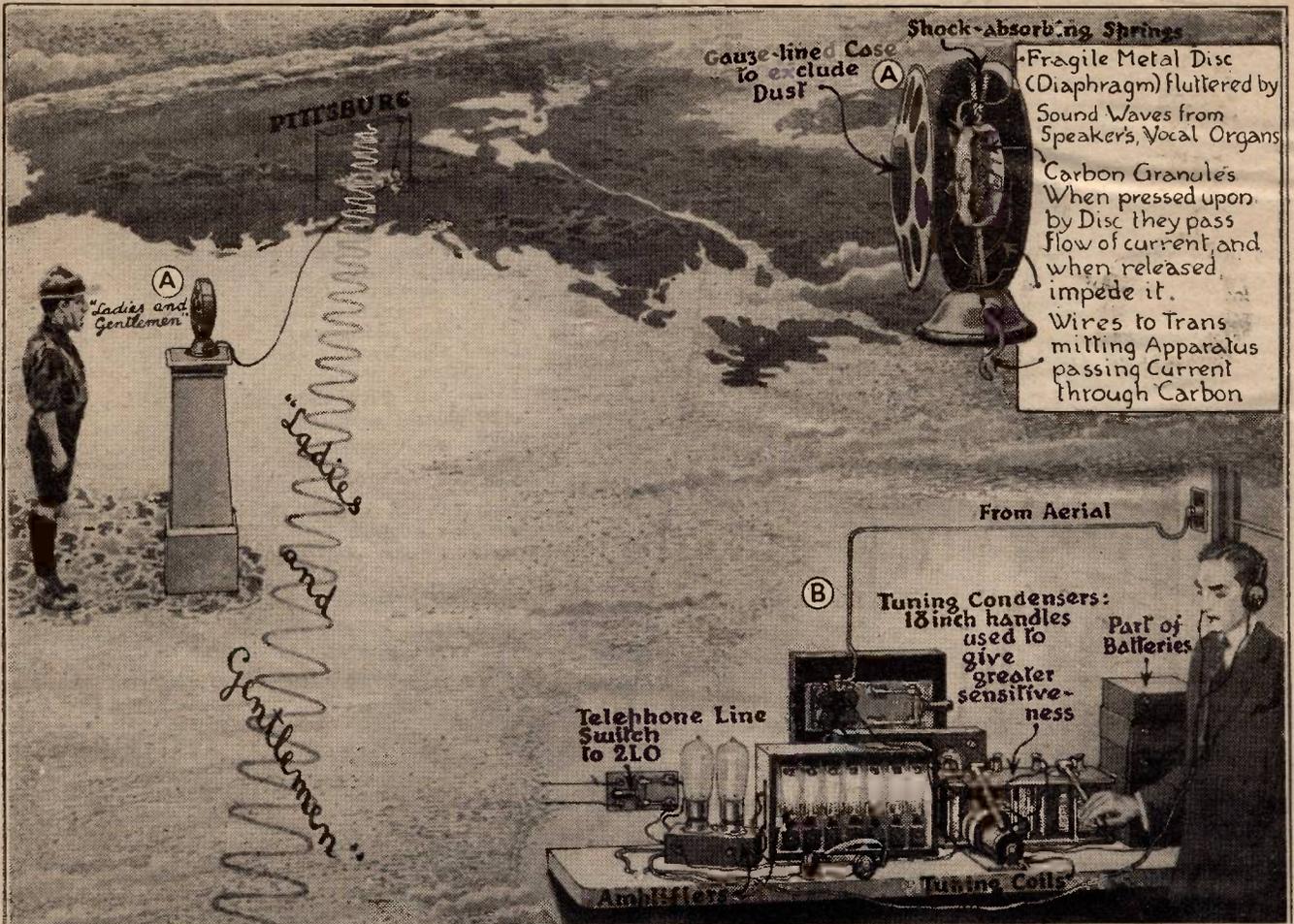
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HOW K D K A IS RELAYED FROM 2 L O.



AN ARTISTIC TWO-VALVE "SUPER."

BUILT AND DESCRIBED BY A MEMBER OF THE "P.W." TECHNICAL STAFF.

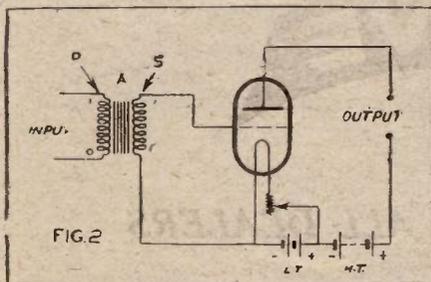
This receiver, as was explained last week, consists of a "super" panel and a separate L.F. amplifier. In this, the second article of the series, the description of the actual construction of the set is commenced.

THE second unit is merely a low-frequency amplifier as was mentioned last week. The receiver was constructed in two distinct units owing to the fact that its scope of action varied between five and twenty miles from a broadcasting station, and also so that unit 2 should be available for other purposes should it be required. This circuit is simplicity itself, as will be seen by examining the theoretical diagram, Fig. 2. The only components employed, apart from valve sockets and terminals, being a low-frequency intervalve transformer and a filament resistance. As will be seen later, only three battery connections between the two units are necessary, the H.T. minus finding its way through the L.T. connections.

First of all the construction of the first unit will be dealt with in its entirety, as this is, when completed, a complete single valve Armstrong "super," and quite capable of being used for loud-speaker work within short range of a broadcasting station. As has been mentioned before, it is not necessary to adhere absolutely to the lay-out and dimensions that will be given, although amateurs with little previous experience of "super" work might be well advised to do so in order to ensure success.

Marking the Panel.

A piece of $\frac{1}{8}$ in. ebonite 12 in. by 7 $\frac{1}{2}$ in. should first be obtained, and nicely squared up. Holes for eight terminals should be drilled at A, B and C, as shown in Fig. 3. The valve-socket holes should be drilled with the assistance of the template provided in Fig. 3A. The positions given by this diagram can very easily be transferred on to another piece of paper by means of a pin or needle with which an indication of the positions can be pierced

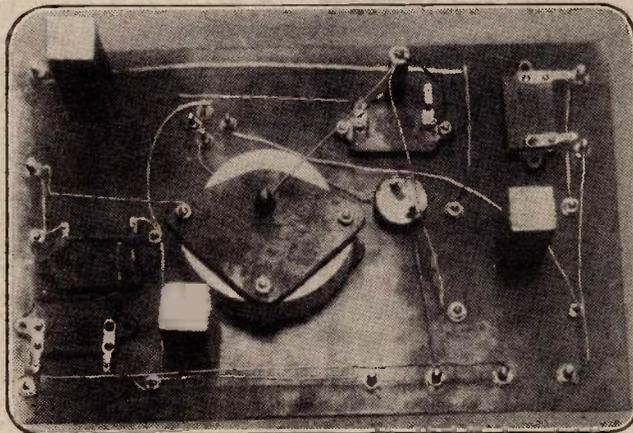


through, and thus avoid the necessity of mutilating the page. Other holes that require to be drilled are D, the variable condenser point of mounting (a J.B. one-

hole mounting condenser was used in the receiver shown in the photographs); F, filament resistance, and G, variable grid-leak. Naturally, the sizes of these holes will depend upon the make of component used in each case.

The coil Holders.

Having drilled the panel in accordance with Fig. 3—which, by the way, shows the top and not the underneath side of the panel—the two coil-holders should be purchased, due regard being paid to the available space left on the panel for mounting them. If the receiver is to be enclosed in a case similarly to the one constructed by the author, it will be necessary to take



Showing the simple nature of the wiring and the neat component lay-out of the "super" panel. Note the three supporting legs.

care that coil-holders with handles of reasonable length are obtained, so that there is no danger that they will project beyond the edge of the panel. Quite cheap coil-holders will answer the purpose, so long as they are reasonably accurate in respect of pin and socket positions, and capable of holding a heavy honeycomb coil rigidly at an angle. The method of mounting the coil-holders and carrying through the connections to the underneath of the panel is by means of terminals which accomplish both purposes simultaneously.

Clearance and Spacing.

The coil-holders can, of course, be taken to pieces, removed from their bases, and remounted on the panel, and from the point of view of neatness this is perhaps to be recommended, but at the same time by leaving them upon their original bases and mounting them upon the panel complete as will be shown in a photograph, a good clearance for the knob on the extension handle is allowed. If other types of coil-holders

with differently shaped handles are employed, then perhaps it would not be necessary to allow for such a clearance.

The positions of the various components is clearly shown in the accompanying photograph, and no difficulty should be experienced in this respect. It may be worth mentioning, by the way, that the various terminals are all spaced $\frac{1}{4}$ in. from the edge of the panel.

It is advisable to mount the coil-holders before the variable condenser and variable grid-leak, as the necessary handling of the panel might cause these rather delicate components to become damaged in some way or another.



Another little item well worth mentioning in passing is in respect of the valve sockets and terminals. Every one of these should be a "screwing fit" into its hole on the panel; not a "sliding fit." If the amateur does not possess a set of stocks and dies, he can either drill undersized holes and rime them slightly until with a little force the terminal or valve socket can be screwed in, or he can construct a rough tap by cutting a slot sharply along the side of a screw of similar size and slightly bevelling the end.

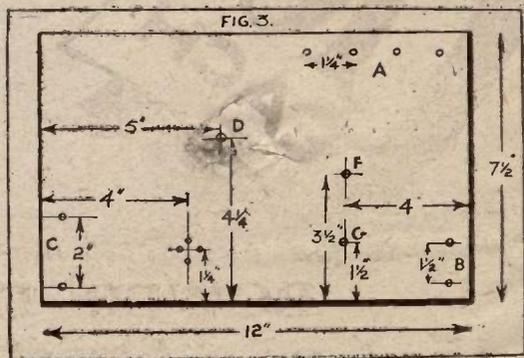
Fixing the Terminals.

If very tight "screwing fits" are obtained, even if no soldering is carried out in the wiring, the risk of connections under the panel becoming loose owing to the turning of terminals in use becomes negligible.

Although not at all a usual procedure, it is at the same time a very excellent scheme to fasten the terminal indicating tabs to the panel before wiring, as if this is done every connection can be closely checked by both the theoretical and wiring diagrams as the work proceeds, thus preventing the slightest possibility of an error in this direction.

These indicating tabs may easily be mounted with shellac, if the latter is of a fairly thick consistency.

(To be continued)



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Mainly About Broadcasting

by The Editor

A FEW weeks ago I saw details of a perfectly authentic "crystal record." Mr. Frank Heinfling, radio officer of the ss. "Californian," picked up signals from Arlington (N A A) at a distance of from 3,500 to 4,100 miles. He was using a galena crystal detector, and confirmation of his remarkable record has been given by the American Bureau of Navigation. Making due allowances for freak reception, Mr. Heinflings' results are none the less very interesting, and constitute a pretty satisfactory reply to the multi-valve fiends who sneer at the crystal, just as some uninformed people sneer at the coherer.

I must confess to a penchant for crystals—especially carborundum. During the war I used the well-known Type 31 Crystal Detector, and, although it often played tricks—the "Billi" condenser had a habit of "sticking" in hot weather—it proved itself a remarkable little instrument time and again. Reception of F L in Montreal was nothing unusual, and poor old Poldhu—despite its asthmatic, low-toned note—"came in" quite comfortably when the ship had travelled as far as Alexandria, some 3,200 and 2,500 miles respectively.

Directional Broadcasting.

I believe Mr. Blake has told readers of "P.W." before that he keeps an old crystal enshrined in a glass case at home. With it he heard the Armistice news in 1918, and since that date he has put it on the retired list, there to rest in perpetual honour, a living witness to the falsity of the multi-valver's libellous remarks. All honour to the crystal—and the crystal gazer—so long as he doesn't overdo it!

I see that directional wireless for broadcasting has been predicted by Senatore Marconi. He has come to the conclusion that directional work in this sphere of Radio is not only practicable, but likely to bring about greater efficiency. In collaboration with that mysterious person, Mr. C. S. Franklin (who may sometimes be seen flitting about Marconi House like a homeless sprite), Marconi recently transmitted over a distance of 2,250 miles with a considerable reduction in the energy usually required to bridge such a distance.

Senatore Marconi believes that the success of his recent experiments with directional wireless will sooner or later develop to such an extent that crystal users in this country will be able to hear American broadcasting direct, because practically all the energy will be transmitted in one direction, thus considerably intensifying signals in receivers lying in the path of the transmitted beam.

The Neutrodyne Circuit.

The Neutrodyne Receiver seems to be gaining in popularity because of its selectivity. On the sea coast, where Morse jamming is bad (there is no need to bring in poor old Leafield), amateurs are using this type of receiver in increasing numbers.

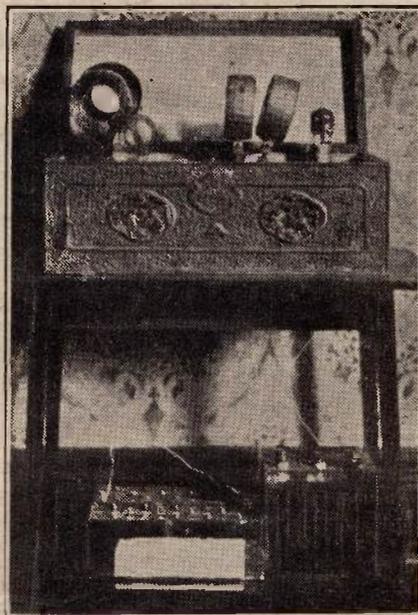
The usual Neutrodyne set—as most favoured by American amateurs—consists of two stages of H.F. amplification, making a total of four or five valves. Only three controls are used, two of which do prac-

tically all the work, while the third clarifies and amplifies signals.

In a correctly made Neutrodyne you will find no distortion or whistle, and one of its most remarkable features is that, day after day, signals will come in on the original adjustments, so that the amateur can make a chart of stations on various wave-lengths, according to the readings of the pointers on the dials of the three central knobs. Its selective properties are equally remarkable, and I can foresee an ever-growing public for this type of receiver.

The H.B.'s and the L.B.'s.

The Highbrows and the Lowbrows are at it again. A glance at the correspondence columns of "P.W." for the last few weeks will convince the impartial observer that a



The artistic two-valve "super" the construction of which is described in an article that appears in this issue.

pitched battle has been in full swing between the rival factions; and if you could glance at my waste-paper basket you would also see that many a poor lawyer has missed a brief for a libel action. Some time ago "Ariel" confessed himself a Middlebrow. Exactly what he meant is vague; but it enables him to keep on friendly terms with both sides, and he can shift his ground as occasion demands.

And if you sift the B.B.C. programmes you will find that the average musical level is Middlebrow—that both the Highs and the Lows have a fair share, with the result that the week's average works out about "one up" for the Middlebrow.

You can't grumble at this—and if you want to have the whole argument put in a nutshell, with impartial reasoning, read Captain Lewis's remarks on the subject in his book, "Broadcasting from Within."

Mr. Percy Scholes recently remarked in POPULAR WIRELESS that in a year or two's time the scoffer at classical music would

cease fire, because he is pretty sure to acquire a liking for good music if he gives himself half a chance.

There is a lot of truth in this, and I would willingly put my money on Mr. Scholes. But such a course of musical soaking can be carried too far. It is quite conceivable (though let us hope more than unlikely) that broadcasting will ultimately change public opinion with regard to "Highbrow" music to such an extent that, in years to come, instead of hearing a street organ mutilate the atmosphere with ragtime, we shall have a street organ repertory made up of Bach fugues and Beethoven symphonies "arranged for barrel organs," while local airs will indulge in Schumann's "Carnival" (with variations on the steam whistle), and gipsies will tell our fortunes to the tune of a Liszt Hungarian Rhapsody. Perish the thought! The very idea sent me to the piano to play the Sonata Pathetique, a la barrel organ. The result—Try it, and pray with me that the B.B.C. don't over-educate their public—with regard to music, at any rate.

Ether Fishers.

In his recent Annual Presidential Address to the Radio Society of Great Britain, Dr. W. H. Eccles said that the purposes of the society were, amongst other things, to be the centre of amateur movements, and that, although it had always been a mystery to him how some people could see anything in rearing rabbits and why others took pleasure in fishing, he felt great sympathy with the experimenter who spends his time fishing in the ether with a bait of ten watts.

It would be interesting to know the opinion of the R.S.G.B.'s learned president concerning the gentlemen who indulge in unauthorised ether fishing, much to the detriment of those peaceful souls who have to put up with the mad wailings of the canary fanciers. The B.B.C. "Black List," to which reference is made by "Ariel," will make interesting reading when it is brought up to date, and the R.S.G.B. and the Radio Association might well agitate in conjunction, in order that this ether piracy might be stamped out once and for all.

USEFUL TIPS.

THE use of double reaction, as it is termed, will not necessarily increase your range or volume, and in practice we have found that the only advantage obtained by its use is selectivity. To obtain double reaction in a circuit employing intervalve reaction on to the anode coil, a three-coil holder should be used, the A.T.I. anode coil and reaction coil all being coupled together.

The total inductance of several coils connected in series is the sum of the separate inductances, while if inductances are placed in parallel with each other the total inductance is found by dividing 1 by $\frac{1}{L_1} + \frac{1}{L_2} + \text{etc.}$

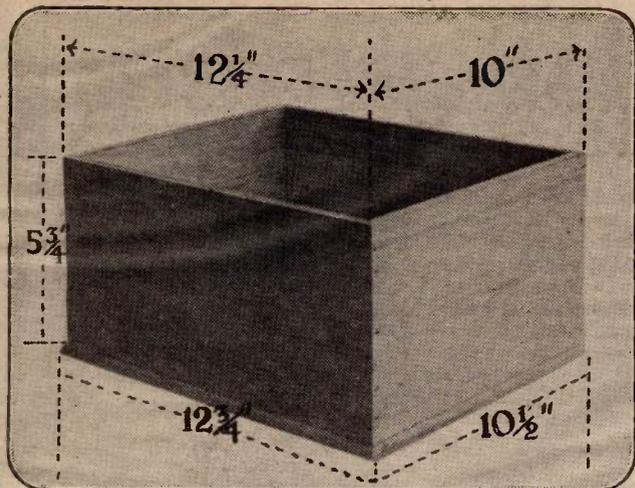


Fig. 1. A dimensional photograph of the cabinet.

FOR many purposes, a two-valve receiving set is almost ideal, especially in the present case, when it incorporates a stage of tuned anode high-frequency amplification, followed by a detector valve with reaction on to the aerial. The recent regulations permitting the use of such a circuit is no justification for the improper use of reaction, however, and the constructor should always be careful that its use does not interfere with other listeners in the vicinity.

Stock Components Only.

This set is economical and at the same time easy to construct. Its finished appearance, together with the necessary batteries and telephones, is shown in Fig. 6, while the principal components are illustrated separately in illustrated heading. Practically the whole of the pieces can be built up from stock parts, or, if preferred, the finished components can be obtained and assembled in their proper positions. In any event, the dimensions given are appropriate to the average components supplied by dealers in wireless apparatus. The parts required are as follows: Ebonite panel, 12 1/4 in. by 10 in.

- Two variable condensers, value .0005 mfd., with knobs, pointers, and dials.
- One grid leak, 1 to 2 megohms, one grid condenser, value .00025 mfd.
- Two filament rheostats, with knobs and pointers.

corners; although a much neater job results by mitring the corners and pinning them together as if making a picture frame, subsequently filling the nail holes with stopping.

Care must be taken to keep the corners square, and the sides upright. The base is a rectangular piece of similar material, and projects beyond the sides of the case, and should be finished with a 1/4 round moulding or a chamfer. The sides of the case are attached to the bottom by gluing and by thin countersunk screws passed through from the underside of the base. When completed, all the pin heads should be punched below the surface, and the holes stopped with a little bees-wax, the case being stained and varnished, or polished as desired.

The next proceeding is to prepare the ebonite panel. This should measure 12 1/4 in. by 10 in., and may finish flush with the face of the case, to which it is secured by four screws near the corners.

Mounting Filament Sockets.

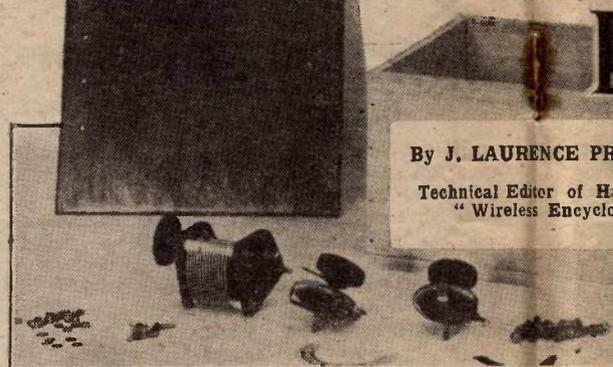
The ebonite should be at least 1/4 in. in thickness and of good quality, and is then marked out and drilled for the various fittings. The location of these are shown in Fig. 3, only the centres for the condenser spindles and those for the filament resistances being shown, as the fixing screw holes should be placed according to the particular pattern of condenser or filament resistance to be used in the set. Valve holders are preferable for the

- Two valve holders.
- Two fixed coil holders with bases, one ditto, plain.
- Ebonite strip for reaction coil lever arm.
- Quantity small brass screws and terminals.
- Materials for case: 4 ft. of 3/8 in. thick timber 5 1/2 in. wide; one piece 10 1/2 in. wide, 12 1/4 in. long for base, 3/8 in. thick.

The first step is to prepare the case illustrated in Fig. 1. This can readily be made from four pieces of good quality deal or pine, 3/8 in. in thickness, which can simply be cut to length and nailed together at the

Construction

Two



amateur constructor, as it is merely necessary to put a little white paint on the bottom of the pins projecting from the valve holder, and to press them on the surface of the ebonite panel, with the result that the white marks will exactly indicate the positions for the holes for the passage of these pins. When drilled, the holders should be fixed in their places by means of the nuts provided, which should have brass washers placed between them and the underside of the panel. These nuts should be tightened up carefully and securely, the lock nuts screwed into place on top of them, but only finger-tight at this stage.

The filament resistances are fixed by two screws passed through the ebonite centre piece into holes drilled and tapped in the panel.

The Variable Condenser.

The condensers are made up from standard parts with the usual fixed and moving aluminium plates, there being 13 fixed plates and 12 moving plates in each condenser. They are fixed by two screws passed through from the top of the ebonite panel into holes drilled and tapped in the ebonite end plates of the condensers.

A standard grid leak and condenser are secured in position towards one corner of the panel, as shown in Fig. 2, and into them one of the clips of the grid leak is attached, one to the terminal of the condenser, and the other end of the grid

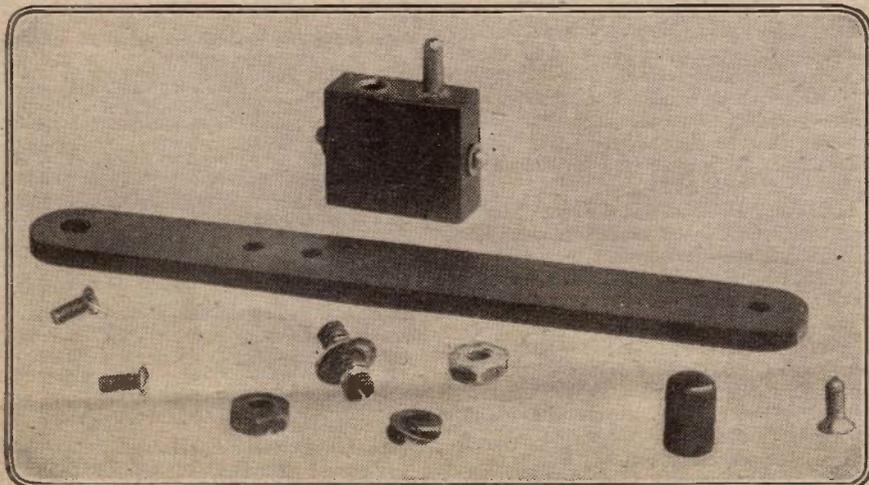
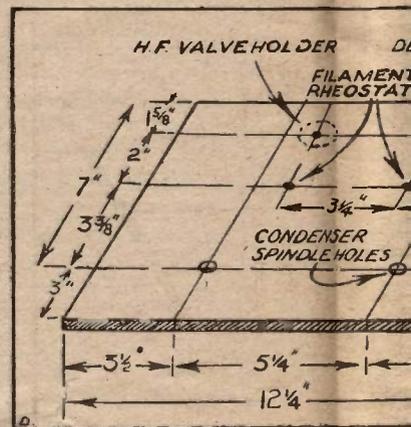


Fig. 4. The parts composing the movable coil holder.

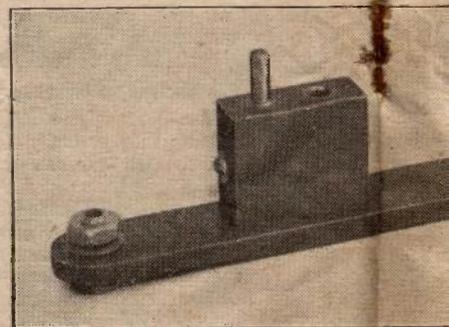
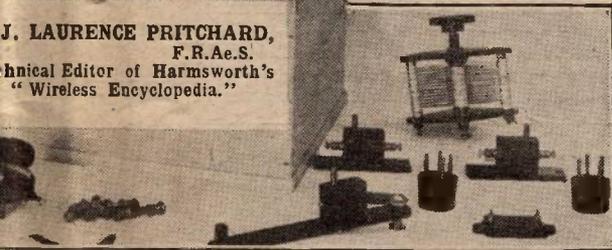


Fig. 5. The moving coil holder for

Action of a Two Valve Receiver

J. LAURENCE PRITCHARD,
F.R.A.E.S.
Technical Editor of Harmsworth's
"Wireless Encyclopedia."



leak is supported on a small separate angle clip.

Making the Coil Holder.

Seven terminals are then fitted for the battery, telephone, aerial, and earth connections respectively, and the two fixed coil holders screwed in place, the appearance of the underside of the panel at this stage of the work being shown in Fig. 2.

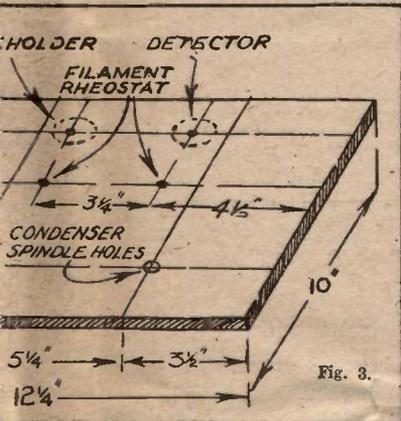
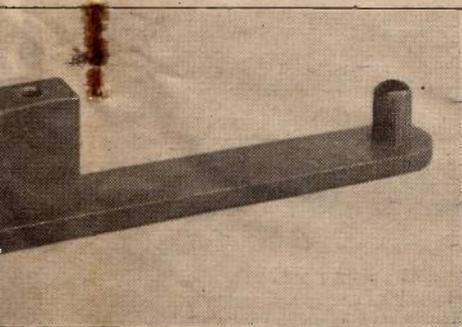


Fig. 3.

The reaction arm is arranged to turn about a pivot bearing made from a hollow screwed rod $\frac{1}{16}$ in. diam. and $\frac{3}{4}$ in. long. A brass washer is soldered to the centre of this screw, as shown in Fig. 4, and two thin nuts and a spring washer should be provided to fit the screw thread.

A hole is then drilled in one end of the arm, and the extremity of the ebonite rounded off neatly. The other end is drilled and the ebonite knob fitted to it with a small screw passed through the arm. The holder is then attached to the top of the arm with two countersunk brass screws passed through the arm, and



Moving coil holder for the reaction coil.

into tapped holes in the underside of the holder. The hollow pivot pin is assembled in place in the larger hole in the arm, and the result, as shown in Fig. 5, is a neat and effective form of simple adjustable lever arm, whereon to mount the reaction coil.

There would be no objection to the use of one of the numerous commercial patterns of movable coil-holder in place of the special type described, but the latter has the merit of simplicity, has proved practical in use, and keeps the wiring practically all beneath the panel. The coil-holder itself can be made, if so desired, from a block of ebonite sawn to the correct shape, and neatly finished by filing. The best results are found when the holder and the arm are matted by rubbing with a mixture of emery powder and water. This is worked with a linen pad and, if carefully done, is very pleasing and workmanlike in appearance. The socket and plug are readily made from rod brass if a turning lathe is available—they are made a push fit into the holes drilled to receive them. It is important that the small screws used for fixing the socket and plug into the block are long enough to reach well into the brass, allowing for the thickness of the connecting wires that have to be turned under the head of the screw. This point should be noticed if using a commercial pattern of holder.

Another little practical point is to see that the moving arm turns truly on the top of the panel, as if it is at all over to one side, it will tend to bind at one part of its movement and be slack at another. The arm should be tested in place to make sure that all is in order before proceeding with the remainder of the work.

A Filament Resistance Test.

Notice also that the edges of the tubular pivot pin are perfectly smooth and

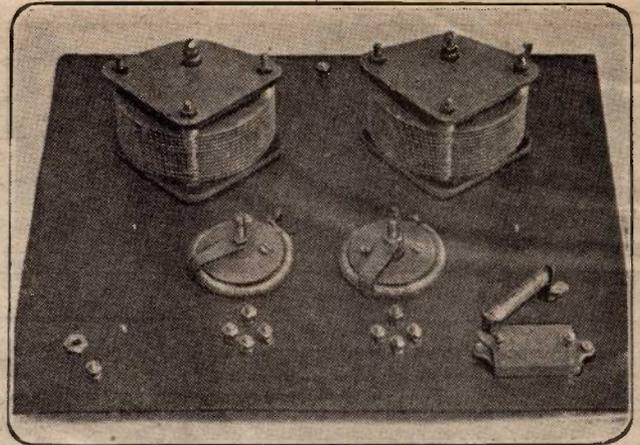


Fig. 2. The components in position under the panel.

slightly rounded off to act as a guide for the wires and avoid any chance of their chafing.

Before proceeding further, test the filament resistances by connecting a small dry battery and telephones across in turn and see that the moving arm makes contact over the whole length of the resistance wire. It sometimes happens that the arm is not perfectly adjusted and does not quite touch at all points in its travel, and it will save much trouble later to make sure of it at this stage.

Testing Variable Condensers.

The condensers should also be adjusted and tested in a similar manner to be quite certain that there is no chance of the moving plates touching the fixed ones. This is easily done with a dry battery and a pair of headphones. One terminal of the dry battery is connected to the fixed plates, and one terminal of the telephones to the moving plates.

The other telephone terminal is connected to the remaining terminal on the battery. The moving plates are then revolved slowly, and should any of them touch there will be a decided click in the 'phones. The faulty plates are then located and adjusted until there is no response whatever in the phones.

(To be concluded).



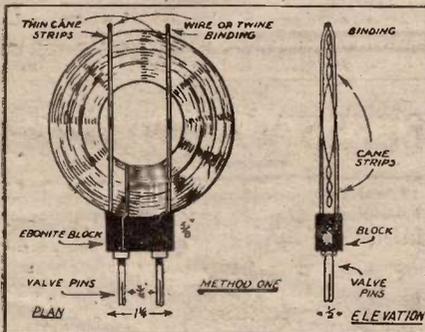
Fig. 6. The complete receiver ready for use.

PRACTICAL IDEAS for the AMATEUR.



MOUNTING COILS.

THE following ideas for mounting coils may be found useful. For basket coils the pins are screwed into a small block of ebonite $1\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2}$ in., and on the opposite side of the block four small holes are drilled, one near each corner. Into these holes are stuck four thin sticks of wood (split cane is very suitable): the basket is dropped in between these sticks, which are then bound together with thin wire or twine at the ends and in the middle through the central hole of the basket coil. The details can be seen quite clearly in the diagram. This method is extremely simple, yet it is very efficient, and it allows the very close coupling which is unobtainable by other methods.



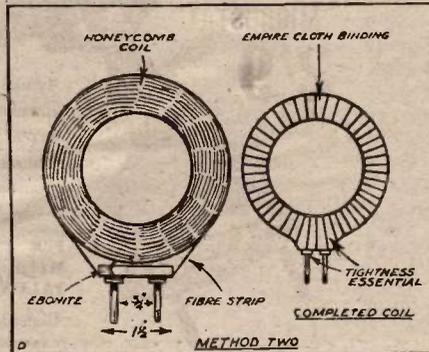
Another method consists of taking a thinner piece of ebonite, say $1\frac{1}{2} \times \frac{1}{2} \times \frac{1}{8}$ in. and threaded holes made for the pins. A strip of strong, flexible material is then taken (I have been using empire cloth, but something less elastic, such as thin fibre, would be better), and cut to a length, which exactly encircles the coil with the piece of ebonite pressed against it, allowing for the ends to be double over the ebonite.

A Simple Method.

Holes are then made in the ends of this strip to correspond with the holes in the ebonite and the pins put in place. If the whole is now tightly bound with empire cloth, it will be found that a very robust coil will result.

In each of these methods connection may be made to the pins either by soldering or by means of a nut and washer put on the pins before screwing them in the ebonite.

Incidentally, it might be mentioned that ordinary rubber solution, such as is found in cycle repair outfits, is very useful for securing the ends of the empire cloth used in binding the coil



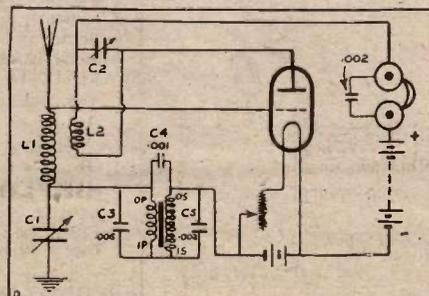
A ONE-VALVE LOUD-SPEAKER CIRCUIT.

THE circuit shown in Fig. 1 is giving excellent results on a loud speaker, and for long distances is remarkable. L1 is a basket coil, about 40 turns; L2 should be about 30 turns; C1 should be not more than .0005, and must have a vernier; C2 is not more than .0003; C3 is .006; C4 .001; C5 .002. The values of these condensers may vary a little according to the make of transformer used. The set works well using a Marconi D.E. 3 valve, with about 60 volts on the plate. The operation of this circuit is just the same as a "straight" circuit, and will give results equal to a valve and crystal reflex.

Surprising Results.

It can get all the B.B.C. stations easily, 5 W A and 5 S C are wonderfully loud. The Radiola concert can be heard well, and several amateurs can be heard on the loud speaker. A few are: 6 P S, 2 D Y, 5 V R, 5 H Y, 5 C B, 2 O M. 6 I M is almost as loud as 2 L O on the 'phones. 2 L O on the loud speaker is quite loud enough for most people, and can be heard practically all over the house.

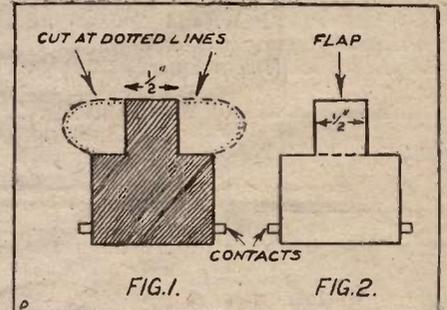
Altogether the circuit is well worth a trial by every amateur and those who use it will be surprised by the results obtained.



ANOTHER MOUNTING FOR BASKET COILS.

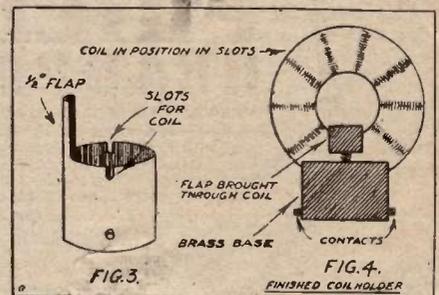
BASKET coils may be mounted in a neat and novel manner by using the brass base of old electric lamps.

Procure one brass base for each coil to be mounted, and clean all glass and composition (usually pink in colour) from the interior, being careful not to break the black wax in the base, nor the two contact wires held therein.



Then cut all the top away, except about half an inch, which is left as a flap for fixing the coil. For cutting, which can easily be done with a pair of scissors, see Fig. 1. The resulting shape should be as in Fig. 2.

Next cut two slots to take the coil, as shown in Fig. 3, and place the coil in the slots, and bend the flap through the centre (of the coil) to secure it. (See Fig. 4.)



Lastly, join the wires from the coil to the wires in the brass base, and the coil-holder is complete. A standard holder must be fitted on the panel of the set, and the different coils may then be plugged in as desired.

This arrangement does away with troublesome wiring-up of each coil inserted, which is usually necessary in other methods of mounting basket coils.

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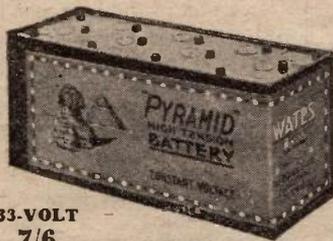
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33-VOLT
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Far in advance of any set at anywhere near its price. The delicate tuning renders it surprisingly selective. Owing to an auxiliary condenser the range extends from 250 to 700 metres.

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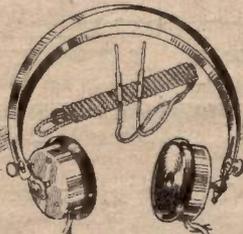


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Extract from a testimonial dated Jan. 21st:
"I have been specially recommended to obtain a pair of your headphones by a friend who, like me, is unfortunately very deaf, and yours are the best he has been able to obtain."—F. G. L.

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Everything in Wireless.
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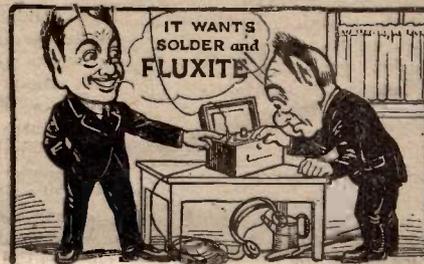
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One minute from Farringdon Street Station (Met. Rly.)

IF WIRELESS WAS WIRELESS—



Wireless is "wire-less" so far but wire is bound to play a part somewhere in the installation. Some amateurs consider the receptive qualities before the appearance of their sets, but even reception is apt to be marred by a hopeless conglomeration of wires and frayed insulation.

Set aside an evening of overhauling—make careful adjustments—take each end of wire in turn, and with solder and a touch of FLUXITE join them neatly into place. You are bound to be satisfied with the result of the few hours spent and the receptive qualities will attain higher sensitiveness in consequence. Soldering is so simple when you use a touch of FLUXITE—just the smallest touch does it.

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FLUXITE SOLDERING SET

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HOW 5 I T "RELAYED" AMERICA.

Behind the scenes at the Birmingham station during the broadcasting of a most enjoyable hoax.

WITHOUT doubt the scene by which the first British wireless panto-revue will be remembered is the hoax by which 5 I T deceived its listeners. It is not surprising that the spoof was so successful, so much so, that there were no fewer than over a hundred telephone calls the same night congratulating and thanking the station for relaying the American station clearer and more distinctly than ever crystal set users had heard it before.

How was it done?

We who watched held our breath with amazement at each moment of the developing hoax. Uncle Joe had lectured the orchestra on what he wished them to do, someone stood against the microphone switch. The dialogue opened. Uncle Joe stood with baton upraised. Just as the first syllable of a word was being uttered, down came the baton swiftly, up went the switch, and you heard that first syllable of a word and nothing more. Then there was a pause, and the announcer warned you that America was coming through, and that it was proposed to relay it.

Home-made Atmospherics.

The switch went up again for a moment, and then the orchestra commenced to play softly. The switch was pulled down. America was coming through, with the strains of "Maryland" played by an American band.

You heard the atmospherics like roaring seas, and gigantic loads of coal dropped in fathomless space, and sizzles and howls and wails. But I saw Colin Gardner standing before the microphone rubbing tissue paper between his hands, I saw Uncle Edgar breaking pieces of wood from a cigar box, and I noticed Uncle Pip (Mr. H. C. Pearson, the announcer) dropping lead shot on a kettledrum; I also saw the engineer fiddling with his tame oscillating valve that is used for Morse practice. That was America coming through, an America made in Birmingham.

The "Rugby Station."

Uncle Edgar simulated the American announcer, every nasality in its place, and told you, "H A D proposed sending over the 'Scouts March' played by the Westinghouse Band."

And the band commenced again, and Colin Gardner, Uncle Edgar, and the rest, behaved as before, while we others looked

on in sheer amazement and wondered how many would be deceived.

It was the last scene of a charade, and it seemed to have been an extraordinarily successful charade. Those happy two hours behind the broadcast scenes were



The "relaying" at 5 I T proceeds with a swing.

among the most absorbing that I have ever had. But one felt at a loss to understand what was happening in hundreds of homes as all these mixed noises, blended into one volume, struck upon the ears of 5 I T's listeners. It was fun to see the broadcast, but one would have liked also to have listened the other end of the microphone circuit as well.

Hurriedly an "intruder" was instructed how to ring the chimés, and as the microphone switch was snapped down a sudden silence came into the place, and a red light glowed on the board, popularly known as Rugby station. The microphone circuit was open; how many thousands of ears were on the alert?

Effect Number One.

Then the showman explained, "the stupendous production regardless of cost that was about to start." He instructed his listeners to note the rise of the curtain, and he commanded it to rise and industriously swung a huge wooden rattle, so that you who listened the other side of the microphone may have heard that imaginary curtain rise, though I, who watched in the studio, saw none at all, but only Uncle Edgar leaning over the microphone and whirling his rattle. That, I think, was effect Number One.

He showed himself a great stage manager that evening. He showed much resource. Once during the opening scenes Uncle Jack, Mr. J. A. Cooper, the engineer-in-charge, signalled the cut out, and reported that the microphone was picking up a generator and hastily the magic sound recording box was changed, and then the switch was pulled down again and the panto-revue rushed on to its fame again.

H. S. C.

TECHNICAL ODDS AND ENDS.

Conducted by J. H. T. ROBERTS, D.Sc., F.Inst.P.

Automatic Wireless Alarm.

THERE are many ships at sea which cannot maintain a wireless listener constantly in attendance at the set. In order that the S.O.S. signal shall give its own alarm, however, a French inventor has devised a special relay apparatus, which is only actuated on the receipt of the well-known "three shorts, three longs, three shorts." This relay then operates a bell or other alarm, by which the attention of the wireless operator or other officer may be attracted. No doubt other automatic wireless alarm devices will follow, but of course it is comparatively easy to devise a relay which will only be operated by one particular and well-defined Morse signal.

Photographs to Mars.

It has been humorously suggested that the attempts to communicate with Mars by wireless should be supplemented by the transmissions of wireless pictures accompanied by the corresponding sounds; for example, a picture of a cat would be accompanied by pussy's characteristic call-sign. On the other hand, it has been argued that even though the Martians may have developed wireless apparatus, there is no reason to suppose that they have used just the apparatus of Dr. Belin or Mr. Jenkins.

The wireless transmission of "talking pictures" to Mars, as an effort of imagination and optimism, leaves television standing.

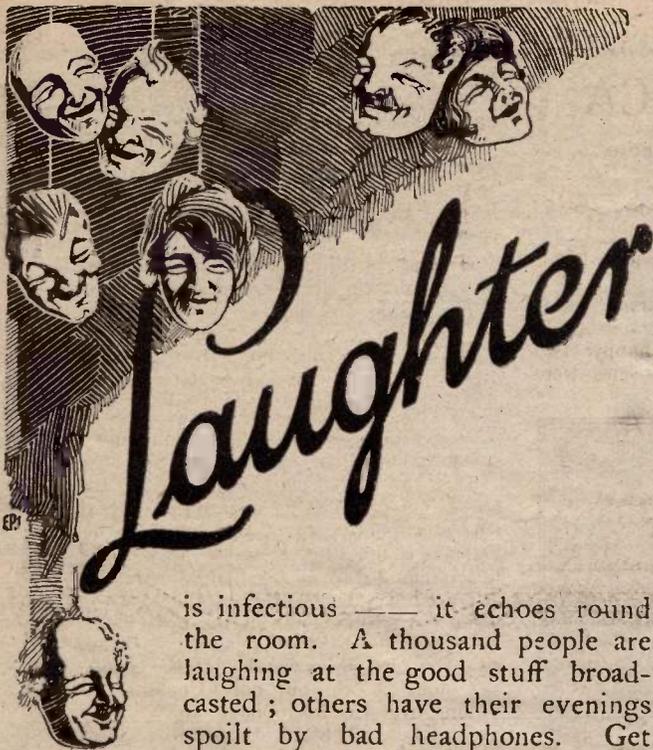
Saving Ebonite.

If you do much experimenting, you will soon find that using a new sheet of ebonite for each new panel lay-out comes expensive. It is true you cannot remove the holes which are present in discarded panels, and plugging is a tedious operation, not worth the trouble. The old panel is, of course, as good as ever, except for the holes—all in the wrong places. A reader sends me a good tip in such cases.

Ebonite "Veneer."

You merely take a piece of very thin ebonite sheet and attach it, like a veneer, to the old panel, the sheet being secured by means of screws or bolts. This is comparatively inexpensive, gives the panel a new lease of life, whilst it still has the original strength, and provided none of the new drillings foul the old ones, the whole is as good as a new panel at a fraction of the cost. The process can, of course, be repeated a number of times.

(Continued on page 988.)



is infectious — it echoes round the room. A thousand people are laughing at the good stuff broadcasted; others have their evenings spoilt by bad headphones. Get Fellows Headphones with your Fellows Set and hear every word clearly.

The "Lightweight" Headphones weigh under 6 ozs., and are extremely comfortable. With the special spring adjustment the ear-pieces may be moved into any desired position or separated without the use of adjusting nuts. This fitting is specially designed not to tear the hair. Wound to 4,000 ohms, they are very sensitive and well made, with duralumin headbands, stalloy diaphragms, etc.

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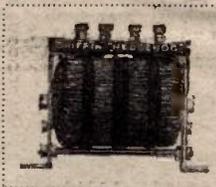
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THE results obtained by the testing department of "Wireless Weekly" provide eloquent testimony to the efficiency and reliability of Pye's Wireless Products.

This short extract from the January 9th issue of the above mentioned paper describes a typical performance of the Pye 4 valve Receiver.

"On trial, on a fair suburban aerial in London, it gave as fine an exhibition of real loud speaking, without distortion or 'gramophone effect,' as we have ever had the pleasure of listening to, using three valves and 200 volts on the power amplifier valve."



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 RECEIVING SET**
 Wave-length Range
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 selectivity is such that
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 Set is rendered par-
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 introduction of a
 Telephone Choke, so
 that no high tension
 current passes through
 the Loud Speaker. A
 Switch is provided
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 Values in the Low
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Variable Battery **10/6**
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each pair fully guaranteed pair 17/6
Adjustable 'phones, 4,000 ohms ... per pair, 11/- and 15/6
Coil Holders, for panel-mounting, lacquered finish;
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Filament Resistances, excellent smooth action; not
the rubbish usually sold at this price each 1/9
Nickel or Brass Switches (small), for panel-
mounting; 8 P.D.T., each 1/3; D.P.D.T. each 2/-
L.F. Transformers, ratio 5:1, tested and guaranteed
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Brass Rod, screwed, 2 B.A. 2 1/2d., 4 B.A. 2d. per ft.
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Everything else for the constructor, at the same rock bottom
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The Runbaken Radio Charger
charges up your
accumulator
from any D.C.
lamp-holder
and keeps it "up
to scratch," and
does it quickly,
cleanly and
cheaply.

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when charging at
night, as the illumina-
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Write for leaflet.
Guaranteed
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DUBLIN: 17, Clare Street.
PARIS: 40, Rue Brunel.

The Real American 'Bus-Bar.'

"POPULAR WIRELESS," Feb. 2nd, says:-

"About the most useful wire to adopt is a
conductor of square section, about 18 S.W.G.
tinned copper, but unfortunately it is rather
difficult to obtain in this country."



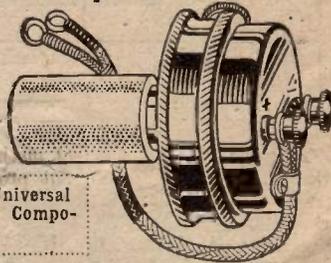
1/8" tinned square copper
wiring rod is made in Eng-
land from the American
pattern, and is mechan-
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soft imitations. 2 ft. lengths, 3/- per dozen, postage 3d.
Nothing like it for wiring up panels—saves macaroni.

Send for list of other good things.

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The HERALD Loud Speaker Receiver.

for building a loud speaker in any
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Adjustable diaphragm. Perfect
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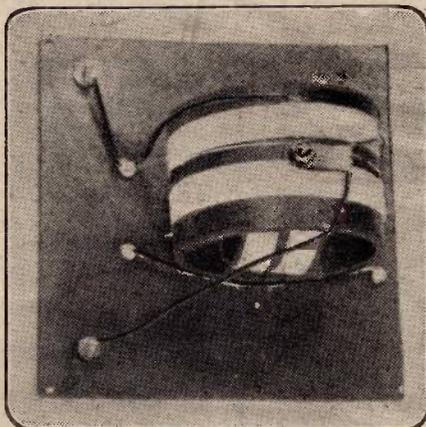
A Section Devoted to the Interests of the Younger Constructor.

A NEAT CRYSTAL RECEIVING SET.

WITHOUT in any way wishing to discourage the earliest attempts of beginners, it is remarkable to notice how many in taking up the simplest form of wireless construction, spend a great deal of time and money in making sets, which at the best can only be described as makeshift contrivances.

Inexpensive Receiver.

Following out the old adage, that well begun is half done, the novice is recommended to devote his energies to the building up of sets, which as he advances in the art of wireless work may be looked back upon with some degree of satisfaction. The man who begins by constructing slipshod



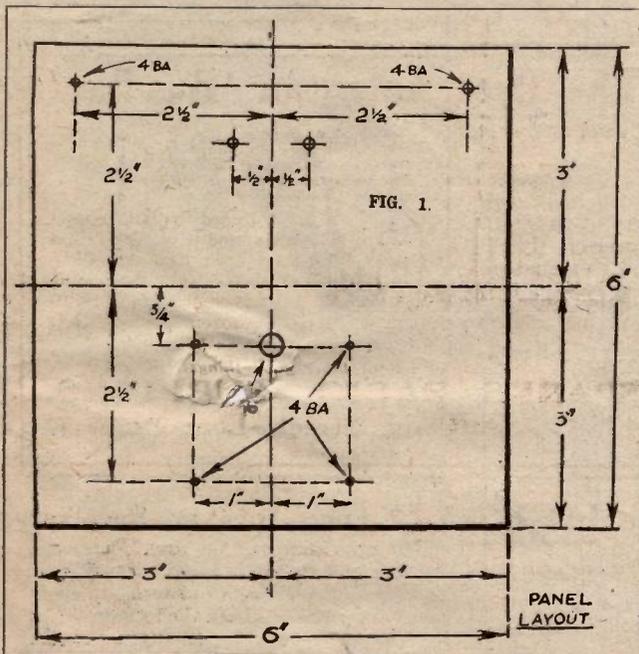
Showing the simple nature of the wiring.

The following components are readily obtained from any wireless dealer, and though low in price are of quite commendable quality:

1. Ebonite panel (6" by 6" by 1/4") .. 1 0
2. Variometer 3 6
3. Crystal detector parts 0 9
4. Ivorine scale and tablets .. 0 5
5. Terminals (four) .. 0 6
6. Systoflex and wire 0 3
7. Telephone condenser 1 6
8. Box and lid 6 0

13 11

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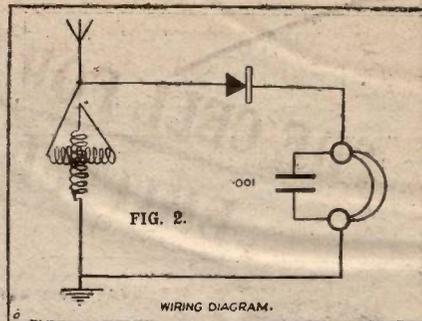


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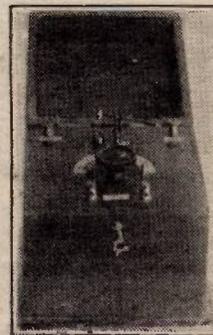
Wiring Up.

The ivorine scale over which the pointer of the variometer works should be cemented to the ebonite by means of a mixture of amyl-acetate and celluloid, the latter forming a very strong adhesive for the purpose, the same method being used for the aerial, earth, and telephone tablets.

Two screws fixed from beneath the panel secure the two parts of the detector, and the crystal may either be held in position by a small set screw or with the aid of Woods' metal.

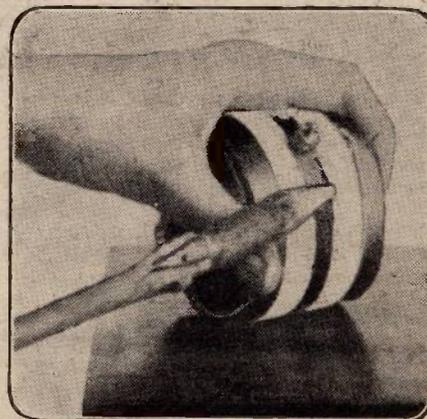
After the four terminals have been fixed in position the set only requires wiring ready for use.

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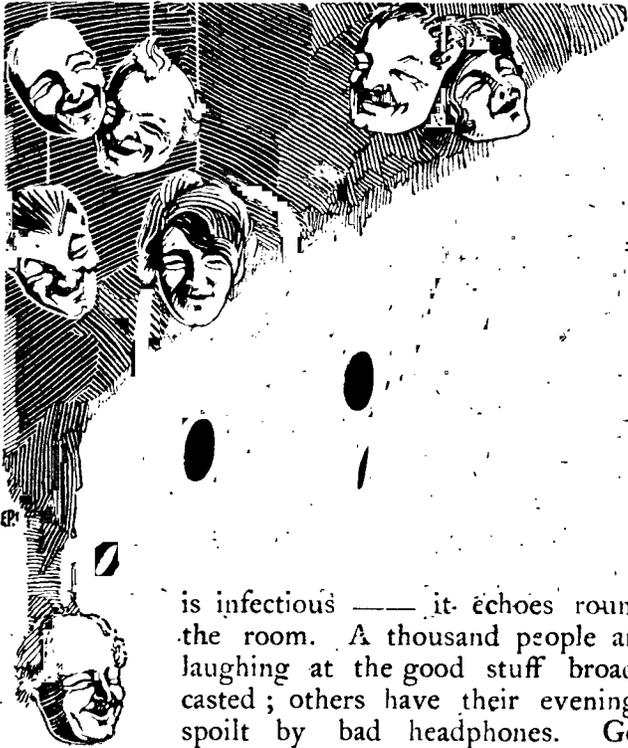


A view of the complete receiver.

(Continued on page 976.)



Soldering the variometer leads.



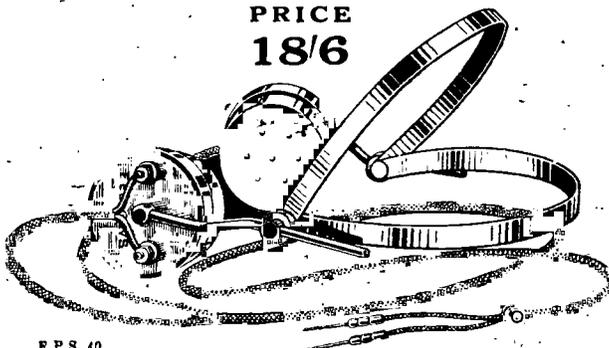
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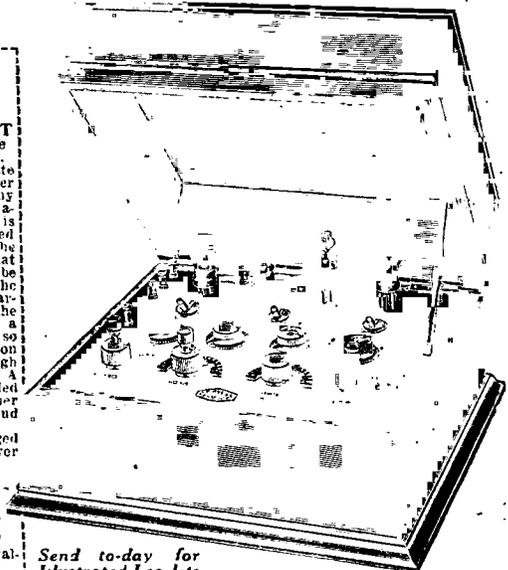
THE results obtained by the testing department of "Wireless Weekly" provide eloquent testimony to the efficiency and reliability of Pye's Wireless Products.

This short extract from the January 9th issue of the above mentioned paper describes a typical performance of the Pye 4 valve Receiver.

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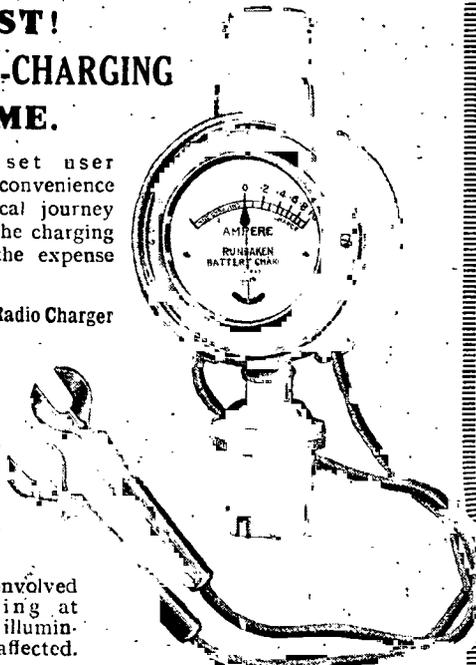
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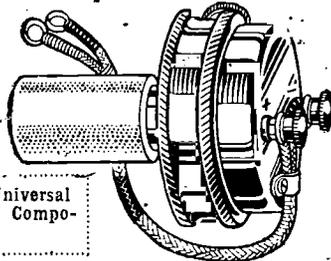
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The JUNIOR A A L U

A Section Devoted to the Interests of the Younger Constructor.

A NEAT CRYSTAL RECEIVING SET.

WITHOUT in any way wishing to discourage the earliest attempts of beginners, it is remarkable to notice how many in taking up the simplest form of wireless construction, spend a great deal of time and money in making sets, which at the best can only be described as makeshift contrivances.

Inexpensive Receiver.

Following out the old adage, that well begun is half done, the novice is recommended to devote his energies to the building up of sets, which as he advances in the art of wireless work may be looked back upon with some degree of satisfaction. The man who begins by constructing slipshod



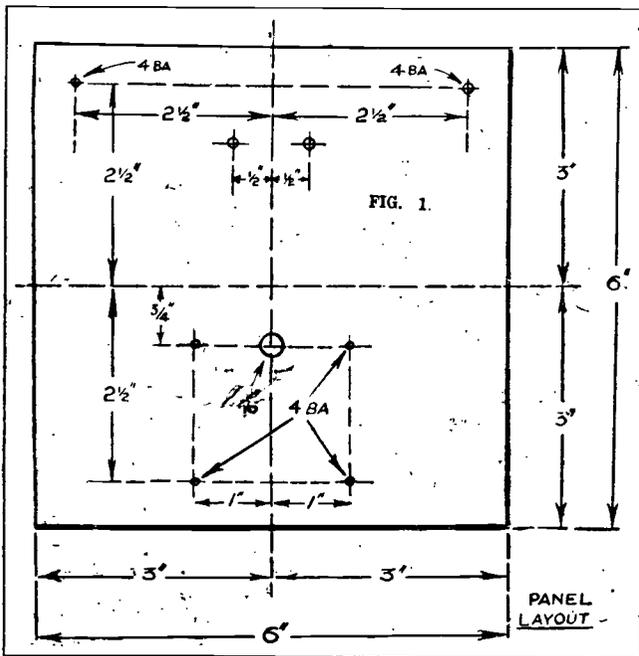
Showing the simple nature of the wiring.

The following components are readily obtained from any wireless dealer, and though low in price are of quite commendable quality:

1. Ebonite panel (6" by 6" by 1/4") .. 1 0
2. Variometer 3 6
3. Crystal detector parts 0 9
4. Ivorine scale and tablets .. 0 5
5. Terminals (four) .. 0 6
6. Systoflex and wire 0 3
7. Telephone condenser 1 6
8. Box and lid 6 0

13 11

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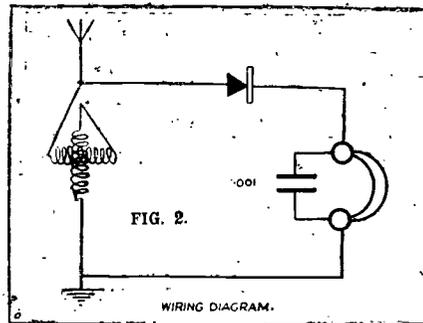


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The variometer ready for mounting.



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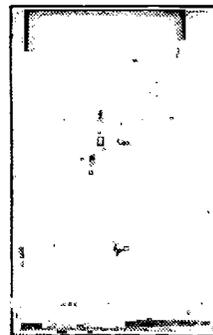
Wiring Up.

The ivorine scale over which the pointer of the variometer works should be cemented to the ebonite by means of a mixture of amyl-acetate and celluloid, the latter forming a very strong adhesive for the purpose, the same method being used for the aerial, earth, and telephone tablets.

Two screws fixed from beneath the panel secure the two parts of the detector, and the crystal may either be held in position by a small set screw or with the aid of Woods' metal.

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A view of the complete receiver.



Soldering the variometer leads.

(Continued on page 976.)

The JUNIOR AMATEUR

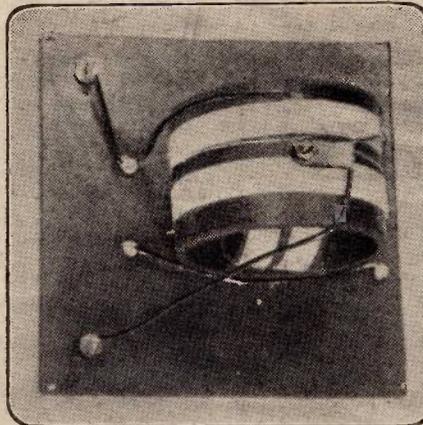
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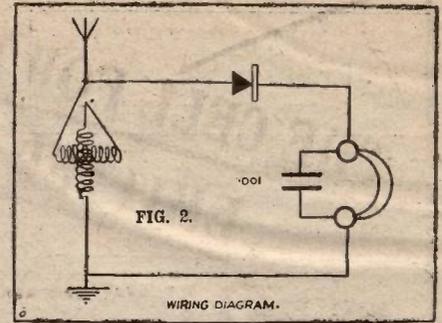
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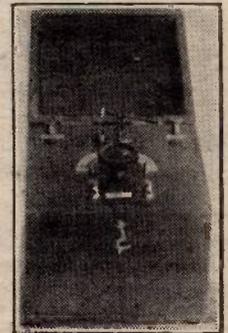
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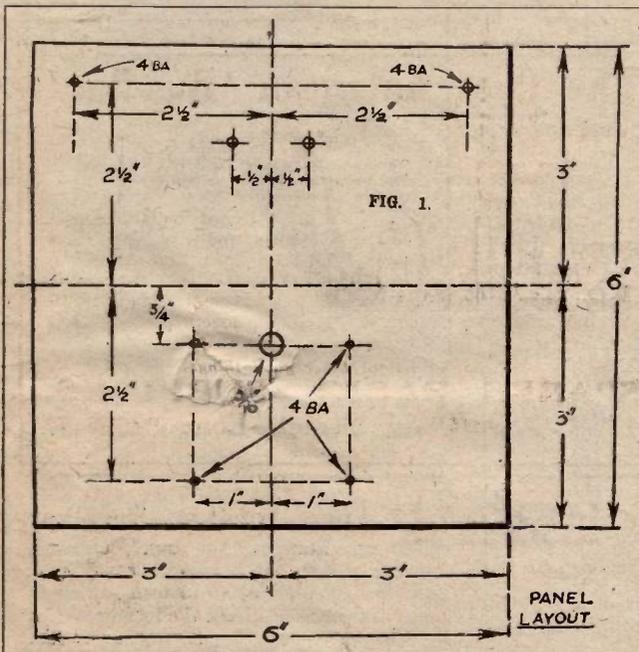
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A view of the complete receiver.

(Continued on page 976.)

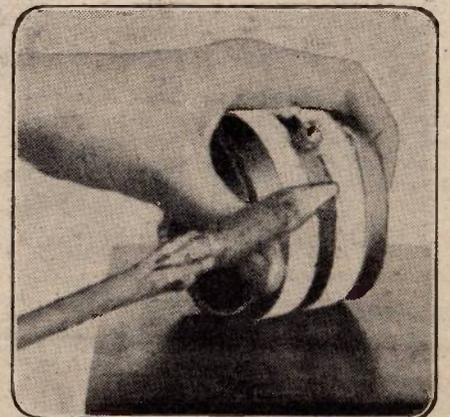


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The variometer ready for mounting.



Soldering the variometer leads.

JUNIOR TATU

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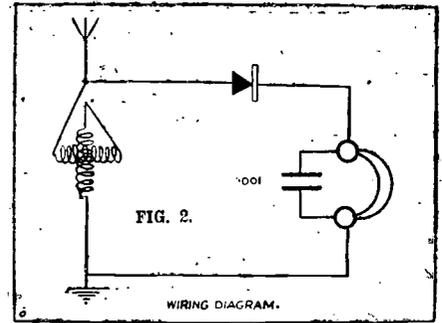
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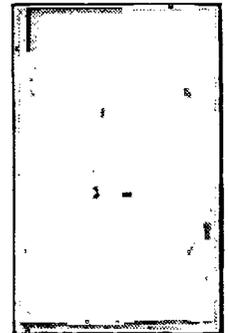
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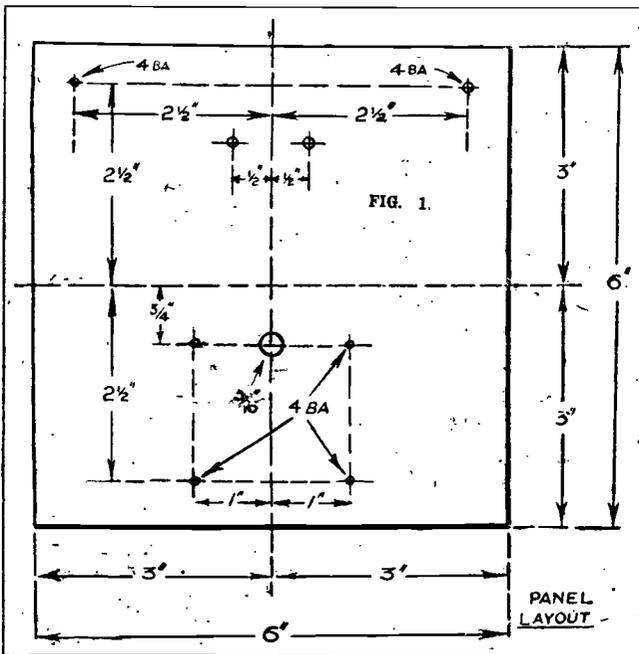
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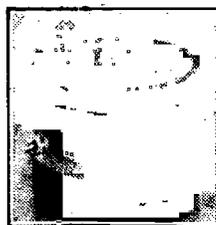
A view of the complete receiver.

(Continued on page 976.)

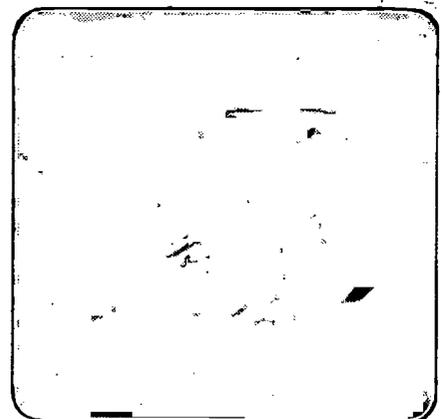


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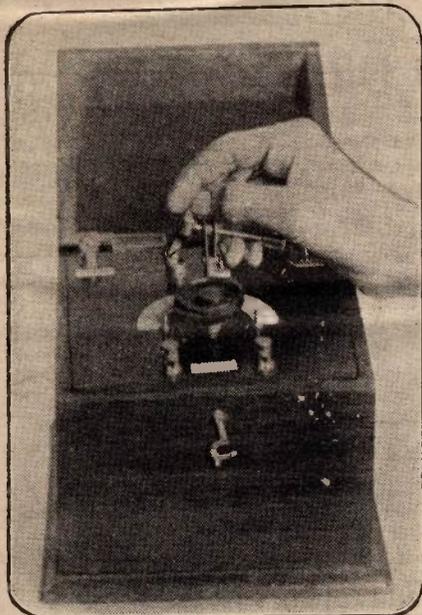


Soldering the variometer leads.

A NEAT CRYSTAL RECEIVING SET.

Continued from page 975.)

one of the telephone terminals. The opposite terminal of the telephone is joined by wire to the spindle contact plate of the variometer, the same wire being continued



Adjusting the crystal detector.

to the earth terminal to which it is soldered. Between the telephone terminals a .001 mfd. fixed condenser is shunted.

To assist the novice in wiring up his set, it may be mentioned that the circuit works as follows. The signals from the aerial pass to the free end of the variometer stator and travel round the stator winding, the end of which is connected to the rotor spindle to which the knob is fixed.

Action of the Variometer.

To the same spindle one end of the rotor winding is fixed, so that the current is thus able to continue its course round the rotor windings, the remaining end of the rotor winding being secured to the bottom spindle, which is connected directly to earth. The relative position of the stator and rotor vary the inductance, or in other words, tunes the aerial circuit. The aerial being thus tuned, the signals travel to the detector where they are rectified, thus allowing the telephone diaphragms to respond to the signals.

Though the set is very simple it is constructed on correct theoretical principles, and possesses distinct advantages over those employing slider tuned coils, chiefly because there is no "dead end" or capacity effect.

The little instrument is well worthy of the addition of a valve amplifier, should the novice aspire to further experiments.

Tuning-In.

When tuning-in, the rotor of the variometer should be rotated very slowly, otherwise, if the tuning is fairly sharp, you may miss the required signals altogether. A great many amateurs condemn their apparatus as

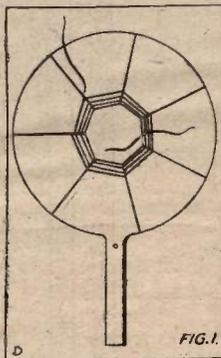
inefficient simply because they tune so rapidly that they miss the signals they are trying to receive.

The Tuning Buzzer.

Care must always be exercised in adjusting the crystal, and it is a good plan to use a buzzer as a testing signal, so as to show when the most sensitive point is found. The buzzer should be some distance from the set.

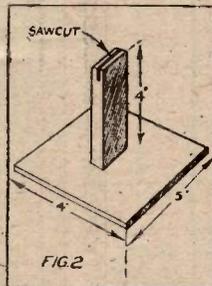
A USEFUL TUNER FOR CRYSTAL CIRCUITS.

THE poor selectivity of some direct-coupled crystal receivers is due partly to the fact that the aerial circuit only is tuned to the required wave-length. In the tuner here described, the closed circuit through the crystal and telephones is also tuned, and undesired frequencies can be eliminated without the loss of signal strength inevitable with the use of "wave-traps." In fact, there is a slight increase in signal strength, due to a "step-up" effect. (Beginners should note, however, that this effect is not the same as that of "reaction" in a valve set, when a portion of the amplified energy is "fed back" to the aerial circuit.)



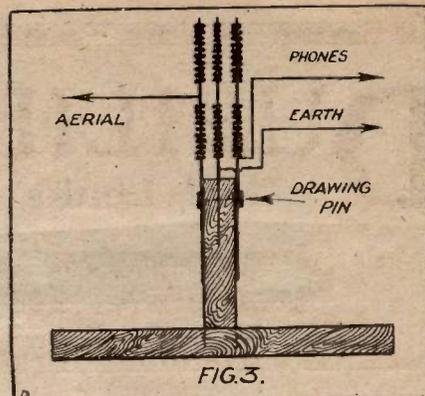
Eliminating Jamming.

Three basket coils are required, each consisting of about forty turns of 24 D.C.C. wire on a former 1 in. in diameter. It will simplify mounting if these are wound on cardboard or fibre as shown in Fig. 1, a piece about 3 in. long being left for use as a "handle." A stand is then made as in Fig. 2.



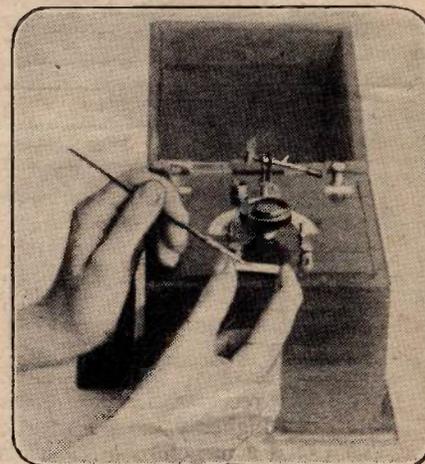
A saw-cut is made vertically in the upright piece of the stand, and one of the coils is fixed in this slot with three or four small pins. Two drawing pins will hold the other coils as shown in Fig. 3. An alternative form of mounting is shown in Fig. 4, where one of the coils (used as the middle one) has a small projection as nearly opposite the handle as possible. This coil is then fixed by a small brass screw or nail, as shown.

The beginning of the first coil is connected to the aerial and the crystal detector. The outside of the first coil is soldered to the inside of the second, and the outside of the second coil is soldered to the inside of the third coil and also to the earth terminal. The outside of the third coil is then taken to one of the telephone terminals. The



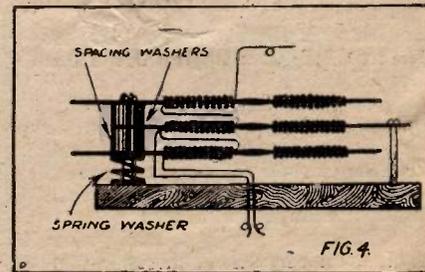
other telephone terminal is connected to the detector and the circuit is complete. A blocking condenser across the telephones is optional, but with most makes of telephones it is not only unnecessary, but undesirable, in a crystal set.

The two coils in the aerial circuit are moved until the maximum strength is obtained on the desired signals and the third coil is then varied until the loudest results are obtained. A final tuning with the aerial coils will often improve strength. If the station cannot be found with the aerial coils, move the third coil a little and try again, or short-circuit the third coil with a piece of wire which can be removed for the final tuning.



Fixing a name tablet on the neat crystal receiving set.

Using a pair of 4,000-ohm 'phones, which are by no means super-sensitive, and Hertzite crystal with this tuner on a standard P.M.G. single-wire aerial, Birmingham at forty miles and Manchester at thirty-five miles are always "on tap," although varying slightly with weather conditions; and the Morse signals that formerly spoilt many transmissions from the former station now cause no interference owing to the addition of the third coil.



DUBILIER

Grid Leaks



Constructional Chats

By PHILLIP R. COURSEY, B.Sc.

No. 5.

On the use of Grid Leaks.

Grid Leak resistances form an essential part of many radio receiving circuits using thermionic valves. In particular a grid leak is very commonly employed when the valve is used as detector, the leak resistance being connected either across the condenser which is inserted in the wire connecting to the grid of the valve, or connected directly between the grid and the filament of the valve.

The function of this grid leak resistance is to provide a path through which the electrons which collect upon the grid of the valve can leak away back again to the filament. Hence it follows that the value of this leak resistance is not particularly important within comparatively wide limits. If the leak has too low a resistance it will impair the proper functioning of the valve, while if it is too high the use of reaction becomes difficult. In many receivers the use of resistances of higher value than the conventional 2 megohms often leads to slightly improved results, and leaks of 3 or 4 megohms resistance may be tried with advantage.

The experimenter using very short wavelengths is also specially recommended to try values other than the normal one, in particular in these cases a lower resistance value (of about 1 megohm or slightly less) often leads to improved results and easier control of the receiver.

THE DUBILIER CONDENSER CO. (1921), Ltd.,

Dept. E.

Ducon Works, Goldhawk Road, London, W.12.

Telephone :
Hammersmith 1084.

Telegrams :
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[E.P.S. 50.]

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It is equally successful as an Oscillator, a Rectifier or an Amplifier, its signals being remarkably strong and clear. There is a Mullard Valve for every Wireless Circuit, Transmitting or Receiving, and there is also a complete range of Valve Accessories such as grid leaks, condensers, anode resistances and valve holders.

Characteristic curves and operating data for this valve will gladly be sent on request.

Obtainable from
all Wireless and
Electrical Dealers.



The
ORA VALVE
Price 12/6

Mullard



Advt. The Mullard Radio Valve Co., Ltd., Balham, London, S.W.12.

E.P.S. 102.

Two Minutes Interval-Please!

By E. Blake A.M.I.E.E.

SINCE broadcasting began in earnest, and the knights of the pen became aware of radio as a real factor in the equation of society, there has been a mild epidemic of prophecy. Gentlemen whose acquaintance with radio began, and thus far persists, with the use of a crystal set have laid themselves out to dream on paper the radio future of the world. Good eggs! As Shakespeare said on the "first night" of "Hamlet."

Bert Smallpot Hears a Bang.

But the one man—as Mr. Kipling has apparently gone out of the story trade, to the world's discomfiture—who could give us an intimate glimpse of the future of radio—and I refer to Mr. Wells—has not, up to the present, obliged. I suppose he is too tickled about this Labour Government.

So, if Mr. Wells will forgive me, I will try to jog his facile pen by placing upon a record a feeble imitation of what he could give us if he would only be the Wells of yesteryear. Here goes! I will try to inject some concentrated Wellsine into it.

THE WAR OF THE WAVES.

"Desh it," said Bert Smallpot, "them bloomin' ships at it again, jest as I got the music. Always at it. Dah, dah, dah. Carn't stop a minnit!" He protruded a large, pink, almost prehensile tongue, and again tried to get a vernier adjustment on his slider. "Desh it," he said an hour later. "The crystal's dropped off again—"

You figure him, a medium-sized dog-doctor's clerk, boasting a large-sized chest measurement and a small-sized nose; the possessor of two suits (Burzon's 47/6) and a "woollie," the pride of his office life and the curse of his landlady. Girls had once claimed his gloaming hours; now he spent all his leisure with head-telephones clamped to his ears; in fact, he was a male telephone girl in spats and hairy undervest. A child of 1924!

Bert Smallpot Sees a Few Things.

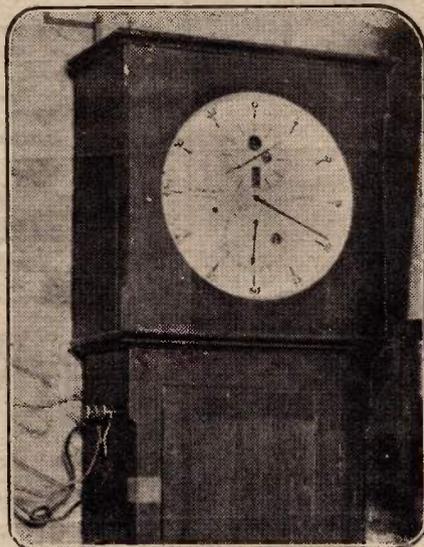
"Les go and buy a Clippit Crystal Cup, eh? Like Fleming uses," said Mr. Smallpot to the ether, which did not reply. "Can't think why 2 L O's so weak ternoight. Desh it, I'll have ter 'op it, it's 9.15. These Dora relics!"

Bert Smallpot stepped into the street. Aeolus was "at it" again. His trousers were flattened against his pipe-stem shanks as he faced the wind. Wheou-u-u!

Bang! The tile did not so much strike him as *bash* him. The ambulance came up in record time. Sleep, age-long sleep, fell upon the child of 1924, and Bert Smallpot did not say it nay.

1984. An old man, wearing spats, tottered down the steps of the British Museum. "Gaw!" he said, as a man on a motor-cycle whizzed through the air and alighted on a moving—an ever-moving—pavement. "Te'ble accident," he muttered. "Man fall'n off bicycle." The man lit a cigarette and made off on the moving pavement at 60 miles an hour. Old Bert kept

to the safe road, which was empty. "Gaw—airplanes," said Bert. The sky was full of noise and lady typists speeding home to Salisbury Plain, where London then lived. "Ere, gov'nor, where's the bus for Clapham?" asked Bert of a man in a peaked cap, dimly reminiscent of the 1924 policeman. "Up there," said the official. "Two seconds late because of the jam in the traffic over Dover." "Wha-a-a!" said Bert. "Better step in here," said the official, "and see the news. Next 'bus flies at 7.0 sharp. Fare, five-tenths." "Five-tenths of wot?" demanded old Bert, in his best official style. "Of a decimo, of course," replied the official. "I've only eightpence," said Bert, "and it's fourpence to Clapham." "Great blowouts! Wot's a'tepence? You need a course of wave-



The clock at the Greenwich Observatory which is used for broadcasting the time signal via 2 L O.

massage!" said the unfeeling child of 1984, waving aside a hurrying private plane for Warsaw.

Bert Smallpot Sees Some More.

"Wot?" asked the man in the one-piece brown felt suit. "'Eld hup by Harabs? Well, why don't yer fizzle hup their magnetos? Wot? Left yer wave-focusser at Haden? Well, if that ain't like yer. Av-right. Keep 'em orf till I kin get the Flying Bike Brigade at Cairo. Them young beggars e'd do with a job nam then." The speaker put something into his hip pocket and hurried towards Old Bert.

"Jeer that?" he asked. "My boy goes orf with 'is squad of Hair Scahts ter study hair-currents hin Harabia, and gits nobbled by them niggers. Now I've got to yell at Cairo and git 'em to flip a few machines across to git them kids clear. 'Arold is *allwis* in these bothers. 'Scuse me, mister, I want that call-booth wot yore 'oldin' hup." Bert did not so much move as flit aside. He did not approve of gentlemen who talked

to Arabia from Museum Street, London. He peered through the glass partition and watched the anxious father. "Cairo! Gaw! That's in Egypt. 'E carn't, 'e simply carn't!" He licked dry lips.

The man put a disc of oxidised metal (one decimo) into a slot and pulled a knob. Things happened. A little door flew open, revealing a telephone mouthpiece. A flap fell down on hinges, and in its place, behold, a window a foot square! Bert caught a glimpse through that window and squealed with fright. "Oo! Like looking into miles and miles of nothing with no bottom to it!"

Bert Smallpot Witnesses Tragedy.

Suddenly the window darkened and then became light again, but with a queer radiance like that of electric spark, dotted all over. The dots grew in size. Flying bicycles! Desert! Brown hills! A confused group of somethings on the ground in the middle distance. Puffs of smoke shot up from the hills. The dots formed into a solid phalanx, then moved as one, slowly—horribly slowly—towards the puffs of smoke. "There's the Harabs. I've seen the like before. Only it was Hafrica that time," said the father.

Occasionally the picture became distorted, and then the anxious father would twiddle a knob like focussing a camera.

The dots stood still over a brown hill. What was happening? A flash occurred amongst the dots and something blazing fell from them. "Golly," said the father, "them niggers have got a P-ray! Drat them Germans!"

The dots closed up. "Now watch!" whispered Bert's companion. First, the puffs of smoke stopped. Then a white river flowed down the hill. Men! In white, loose clothes! "Eh! They've tickled 'em up!" The father danced up and down.

"Well, I'm 'Enged!"

"Gaw! What is it?" gasped Bert.

"Burnt all their metal things up. Even their brace-buttons, if they 'ave 'em!" The dots swooped down. Stopped. The confused mass of somethings moved towards them.

"Done to a turn! They'll round 'em up and stick 'em on irrigation work at Metini. C'm on, matey, my boy'll be 'ere in time for tea. What's yours?"

"Was—was that picture real?" Bert stammered.

"Swee thing! And my boy's snoop'd a clear five thousand for himself out o' this. Look! There's another o' those darned Greek revolutions. Sick of 'em. Only show 'em in the summer, because most people are abroad then."

"Well, I'm 'enged," said Bert. "Oo did it all come about? Those crystal receivers—perhaps—I dunno—I'm tired—but, I'm 'enged! All 'ere on a cinema, while it happened. Wish I wasn't so old. Stuck in that glarss case all them years! Gaw!"

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Patent applied for.

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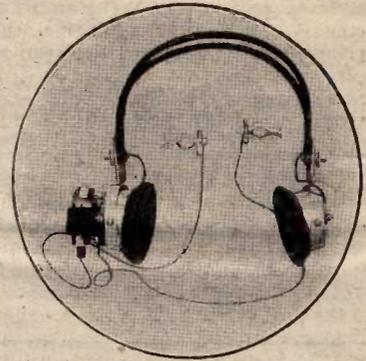
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(Improved Design.)

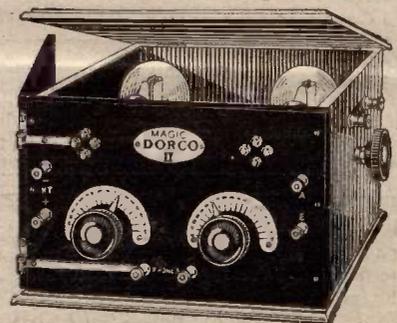
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BRITISH manufacture **THROUGHOUT**

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(Plus Taxes 15/-)

Carriage paid British Isles



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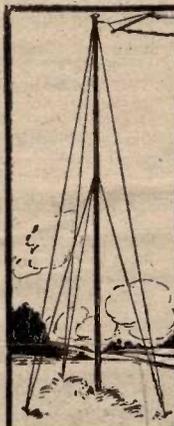
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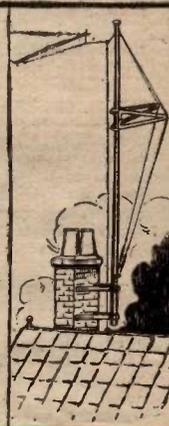


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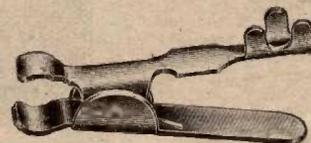
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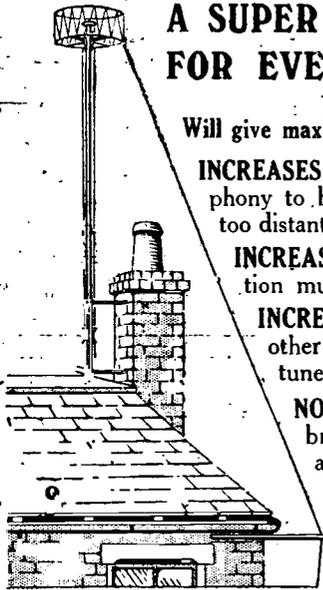
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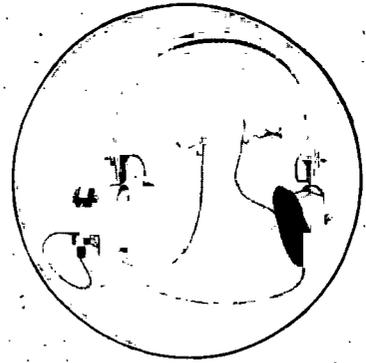
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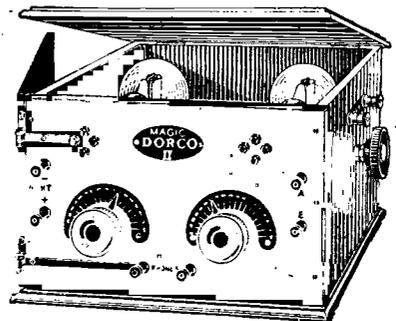
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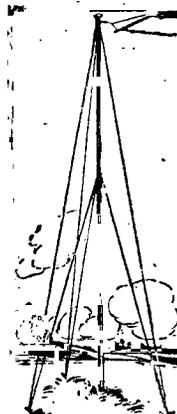
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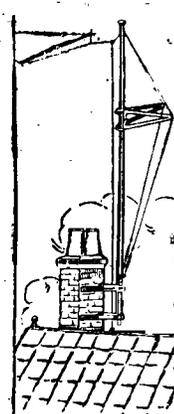


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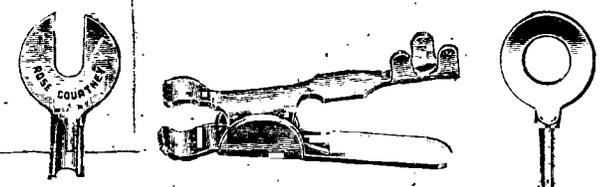
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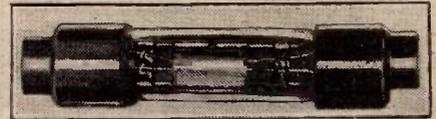
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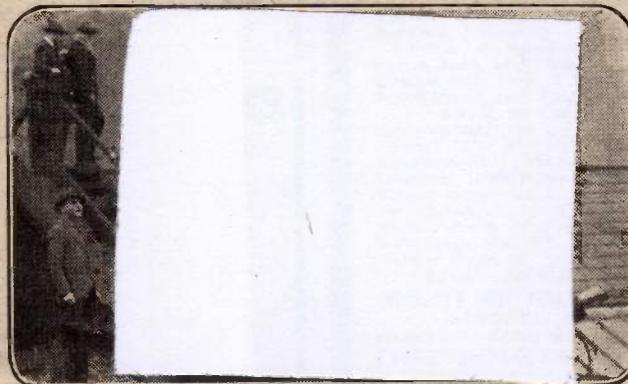
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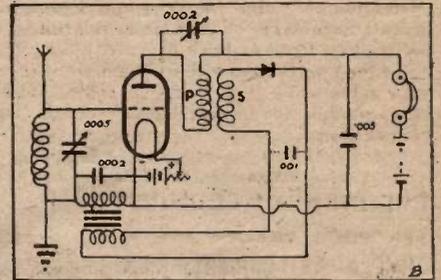
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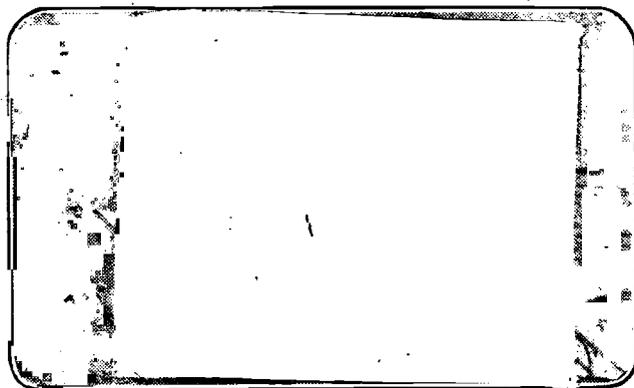
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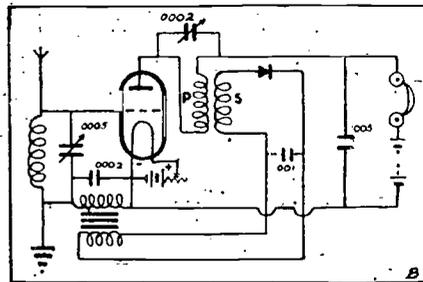
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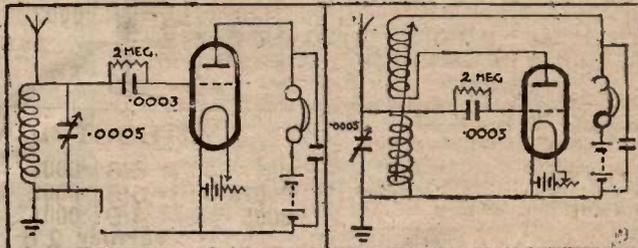
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RADIOTORIAL QUESTIONS & ANSWERS.

(Continued from page 982.)

falling off in capacity toward the end of the scale. The effect is obtained by means of specially shaped vanes which are used in place of the regulation semi-circular type.

"REACT" (Terling).—What is the usual single-valve circuit (a) without reaction; (b) with reaction? I wish to employ basket coil tuning. It is necessary to place a variable



condenser both across the A.T.I. and reaction coil?

These two circuits are similar in all respects except that the second one includes a reaction coil. Generally speaking, the reaction coil should be about 80 per cent. the size of the coil to which it is coupled, but for best results some experiment in this direction is necessary. The fixed condenser across phones and H.T. should have a capacity of approx. .002 mfd.

F. J. L. (Burton-on-Trent).—When reading some wireless papers sent to me by a friend abroad, I have frequently seen the expressions "DX receiver," and "DX signals," but I cannot find the terms used in English papers, or any other expression which is used in just the same way. What does DX mean, and what is the English equivalent of these terms?

The expression DX is used by American amateurs to denote "long distance," so the above terms simply mean "long-distance receiver" and "long-distance signals."

"EARTHING" (Royston, Cambs.).—In a large transmitting station does the earth

employed generally consist of a buried plate, in the same way as a small receiving station?

The principle employed is generally the same, but the "buried plate" takes the form of an elaborate system of buried plates spreading out over a wide area and connected by radial wires to a central earthing point. Very great importance is attached to the earthing system, and it is often the factor which decides the actual site of the station when a suitable district has been chosen.

S. E. D. (Thorpe Bay).—What are the materials used in the various portions of a valve?

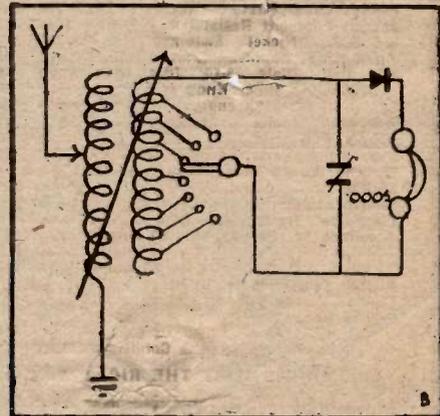
The plate and grid are generally made of nickel, though sometimes tungsten is used. The filament is made of tungsten. The base is constructed of brass, which is filled with a compound of bitumen.

F. C. (Radlett).—I wish to try the choke method of L.F. amplification, is it possible to use it in an amplifier connected to a crystal set?

Probably not with any great degree of success, owing to the fact that if the choke is placed across the grid and filament of the valve, and across the phone terminals, there will not be a sufficient variation of potential between the grid and filament to enable the valve to give sufficient amplification. This is why a transformer giving a step-up of voltage is always used.

B. J. T. (Chatham).—I wish to erect a simple crystal set, but as jamming in this district is very troublesome, I am hoping to include some device which will render this less troublesome. I am told a loose-coupled set is best, and I could construct slider coils or one of the "tapped" kind, but I am not sure of the connections. If the aerial is not actually connected to the crystal in any way, how does the latter rectify the received energy?

The accompanying diagram shows the connections of a loose-coupled crystal set. The primary is tuned by a slider, and the secondary is tuned by tappings and by the variable condenser connected as shown. The movement of the secondary coil inside or close



to the primary coil will also be found to slightly affect the tuning, but the adjustments are very simple, and the selectivity is often very great compared with a directly-coupled detector circuit.

The energy rectified is that transferred across the space from primary to secondary coils, and it will be found, therefore, that the distance between the coils is important, and slight modifications of this distance will often eliminate undesired signals, but will leave the broadcasting quite clear.

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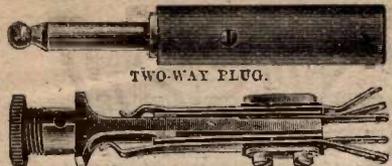
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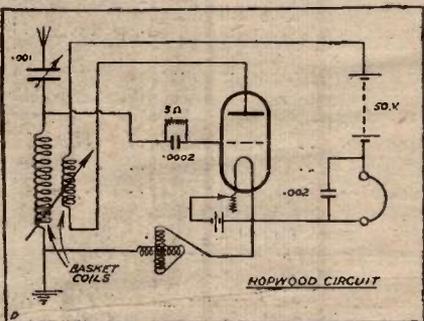
CORRESPONDENCE

THE HOPWOOD CIRCUIT.

The Editor, POPULAR WIRELESS.
Dear Sir,—In these days of endeavouring to get as much as possible out of one valve, we have been hearing a lot about the merits of the "May" circuit, but nobody seems to trouble about the "Hopwood" circuit given in "P.W." a little time ago. Out of curiosity I tried this circuit, and the results are astonishing. Besides, it is more economical than the "May" both in L.T. and H.T.

I am twenty-five miles from London, my aerial is about 90 ft. single wire, only 20 ft. high, and badly screened, yet 2 L.O. comes in too loud for the 'phones to be comfortable on the head, and will work a high-resistance loud speaker well. Announcements can be heard across the room when the 'phones are worn by another person. The only drawback is capacity effects—i.e., if the 'phones are removed from the head without first adjusting the variometer to allow for doing so, the thing will howl. But by careful manipulating, even this can be obviated. I give my circuit with valves, in the hope that it may be of some assistance.

The valve is a Mullard Ora, 4 v. L.T., grid leak to suit valve. The aerial coil should be large enough to tune down to 2 L.O. when at full capacity of condenser. Reaction coil slightly larger. The modulus



operandi is as follows: Variometer at zero. Tune in 2 L.O. by condenser and bring reaction up, but not to oscillation point. Now turn variometer, when signal strength will increase, and at same time reduce capacity on condenser. A little manipulation and surprising results are obtained, and, with care, no interference should be caused to neighbours. In conclusion, I may say that all the British broadcasting stations have been heard with a strength equal to two valves; and, in addition, the new Belgian station has been heard distinctly. The condenser may be in parallel to the coil, enabling finer tuning, but sacrificing a little signal strength. The variometer should be kept away from the coils as far as possible.

Wishing your valuable paper—of which I have been a reader since No. 1—every success. Yours faithfully,
W. F. BARTHOLOMEW,
68, Tamworth Road, Hertford.

GOING TO EXTREMES.

The Editor, POPULAR WIRELESS.
Dear Sir.—Our grateful thanks are due to those courageous listeners who have so faithfully castigated the B.B.C. on the matter of "highbrow" programmes. In my opinion, however, they have not gone far enough. Let us to the whole hog, and—

- (1) Sack the University-educated Uncles, and engage representative British working men, who are not so fussy about aitches and correct diction.
 - (2) Cut out the "refined" humorists, and give the old red-nosed variety a chance (after the babies have gone to bed, of course).
 - (3) Switch off the Chopin and Beethoven cranks, and have a few piano-organ and paper-and-omb recitals for the benefit of the masses.
 - (4) What about a permanent choir of Islington "harmonisers"?
 - (5) Who wants Covent Garden? Relay a few matches from the "Ring" occasionally, in the interests of British sport!
 - (6) Abolish the Pussfoot section of the Sunday programme, and give us a lively "cabaret" entertainment instead.
 - (7) Import a tribe of real cannibals from the South Seas, for war-dances, bone-rattling, blood-curdling yells, etc.
 - (8) Sack the Director of Programmes—broadcast him, in fact.—Anyone could manage his job. Yours most sincerely,
HENRY W. LEE,
147, Brayard's Road, Peckham, S.E. 15.
- NOTE.**—This letter is published because we believe in ventilating all shades of public opinion. We do not associate ourselves with a single sentiment expressed in the letter, but readers will probably agree that our correspondent is indulging in a little humour peculiar to himself.—EDITOR.

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SPECIAL LINE.
First-class English make, 6-v. 60-amp hours, 25/- ea.
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When you have realised that your poor tuning is due to that inefficient Slider and Plunger, see the
G-W. SLIDER
which makes a broad contact along ONE WIRE and rolls smoothly over them without scraping or wearing them.
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Some ENGLISH and Continental territories available.



THE WEEK'S BROADCASTING PROGRAMMES.

FORTHCOMING SIMULTANEOUS EVENTS.

Sunday, February 24th.—2 L O Light Orchestra. Time Signal and Bulletin.
 Monday, February 25th.—The B.B.C. Literary Critic.
 Tuesday, February 26th.—French Talk. Savoy Bands.
 Wednesday, February 27th.—B.B.C. Dramatic Critic.
 Thursday, February 28th.—B.B.C. Music Critic. Radio Society Talk. Savoy Bands.
 Friday, February 29th.—B.B.C. Film Critic.
 Saturday, March 1st.—Savoy Bands.

LONDON (2 L O).

Sunday, February 24th.—Rev. F. R. Barry, M.A., of King's College. Address. 2 L O Light Orchestra.
 Monday, February 25th.—B.B.C. Literary Critic. Operatic Evening.
 Tuesday, February 26th.—Mavis Shellshear, songs at the harp. The Ensemble Singers.
 Wednesday, February 27th.—B.B.C. Dramatic Critic. Orchestral Concert.
 Thursday, February 28th.—B.B.C. Music Critic, Philip Wilson on Music. The Spencer Dyke String Quartette.
 Friday, February 29th.—B.B.C. Film Critic, Orchestral Concert. Mr. Reginald Waterfield, F.R.A.S., on Mercury and Venus.
 Saturday, March 1st.—St. David's Day. The Savoy Bands.

MANCHESTER (2 Z Y).

Sunday, February 24th.—Rev. J. A. Reardon, Address. Classical Music.
 Monday, February 25th.—French Talk. Programme from London.
 Tuesday, February 26th.—George Dave Frank's Dance Band. Savoy Bands from London.
 Wednesday, February 27th.—2 Z Y Orchestra, and from London.
 Thursday, February 28th.—French Talk. 2 Z Y Dramatic Company and 2 Z Y Trio.
 Friday, February 29th.—Spanish Talk. Vocal Night.
 Saturday, March 1st.—Orchestral Night, mainly classical.

BOURNEMOUTH (6 B M).

Sunday, February 24th.—Bournemouth Wireless Orchestra.
 Monday, February 25th.—Programme mainly from London.
 Tuesday, February 26th.—Popular Orchestral Night, and from London.
 Wednesday, February 27th.—"Picture" Night and from London.
 Thursday, February 28th.—The Crystals Concert Party. Dance Band from King's Hall. Savoy Bands from London.
 Friday, February 29th.—Gounod Night, by the Orchestra.
 Saturday, March 1st.—Welsh Night. The Wireless Orchestra.

NEWCASTLE (5 N O).

Sunday, February 24th.—Rev. T. Miller Johnson, Address. Olive Timlinson's Trio.
 Monday, February 25th.—Programme mainly from London.
 Tuesday, February 26th.—Orchestral Night.
 Wednesday, February 27th.—Orchestral Night.
 Thursday, February 28th.—Programme mainly from London.
 Friday, February 29th.—Wireless Orchestra and from London.
 Saturday, March 1st.—Orchestral concert.

ABERDEEN (2 B D).

Sunday, February 24th.—The Right Rev. Lord Bishop of Winchester, M.A., D.D., from Bournemouth.
 Monday, February 25th.—Programme mainly from London.
 Tuesday, February 26th.—Modern English Composers' Night.
 Wednesday, February 27th.—French Talk. Dance Night.
 Thursday, February 28th.—Special Vocal Night.
 Friday, February 29th.—Popular Play Night.
 Saturday, March 1st.—Student's Night. Savoy Bands.

GLASGOW (5 S C).

Sunday, February 24th.—The Right Rev. Lord Bishop of Winchester, M.A., D.D., from Bournemouth. The Westbourne Church Choir.
 Monday, February 25th.—Programme mainly from London.
 Tuesday, February 26th.—The Parkhead Forge Silver Prize Band.
 Wednesday, February 27th.—Classical Programme.
 Thursday, February 28th.—Orchestral Concert.
 Friday, February 29th.—Orchestral Night.
 Saturday, March 1st.—Popular Orchestral Night.

BIRMINGHAM (5 I T).

Sunday, February 24th.—The Rev. Tissington Tatlow. Address. Station Orchestra.

(Continued on page 988.)

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CRAWFORD'S JACKS

PUT ONE IN EVERY ROOM

A Permanent wire from the Set, attached to a Crawford's jack each side of the fireplace, makes listening-in a comfort.

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Improve Reception and convert that harmful glare to a pleasant subdued glow.

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Capstans, drills, forge, tapping machine, disc grinder, time recorder, milling machines, centre lathes.—Seen 13, Whitcomb St., London, W.C.2., or list posted.

Fix your crystal in GOLD SEAL PLASTIC METAL.

It is positively the best contact possible, and results in **LOUDER AND CLEARER SIGNALS.** Guaranteed to contain no mercury. Price 6d. per packet, sufficient for 3 to 4 crystal cups. Of all Wireless Stores.

Wholesale Enquiries (or sample pkt. 6d.) to **SAMUEL LEVY 53, Ben Jonson Road, Stepney, London, E.1.**

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Make the insulation of your panel perfect by painting all connections with this perfect insulator. 2d. stick sufficient to cover 3 or 4 valve panels. Of all Wireless Dealers, Ironmongers, &c. Manufacturer:

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The crystal you have been looking for. Has a greater range than any other known crystal, and is sensitive all over. Don't tolerate cheap, inferior crystals. Insist on the best. Telenium is the best. 2/-, post free from

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41, CONSTABLE ROAD, HAMPSHIRE, LONDON.

PROGRAMMES.

(Continued from page 987.)

Monday, February 25th.—Programme mainly from London.
Tuesday, February 26th.—Miscellaneous Programme mainly orchestral.
Wednesday, February 27th.—Classical Programme The Joseph Lewis Octette.
Thursday, February 28th.—Popular Classics Programme.
Friday, February 29th.—Chamber Music Programme.
Saturday, March 1st.—St. David's Night.

CARDIFF (5 W A).

Sunday, February 24th.—Rev. J. Henry Thomas, Address. "Scouts' Own" Symphony Concert.
Monday, February 25th.—Programme mainly from London.
Tuesday, February 26th.—Shakespeare Night, and from London.
Wednesday, February 27th.—Popular, Orchestral Night.
Thursday, February 28th.—Programme mainly from London.
Friday, February 29th.—Choral Night. The "Eclipse" Prize Singers.
Saturday, March 1st.—St. David's Day.

TECHNICAL ODDS & ENDS

(Continued from page 972.)

"Dud" Insulators.

There seems to have been an impression amongst a certain section of manufacturers (happily not the responsible firms) that anything that looked like an insulator was good enough for wireless. As a matter of fact, only the highest quality of insulating materials are really good enough for wireless, and certain cheap composition dials, sockets, grid condensers, and so on, that have sprung up and are selling for a fraction of the price of the genuine articles after which they are modelled, should be scrupulously avoided if you would avoid disappointment with your set. In many cases these are nothing but various kinds of clay mixed with inferior shellac or varnish and, if not actually good conductors, are anything but good insulators. In America they have a special name for components of this kind—they call them "mud" parts!

Armstrong "Muffler."

I hear that E. H. Armstrong is engaged on some experiments designed to remedy the interference troubles said to be caused by his famous super-regenerative circuit. It is believed that most of the difficulty is due to poor manipulation, but Armstrong suggests the use of an additional H.F. valve as a "muffler."

Choking Device.

Just as in an internal-combustion engine silencing is obtained by means of a muffler, so in the operation of the super-regenerative circuit a radio-muffler can be incorporated. It is interesting to note, in considering this analogy, however, that whereas in the engine the muffler or silencer is placed after the engine (so to speak) in the radio-circuit the H.F. valve muffler comes before the regeneration.

High-Frequency Losses in Cabinet.

It is surprising in what queer ways radio-frequency losses may be incurred in the set. On being advised not to place your tuning coils, such as inductances, variable capacitors, or vario-couplers, too near to the wood of a cabinet, you would probably think the precaution was a little overdrawn.

Capacity Leakage.

But in a case recently examined, where the set worked badly when the lid was closed, and well when the lid was open, it was noticed that the tuning coil came into very close proximity with the varnished lid of the cabinet when the lid was down. On re-arranging the position of the coil, the set worked well with the lid closed. The trouble was due to radio-frequency losses produced by the varnished wood being too close to the coil.

Atmospheres Cut Out.

The interruptions or fluctuations corresponding to code-signals, or speech-currents, are then superposed by a second modulation upon the first or 5,000-metre modulation. The advantage claimed for this system is that the receiving set can be tuned, in effect, for two separate frequencies, that of the primary wave (300 metres), and that of the continuously-modulated wave (5,000 metres). This removes most of the effect of atmospheric interference, as only those interfering impulses which correspond with both of these critical frequencies will pass the doubly-tuned filter-circuit of the receiving set.

Sensitivity and Selectivity.

A receiving set which is exceedingly sensitive should be correspondingly selective at the same time. One reason for this is because, owing to its sensitivity and long-distance range, it will be capable of receiving a greater number of stations, the necessity for greater selectivity in this case being obvious.

Heterodyning.

Another reason, however, is that no transmitting station emits an absolutely pure note, that is, a wave of a single frequency. When a receiver is extremely sensitive, some of the harmonics of near stations may be received by it, unless the receiving set is sufficiently selective to tune them out.

THE CHEAPEST HOUSE FOR EBONITE.
Best Quality; Matt Finish; Any Size Cut. 1/4" thick. 2 sq. inches 1d.; 3-16" thick, 3 sq. inches 1d. All thicknesses supplied. Post paid on 10/-.
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Do you realise that an outside aerial is as unnecessary for good reception as it is unsightly?

THE "ARGENTONE" AERIAL is a neat, single-strand, super-sensitive, high-conductivity copper cored aerial, specially adapted for indoor use, and gives wonderful results.

"ARGENTONE" can be obtained from any Wireless Depot at a cost of 4/- (100 feet) or post free direct from.—

T. W. YOUNG, LTD., 84-86 CITY ROAD, LONDON, E.C.1

How to determine suitable Values for Rheostats.

TABLE 3.
Values of Resistance and current carrying capacity of Rheostats in Filament Circuits.

Type of Valve.	Ohmic Resistance and Continuous current carrying capacity of rheostats required when rheostat controls given number of valves. NOTE—In almost all cases, each rheostat controls one valve only.				
	1 valve.	2 valves.	3 valves.	4 valves.	5 valves.
Ordinary Bright Emitters (No. of Cells = 3)	2.0 ohms. 2 amp.	1.5 ohms. 1.4 amps.	1 ohm. 2.1 amps.	.8 ohm. 2.9 amps.	.6 ohm. 3.5 amps.
Type H, Dull Emitter (No. of Cells = 1)	3 ohm. 1 amp.	3 ohm. .8 amp.	2 ohm. 1.2 amps.	1.1 ohm. 1.6 amps.	1 ohm. 2.0 amps.
"Pos. Nut," Dull Emitter (No. of Cells = 1)	4.8 ohms. 25 amp.	2.4 ohms. 5 amp.	1.6 ohms. 15 amp.	1.2 ohms. 10 amps.	1.0 ohms. 12.5 amps.
50 Ampere, Full Emitters (No. of Cells = 2)	*22 ohms. .06 amps.	*14 ohms. .12 amps.	*9 ohms. .18 amps.	*7 ohms. .24 amps.	*5.5 ohms. .3 amps.

* NOTE:—It is advisable that the resistance for the 50 ampere valve be in two sections; half being permanent and the other half variable. For example—in a one valve set it should be wired permanently in series with the rheostat and valve, the variable rheostat having a resistance of 15 ohms.

It is essential that suitable filament rheostats be used in conjunction with the above valves and batteries, in order that the best results may be obtained. It should be specially noted that most of the rheostats now offered for sale were designed for use with bright emitter valves, and are unsuitable for use with the new dull emitter valves.

It is important to have the resistance of a valve sufficient to reduce the voltage to the minimum voltage required, as otherwise the filament will be over-heated and this will, in some types of dull emitter valves, reduce their efficiency to that of the bright emitters. On the other hand, if the resistance be of too high a value, the greater part of it is useless, and the regulation on the useful part is comparatively coarse.

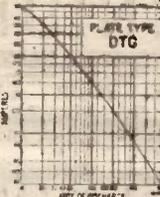
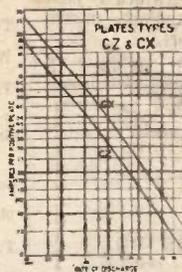
To obtain the correct value of resistance required, the following formula may be used:

Value of resistance required =

$$\frac{\text{(Number of cells in series} \times \text{E) (Lowest voltage required to operate valve)}}{\text{(Current required per valve)} \times \text{(Number of valves controlled by rheostat)}}$$

The values given in Table 3 have been obtained by the use of this formula.

Characteristics of Exide Batteries.



The above curves give the actual capacity obtainable at various rates of discharge.

Note that the values on the vertical scale are given per positive plate. (The figure following the alphabetical symbol by which the various cells are catalogued denotes the number of positive plates).

Example: A CX 5 cell discharged at 5 Amperes (i.e. 1 ampere per positive plate) would give that current continuously for approximately 14 hours.

The above illustration gives an idea of the amount of valuable information contained in the new 12-page EXIDE Booklet

The book has been entirely rewritten, and contains much technical information of value to every wireless user.

A Post Card will bring a copy by return.

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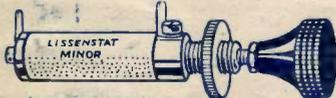
The long life battery.

AND CHLORIDE BATTERIES FOR HOUSE LIGHTING.

Things you should know about Filament Control—

Your dull emitter valves must have fine control—and this fine control must LAST. When you buy your rheostat, do not merely ask whether it gives fine control do not rely upon the evidence of initial demonstration, but ASK HOW LONG THE FINE CONTROL WILL LAST FOR. If you are offered a powder rheostat—ASK, WILL THE POWDER "PACK" together in use? ASK WHETHER ANY POWDER RHEOSTAT YET MADE HAS EVER FAILED TO "PACK" AFTER USE. "PACKING" means the tendency to close together which is an inherent trouble in all powder rheostats which rely upon the application of pressure for the variation of resistance. "PACKING" is a likely source of great trouble in a powder rheostat. With a cheap rheostat your dull emitter valves are always in danger. You can get the valve to glow, BUT THIS IN ITSELF IS NO TEST OF FINE CONTROL. ASK HOW MANY TURNS the knob will make from the point where the filament begins to glow until the position of minimum resistance of the rheostat is reached. Oftentimes, with a cheap rheostat, the whole range of resistance variation is accomplished with HALF A TURN OF THE KNOB. This means that a shade of a turn represents many ohms variation. A little turn too much, and the result is a burnt-out valve. Every time this sort of control is moved your expensive dull emitter valve is in danger. HOW DIFFERENT IS LISSENSTAT CONTROL—every part of a turn represents a fractional change of resistance. Several turns are necessary to vary the resistance over the whole of its range. Positive variation throughout. If you buy dull emitter valves, it is worth while using LISSENSTAT control. AND LISSENSTAT CONTROL A LONG TIME HENCE WILL BE THE SAME FINE, PERFECT CONTROL IT EVER WAS. Why risk a substitute when you can now get your choice of three types of LISSENSTAT CONTROL?

The latest type of Lissenstat Control—
The LISSENSTAT MINOR (prov. pat.)—



This is intended to provide something of the beautiful LISSENSTAT control at a popular price. Infinitely superior to wire or powder rheostats. Well made throughout. Indestructible. The LISSENSTAT MINOR is the next best thing to LISSENSTAT control itself. It is a perfect little device. For efficiency, use a Lissenstat Minor for each valve. **3/6**

The LISSENSTAT (prov. pat.)—



There is a perfectly free movement of the whole resistor column—fine variation of resistance because of the elastically deformable spring discs which form part of its unique construction—it is an ideal control for dull emitter valves. All those who desire exact control of critical electronic emission should use the LISSENSTAT. It adds range to a receiver in a way you never thought filament control could. Brings detection to the finest point. Use a separate Lissenstat for each H.F. and the detector valve. **7/6**

The Protection of the LISSENSTAT UNIVERSAL—



This is specially designed to provide a safeguard against burning out expensive dull emitter valves. A minimum resistance can be left in circuit to protect the valve, and yet the resistance can be reduced to zero when full battery pressure is needed. It gives all the beautiful LISSENSTAT control with the additional protection named. Full resistance is 50 ohms. Use one for each H.F. and Detector for efficiency. **10/6**

To those who make the mistake of thinking that LISSENSTAT (prov. pat.) control is the same thing as an ordinary rheostat—LET THEM TRY THE DIFFERENCE. After you have tried all the other controls on your receiver in vain to bring in a distant station you know is there, just a tiny turn of the LISSENSTAT knob will bring it in clearly and through a dead background of silence.

Maximum Transfer of Energy with LISSENAGON COILS—

It is the function of your aerial to pick up energy—it is the function of your inductance to build up the voltage which will operate the grid of the first valve.

Do the coils you use make a maximum transfer of this energy or is there any minute loss which weakens the strength of your detection? The magnetic linkage between LISSENAGON coils is such that a transfer of energy will be affected even though the coils are comparatively a great distance apart. The farther apart coils can be kept the sharper and more selective tuning becomes. IT IS PARTLY DUE TO THE STRONG MAGNETIC FIELD BETWEEN LISSENAGON COILS, AND PARTLY DUE TO THE NEGLIGIBLE LOSSES IN THE COILS THEMSELVES that LISSENAGON coils will oscillate easily even though at a considerable distance apart, as there are practically no damping losses to be overcome, even on the extreme low wavelengths.



LISSENAGON TUNING CHART Note the New Coils: 30, 40 & 60

TABLE 1. Wavelength range when used as Primary Coils with Standard P.M.G. Aerial and '001 mfd. condenser in parallel.			TABLE 2. Wavelength range when used as Secondary Coils with '001 mfd. condenser in parallel.		
No. of Coil.	Minimum Wavelength.	Maximum Wavelength.	Minimum Wavelength.	Maximum Wavelength.	PRICE.
25	185	350	100	325	4/10
30	235	440	130	425	4/10
35	285	530	160	490	4/10
40	360	675	200	635	4/10
50	480	850	250	800	5/-
60	500	950	295	900	5/4
75	600	1,300	360	1,100	5/4
100	820	1,700	500	1,550	6/9
150	965	2,300	700	2,150	7/7
200	1,855	3,200	925	3,000	8/5
250	2,300	3,800	1,100	3,600	8/6
300	2,500	4,600	1,400	4,300	10/2

Regeneration is No Alternative to Radio Frequency Amplification—

It is a mistake to assume that because aerial reaction is used there is no need for radio frequency amplification in the same receiver. One stage of LISSEN REACTANCE (prov. pat.) should be used in every receiver. It makes reproduction purer, brings in distant stations with far greater ease and certainty, and makes a receiver far more sensitive. LISSEN REACTANCE makes rapid tuning possible and H.F. amplification exceedingly efficient and easy. It is simple to connect—see blue print with each. It has a switch already mounted and complete. No complications.

150 to 10,000 metres **19/6** 150 to 600 metres **17/6**

Radio Frequency Plus Regeneration—

That is why LISSEN REGENERATIVE-REACTANCE (prov. pat.) has been so successfully used in the reception of American telephony. It replaces aerial reaction and makes a receiver exceptionally sensitive. It is NON-RADIATING, replaces plug-in coils, is lower in cost than a set of coils to cover the same wide range—it is easier to handle, one knob controls tuning and reaction. Introduced into the anode circuit it forms an unequalled first stage of radio frequency. Reception is often possible with both aerial and earth connections dispensed with. Blue print with each shows the easy connections. Unbroken regeneration possible over the whole range, complete with internally connected switch. No soldering. LISSEN ONE-HOLE FIXING, OF COURSE. 150 to 4,000 metres **£2/12/6**
Tune always with a vernier (preferably use the LISSEN Vernier, specially designed for fine tuning in H.F. circuits), price **12/6**



Sensitivity aided by the LISSEN VARIABLE GRID LEAK—

There is a unique resistant element used in the LISSEN Variable Grid Leak which cannot be duplicated because it is covered by definite patent claims. Valves vary in characteristics, and it is an excellent thing to be able to alter the leak value. With the LISSEN Variable Grid Leak the exact value of leak resistance can be selected to suit every working phase of the valve and circuit, thereby obtaining correct grid potential UNDER ALL CONDITIONS. LISSEN ONE-HOLE FIXING, OF COURSE—POSITIVE STOPS BOTH WAYS **2/6**



Build up Beautiful Tone Quality—

Put the LISSEN Tr Transformer immediately after the detector valve—a wonderful power amplifier, too—this incomparable transformer can also be used throughout. IT HAS A COIL WHICH WOULD AMPLIFY BY ITSELF WITHOUT ANY IRON CORE AT ALL **30/-**

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