

Popular Wireless

and Wireless Review

PRICE 3d.

No. 126, Vol. VI.

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

EVERY FRIDAY.

October 25th, 1924.



Mr. Harry Tate (behind the receiver) entertaining veterans of variety at his Sutton Home.

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"How to Build a One-Valve Reflex Set."

"Another 'All Wave,' Crystal Set."

ETC., ETC., ETC.

FEATURES IN THIS ISSUE.

MAINLY ABOUT BROADCASTING.
CONSTRUCTIONAL NOTES.
SHORT-WAVE RECEPTION.

HUMOUR AT THE RADIO EXHIBITION.
ON THE HIGHER FREQUENCIES.
ARTISTES OF THE ETHER.

PILOT

Before you build—or buy— a Set, learn about the new Pilot System.

WHEN a man decides to build a good Receiving Set he immediately comes up against the difficulty of a suitable cabinet and the drilling and the engraving of the Panel. Cabinet-making is a skilled man's job and many a perfectly good piece of ebonite has been spoilt by a hole in the wrong position or because it has been incorrectly cut to size.

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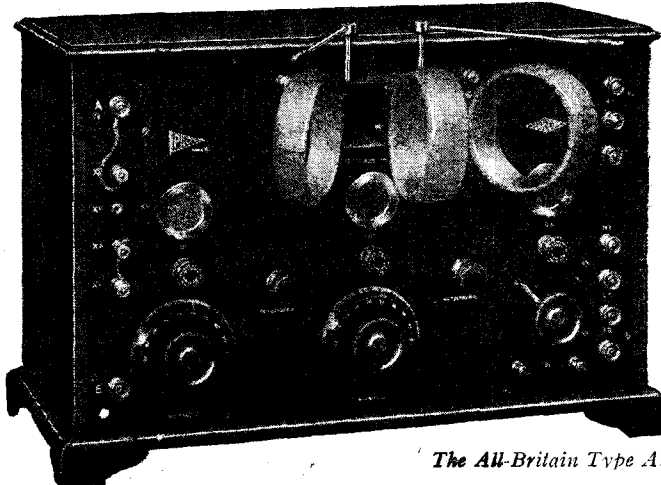
Remember that if our instructions are followed we positively guarantee that all Type B Receivers are the equal in every respect to the more Expensive Type A Sets. Our Service Dept. is available for all our customers and will test and rectify errors of construction at a nominal charge. We want all our customers to have the utmost confidence in every Set produced under the PILOT Panel Service.

Every Wireless Receiver depends for its efficiency upon the panel. Low grade ebonite will prevent any Set from functioning properly. Every PILOT panel is manufactured from the highest grade Post Office ebonite cast accurately to size, matt finished on both sides, and with edges squarely ground. We guarantee every panel to be leak-proof and non-warping. Each panel engraved with the word "PILOT" and supplied carefully packed in sealed wrapper. Standard 1 in. thickness throughout.

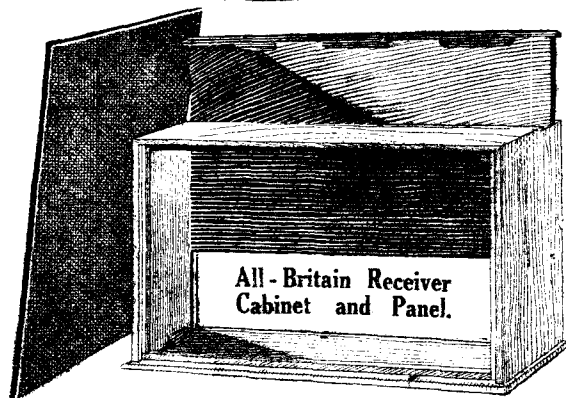
The only trouble-proof method for the Home Constructor—

USE the Pilot System and enjoy the following *exclusive* advantages:—

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The Transatlantic V (a super 5-valve long distance Receiver).
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The "Popular Wireless" Constructional Reflex.
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Registered No. 447149



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"THE BEST YET TRIED"

Messrs. Tungstalite, Ltd.,
47, Farringdon Road,
London, E.C.1.

COPY.

Station House, Edlingham,
Nr. Alnwick, Northumberland.
October 8th, 1924.

Gentlemen, Tungstalite Blue Label Crystal No. 447149.

Purchasing a piece of above about two months ago I have found it entirely satisfactory and very much superior in every respect to others, but particularly as regards clarity and signal strength.

I have yet to find a spot on the crystal which is not sensitive. The mere fact of bringing cat's-whisker into light contact always ensures signals of good strength.

On a set comprised of tapped inductance and detector only (two 10 tappings) 5 N O (30 miles distant) comes in loud enough to be thoroughly enjoyed on *two* pair phones.

Aberdeen (100 miles) is also received at slightly less strength, but loud enough to be followed. This reception appears the more remarkable as my house is situated somewhat in a hollow, considerably below the level of the main roadway, and closely screened by moorland heights. This reception is not due to radiation, nor is it a freak.

It is simply a question of fitting this TUNGSTALITE BLUE LABEL CRYSTAL No. 447149, which, for loudness and purity excels any I have tried, or, as yet, heard of.

Yours faithfully,

(Signed) H. AUDIN, Station Master.

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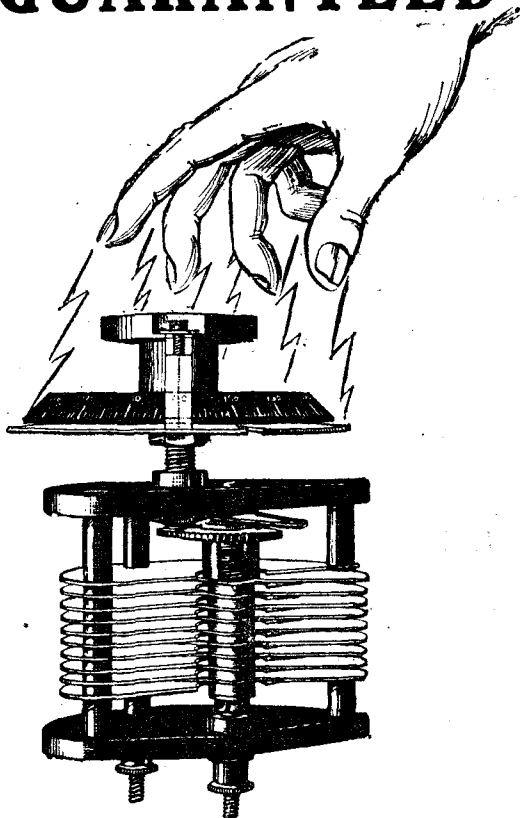
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"DISTORTION IMPOSSIBLE"

—says a user.

His letter reads:—

"The Loud-speaker received is the nearest to perfection I have ever heard. On Tuesday I did my best to make it distort the speaker's voice and also the music, but found this impossible. I have used various other makes, but can assure you that yours is the nearest to perfection yet placed before the public."



WEMBLEY LOUD-SPEAKER

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22/6

Write for Lists of other Stella Loud-speakers at **35/-** and **70/-**.



STELLA 'PHONES.

These noted light-weights are tested and guaranteed to give perfect and distortionless reception, with maximum comfort. Thousands sold to satisfied customers. Equal to any and cheaper than most other really good 'phones. Carriage paid, or from local dealers.

Per pair **17/6**



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FERRANTI

HOLLINWOOD, LANCASHIRE.

Reprinted by courtesy from the DAILY DISPATCH, of Friday, September 19, 1924.

A FAMILY TWO-VALVE SET

To work Loud Speaker from Local Station—Constructional Details.

By RHEOSTAT.

SO great has been the response to my last week's offer to give full constructional details of the two-valve loud speaker set I then described, that I am making this the subject of this week's article.

Here is the method of procedure.

For the panel get a piece of ebonite, 12in. by 6in., and a quarter-inch thick; do not use thinner, or the weight of the

loud-speaker, at $4\frac{1}{2}$ and $7\frac{1}{2}$ inches from the left side, along the bottom line, complete the drilling.

The transformer will need holes which can be drilled when other components are placed.

Assemble all the terminals—you will need 13—and screw up tight until the nut binds. The valve holders can next be fixed in position.

valve, that is, the unevenly spaced one, goes to the third terminal down the right side. The fourth or bottom terminal on the right goes to the terminal in the centre of the bottom of the panel, this being the switch.

The plate terminal of the left-hand valve goes to the right socket of the switch, to the right-hand 'phone terminal, and to one side of a .001 fixed condenser.

The third terminal down the left side, H.T. positive, goes to I.P. on the transformer, O.P. on the transformer going to the left-hand socket of the switch. Across the I.P. and O.P. of the transformer, the other .001 fixed condenser is bridged. The grid terminal of the left-hand valve is connected to the transformer terminal marked O.S.

Another wire is taken from I.P. on the transformer to the left-hand telephone terminal and the other side of the .001 fixed condenser, and the wiring is complete.

Looking now at the front of the panel, the terminals will be: Top left, aerial; top right, earth; right side, L.T. positive, L.T. negative, H.T. positive, and H.T. negative. The two top left-hand terminals are for the aerial coil and the lower ones for the reaction coil.

I should recommend an R or Orà for the first valve, and one of the new Mullard L.B. for the second, a 45-volt accumulator, and Siemens S80 H.T., which is 90 volts, a 35 Atlas coil for the aerial tuning, and a 50 for the reaction.

WEEK-END TESTS

The sockets are the ordinary valve filaments, and for the switch a valve pin is attached to a short piece of flex joined to the switch terminal. If the pin is placed in the left socket one valve is in use, and if in the right socket and the second filament is turned on, both valves are operating, the first as a detector and the second as a high-frequency amplifier. Helpful notes on working this set will follow.

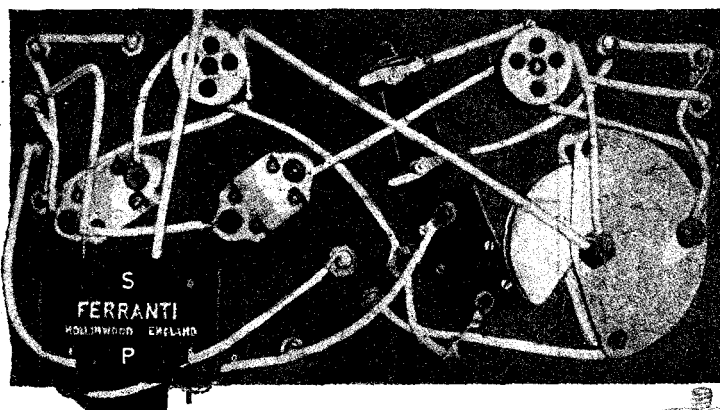
During the week-end I made further tests with this set, and found that its performance fully bears out all the claims made.

After the vocal part of 2ZY's programme had finished on Saturday evening we were switched on to some very indifferent dance music so decided to search around.

I put in the long wave coils, 150 and 200 Atlas and slowly turned the condenser, when 5XX came in with a bang without the least sign of Manchester, although only just under four miles away. There was quite enough volume for three loud-speakers, an Amplion, a Brown, and a G.R.C.

It is very evident from these tests that anyone, anywhere south of Manchester, will have at least two stations at loud-speaker strength; often more.

I had at least two dozen amateurs in on Sunday, and just before five, when waiting for the kiddies' corner, Liverpool came romping in on the loud-speakers.



components will buckle it. Take off the outer skin by rubbing with emery cloth stretched over a flat piece of wood, or a joiner's rubbing cork.

With a needle scrape a line all round, three-quarters of an inch from the edge. All the terminals must be drilled on this line; put a distinguishing mark on the top, and mark off the spaces. On the top line, two inches from the left side, drill the hole for the earth terminal, and at $3\frac{1}{2}$ inches drill four holes for the valve. The second valve will be at 8 inches, and the aerial terminal at 10 inches from the left side. [All the measurements and spacings are on the back of panel, and, of course, will be reversed in the finished set].

Down the left side of panel drill holes for batteries, three-quarters of an inch from the top, and apart.

The terminals are: Top, L.T. positive; second, L.T. negative; third, H.T. positive; bottom, H.T. negative.

On the right-hand side, with the same spacing, drill four terminal holes, the two upper ones for the aerial coil, and the lower ones for the reaction coil.

Rule a line across the panel from side to side, dividing it into two even parts, and at 2 and $4\frac{1}{2}$ inches from the left drill the holes for the two rheostats. At a point 3 inches from the right side, and 2 inches from the bottom edge, drill the hole for the variable condenser.

Divide the panel again, this time from top to bottom, and $1\frac{1}{2}$ inches from the lower edge drill a hole for the switch terminal. One inch above, and an inch on each side, drill two more for switch points.

Two more holes for the 'phones or

THE WIRING.

The condenser is an Atlas .0005 variable, the combined grid condenser and leak being of the same make, the values being .0003 and 2mg.

The transformer is a Ferranti, the .001 fixed condenser across the 'phones, with the same value across the primary of the transformer. The rheostats are the new porcelain Atlas.

The photograph will show the exact position of each component, and with the measurements given even the novice should not find any difficulty in connecting up.

Take a wire from the aerial terminal to the top terminal on right, and to fixed plates of .0005 variable condenser, then to one side of grid condenser and leak. The grid condenser is fixed flat on panel by Chadderton's compound. The other side of it goes to grid terminal of right-hand valve—the grid terminal is the top socket of the three evenly spaced ones, the socket that stands away from the other three being the plate.

The earth terminal goes first to the top terminal on the left side, to the fourth on the left, to the right side socket of the left-hand valve, to moving plates of .0005 variable condenser, to right socket of right-hand valve, and on to the second terminal down the right-hand side.

The second terminal down the left side, the L.T. negative, is connected to I.S. on the transformer, also to one terminal on each of the two rheostats, the other terminals on each rheostat being connected to the left sockets on each valve, one to each.

The plate terminal of the right-hand

If you remember



Jones's extraordinarily caustic remarks concerning Loud Speakers, you will be surprised at the calm serenity which reigns throughout his household since the advent of the "Sparta." Judging by his obvious eagerness to display it, he is thoroughly proud of this excellent Speaker. In fact, his persistent desire to make you "listen just a minute" is only equalled by that of the fond parent possessed of a precocious but misguided child nearly able to recite "The Loss of the Royal George." Yet even his severest critics are unanimously agreed that his claims for sweet,

undistorted melody and sustained volume are decidedly upheld by the "Sparta"; whilst the younger generation are thoroughly appreciative of the Savoy Dance music and vote the clarity and purity of reproduction to be first-rate.

If you think Loud Speakers must necessarily distort, hear the "Sparta" demonstrated—you will quickly realise why Jones is so enthusiastic. All good dealers stock the "Sparta."



Sparta LOUD SPEAKER

Fuller's United Electric Works, Ltd.,
Woodland Works, Chadwell Heath, Essex.

Telephone: Ilford 1200 (6 lines). Telegrams: "Fuller, Chadwell Heath."
LONDON DEPOT: 58, High Street, W.C.2.
Telephone: Gerrard 5070.

Type A 120 ohms
Type HA 2,000 ohms
Type HHA 4,000 ohms
£4 15 0

Type B. The first Loud Speaker to provide for additional control through a 6-position tone selector.

Type "B." 120 ohms.
£5 15 0

Type "HB." 2,000 ohms.
£6 0 0

Type "HHB." 4,000 ohms.
£6 0 0

Send to-day for List describing "Fuller" Components.



The Law decides for Ericsson (British) 'Phones

In the High Court of Justice
the sixth day August 1924 between
THE BRITISH L. M. ERICSSON MANUFACTURING CO., LTD.
(Plaintiffs) and OTHERS (Defendants).

Important Notice

HAVING received many complaints from disappointed customers who have been misled by the false description given to 'phones sold by some dealers and described as "Ericssons," we have been compelled to take action in the High Court of Justice.

The following is an extract from the Court Order:—

"This Court Doth Order and Adjudge that the Defendants their servants and agents be perpetually restrained from using the name Ericsson as descriptive of or in connection with the sale of Head 'Phones for Wireless Telephony (other than Head 'Phones manufactured by the Plaintiffs) without clearly distinguishing the Head 'Phones so sold from the Head 'Phones manufactured by the Plaintiffs and from selling or offering or advertising for sale any Head 'Phones not manufactured by the Plaintiffs in such manner as to represent or lead to the belief that the Head 'Phones so sold or offered or advertised for sale are of the Plaintiffs' manufacture.

"And it is Ordered that the Defendants do pay to the Plaintiffs their costs of this action" etc

ALWAYS ask for Ericsson BRITISH Telephones. They have "Ericsson" stamped on each earpiece.

Prices: 120 ohms - 24/6
2,000 " - 25/6
4,000 " - 26/6

Write to-day for lists or apply nearest agent regarding Ericsson products.

Selling Agents:—
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NOTTINGHAM: W. J. Furse & Co., Traffic Street.
COLCHESTER: 121, High Street.
SCOTLAND: Malcolm Breingan, 57, Robertson St., Glasgow.
BIRMINGHAM: 14-15, Snow Hill.
N.E. ENGLAND: Milburn Ho., Newcastle-on-Tyne.
LEEDS: North British Engineering Equipment Co., Excelsior Buildings, Leeds Lane.
IRISH FREE STATE: Stocks carried by A. W. Doyle, Kelly & Co., 174, Great Brunswick St., Dublin.
BELFAST: R. Robertson, Ltd. 46, May Street.

THE BRITISH L. M. ERICSSON
MFG. CO., LTD.

67/73, Kingsway, London,
W.C.2



Ericsson
(British)
Telephones
Buy British Goods Only



POPULAR WIRELESS

AND WIRELESS REVIEW.

October 25th, 1924] THE RADIO WEEKLY WITH THE LARGEST CIRCULATION. [Every Friday, Price 3d

Technical Editor
G. V. DOWDING, Grad.I.E.E.Editor:
NORMAN EDWARDS, M.Inst.R.E., F.R.Q.S.Scientific Adviser
Sir OLIVER LODGE, F.R.S.

RADIO NOTES AND NEWS OF THE WEEK.

Worth Visiting.

FEW Londoners are aware of the wonderful wireless exhibits on view at the Science Museum, close to the Albert Hall, Kensington. Amongst the fascinating apparatus assembled are examples of pioneer wireless instruments as used by Hertz, Dr. Fleming, Mr. Marconi, and Sir Oliver Lodge.

* * *

Australian Progress.

COMPREHENSIVE wireless plans are being made in Australia, including a scheme for at least one big 5 kilowatt broadcasting station in each state. Victoria and New South Wales may possess two of these stations, and the wave-lengths reserved for broadcasting range from 250 to 2,500 metres. Experimental licences will cost £1, but ordinary listeners will have to pay thirty-five shillings for their licences.

* * *

New Zealand's Record.

NEW ZEALAND has some splendid radio records to its credit, and it is interesting to find that some of these have been set up when using standard British receivers. Recently one amateur tuned in San Francisco at a distance of 7,000 miles, using an RI set—the Number 5 V A model.

* * *

The Initials Craze.

THE habit of using initials in wireless seems to be on the increase, and after a time it becomes quite natural to use the call-sign instead of a station's name. Everybody knows the meaning of "2 LO," "H.F.," "S.B.," and dozens of similar groups, nowadays. The term "DX" for "long distance" is becoming fairly common, and another abbreviation which is gaining ground on account of its convenience is BCL, which, being translated, means "Broadcast Listeners."

* * *

Neat Work.

ARRIVED Quebec. Cheerio.—Pat," was the wireless message sent by Mr. Patrick Lee, of the Canadian North-West Mounted Police, to a relative in Ealing. It was picked up direct from the Government steamer "Arctic" by Mr. Gerald Marcuse, of Caterham, who six months ago, was visiting Canada for the International Radio Union Conference. He then arranged with the "Arctic's" operator to listen-in for news from the ship when she returned to the St. Lawrence, and redeemed his promise by taking down the above reassuring message from an Ealing man whose relatives had not heard of him for two years.

Spanish Broadcasting.

NOW that Madrid comes over so well, great interest is being taken in the new Spanish station at Barcelona (E A J 1), which has been testing on 325 metres. At present low power is being used, but this will shortly be increased by the installation of a standard broadcast transmitter, rated at one and a half kilowatts.

* * *

The Great Hobby.

MANCHESTER'S Wireless Exhibition, which is closing to-morrow (Oct. 25th), has proved again how keenly radio has caught the public fancy. Every

WHAT THEY SAY.

"Let wireless weld all humanity together so that they can face their common difficulties in a spirit of co-operation and mutual trust."—Sir Oliver Lodge.

"There is a man at the end of my road who has a loud speaker so powerful that I can hear Uncle Rex's watch ticking. And when the weather is fine he sticks it in the garden so that everyone in the Home Counties can hear what a loud loud speaker his loud speaker is."—F. W. Thomas, in the "Star."

"Wireless broadcasting is the youngest of human arts. It is safe to say that there has never been any development of human activity which has interested so many or so diverse minds with such rapidity, or stirred the consciousness of mankind to such universal wonder."—"Daily Telegraph."

The statement has been made—not by the B.B.C.—that Britain has the finest broadcasting service in the world—and I think the observation is a true one. Are we satisfied? No, decidedly not. We are very dissatisfied with what has been accomplished, and we hope to do much greater things in the future.—Lord Gainford, Chairman of the B.B.C., in an interview with the "Manchester Evening Chronicle."

THE WEEK'S QUERY.

I am getting the knack of tuning, but am not quite sure of the condenser adjustment. Should the moving plates be all in, half in, or all out?

show that has been organised reports the same enthusiasm, and several manufacturers have recently told me that they have been amazed at the grasp of the subject which some radio amateurs have attained. Already great interest centres around the forthcoming London Exhibition, which is to be held at the White City from Nov. 15th to Nov. 29th.

* * *

Long Distance Work.

A SOUTH SHIELDS correspondent has forwarded me some interesting details of long-distance broadcast reception on an indoor aerial. On a recent Sunday evening Rome (425 metres) was received at good strength, and the transmission was perfectly clear. Fired by this success, an attempt was made the same

evening to receive American broadcasting, and two unknown Transatlantic stations, and finally W G Y, were all brought in at quite good strength.

* * *

Keeping Anniversaries.

ONE thing that I think the B.B.C. deserves credit for is the way in which they observe anniversaries, and keep memories green. "Army Reminiscences" was a case in point, and another interesting forthcoming programme is the special one arranged for Armistice Day, Nov. 11th.

* * *

Belfast Ready.

WHEN Bournemouth station was opened, about 12 months ago, there seemed little prospect of the erection of another main B.B.C. station; but Ulster has exceeded expectations, and the Belfast station is due to be officially opened to-day (Oct. 24th). The Duke of Abercorn, Sir James Craig, Lord Gainford, the Lord Mayor of Belfast, and the Principal of Belfast University, are amongst the speakers, some of whom will be S.B. to-night.

* * *

Flatter and Flatter.

LEAFIELD'S harmonies have been less troublesome lately, but during the last few weeks the tuning of 5 X X has seemed to get flatter and flatter. At thirty-five miles, on a two-valve set, I can now hear signals quite well with any adjustment of the tuning condenser, and a Copenhagen correspondent tells me that he has noticed the same trouble, even at that distance.

* * *

Secret Radio?

MR. WILLIAM DUBILIER, of condenser fame, has been investigating a new German invention by means of which commercial news by wireless can be transmitted without fear of its being "tapped" by unauthorised listeners. The machine is fundamentally simple, but absolute secrecy is obtained by reason of the fact that countless transmitting combinations can be used and altered at will, the result being meaningless to all except to the authorised listener.

* * *

Wireless in a Hospital.

BY the way, the photo which appeared on page 297 of P.W. No. 124, showing a wireless set in a hospital, is an official photo of the presentation of a loud-speaker equipment (provided by the Birmingham Radio Circle) to the Queen's Hospital, Birmingham. Mr. Percy Edgar and the House Governor of the Hospital can be seen in the photo.

(Continued on page 422)

Liverpool Moving.

LIVERPOOL Relay Station will soon be moving to a new home, owing to interference with the wireless branch of the Liverpool Territorial Signal Corps.

The new site will be the one originally chosen at the Corporation dust destructor, in St. Domingo Road.

Wireless Insurance.

FIRE insurance companies generally ask no extra premium when wireless is installed upon insured property, but they should always be notified by the policy holder when an aerial is erected.

Insurance to cover other wireless risks has now developed into quite a big business, and a great many people have taken advantage of the protection it affords since this class of business was introduced by the Liverpool Marine and General Insurance Co.

Interesting Experiments.

SOME interesting experiments were recently carried out at Southampton to test the possibility of direct wireless telephone communication between incoming ships and the dock authorities ashore. A 50-watt transmitter and a three-valve receiver were used, and there is no difficulty about tuning in, as the apparatus works on a fixed wave-length of 250 metres. Some very promising results were obtained, and it is possible that this aid to the pilot will soon be universally adopted.

R1 to R9.

THE technical editor tells me that, referring to his contribution, "Some Unidyne Troubles," in "P.W." 124 (page 302), a correspondent has asked him whether weak signals are described there as "R1" or "R1."

It seems hardly necessary to say that in accordance with universal practice he uses the scale R1 to R9, to indicate "dead weak" to "very strong signals"; and that in this instance, where the signals were hardly audible, he calls them "signals of R1 (R One) order."

Dublin to Broadcast?

AT the time of writing no definite announcement has been made regarding the establishment of a broadcasting service in the Irish Free State; but a scheme has been drawn up provisionally which provides for a main station in Phoenix Park, Dublin, with relays in Cork, Galway, and Limerick.

A Prince's Set.

READERS who have seen the Western Electric Company's seven-valve super-sonic heterodyne receiver will be interested to know that one of these instruments is packed up in the luggage of Prince Parachatra, brother of the king of Siam, who is now en route for Bangkok.

AMERICA ON A ONE-VALVE UNIDYNE.

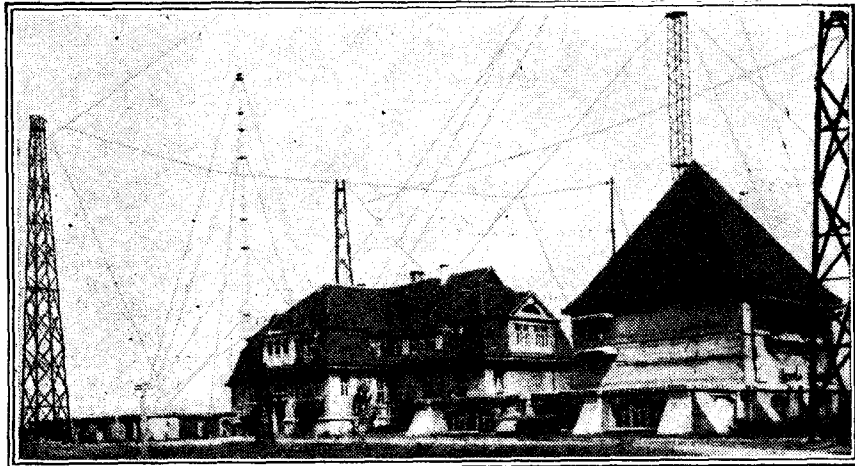
The Editor, POPULAR WIRELESS.

Dear Sir,—You might be interested to know that on a single-valve Unidyne set of my own construction, using a Thorpe K 4 valve and home-made basket coils, I was successful on Sunday evening, the 12th inst., or rather early this morning, after listening in vain for Captain Eckersley's speech to be relayed through 5 S C from K D K A, in picking up a church service which was being relayed by wireless on a wave-length which appeared to be in the vicinity of 400 metres. I was able to keep on to this station from about 12.45 a.m. till 2 a.m., at which time it closed down, the announcer giving the call sign W G Y, Schenectady, New York. Speech and music being quite distinct, except for some atmospheric and fading. I distinctly heard him (the preacher) read the lesson from Romans, chap. viii., and close by singing verses 1, 2, and 4 of hymn No. 405, "Fight the good fight." I will be glad if any of your readers can confirm this report. I have also received the following stations at above address, 2 B D, 5 N O, 6 B M, 2 Z Y, 5 W A, 2 B E, and of course Glasgow (5 S C), and a French station as well, but I did not get the call sign. As this is my first valve set, and was built entirely to the instructions in your valuable paper, I think this reflects great credit on the inventors of this circuit.

Yours faithfully,

J. RALSTON.

32, Kilnside Road, Paisley.



Station Buildings and Aerials at Konigswusterhausen (L P).

When in London the prince examined and tested the set, and now he has high hopes of receiving British broadcasting regularly in Siam.

The Radio Week.

INTERNATIONAL Radio Week has this year been fixed for November 23rd to November 30th. Most European and American stations will take part, and the B.B.C. is co-operating heartily in the scheme. Every night from 10.30 p.m. onwards an hour will be devoted to the relaying of foreign transmissions, and talks on international affairs are being planned. It is hoped to secure some good programmes of representative music from the different countries participating.

Amateur Detectives.

RECENTLY listeners in the Seven Kings district have been driven almost mad by oscillation interference, and a few stalwarts armed with frame aerials have been doing some good detective work in an attempt to stop the nuisance. 2 A U V was red-hot on the trail the last time I heard of him, and he certainly has the good wishes of the neighbourhood to back up his efforts.

Wireless on Seaplanes.

A WIRELESS-FITTED seaplane which has been undergoing tests at Hamble (Hants) is specially designed to carry invalids ill with fever on British Guiana plantations to the nearest place where they can obtain treatment. Hitherto many sick men have died on the 200-mile journey because, owing to bad transport, it took seventeen days to carry them to safety, but the seaplane is designed to do the journey in about two hours, and will be in wireless touch with both ends of the route all the way.

The "P.W." Photos.

SEVERAL readers have expressed appreciation of the photographs of the interiors of the various B.B.C. stations which have been appearing in "P.W."; but so far as we know only one has tumbled to the fact that a photograph of the Hull station was erroneously described as "The Control Room of the Leeds-Bradford Station," in "P.W." 123 (Oct. 4th).

Mr. Reith's Book.

I AM told by Mr. J. C. W. Reith (managing director of the B.B.C.) that his promised book is now completed, and will probably be on sale by the time these lines are in print. It is called "Broadcast Over Britain"—a subject upon which Mr. Reith is the authority.

The White City Exhibition.

LONDON'S second and biggest wireless exhibition opens at the White City on November

15th, and one of its big attractions will be the POPULAR WIRELESS Constructors Competition. The rules governing this competition will appear in our next issue. There will be a junior section for sets made by amateurs under 15, and a senior section for those made by amateurs over 15.

Prizes for Constructors.

THE competition is open to all classes of receivers. Neatness, originality, and efficiency will be the main points on which the sets will be judged. POPULAR WIRELESS is presenting two silver cups—one for each section—as first prizes. The organisers of the exhibition are also presenting gold and silver medals as second and third prizes in both sections.

Send Along Your Set.

READERS of "P.W." desirous of entering this competition should send their sets to the Organisers of the Radio Exhibition, White City, Uxbridge Road, not before November 12th, and not later than November 14th. Every set must have a label attached bearing the owner's name and address. All sets are sent at amateur's own risk. Full details will be given in next week's issue. **ARIEL.**

SATISFYING A NATION.

THE GROWTH OF THE B.B.C.

By J. C. W. REITH, M.Sc.

(Managing Director of the B.B.C.)

An article from the pen of Mr. Reith is always of interest and in the following contribution, specially written for "Popular Wireless," the Managing Director of the B.B.C. draws an arresting pen picture of the growth and spread of the activities of the most efficient broadcasting service in the world.—The Editor.

THE B.B.C. is getting a pretty big concern, and it is common knowledge that when a business of any kind expands very rapidly it is rather apt to get out of hand. Many organisations, when comparatively small, were efficiently managed and highly successful in every respect, but when for one reason or another they suddenly began to grow and to launch out in new directions, all sorts of troubles began.

The Critics and the B.B.C.

I heard recently of a man who was making over three thousand a year out of a little bakery business in quite a poor quarter of a provincial town. Then he thought he would start branches in other parts of the town, and generally open out his trade. He lost all his savings, and now, I believe, he has no business at all. There is a line which expresses what happened:

Like kings we lose
the conquests
gained before,
By vain ambition
still to make
them more.
Each might his
several province
well command,
Would all but stoop
to what they under-
stand.

This might seem to put a premium on ambition and initiative, but it really does nothing of the kind. Nor should anyone be discouraged by the toll of disaster which often follows such enterprise as was shown by the little baker. It should just make us very careful to ensure that our projected moves are wise ones, and that we can still keep our business in hand, even though it cannot have the same personal supervision in all its details.

Now an extension of operations from one town to about twenty inside two years is something quite unusual, and it would be so recognised even if the business were such a simple and straightforward one as selling cakes or tobacco, or even, to come a little nearer home, wireless gear. Developing a broadcasting service is a very different thing from extending the market for any ordinary kind of product. There are many serious problems to be considered when one is doing this, but broadcasting includes them all before its difficulties really begin.

Some people are unreasonable towards broadcasting. The B.B.C. has always been very polite to its critics—not that there are many of them—even to the kind of man who, after listening to some particular thing that does not happen to suit him, seizes pen and paper and condemns all that the company

ever did, and finishes perhaps by saying that he enjoyed the programmes more when there was no regular service at all, but just a few amateurs sending out a little music now and again. Incidentally, what a tribute and a reward is there!

I think people are beginning to understand that no concern in history ever took on quite such an embarrassing and endless task as that of trying to satisfy a whole nation at once, and to keep on doing it day after day, night after night. But they do not all appreciate it as fully as they should, and some do not yet seem to appreciate it at all. It would do them a world of good to come and sit by a station director for a week or two, or even by an engineer-in-charge. And then they would have a very incomplete experience of what it all means.

I have said that businesses some-

between these two categories there lies a great range of possibilities which are made practical by joint action between broadcaster and listener. This happy state of affairs is becoming more and more necessary because new listeners are being added every day.

A Great Development of the Age.

Hardly a manufacturer I meet but reports busy times in his factory. Broadcasting itself is still extending; new stations are being opened and fresh lines of activity developed. People who were originally rather inclined to despise it because they thought it was only a passing craze, or because they did not imagine it would bring to them that they had not before, have now to come to find that no house is complete without a receiving set.

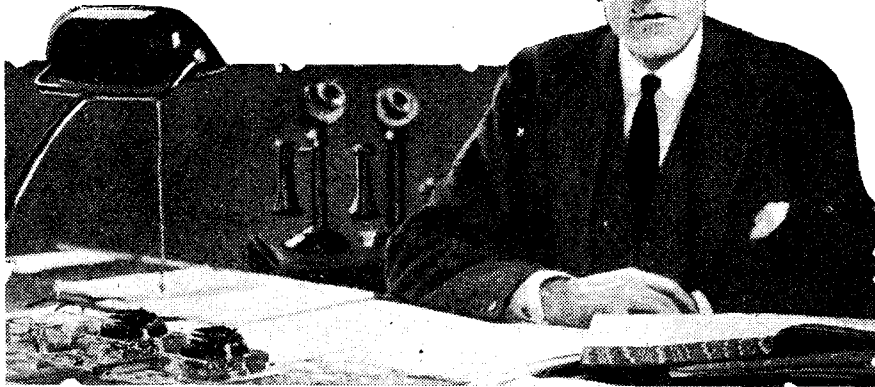
The service is now taken seriously by those who underestimated it before. There is more in it than they thought. There is more in it than anyone thought. We can see opinions on its influence given in all sorts of unexpected quarters. It is no exaggeration to say that it is one of the really great developments of the century—or age—or of any age. People who are accustomed to assessing the value

of various influences which have arisen from time to time cannot as yet determine where it is going to lead, or to what extent it will change some of the conditions of life to which we have grown accustomed.

Wireless in general will change the whole face of civilisation, and may revolutionise our established processes in many different fields. Broadcasting, within this greater upheaval, is evolving a silent revolution of its own, and all listeners and broadcasters are concerned in it, and have their parts to play. When we find ourselves becoming involved in some new movement we are wise if we consider carefully what our attitude to it is to be, and if we are to do this properly we must invariably, and to a great extent, try to sink our own individualities and our own inclinations and desires in the wider considerations which may be those of a household, a community, or a nation.

Those who were amateur experimenters when broadcasting began, or who have taken up the pursuit since, and in general those who have participated in the growth of broadcasting through regular listening, are, so to speak, in on the ground-floor, and

(Concluded on page 482.)



Mr. J. C. W. Reith—Managing Director of the British Broadcasting Company.

times get out of hand, but the B.B.C. has not overgrown itself in this way, for at the head office we are still able to keep in close touch with all the stations, and not only know what is happening, but have just as much say in what is happening as is necessary. There is a vast amount of work going on—essential work—which no one knows anything about, but without which there would be no programmes for people to criticise at all.

The Necessity for Co-operation.

Some of those who listen to programmes are far too much inclined to judge the B.B.C., and British broadcasting in general, by one item from one station on one evening, and forget all about what is being done all the rest of the time in all the other places.

Broadcasting, more than anything else I know of, demands an intelligent and sympathetic co-operation between the two parties chiefly concerned, and it needs also a recognition of other people's requirements, often a difficult recognition to give. There are some things we can do on our own, and there are some we cannot do at all, but

ARGENTINA'S SUPER-STATION.

The Monte Grande Installation Now Heard Throughout the World:

(FROM OUR OWN CORRESPONDENT IN ARGENTINA):

EVEN before litigation in the English courts drew attention to the commercial value of the Monte Grande (L P Z) radio high-power station, Argentina interest had been centred in this exceedingly important installation, which performs work in international communications throughout the world. From almost any high building in Buenos Aires the aerial towers can be clearly seen, and they are used by the Military Survey Office as points of comparison in the preparation of their maps.

Ten Huge Masts.

The power-house, which is of colossal construction, is built on huge reinforced concrete piles three metres above the common floor level. The height of eight of the towers is 210 metres, the two centre towers being 219 metres. Six were built by the Telefunken Company, a German enterprise, and four by the C.T.S.F., a French company.

The weight of each of the German towers

is 125 tons, calculated to withstand a base-pressure of 250 tons at the foundations. The strain calculation in time of storm and hurricane is of 40 tons at top and 20 tons at base. The base of the tower is supported on eight coils of insulators, each of which is calculated to stand a strain of 80 tons, the maximum pressure placed upon the insulators in actual practice being 31 tons. Constructed in pairs, the average time occupied in the mounting of each pair was three months. The base of each tower is formed of reinforced concrete, and, in size, measures 3 by 4 by 4 metres. In some cases the bases are as deep as 5 to 9 metres, the size varying according to the character of the type of soil encountered.

Twelve Thousand Volts.

The four French towers vary but slightly from those of German construction, being square in shape, while the latter are triangular in formation. Each of the French towers weigh over 85 tons, and rests upon a 260-ton foundation securely attached to

piles weighing over 85 tons driven down into bed-rock. The towers are stayed at six places to four points, and are not insulated at the base.

Deep beneath the surface a 3-phase power-cable carries over 1,000 kw. at 12,500 volts pressure to the sub-station of the Compañia Alemana at Banfield, providing sufficient energy to run the whole of the installation. Two other cables connect Monte Grande with the central office in Buenos Aires, while both stations (Monte Grande and Villa Elisa) are connected by means of a switchboard in the central office.

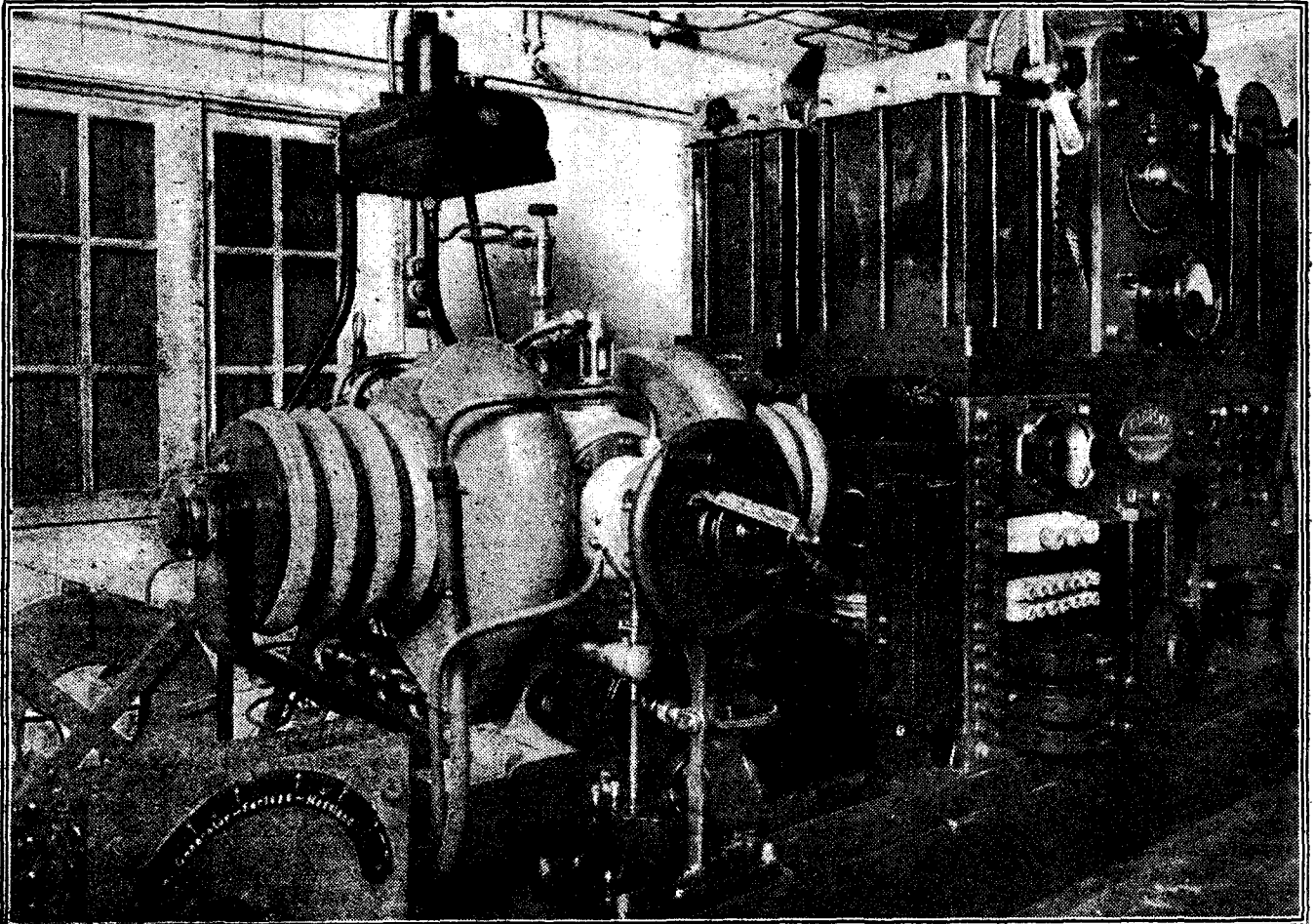
Oil Cooled Transformers.

The Telefunken high-frequency alternators are driven by a 800 h.p. 3-phase motor, delivering 6,000 cycle current at 750 volts and 1,000 amperes. A frequency, varying between 11,000 and 44,000, can be obtained, giving a wave-length from 6,400 to 27,500 metres.

Doubling and tripling transformers coupled to banks of condensers are used, these being oil-cooled. The doubling and tripling transformers are oil-cooled by means of a centrifugal pumping system.

The power enters from the Banfield works at 12,500 volts and is transformed down to 3,200 volts for driving the 3-phase motors, while, for lighting, it is transformed down to 230 and 110 volts.

The huge transformers employed for this purpose are also oil cooled and, of course, very efficient insulation is provided.



A section of the transmitting plant at the Monte Grande station. Photo shows the A.R.C. transmitter and switchboard.

HOW TO BUILD A ONE-VALVE REFLEX RECEIVER.

By E. L. MUNNS.

Straightforward constructional details for the amateur who has had a little experience in building receivers.

THIS article is more especially intended for the amateur who has had a little experience in constructing and operating the simpler types of apparatus. It is a trifle more ambitious than the simple one-valve circuit, and is much more efficient. For this reason the writer does not recommend the use of dual amplification to the absolute beginner.

The Circuit.

Looking at the circuit in Fig. 1 it may be seen that the H.F. oscillations in the aerial are conveyed to the grid of the valve and

This latter fact makes it necessary that the valve, as far as possible, should be suitable for both radio and L.F. amplification. The writer employs a very hard Ediswan A.R. or a Phillips R valve.

Constructional Notes.

A few notes on the actual construction of the set are now given, although little need be said, as the diagram in Fig. 2 is self-explanatory.

The panel used was 8 in. x 12 in. x $\frac{1}{8}$ in., and

was found to be very convenient. The components may seem slightly crowded, but the wiring was quite simple, being carried out with No. 16 S.W.G. tinned copper wire.

No difficulty should arise if these dimensions are used.

The L.F. transformer, as may be seen, was shrouded in an iron case, which proved a great advantage. If, however, you wish to employ a transformer that is not shrouded, it is advisable to space

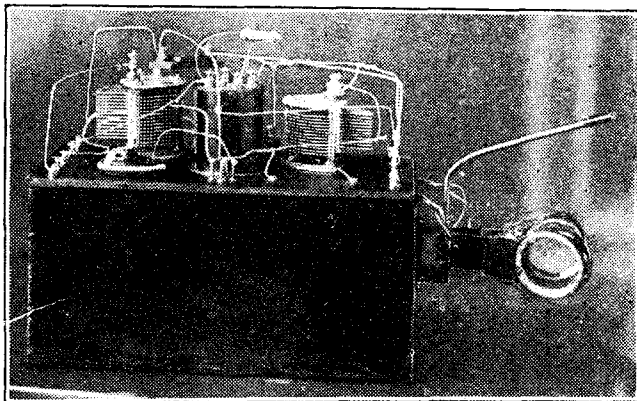
the wiring with care, as capacity effects may be very noticeable.

The L.F. transformer should be of very good quality, the ratio being either 4-1 or 5-1. The one used on the writer's set was 5-1. If undue capacity effects are experienced the transformer should be looked at first. It might be necessary to shroud it to prevent interaction.

The two variable condensers were both .0005 mfd., and proved to be very satisfactory. They tune the aerial and anode coils respectively, and the former was wired permanently in series with L1, as this method gave the best results.

If you want this set to have a long range of wave-lengths it would be an advantage to employ

a switch for putting the aerial condenser either in series or parallel. If this is done you will not need so many coils.



A view underneath the panel, showing the wiring.

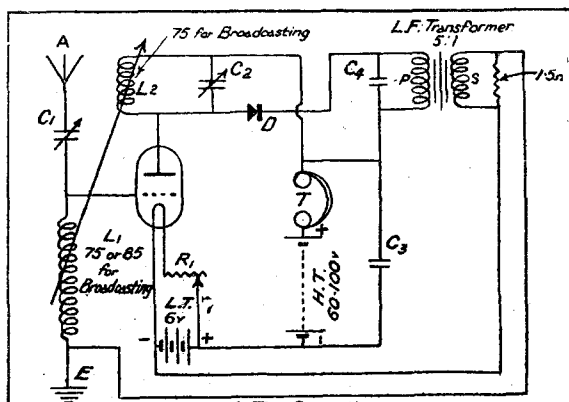


Fig. 1. The Circuit.

Values of Condensers
C1 = .001, .00075 or .0005 mfd.
C2 = .00075 or .0005 mfd.
C3 = .002 mfd. approx.
C4 = .001 mfd. approx.

The fixed condensers C3 and C4 are not necessary, but different values should be tried before wiring up any values permanently.

are then amplified. In this state they are rectified by the crystal, D. They have now been converted into L.F. impulses.

Having next passed through the step-up transformer they are again communicated to the grid of the valve, which now amplifies

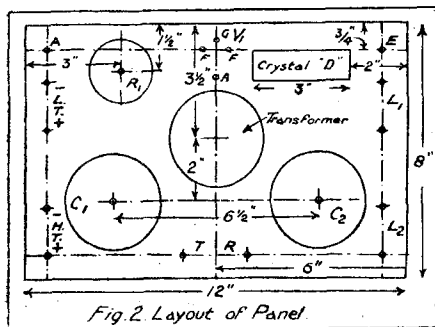


Fig. 2. Layout of Panel.

at low frequency. These magnified L.F. impulses pass through the anode coil, L2, and thus through the telephone receivers, T. Thus it may be clearly seen that the valve is performing two functions: (1) acting as an H.F. amplifier, and (2) as an L.F. amplifier.

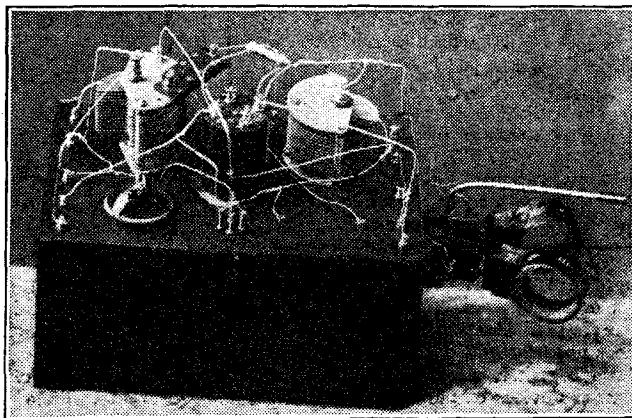
The crystal used was Hertzite, although leonite and galena were tried, but were not nearly as good as the first-mentioned. This is, of course, a very important item, and should be borne in mind when purchasing the crystal.

If possible, test several crystals on the dual circuit in order to obtain a good specimen. The one used by the writer is capable of receiving 2 L O at a distance of 70 miles. The speech is not always audible, but instrumental items are quite good. This crystal proved as excellent in conjunction with valves as when used as a rectifier.

How to Operate the Set.

The operation of the set is carried out in the following manner. First insert in the coil-holder suitable coils to cover the wave-length of the station you wish to receive. Place them a fair distance apart (say, more than 50°) and move the condensers in the usual manner until the desired station can

(Continued on page 426.)

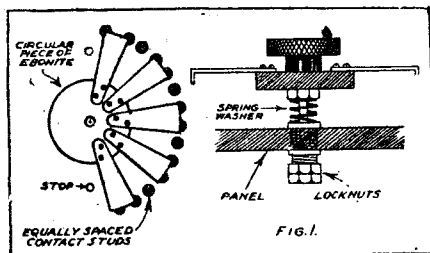


The disposition of the components can be seen clearly from this photograph.

TWO TECHNICAL HINTS.

A Switch for H.F. and Detector "Unidyne"—Tuned Anode Control.

A VERY simple switching arrangement for the H.F. and detector Unidyne is shown below. In one operation it switches off the filament, reverses the reaction, and switches the input from the grid of the H.F. valve to the detector grid.



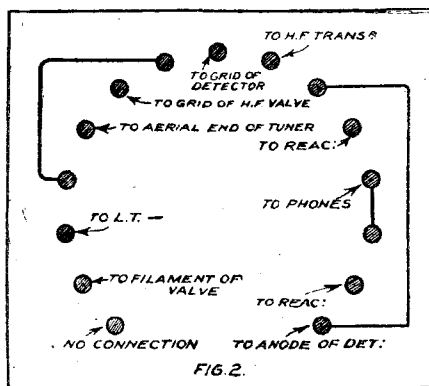
instead of employing three separate operations, as in the original model Unidyne described in POPULAR WIRELESS. The articles needed are:

- 15 Contact studs,
- 2 Stop pins,
- 2 inches of 2 B.A. rod,
- 1 Bush,
- 1 Spring washer,
- 3 2 B.A. nuts,
- 1 Ebonite knob,
- 1 Piece of spring brass about $2\frac{1}{2}$ in. by $1\frac{1}{2}$ in.
- 1 Piece of ebonite $1\frac{1}{2}$ in. square.

The ebonite is made into a circular piece $1\frac{1}{2}$ in. in diameter, and when the brass has been shaped into five arms, as in Fig. 1, these are fixed to the ebonite as in Fig. 1. The connections are shown in Fig. 2. Precautions must be taken to see that the contact arms each afford good connection between the studs they rest on.

TUNED ANODE CONTROL.

WHEN the tuned anode method of coupling H.F. valves is employed, two or more stages may be simultaneously tuned by arranging a single sliding member



in such a way that it engages the edges of the condenser dials, as shown in the accompanying illustration. This arrangement does not necessitate placing the condensers close together, as is the case with other similar devices employing a revolving cone placed between the dials.

Pieces of rubber or cork, A, are secured to a strip of hard wood, B, by means of a little glue or seccotine. The bearings for this strip consist of two small cotton reels, C, which are swivelled to the panel by means of small bolts. The pressure between the edges of the dials and the cork or rubber strips should keep the wooden slider in position.

HOW TO BUILD A ONE-VALVE REFLEX RECEIVER.

(Continued from page 425.)

be heard. Now increase the reaction—i.e. bring the coils a little closer, and then retune both condensers. Repeat the operation until the desired strength is obtained.

If this method is carried the set will not burst into self-oscillation, as it probably would if the coils are close when tuning is commenced. If it does oscillate, however, lessen the reaction, or carry out the alternative method, which is dimming the filament of the valve.

The coils used were of the honeycomb type, and below are the necessary coils to receive most of the important stations when CI is in series:

	Anode (L2)	Aerial (L1)
Broadcasting..	75	75 or 85
Hague	200	150
Eiffel Tower..	500	300
Radiola	400	200

All the stations given in the next paragraph were received on the broadcasting coils (except the three Continental ones given above).

Results.

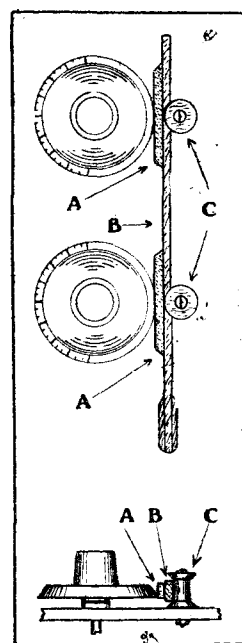
The results obtained with this receiver are far superior to those with a single valve of the usual type. The following stations were logged in one evening: London (2 L O), Birmingham (5 I T), Manchester (2 Z Y), Bournemouth (6 B M), Glasgow (5 S C), Newcastle (5 N O), Cardiff (5 W A), Aberdeen (2 B D),

Radiola (S F R), Eiffel Tower (F L), École Supérieure, Paris (P T T), Hague (P C U), Ramsgate Post Office, North Goodwins, South Goodwins, and several amateurs.

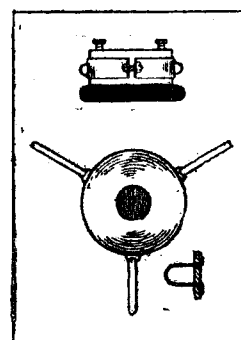
As these results were obtained from Margate, little difficulty should be experienced in receiving all the British

stations from any part of the country unless you are situated in a "blind spot."

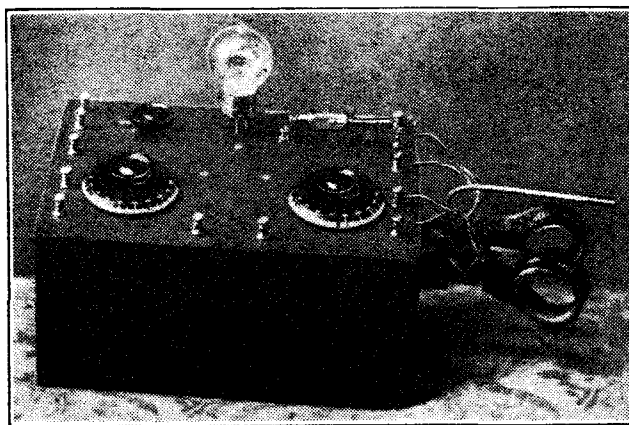
The reaction effect produced by the aerial and anode coils being coupled is a great advantage when used with care. It is necessary to have the coils coupled in the right directions or the effect will not exist. If this is so, reverse one of the pairs of leads, either those to the aerial coil or those to the anode coil. This should remedy the defect.



LOUD SPEAKER EXPERIMENTS.



THE casing of the "loud speaker" receiver is provided with a sheet metal strap to which is fitted three or four staples which are passed through holes in same, bent over on the underside, and then soldered as shown in the diagram.



The complete one-valve reflex receiver.

Lengths of $\frac{1}{4}$ in. square-section elastic are then passed through the staples, their outer ends being secured to a suitable frame. The tension on the elastic strips should be well equalised, the idea being to minimise mechanical vibration, which is very pronounced when the receiver is mounted on to any solid structure common with the base.

METHODS OF SWITCHING IN WIRELESS CIRCUITS.

By T. P. BEARD.

This is the third and concluding article of a series dealing with a practical aspect of wireless work of importance to all amateurs.

WHERE a high-frequency valve is used before a valve detector and a switch is required for cutting in or out the high-frequency valve, it is necessary to make provision for connecting the aerial to the grid of the high-frequency valve or to that of the detector as required, and also to switch off the current from the high-

of the high-frequency valve is switched on and the plate of the high-frequency valve is connected to the grid leak of the second valve, and both valves are then in use. If reaction is used in a circuit of this type, provision must be made for changing the direction of the reaction coil when changing the number of valves in use. A method of doing this is shown in the next figure.

Changing Over Reaction.

The last figure showed the method of switching one high-frequency valve without reaction. Fig. 13 is the same circuit, but with the addition of a reaction coil, L 3, and another switch, S 2. The connections to this switch will be very easily followed.

It will be seen that putting the switch to the right or left comes to the same

thing as removing the connections to the reaction coil from their terminals and connecting them up again the other way round. The switch will be in one position for use with two valves (to be found by experiment), and when the high-frequency valve is cut out, the switch S 2 will have to be thrown over to its opposite position.

Switching Reaction from A.T.1. to Tuned Anode Coil.

When reaction is used in a receiver having one or more stages of high-frequency amplification, it is usual to couple the reaction coil to the tuned-anode coil or high-frequency transformer between the high-frequency valve and the detector.

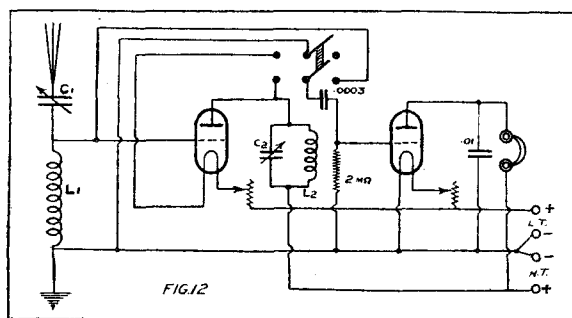
It is often very useful to be able to switch the reaction coil so that it may be coupled to the aerial tuning inductance or to the tuned-anode coil or transformer at will, and Fig. 14 shows how the necessary switch should be connected in the circuit. The connections will be very easily followed, and the diagram does not need any explanation. L 1 is the aerial coil, L 2 the tuned-anode coil and L 3, L 4 the alternative reaction coils.

Changing Over from Tuned Anode to Transformer H.F. Coupling.

In Fig. 15 is shown a method of using a change-over switch to change the high-frequency coupling from tuned-anode to high-frequency transformer, using the same variable condenser in each case. It will be seen that the upper centre switch contact is connected to the plate of the high-frequency valve and also, by way of a .0003 mfd. variable condenser, C 2, to high-tension positive.

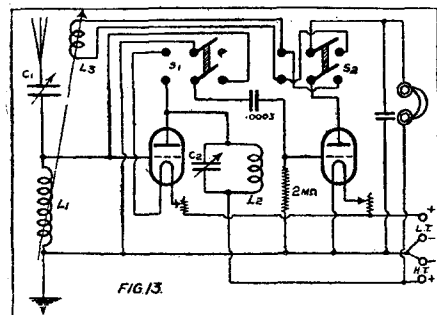
The upper and lower left-hand switch contacts are connected together, and are

taken to one side of the tuned-anode coil, L 2, the other side of this coil being connected to high-tension positive. One end of the primary of the high-frequency

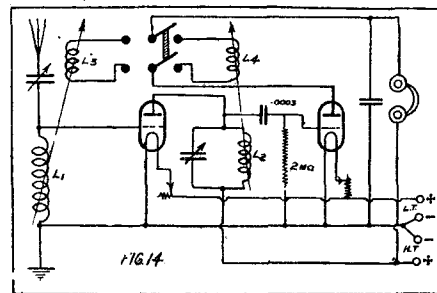


frequency valve filament when that valve is not in use. A double-pole change-over switch of low capacity type will be required for this purpose.

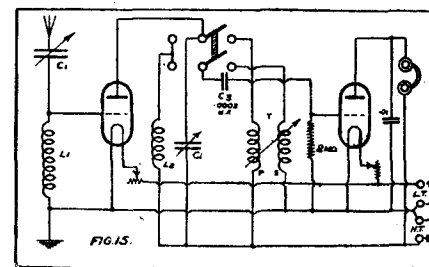
In Fig. 12 it is assumed that the tuned-anode method of high-frequency coupling is used, L 2 being the tuned-anode coil, and C 2 is a variable condenser in parallel. The centre and left-hand contacts on the upper side of the switch S simply switch on the filament of the high-frequency valve, the upper right-hand contact being left empty. The lower contacts of the switch are connected as follows: The centre contact is joined to the grid leak and condenser on the grid of the second valve, the left-hand lower contact is joined to the plate of the first valve, and the right-hand contact to the aerial lead.



If the switch is over to the right, the filament of the first valve is switched off, and the aerial is led round to the grid of the second valve via the grid leak and condenser, and the circuit will therefore be the usual single-valve detector circuit. By placing the switch arm over to the left the filament

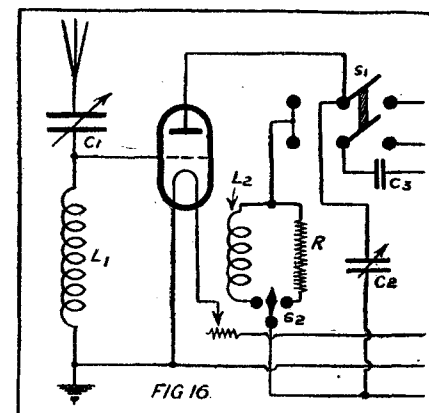


transformer, T, is joined to high-tension positive, and the other end to the upper right-hand switch contact. The lower centre contact is taken to the grid condenser, C 3, of the second valve as shown, and the lower right-hand contact goes to the secondary of the high-frequency transformer.



By following the diagram it will be seen that when the switch arms are over to the left, the plate of the first valve is joined to the upper side of the tuned-anode coil, L 2, also to the grid condenser of the second valve, and the anode condenser, C 2, is

(Continued on page 428.)



Technical Notes

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

Tinning Made Easy.

A SIMPLE method of tinning terminals and metal parts generally is described in an American wireless journal. A metal vessel, sufficiently large to hold the articles to be tinned, is obtained, and is filled with sufficient water to cover the articles. To this is to be added not less than an ounce of cream of tartar per pint of water.

A stick of solder is melted in an old spoon, and is dropped, in this molten condition, into the water, the cream of tartar being added subsequently. The metal articles to be tinned should be thoroughly cleaned (by dipping in nitric acid for a few moments, and then rinsing with water) and should then be placed in the bath described above, and the solution boiled for an hour or longer.

A Frame Aerial.

It is well known that the amount of energy picked up by a loop aerial is very much less than that received by a good outdoor aerial in the same circumstances. It would appear advantageous, therefore, to use an outdoor aerial on a loop set; but this entails a separate tuning unit. If, however, a second loop of, say, two or three turns, be wound in the centre of the frame aerial, this second loop being in series with the outdoor aerial and the earth, there will obviously be inductive coupling between this second loop and the frame aerial proper.

The second loop and the frame aerial loop may be separated by a distance of, say, 1 to 3 inches; if the distance is increased, the selectivity is increased but the sensitivity decreased. The second loop thus functions as an untuned aerial circuit. Greater signal strength may sometimes be obtained by increasing the number of turns on the second loop to six or seven, and a small fixed condenser may sometimes with advantage be included in the circuit of the second loop. The frame aerial loop, of course, remains connected to the set in the ordinary way.

Rattling Telephones.

Rattle in the telephone receivers may be due to different causes. In the first place it may be that the diaphragm is slightly bent and is practically touching the magnets, so that when signals are being received, intermittent contact is made between the magnets and the vibrating diaphragm. If so, the remedy is to remove the diaphragm and reverse it. Another cause of rattling is the presence of grit between the diaphragm and the magnets which, owing to the extremely small clearance between the two, may easily cause mechanical contact. It sometimes happens that small iron filings

or specks of iron dust may remain within the receiver case after manufacture, and these are particularly liable to adhere to the pole-pieces. If, therefore, rattling in the 'phones is noticed, the pole-pieces should be carefully inspected for the presence of any such magnetic particles.

Fading Signals.

When a station fades out, after having been properly tuned in with maximum intensity, it is usually better to wait a few moments to see if it comes up again to normal strength, rather than to upset the

METHODS OF SWITCHING IN WIRELESS CIRCUITS.

(Continued from page 427.)

shunted across the tuned-anode coil. The windings of the transformer are now out of circuit. With the switch in this position, the tuned-anode method of coupling is in use.

If the switch arms are put over to the right the plate of the first valve is joined to the upper end of the transformer primary, the variable condenser C 2 is shunted across this winding, and the grid condenser of the second valve is connected to the upper end of the transformer secondary. The lower end of this winding is joined to low-tension negative in the usual manner. This switch position gives transformer coupling.

Changing from Tuned-Anode to Resistance-Capacity H.F. Coupling.

A simple two-way switch incorporated in the last figure enables this to be done. Fig. 16 is a reproduction of part of the circuit given in Fig. 15, showing a high resistance of 100,000 ohms, R, connected to the upper end of the tuned-anode coil, L 2. The lower end of this resistance is taken to one of the contacts of the switch S 2.

The lower end of the tuned-anode coil is joined to the second contact of S 2, and the arm of this switch is joined to the positive of the high-tension battery. It will be seen that S 1 and S 2 enable any of the usual combinations of high-frequency coupling to be used at will.

adjustment of the dials. It is true that cases have been recorded where the wavelength of the transmitting station, more particularly certain foreign stations, has varied quite considerably during the transmissions, but generally speaking, sudden or momentary variations in the intensity of reception are due, not to the transmitter or to the receiver, but to atmospheric and other conditions prevailing at the time. Of course, in some cases, nothing more mysterious than a failing filament battery will be found to be the cause.

Artificial Crystals.

Many of the crystals used for wireless detection are metallic sulphides, and can be prepared artificially in the chemical laboratory. It is remarkable, however, that when so prepared they usually appear in an amorphous form and possess little or no rectifying properties. It seems from this fact, and also from many other observations, that the rectifying property is dependent upon the crystalline formation. It is possible, by special arrangements, to manufacture most, though not all, of the commoner wireless crystals by artificial means and in the crystalline form. The

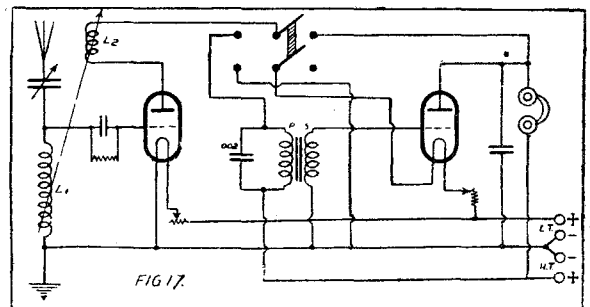
(Continued on page 483.)

Switching One Stage of L.F. Amplification.

This circuit, Fig. 17, shows how a change-over switch may be used to cut in or out of circuit a stage of low-frequency amplification after a detector valve. P and S are the primary and secondary windings of a low-frequency transformer, and L 2 is the reaction coil. The upper centre switch contact is taken to one end of the reaction coil, the other end of which is connected to the plate of the detector valve in the usual manner.

The upper left-hand contact of the switch is joined to one end of the transformer primary, and the right-hand upper contact to one side of the telephones. The lower centre and lower left-hand contacts of the switch are joined to the filament of the second valve and to L T—respectively.

When the switch arms are over to the



left, the reaction coil L 2 is connected to the primary of the transformer, and the lower centre and left-hand switch contacts close the filament circuit of the second valve, allowing the filament of that valve to light up. In this switch position the low-frequency amplifier is in circuit.

If the switch is thrown over to the left, the filament circuit of the second valve is broken and the reaction coil L 2 is joined directly to the telephones. In this position the circuit is an ordinary single valve detector arrangement with reaction.

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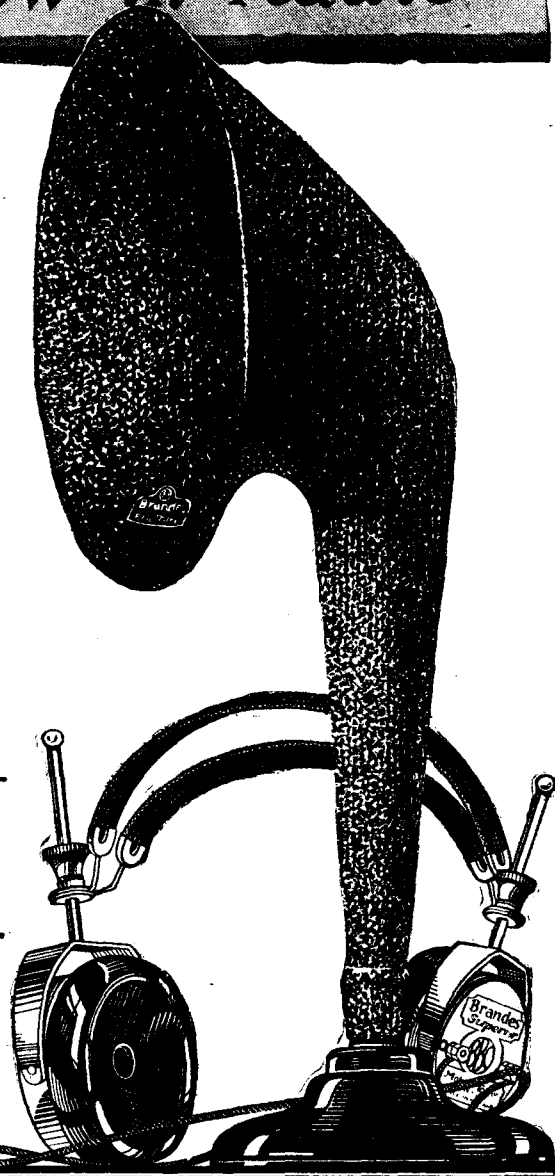
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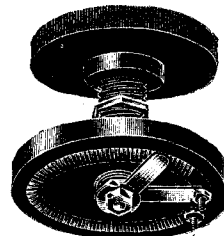
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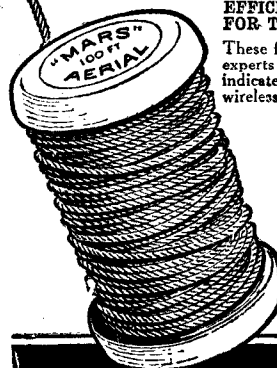
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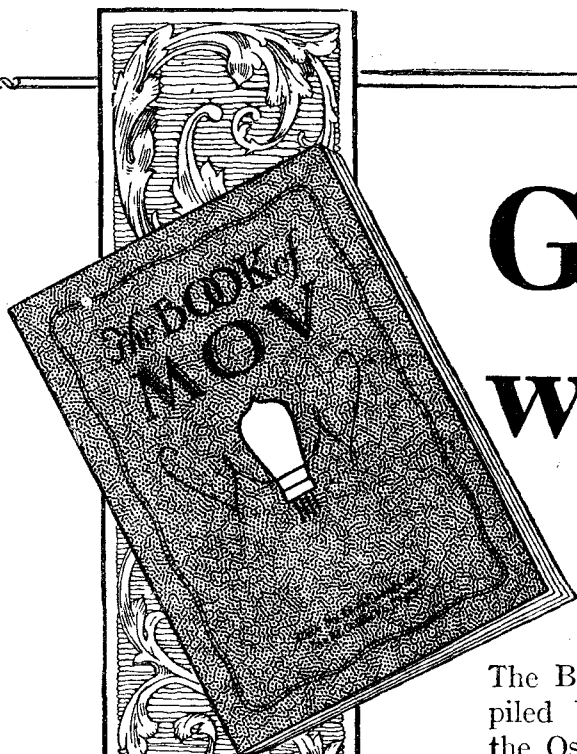
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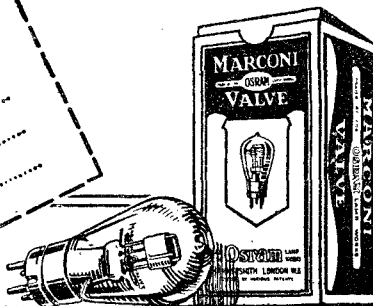
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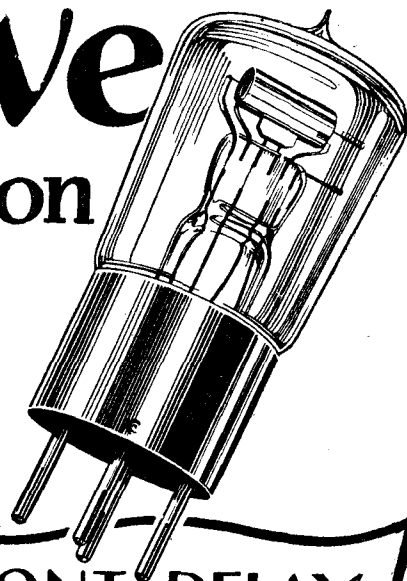
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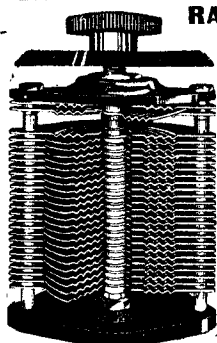
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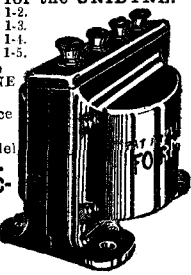
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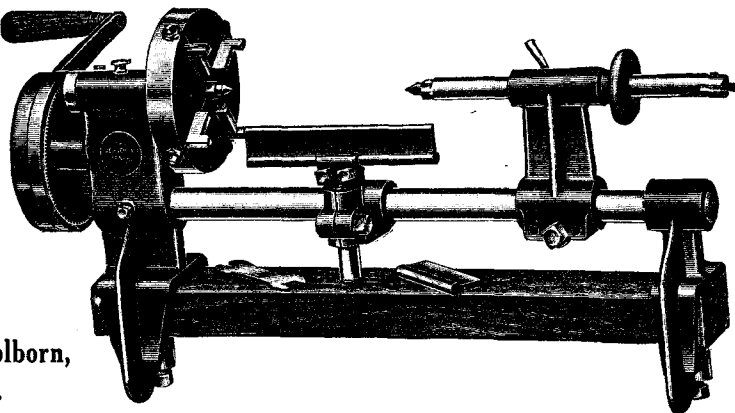


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PART I.—A GENERAL TALK ABOUT WIRELESS.

LET us admit at the outset that a description of wireless as a co-operation between broadcasting stations, receivers, and "wireless waves" is no help to the person who, unversed in the elements of electricity and magnetism, wishes to know in detail how this seeming miracle or broadcasting is accomplished. But it must be admitted also that, in order to write lucidly of the processes of wireless, assuming on the reader's part little or no understanding of the properties of electric and magnetic circuits, one is forced to make use of rough analogies, makeshift images, and mechanical comparisons.

This is apt to give the learner only a crude idea of what are some of the most awe-inspiring revelations of the unseen world of vibrations. Still, the facts and figures which will be given in this and the following articles will, I hope, give a simple and fairly complete exposé of the secrets of wireless, and imagination will complete the story.

Wireless Waves.

As a rule, when we wish to understand how something works we do not trouble very much about its superficial appearance, its colour and form, and so on. We strip off the outside to get at the fundamentals inside. Steam-engines are given many forms, but they nearly all work on some common principle. So it is with wireless. There are wireless telegraphy, wireless telephony, broadcasting, wireless beams and wireless "lighthouses," wirelessly controlled ships and aircraft, and wireless "death rays."

But these are only different applications of one process which is fundamentally the same in all; that is, the production and propagation of waves. Can we reduce the matter to even more simple terms? Yes.

The waves are, after all, only a means to an end. What part do they play in wireless? Well, one step brings us right to the heart of the matter. *The function of the waves is to convey something from one place to another.*

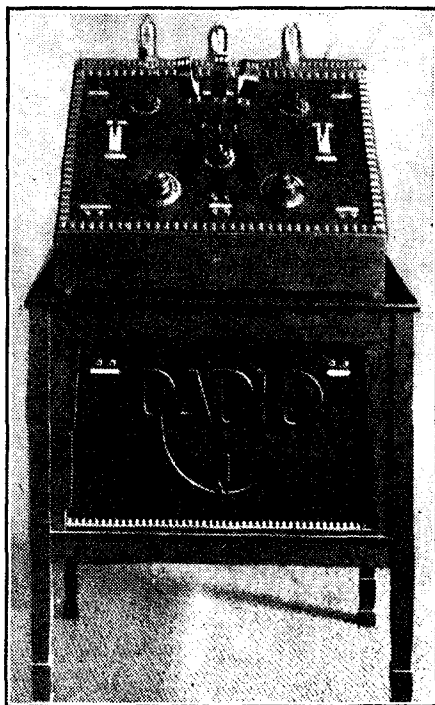
Just as in ordinary telegraphy the wires link town to town and carry the electrical impulses in "dots and dashes," so wireless waves transfer electrical impulses or signals from wireless stations to wireless receivers. That is the point to grasp; there is no mystery, no miracle; wireless is not a magic method of communication employing no connecting material between sender and receiver. It is not a sort of imitation telepathy by an electrical Zancig.

The message, whether it be in Morse code or a violin solo, is turned into a form in which it can be carried by wireless waves, and these faithfully bear their burden far and wide. Do not be bewildered at the statement that the messages are turned into another form. Remember that on the

surface of the gramophone record there is music or speech *in another form*.

So in the printed score there is music *in another form*. And in the Braille type of the blind there is intelligence in an unusual form. The secret lies in the interpretation. In wireless, the interpreter is the receiver.

It will be much easier for you to understand wireless, and broadcasting in particular, if you assimilate the idea of music and speech having electrical counterparts, or being recorded somehow in some form so that they can be turned back into sounds



A 3 Valve Cabinet Set made by a Dutch Amateur which won first prize at the Amsterdam Exhibition.

at will. You will wonder at this stage *how* music can be recorded electrically, and in what appears to be empty space.

The explanation of that must come a little later. In this article I want to pave the way to the explanations of the technique of wireless by laying open to you the process in general, and up to now we have learned that music and speech, or any sounds, are capable of being, as it were, *moulded* in electricity and turned by the receiver back into sounds again. The vehicles which carry the electrical impressions of these sounds from the broadcasting station to the receiver are wireless waves.

Evidently the next question is, "Well, but what are wireless waves? In what do they occur, and how are they caused?" We cannot get at the explanation of all that

at the moment, because I want first to give a few examples of broadcasting not under the control of the B.B.C., which will help you to grip the essentials of the matter.

In olden times, when danger threatened the country and it was necessary to rouse the men of the shires, our forefathers used to light beacons; the first was lit, and those watching at the next saw the flames and lit their beacon also, and so the signal ran the length and breadth of the country—a pretty example of broadcasting by relay stations.

There is more similarity between this old-time method of conveying a signal and modern broadcasting than you might guess. First, the signal from the beacon went out in all directions. Secondly, the signal carried farther across flat country than across hilly country. Thirdly, the signal could be received in a given locality by any number of receivers tuned to the wave; the receivers being men's eyes.

Fourthly, the signal was carried by means of waves—waves of light. Fifthly, the signal travelled across space at exactly the speed at which "broadcasting" travels. Sixthly, the signal could be received at a greater distance if the receiver, the eye, had an amplifier (say, a telescope). Seventhly, the signalling waves were caused by exactly the same natural phenomena as those which cause wireless waves. One could give other parallels, but those seven are enough to show you that broadcasting is but a modern adaptation of an old, old method.

Intelligence Across Space.

The drums of savages in the African forests signal news of war and death to other tribes far distant. Another example of broadcasting—by waves in air. Ships that pass in the night signal to each other by lamps. A flickering light from the bridge of one tells in the longs and shorts of the Morse code the name of the ship, whereto it is bound, and the port from which it sailed. An officer on the other vessel receives the Morse signals—by eye—and flashes back similar information on his lamp—an illustration of a system of wireless telegraphy which was used long before Marconi was born.

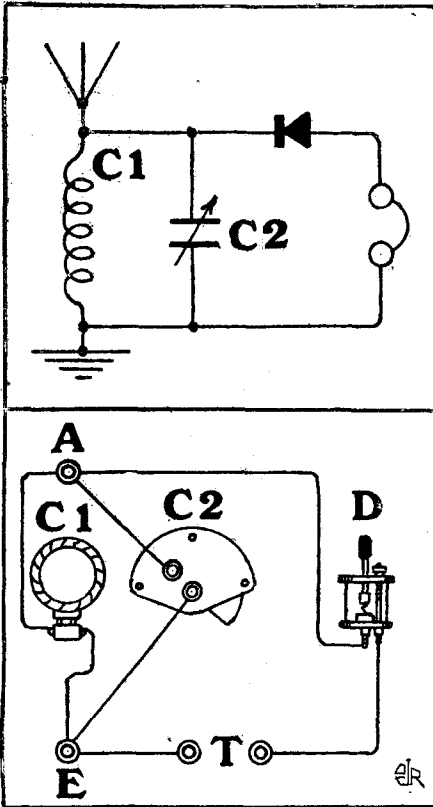
Here again we have an instance of intelligence transmitted across space by waves; the lamp is the wireless station, the eye is the receiver. The difference between this wireless telegraphy by lamps and that by which Marconi will flip your message across the globe consists chiefly in the length and power of the waves used. In nature and properties the waves of both systems are alike and are caused by the same natural phenomena.

In the next article we shall learn more about wireless waves and how wireless engineers produce them.

ANOTHER "ALL-WAVE" CRYSTAL SET.

By OSWALD J. RANKIN.

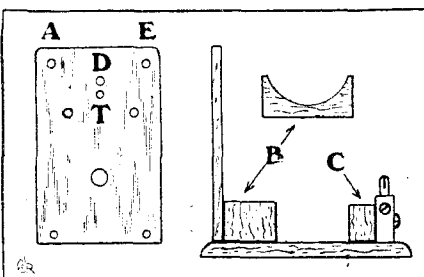
THE crystal receiver to be described in this article was hurriedly constructed from a few spare components and odd pieces of material, being originally intended as a rough-and-ready standard tuning receiver to be used only for the purpose of



making certain comparisons during a series of experiments, but since the simplicity of its design may possibly appeal to the amateur of limited workshop experience, it is here proposed to detail its construction and use. As will be seen above, the circuit is a standard crystal circuit with a No. 35 or 50 plug-in honeycomb coil, C1, which is shunted with a .0005 mfd. variable condenser, C2, the crystal detector and telephones completing the circuit in the usual way.

Simple Construction.

The figure below and the accompanying photograph should convey the idea to the



reader's mind. The panel is $5\frac{1}{2}$ in. by $3\frac{1}{2}$ in. by $\frac{1}{8}$ in. in thickness, this being cut out from the best quality matted ebonite sheet. Holes are drilled to take the A and E terminals, the crystal detector, D, the telephone terminals, T, and the condenser bush. Two small holes are also drilled through the lower end to take wood screws which secure the panel to one side of a wooden block, B, previously recessed to take the moving plates of the condenser and screwed to a wooden baseboard which is 5 in. long by 4 in. wide. This block, before being recessed, should be about $3\frac{1}{2}$ in. by $2\frac{1}{2}$ in. by $\frac{1}{2}$ in. in thickness.

Wiring Up.

The coil socket is drilled through the centre and screwed to a small wooden block, C, which is secured to the opposite end of the baseboard in the manner shown.

A FINE TUNING CONDENSER.

A VERY useful vernier condenser can be easily made from a few odd pieces of material and an old condenser dial. The idea is clearly outlined in the accompanying sketch and needs little explanation. A is a thin brass plate which is drilled to take a short piece of threaded brass spindle, and three small screws. All holes are well countersunk, those for the screws to take the heads of same, and the large hole to take a little solder which joins the plate to the spindle.

Mica Dielectric.

The spindle should be about $1\frac{1}{2}$ in. long (according to the thickness of the panel), and before screwing the plate to the under side of the ebonite dial, B, the edges should be nicely rounded off with a file and some emery cloth. It is most important that the face of this plate should be perfectly smooth. The fixed plate, C, is then screwed down on to the panel and covered with a sheet of ruby mica, D, which is secured to same by means of a little shellac varnish and a hot iron. One of the screws is longer than the others, and this is arranged as a bolt for connecting up purposes.

The complete condenser is shown in the lower sketch, where it will be seen that the contact from the movable plate is taken from the end of the spindle by means of a strip of spring brass, E, and from the fixed plate by means of a nut attached to the end of the long screw.

The terminals, condenser, and detector may now be mounted on the panel, these being wired up with square section bus-bar exactly as shown in the wiring diagram, on the left.

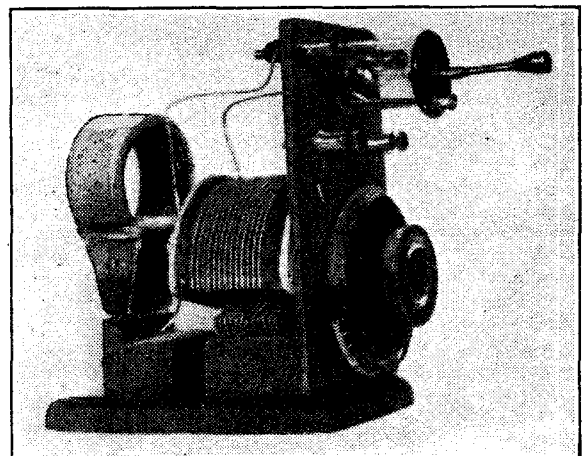
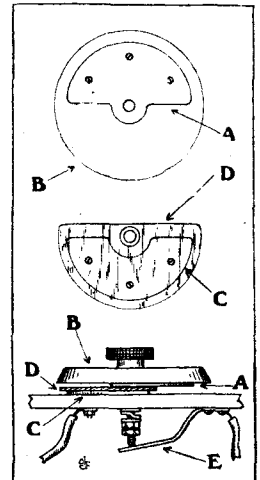
Testing the Coils.

Using the average aerial a No. 35 or 50 plug-in coil will bring in any broadcasting station, providing the condenser has a capacity of .0005 mfd. and that the operator is within crystal range of a station, and a No. 150 coil will be about correct for 5 X X. The position of the moving plates of the condenser should be carefully noted and if, for instance, they should be adjusted to maximum capacity when using a No. 35 coil on the broadcasting wave-lengths, then a No. 50 coil should be substituted and the capacity reduced. Similarly, if the condenser is set at zero, that is, if the moving plates are "all out," this indicates that a smaller coil may give better results with a little capacity. The point which should always be aimed at is to use as little capacity as possible.

With the present arrangement the operator is enabled to note the condenser settings at a glance, and one is thus able to gain a considerable amount of knowledge on the subject of tuning.

Naturally this condenser will not have a very great maximum capacity and should only be used in conjunction with a condenser of the ordinary type in order to provide finer tuning. The connections in this case will therefore be from each of the sets of plates, of the larger condenser to C and E of the small vernier.

Tuning will then be carried out in the usual way until best results are obtained and the final tuning is carried out by varying the vernier.



A photograph of the "All-wave" Crystal Set described above.

THE RECEPTION OF SHORT-WAVE SIGNALS

A LONDON AMATEUR'S EXPERIENCES

By W. PULLMAN (5 L.P., of London.)

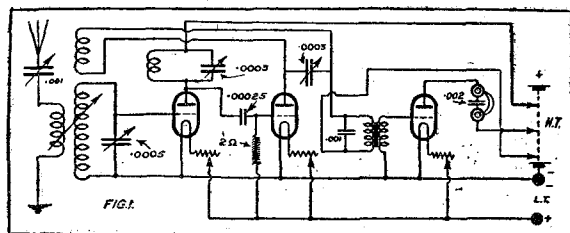
The amateur station, 5 L.P., is well known to London listeners, and in this short article Mr. Pullman offers some interesting suggestions to readers of "P.W." with regard to short-wave reception.

[I]N these days, when every amateur is doing his best to transmit on a short wave-length of, say, 120 to 150 metres, and in some cases down even lower, many people have found it difficult to get good reception. Not that short-wave reception is any more difficult than any

Having due care to all these points, let us commence on a receiver which, though well known, is little used, and so dispose it that it may be truly portable. Taking the circuit shown in Fig. 2, we may lay it out as shown in the rough sketch, Fig. 3. I think all the components speak for themselves.

The coil is wound in three sections (Fig. 2), A and C being $\frac{1}{3}$ of the number of turns on B, and the minimum wave-length of the coil is equal to the turns at B multiplied by 10.

The writer saw this, or, at any rate, a similar circuit, some time ago in an American paper, and tried it out with most excellent results, and for this reason feels that it is a quite worth while circuit for any amateur.



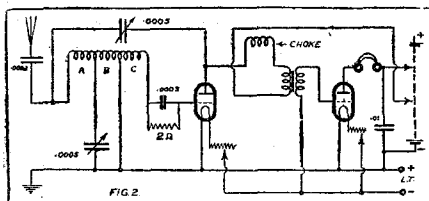
other reception, but everyone has got used to one type of working.

First of all, one must realise that short-wave tuning is much finer than long wave, and therefore greater care is required. I venture to give one or two circuits which have proved very successful for this particular work. Fig. 1 is very simple to operate, and it will be noticed that the aerial coil of eight turns is wound on the secondary to give a close-coupling.

Some Important Points.

Fig. 2 is an extremely efficient circuit. It is well-known, but, I venture to think, little used, though it is worthy of a trial both for short and long wave reception.

I could give dozens of circuits, each of which would be found to have some advantages over the ones at present in use; for it must be owned that a very large number of amateurs are far from expert in the reception of short-wave signals.



The insulation both of the aerial itself and the lead-in are highly important, and every care should be taken to avoid losses in this direction; and it must not be forgotten that even the smallest trace of soldering paste left at the back of the panel may have disastrous effects. I mean from the point of view of signals.

Again, the wiring of the panel itself should be well done in bare wire, and care should be taken that the various components are so disposed that the wiring is as short as possible.

A Counterpoise Earth Advisable.

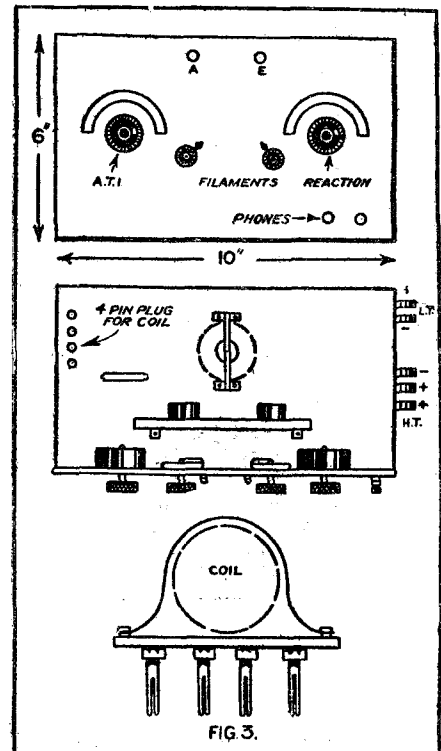
To those interested in the transmission of short-wave telephony, I would recommend the circuit shown in Fig. 4, which is similar to that used in my own station, 5 L.P. It is simple to operate and gives quite full modulation, and is quite efficient.

The grid coil, it will be noticed, is not in any way coupled to the aerial inductance, but is separately tuned with a condenser (.0005). This gives very sharp tuning, and enables very critical adjustment of modulation to be obtained. This circuit is also shown with a .1 mfd. condenser in the earth lead, which may be dispensed with if the household light supply is not used.

It will also be found that a counterpoise or earth screen will be of considerable advantage, especially for short wave work. The valves used, and for which this circuit is designed, are power A.T. 25, modulation L.S. 2, and speech amplifier, any good R type. It will thus be seen that this transmitter has the added advantage of not requiring two-power valves, which is quite a consideration when expense has to be studied.

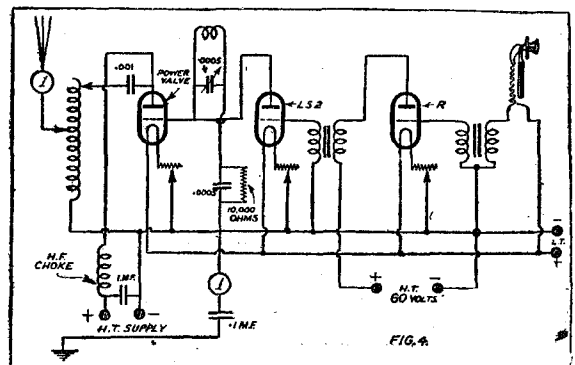
The aerial inductance should be wound of heavy-gauge wire or strip on a skeleton former made from ebonite rods, fixed to ebonite end plates about 10 in. diameter and 14 in. long, and the wire should be spaced about $\frac{1}{16}$ in.

The grid coil is wound on a 4-in. former of 22 S.W.G., D.C.C., and it will be found that about 22 turns will work quite well on 160 to 200 metres' wave-length. If preferred, ordinary plug-in coils may be used.



Winding the Radio Choke.

The high-frequency choke may be wound on a 4 in. former of ebonite, and have 300 to 400 turns of 28 S.W.G., D.C.C. wire. It is quite as well to wind this to



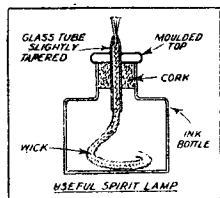
500 turns, and tap every 50 from 300, so that the most suitable value may be easily found. Apart from the foregoing points, the whole transmitter is so simple that it hardly requires explanation, but of course, the aerial, as for reception, should receive most careful attention.

Constructional Notes

Conducted by Dr. J. H. T. ROBERTS, F.Inst.P.

Useful Spirit Lamp.

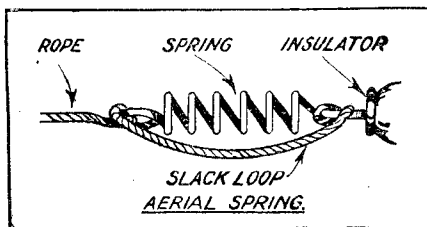
A SPIRIT lamp is very useful for a great variety of purposes in the experimenter's laboratory. It gives a small and not too hot flame, without any soot, and is very convenient for fixing crystals in fusible metal in their crystal cups, for soldering small joints, and very many other purposes. It is not necessary to buy a conventional spirit lamp, however, as one may readily be made from an ink bottle, through the cork of which a central hole is drilled for the in-



sertion of a short piece of glass tube. A piece of round wick, about $\frac{1}{8}$ or $\frac{3}{16}$ in. diameter, should be passed up the glass tube, and if the tube has previously been slightly tapered (as shown) by heating in a Bunsen flame and drawing out, and then cut off with a sharp edge, the wick may from time to time be pulled upwards, and will not be liable to fall backwards down the tube again.

Aerial Spring.

It is well known that, owing to variations in the humidity of the atmosphere, the ropes frequently used for supporting the outside aerial wire vary in length, with the result that in certain kinds of weather the aerial may sag quite considerably, whilst in other conditions it may become so taut as to be in danger of snapping. In order to maintain the aerial in a taut condition in all weathers it is sometimes recommended to pass the supporting rope over a pole on the mast, and to attach a weight to the lower end of this rope. A simpler method, however, is that indicated in the illustration. The aerial is attached to the mast or other support by means of a strong spiral spring of fair length, and this spring takes up any

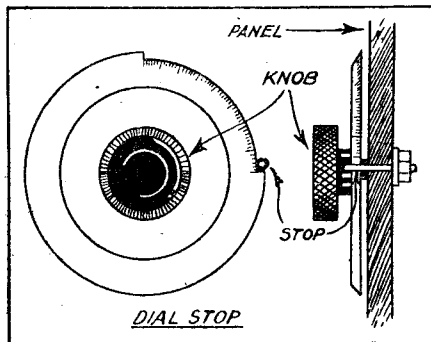


variations in length due to the supporting rope. In case the spring should break at any time, it is a good plan also to connect a slack loop of rope across the ends of the spring.

Dial Stop.

The following hint, from "Radio Digest" (New York), is useful for the dial of a vario-

meter, where it is undesirable to turn too far in one direction, and has the advantage that it prevents the flexible leads from being twisted off. The method will be seen from the figure. Over one-quarter of the circumference of the dial, the latter is filed away for about one-sixteenth of an inch, and a stop is then inserted in the panel from the back, projecting through in such a way that the dial is limited to a revolution of 90 deg.



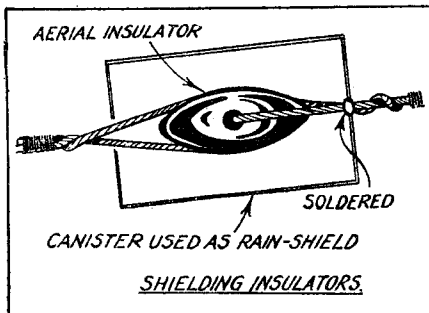
Of course, the same result can be accomplished by using a panel stop and securing a projecting pin to the dial.

Universal Connectors.

The small dress fasteners, variously known as snap-fasteners and patent-fasteners, not unlike a diminutive version of a glove-fastener, may be made to serve a great variety of useful purposes as connectors. For example, by soldering one half of the fastener to the 'phone tips and the other half on the panel by means of a pin or small screw, the 'phones may be plugged in easily and, furthermore, if the cord should accidentally receive a strong pull, the connector is released without any danger of disturbing the set. A very good multi-point switch may be made by pinning to the panel as many points as are required in circular formation, with one at the centre of the circle, and then to employ a switch-arm consisting of a strip of brass with half of a connector soldered at each end at a distance apart equal to the radius of the circle. The fastener in the centre forms the swivel and when the right point of the switch is found the other fastener is inserted. Another use is to form a contact-swivel for honeycomb or other coils. The ends of the coil are brought to the two projecting halves of the connectors, the opposite halves of the connectors being soldered to the ends of the two brass strips. The coil is sprung in between the two strips, the snap fasteners in this case doing duty both electrically and mechanically. Coils may easily be interchanged. A great many other uses for these connectors will occur to the reader.

Shielding Insulators.

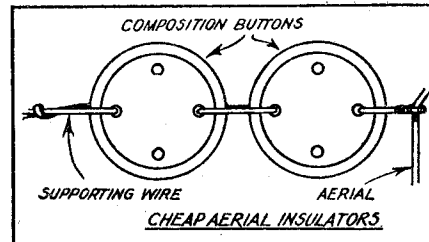
Here is a very simple and useful arrangement from "Radio News" (N.Y.), which considerably improves the efficiency of aerial insulators, especially in wet weather. Everyone knows that an insulator can only function efficiently so long as its surface is clean and dry. A film of rain water on the surface of the insulator will very materially



reduce its insulation resistance, and likewise the deposition of soot and other dirt upon the surface will produce a more or less conducting film. A tin canister or other convenient shield may, however, be slipped over the insulator, in the manner indicated in the drawing, and will have the effect of preventing rain from reaching it and also, to a large extent, of retarding the deposit of dirt upon its surface. In order to prevent rain water from entering the shield or cover, and also to keep the cover in a symmetrical position, the latter should be soldered at the point of contact of the shield with the shaft of the insulator, as shown in the figure.

Cheap Aerial Insulators.

It is very important to have the aerial, even if it be an indoor one, adequately insulated, and for use as improvised insulators a considerable variety of more or less common objects have from time to time been suggested, including bottle-necks, glass tubes, rubber rope, and so on. One of the simplest and readiest insulators, however, is a large composition or bone button. Practically any type of moulded button will be found to be a good insulator, and those which are made of a



vitreous substance are frequently very good insulators. The holes already present in the button are convenient for looping the wire, and two or three buttons used in series give insulation quite equal to that provided by the more conventional article.

For outdoor aerials which have to stand considerable variations of temperature and the different pulls due to wind pressure, etc., the button insulator is not recommended, as it is not sufficiently strong. But for all types of indoor aerial it will be found very satisfactory if a suitable insulating material has been selected.

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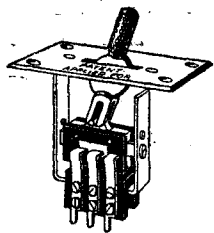
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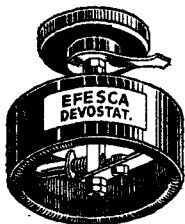
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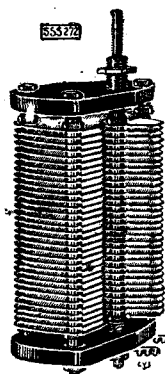
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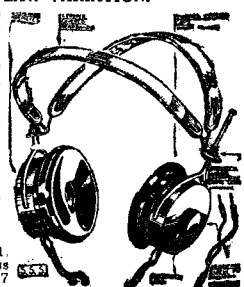


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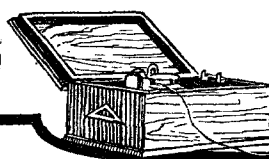
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L.F. AMPLIFICATION AND INCREASE OF RANGE.

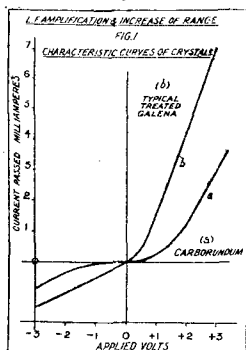
By **LIEUTENANT-COMMANDER H. W. SHOVE, D.S.O., R.N.**

This interesting article, by a wireless expert of the Royal Navy, deals with a subject of importance to every experimenter, and gives a clear outline of the comparative merits of H.F. and L.F. amplification.

It is commonly said, and popularly taken for granted without further question, that when it is desired to increase the "range"—i.e. the sensitivity to distant or weak signals—of a receiver the correct procedure is the addition of H.F. amplification, whereas L.F. stages only add to the volume of signals already detectable. It is the object of the writer in the present article to examine this generally accepted idea, with a view to putting before his readers considerations which may tend to a clearer conception of the reasons for this belief and the limitations within which it is true. Finally, he has a few practical suggestions to make. Crystal rectification is primarily considered, although a good deal of the argument applies equally to cases where the rectifier is a valve. In the first place, it is necessary to get a clear idea of what constitute "detectable" signals, and of what exactly an amplifier does.

Crystal Limits of Sensitivity.

Fig. 1 shows the characteristic curves of (a) a carborundum and (b) a treated galena crystal, such as the ordinary types sold under various trade names. It will be seen that in both cases there is a sharp bend in the curve—i.e. a fixed original potential at which the increase of current due to a cer-

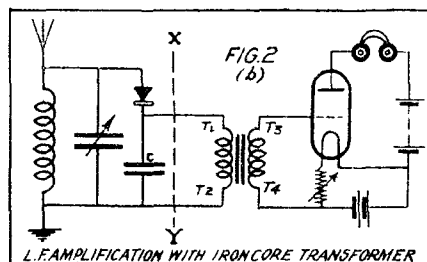


applied to the crystal, there will be a difference in the currents corresponding to equal increase and decrease of signal voltage, however small such increase or decrease may be. That is to say, there is no definite point at which we can say, so far as the crystal is concerned, that the rectifying action ceases and that signals are undetectable. The position of the bend in the characteristic curve is, of course, all important, and in trying out any new detecting crystal it is necessary to ascertain by experiment where it lies. Fortunately for the simplicity of our apparatus it happens to be at "zero" or earth potential in all the generally used crystals except carborundum. But this must not be assumed with a new detecting substance (of which, by the way, there may be a very large number not yet discovered).

Amplification Efficiency.

Now it would seem from the foregoing that, however distant or weak signals may be, we ought, if we have a satisfactory device, to be able to render them audible by amplification, either before or after rectification, with equal ease. Why, then, is this not found to be the case in practice?

The two chief reasons are: (1) That it is

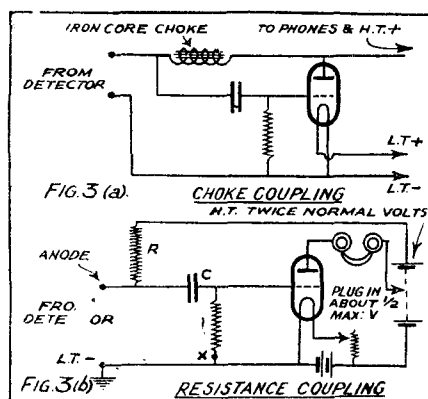


not generally practicable to make use of reaction on the L.F. side (though it has been done); (2) That the ordinary system of L.F. amplification by iron core intervalve transformers is not so efficient as the systems used in H.F. work.

Fig. 2 shows, side by side, the two commonest methods of adding a valve to a crystal detector: (a) as an H.F. amplifier with tuned anode coupling, and (b) as an L.F. amplifier with iron core transformer. In (a) the potential variations applied to the detector and 'phones are those across the tuned anode circuit L.C., and it is the amplitude of these variations that governs the current variations in the detector circuit and consequent signal strength.

The principle on which these voltages are built up is really that of the "rejector"—i.e. when the anode circuit is exactly tuned to the incoming wave it opposes a practically infinite impedance to the passage of currents of the incoming frequency. Thus the voltage drop across it is the maximum amplified voltage obtainable from the valve and all the current due to this voltage is

available in the detector circuit. There are, of course, losses in the circuit L.C., but it is not difficult (on the broadcast wave-lengths,



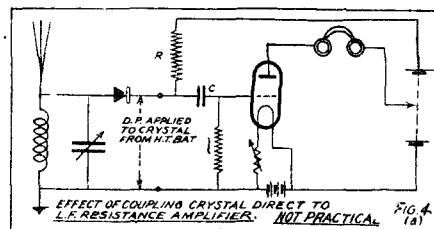
at any rate) to design the apparatus so that they are very small.

So far it would seem that we could substitute a very high resistance for the tuned anode and get the same results. But here we come up against two considerations.

(1) Whereas the impedance of the tuned anode to the D.C. of the H.T. battery is low, so that we do not need to consider it in fixing the voltage which must be used to get the anode potential necessary to the proper functioning of the valve, the resistance will oppose the passage of the D.C. just as much as that of the H.F. oscillations, so that, to reach a high degree of efficiency, the H.T. battery would require to be large.

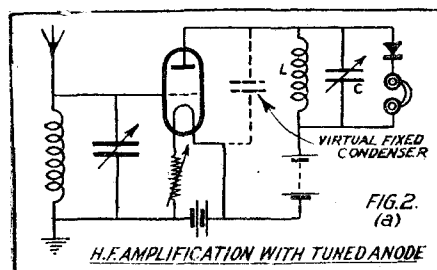
(2) There is a "condenser" effect, as shown by the dotted lines in the figure, between the anode and filament of the valve which short-circuits the external anode circuit and, at the very high frequencies (short waves), the loss by this path destroys the efficiency of the apparatus.

Objection (1) is only a matter of degree



and can be compromised, so that the resistance method can be, and in fact is, used with success on frequencies lower than about 300,000 per second (waves over 1,000 metres). But objection (2) is serious, and indeed, save with specially designed valves, etc., practically fatal for higher frequencies than those named.

(Continued on page 442.)



tain increase of applied E.M.F. is considerably greater than the decrease of current due to an equal decrease in E.M.F. It is on the sharpness of this bend that the value of the crystal as a rectifier depends. But I do not propose to discuss this point here. The object of the figure is to show the continuity of the curve.

It will be seen at once that, provided we are actually working at the bend—i.e. provided the correct initial potential is

L.F. AMPLIFICATION AND INCREASE OF RANGE.

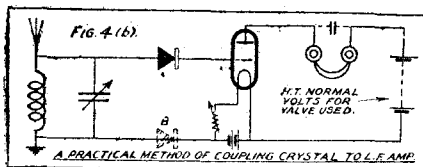
(Continued from page 441.)

In Fig. 1 (b) everything to the right of the dotted line X Y is at low frequency. The small condenser *c* is used, as a rule, for the express purpose of by-passing the H.F. impulses, but its high impedance to L.F. forces these impulses to apply themselves to the primary of the iron core transformer $T_1 T_2$. This transformer is usually designed with a "step-up" between the windings, so that theoretically the voltage across the secondary $T_3 T_4$ is higher than across $T_1 T_2$. It is not possible to examine this theory within the limits of the present article, but it may be said at once that in practice this step-up is largely illusory.

There are always losses opposed to the action which very quickly bring down the voltage across $T_3 T_4$. And these losses, due to interwinding capacity, hysteresis in the core, etc., are not merely a certain percentage of the theoretical E.M.F. They vary with the frequency as well as with the amplitude, and may easily—and in the case of weak signals very quickly do—damp out the oscillations sufficiently to leave us with an actual loss of potential in the transformer. And we cannot save ourselves by using a tuned circuit here, because the oscillations at audio-frequency are not (like those at radio-frequency) on one wave-length.

Avoiding Distortion.

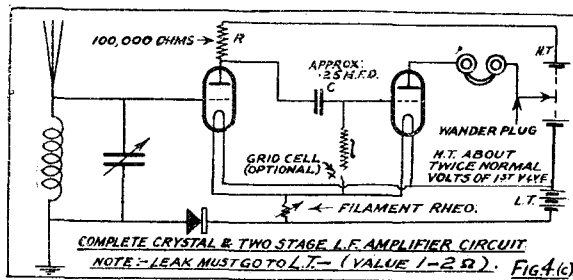
They cover the whole range of note-frequencies audible to the human ear. So that all we can do with an L.F. transformer is to make its resonance curve as flat as possible, to avoid distortion put up with the



inevitable losses introduced. Unless, then, our signals are already strong enough to overcome these losses we cannot usefully employ this method of amplification. It is this fact that explains why it is commonly said that L.F. amplification does not bring in signals previously inaudible.

Fig. 3 (a) shows "choke" coupling. I will not linger over this, beyond saying that as we again have an iron core the hysteresis losses will still be with us, while we have sacrificed the "step-up" and limited the possible amplification to the amplification factor of the valve. The only advantage of the method over the resistance coupling shown in Fig. 3 (b) is that it is somewhat easier to get a high percentage of the theoretical maximum (but at the expense of introducing distortion) without using a high plate voltage. In Fig. 3 (b) we have a diagram of a resistance coupled L.F. amplifier, which in the form shown is suitable for use after a valve rectifier.

Here the E.M.F. applied across the grid and filament of the valve is that across the resistance *R*. As there are no hysteresis or capacity losses, and as we do not require to compromise, as with the transformer, to avoid distortion (which is wholly absent owing to the aperiodic nature of the apparatus) this form of L.F. amplification will respond to very weak signals. The actual amplification is limited theoretically by the amplification factor of the valve, but to obtain this in practice *R* would have to be infinite. The H.T. voltage would likewise have to be infinite, so that in practice we



have to be content with a degree of amplification less than this factor.

"Direct" Amplification.

Without going into detail, for which I have not space, it may be said that with an average "R" valve we can get about 2/3 of the theoretical maximum by making $R = 100,000$ ohms and using double the normal H.T. voltage. The function of the condenser *C* is to prevent the D.C. voltage getting to the grid, and so rendering the arrangement inoperative. It should be fairly large (about .25 mfd. is suitable), but the value is not critical.

The grid leak *L* is not for rectification, but to give a suitable grid bias. A biasing cell at *X* may be used sometimes to assist this. The arrangement of Fig. 3 (b) is not suitable to follow a crystal detector as the first stage of L.F. amplification, since it would involve putting a large potential on the crystal, as we see in Fig. 4 (a). To avoid this we can adopt the arrangement of Fig. 4 (b), where the crystal is connected directly in the grid circuit of the first amplifying valve. It can, of course, be either at *A* or at *B* without affecting the theory of the circuit, but the writer favours *B* as the point for best

results. This, however, is easily settled by experiment.

Purity Before Signal Strength.

We do not now, of course, get the benefit of any step-up effect whatever, the function of the crystal being merely to rectify the impulses before they reach the valve, and the signal strength will not probably be greater from this arrangement, without further amplification, than they would be with a single detector valve without reaction. But the signals will be of "crystal" purity, and, if a second valve be added, by the use of the arrangement shown in Fig. 4 (c), we shall have a very fairly sensitive circuit of quite respectable power and still giving absolutely pure reproduction. The addition of a third, or even a fourth, valve may be tried, and it will be found that not only volume but "range" is increased.

And this will be accomplished while still retaining the incomparable purity of the crystal receiver. It seems to the writer that a great many listeners are not fair to the B.B.C. or to themselves. The present broadcast transmissions are a triumph of pure reproduction.

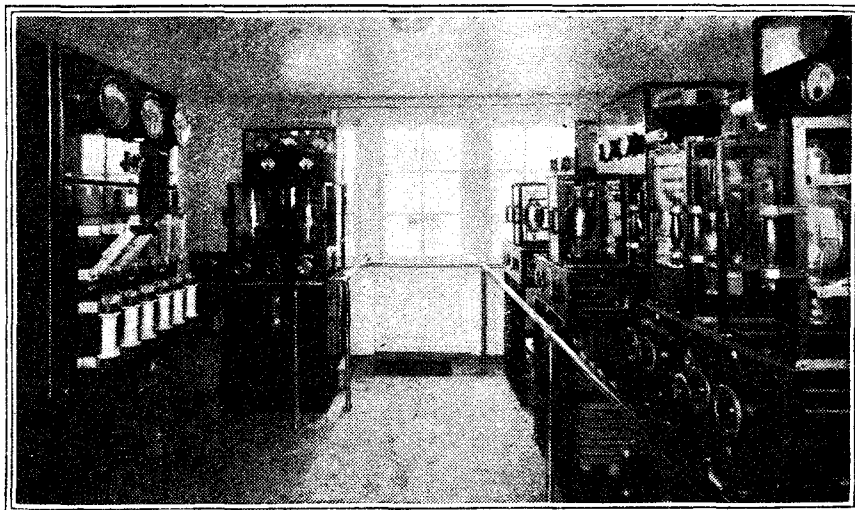
A very large percentage of users of valve sets lose all the pleasure of this by employing distorting methods of reception. L.F. transformer amplification is one of these, reaction can easily become another. H.F. amplification, apart from reaction, is less dangerous. But it complicates tuning.

Three Striking Advantages.

The arrangement described above does not claim to give the same results as regards sensitivity, in proportion to the number of valves used, as the ordinary H.F. methods. But it should appeal to many because:

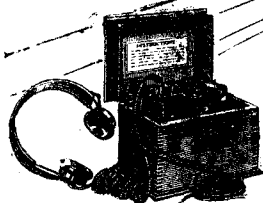
- (1) there is no distortion;
- (2) there is no tendency to "howl";
- (3) above all, there is no complication in the tuning, which remains exactly the same as for the simplest crystal set.

With the editor's indulgence, I hope in a future article to describe in detail the construction and use of a set on these lines and to give a few figures as to my own results. Meanwhile, I shall be glad to hear from anyone interested in this very promising line of development.

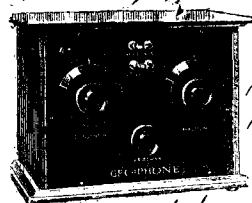


The Transmitting Plant at the Brussels Broadcasting Station.

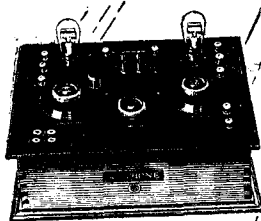
Britain's Best BROADCASTING SETS



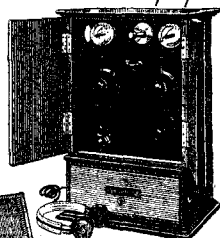
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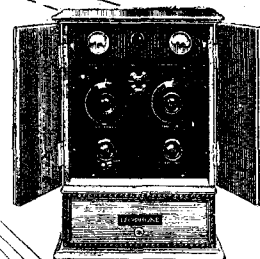
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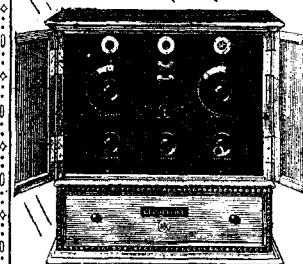
Advertisement of The General Electric Co., Ltd.
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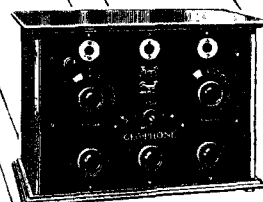
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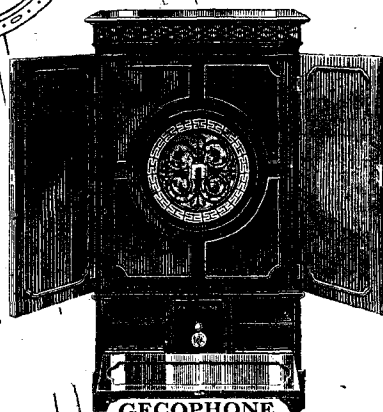
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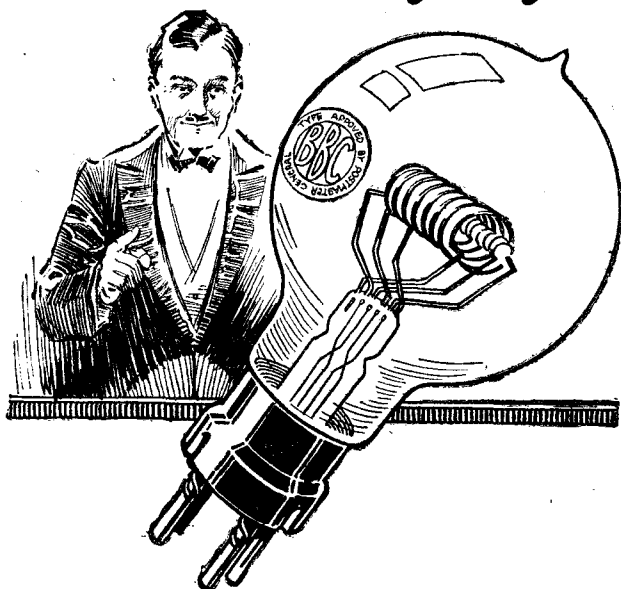


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Take a twelve-week period, using your set, say, 4 hours each day with an ordinary "R" Type valve. During that period your accumulator will require recharging ten times at 2/- per charge, or 20/- in all.

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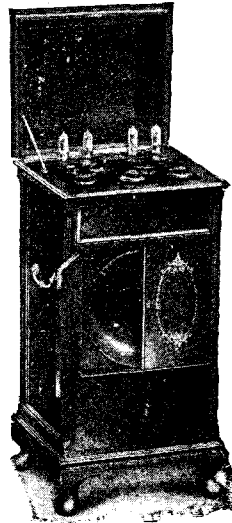
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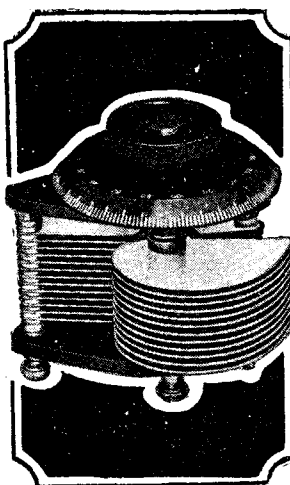
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Mainly About Broadcasting

by
The Editor

THE fact that the B.B.C. obtained permission from the Post Office to broadcast political speeches by the leaders of the three chief Parties augurs well for the future and freedom from red tape of the B.B.C. They cannot be accused of not being impartial in the broadcasting of these speeches. Mr. MacDonald, Mr. Baldwin, and Mr. Asquith have been given equal facilities for placing their Party's views before an audience of unprecedented size.

It is to be hoped that this innovation of broadcasting political speeches will pave the way, and will eventually result in the B.B.C. obtaining permission to broadcast occasional speeches from the House of Commons.

Everybody is interested to some extent in politics these days, and if it were possible to listen in one or two evenings a week and hear big political leaders address the House on some vital question of the day, I am sure many, many thousands of people would make up their minds to install a wireless set, if only for the reason that they would be able to hear speeches from Parliament. Admittedly, a good deal of the Parliamentary business would be unfit for broadcasting.

"Educational" Broadcasting.

There is a lot of dull routine in the House of Commons; but, on the other hand, there are times when the Man in the Street opens his morning newspaper and reads a vivid account of some great speech made in the House of Commons the night before, and wishes that he could have been there to hear it.

Once the B.B.C. obtain permission to install a microphone in the House of Commons, and to broadcast really interesting speeches, there will be a great and increased revival of interest in wireless throughout the country.

I have noticed in the papers lately, and in various magazines, a good many platitudes about the "educational effect" of broadcasting. A good many of the writers of these rather smug articles, dealing with the "psychology of broadcasting and its effect on the child mind," etc., seem to be obsessed with the idea that anything new (like broadcasting) must be twisted and contorted so that it can be used in some way or another as a means of "educating" people.

A good many of my readers have probably noticed a lot of jargon of this sort in the papers in connection with theatres. The high-brow critics write column after column emphasising the need for loftier plays, and well-known authors, producers, actors, etc., submit themselves to interviews and dilate with considerable self-satisfaction on the "educational effect" the stage has, and hopes to have, in increased measure, on the poor public.

This craze for educating people must not be allowed to swamp the true vocation of broadcasting. First and foremost, broad-

casting is a source of entertainment, and first and foremost the theatre should primarily concern itself with entertaining its patrons.

When a man goes home from his office and decides to go to a theatre, he may, according to his temperament, prefer to be superficially amused or to have his brains stimulated. If he wants to be amused he goes to see George Robey; if he wants his brains stimulated he goes to the Everyman Theatre, or some other high-brow theatre, and revels in a dose of Bernard Shaw.

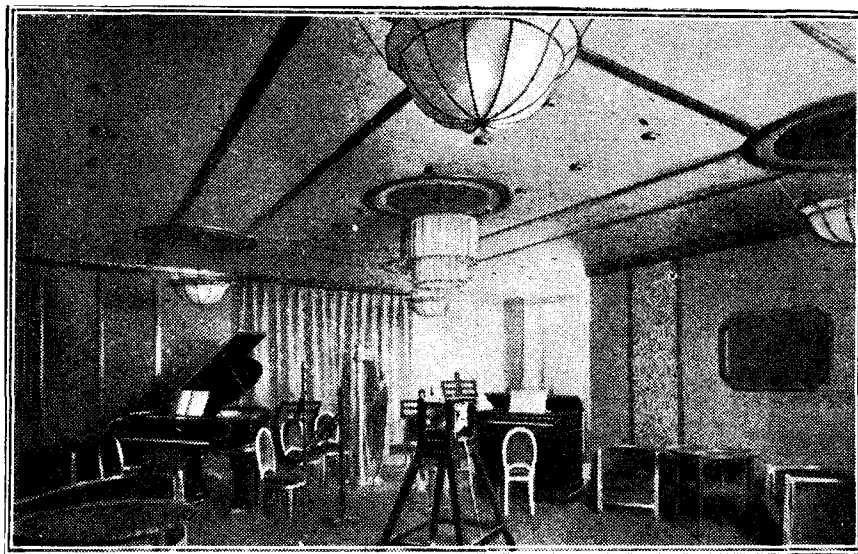
That is quite all right, but the trouble is that a movement seems to be spreading to make nearly every sort of entertainment of "educational" value, and the same disease is in danger of attacking broadcasting. The trouble has not gone too far at the moment, and with luck it can be nipped in the bud.

But, frankly, there seems to be a craze amongst certain members of the B.B.C.

considerable number of people who prefer to seek culture and general enlightenment in other directions, and who, when they put on the 'phones, would much prefer a straightforward course of entertainment, mixed with one or two sensible and straightforward talks, instead of programmes which, although at the moment are not unduly obsessed by the craze for disseminating education right and left, certainly show a tendency to slip that way.

"Guff."

I remember publishing in POPULAR WIRELESS, about eighteen months ago, a number of letters from well-known people expressing their views on the educational possibilities of broadcasting, and one of the choicest letters published was by that well-known authoress and critic, Miss Rebecca West. I will not reproduce that letter here again, but the gist of Miss West's views



The Studio of the Broadcasting Station at Brussels.

staffs at various stations to produce programmes which will have an "educational" effect. There is a good deal of talk about "educating" the public to appreciate good music, and there seems to be a good deal of talk about "educating" the public to appreciate good poetry.

Whether the public wants all this education, and whether they thank the B.B.C. for their efforts to "educate" them, is a matter of opinion. I write this in no carping spirit; in fact, I cannot help feeling rather amused at the whole business. But the thing is becoming so noticeable of late that I cannot refrain from drawing my readers' attention to it, and inviting them to express their views in letters for publication in this journal.

For all I know the majority of listeners-in may prefer this subtle form of "education," but on the other hand there may be a con-

was "never mind all this guff about educating people by wireless; bring a little laughter and entertainment into thousands of homes, and the B.B.C. will be doing a wonderful work."

Frankly, I am heart and soul with Miss West in that opinion.

Re-reading this article, it occurs to me that some readers may say it is contradictory—because the opening paragraphs advocate the broadcasting of political speeches in the House of Commons. Some may regard such transmissions as educational—some may not. Personally, I find politics of to-day more amusing than any revue; but there again crops up the slogan of the B.B.C. "We cater for the majority." And possibly the view I hold is very much in the minority. Anyway, it's an amusing question, if nothing else!

HUMOUR AT THE RADIO EXHIBITION.

By "ARIEL."

IN the Radio world the exhibition recently held at the Royal Albert Hall was considered by some to be the greatest event of the year, over 31,000 visitors having passed the turnstiles during the eight-day show. Of this large number two-thirds were men. The exhibitors told me they were very pleased with the results of the exhibition. The interest of visitors, they said, was most encouraging, and it is expected that this winter will see a boom in the wireless trade; in fact, the optimism shown by some was somewhat far-reaching. One

"In that case," she said, "you ought to be able to answer my questions." "Certainly, madam," replied the assistant. "Well, can you tell me where I can buy a crystal—a really good crystal, you know—one that will get all the world—if I wish it!" The polite assistant hastily escorted her to a stand, which was exhibiting crystal wireless receivers.

I had rather an amusing experience one day with a family who showed great interest in my explanation of the twenty-four valve

which was showing on our stand. At the conclusion of my explanation, the father came up to me in a confidential way and asked whether it would be possible for his son to make the set. If so, would I draw out the diagram?

I quickly glanced at his son—a boy of about fourteen—and told the father that it might be possible if he thought his son was skilled enough; but it would take me too long to draw the diagram now, and I would do so after the exhibition.

The Young Constructor.

The father then introduced me to his wife and son. The mother of the boy immediately commenced to tell me the good points of her son. "Henry (no relation to John) is very clever," she said, "and is top of his form in scripture and history—aren't you, dear? And," continued his mother, not waiting for a reply from her son, "his master, Mr. Scribbins, told Arthur, my husband, that he would be quite good at engineering."

"Has he a wireless set?" I interrupted. "Oh, yes, a crystal set he made himself," she replied. "And I think that is very good for a boy of his age; only fourteen next month, you know."

I then asked the father: "Do you think he can make a set as big as this twenty-four valve set?"

"Well—Henry, do you think you can make this set?" the father asked his son, with pride—as much as to say, "Of course you can, easily!" The boy spoke for the first time, "N-n-n-n, daddie, I-I-I-I-d-d-d-don't think s-s-so!"

His mother turned angrily to him. "You're a ninny, child! Why didn't you say 'yes'? Come along, Arthur, we are taking up too much of this gentleman's time."

The father shook hands with me and they all left the stand.

It is a pity that parents will make such fools of their sons, or, as the parents would say, "It is a pity our sons will make fools of us!" The above story will probably be quoted by the parents to their friends, prefaced by this ejaculation, to warn them what they have to contend with in this hard world.

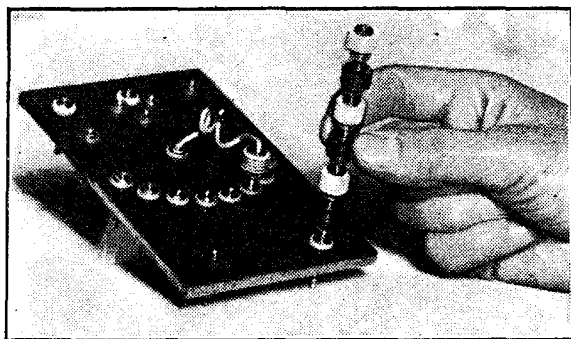
On one of the stands at the Exhibition a lamp was placed, which flashed at intervals. It was there only for the purpose of advertising, but it is surprising how many visitors discussed this lamp. Some said it was transmitting messages, and a whole family, sister, mother, and father, were taken in by a little boy who told them the lamp was used for receiving Morse signals from the other side of the world!

Awkward Questions.

Another exhibitor, who was showing a patent crystal of the "ites" family, was asked by a visitor several questions on crystal reception. Having at last satisfied himself, he went away, but returned to the tired representative just before closing time. "Can you tell me," he asked, "how many crystals of the 'ites' family there are on the market?" "I can't tell you off-hand," was the reply, "but of course there is Hertzite, ebomite, zincite, sunlight, daylight, searchlight, and appetite!"

It was amusing to see how carefully some of the visitors collected the leaflets given away on almost every stall. Arms full and pockets bulging, they still could not resist taking every scrap of descriptive literature they saw!

It is surprising, too, how many people came up to our stand during the Exhibition and asked what was the reason for the blind at the back of the twenty-four valve set, and numbers asked whether we use 'phones or loud speaker! But in spite of many funny questions, the public showed a greater interest in the exhibits and much more enthusiasm than at any previous exhibition.



One of the "Clix" Terminal Boards shown at the Albert Hall Exhibition.

trader told me that the Albert Hall will not be large enough for the next year's show, if one is organised—Olympia would have to be used.

Exhibitions usually mean hard work for the exhibitors and their representatives. The long hours kept are very tiring to the man who has to stand and answer visitors' questions. But in spite of this there is much amusement to be gained, and the change from everyday life is most welcome to many of the representatives sent by the exhibitors.

I spent nearly every evening at the Albert Hall during this exhibition, waiting on visitors who came to the "P.W." stand. I remember one lady asked me a very simple question on crystal reception, and, after I had given her a reply, she asked me another question, and yet another. At the conclusion of a discussion I asked her where she had obtained her wireless knowledge.

A Wireless Fiend.

"Oh," she replied, "I have three sons who are simply mad on wireless. They argue morning, noon, and night, until at last I myself have become a wireless fiend!"

I was glad I had met this lady early in the show, as it gave me a warning that I might meet others equally well acquainted with the subject.

The exhibitor next to the "P.W." stand was showing wireless magazines of foreign countries, and during the day, when a large crowd had assembled round his stand, an elderly lady asked if they supplied magazines all over the world.

"Of course," replied the assistant. "Do you supply them in India, Australia, Canada?" "We do," was the answer.



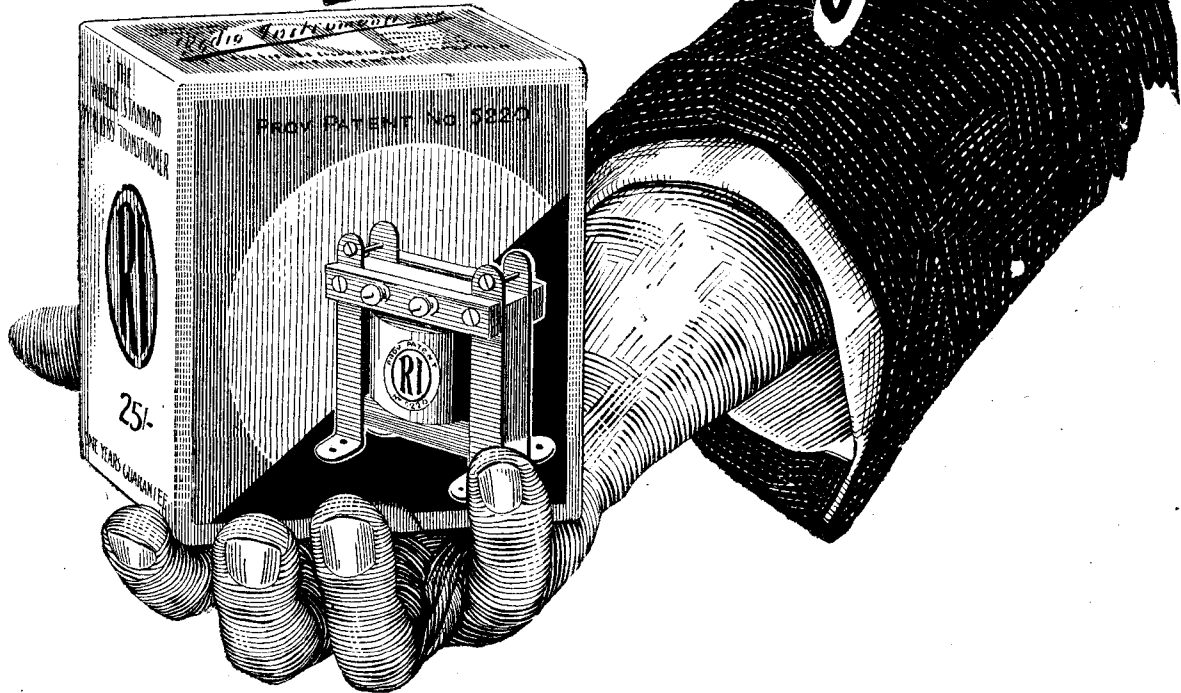
One of S. G. Brown's Giant Loud Speakers at the recent Exhibition.

PRIZES FOR CONSTRUCTORS

In next week's issue full details will be given regarding the "Popular Wireless Constructors' Competition," to be held at the White City Exhibition, Nov. 15th.

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YES—18 micro-microfarads, the lowest self-capacity of any transformer in general use, it eliminates the chief cause of distortion and enables a greater degree of amplification to be obtained at the higher frequencies up to the useful range of audibility.

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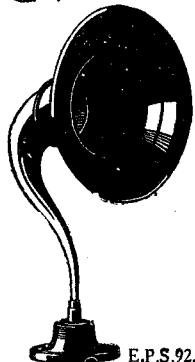
Hullo everybody! I know you will forgive me if I indulge in a little bit of trumpet blowing, but I simply can't help feeling a shade pleased.

To begin with the dreaded slump associated with the summer months simply didn't materialise—any more than the summer itself, and the sale of every one of my products has shown a steady crescendo. I have to thank my Production and Sales departments for this, but most of all I have to thank you. Now I want to do something for you in return.

The Fellows Junior Loud Speaker, with its adjustable diaphragm, pleasing lines, and rich, mellow tone is too well known to need introduction. Perhaps you have coveted one. Well, there is now no need for you to deny yourself any longer. Its price has been reduced to 30/-. For the price of a second pair of telephones you can enable everyone to listen in at once!—another illustration of

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5. 4 in.,	"	"	600 to	750 "	10d. "	5.	8d. "
6. 4½ in.,	"	"	700 to	1,000 "	1/2 "	6.	9d. "
7. 5 in.,	"	"	850 to	1,350 "	1¼ "	7.	10d. "
8. 5½ in.,	"	"	1,300 to	1,750 "	1/8 "	8.	1/- "
9. 6 in.,	"	"	1,700 to	2,600 "	2/- "	9.	1/2 "
						10.	1/4 "
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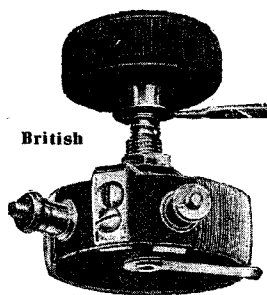
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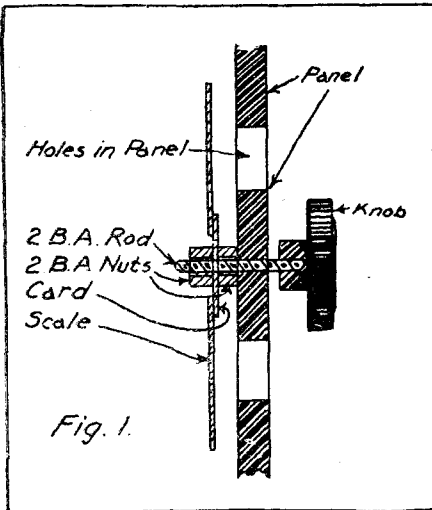
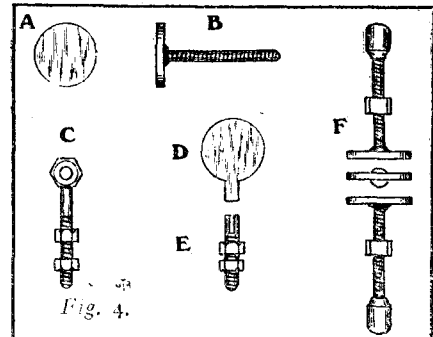
SOME USEFUL IDEAS.

An Ivorine Scale—A Note on Long-Wave Coils—A Loud-Speaker Plug—Neutralising Condensers.

AN ivorine scale, as sold for filament resistances, was obtained and the back divided into 26 equal parts—i.e. 2 for each broadcasting station. One segment was marked "London, 2 L O,

brass discs, A, about $\frac{1}{2}$ in. in diameter, which are soldered to one end of a small threaded brass spindle in the manner shown at B. The supporting pillars, which are attached to the panel, consist of nuts, soldered to the ends of threaded brass rods, as shown at C. The fixed plate, D, is soldered in a slot cut in a short brass rod, E, which is also threaded and provided with nuts for the purpose of fixing same to the panel.

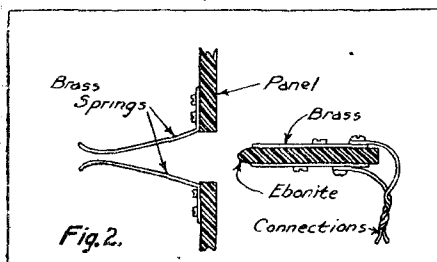
Diagram F shows such an arrangement mounted on the outside of a receiver panel. In some cases the discs may be dispensed with if rods of about $\frac{1}{4}$ in. diameter are used and the "electrode ends" are filed perfectly flat.



365 m.;" and the opposite segment marked "Ac 45, An 80, Re 156," for the readings of the aerial anode and reaction condensers respectively. Other stations and their respective readings were filled in in opposite segments. A piece of circular cardboard was stuck concentrically with and on the scale so as to enable a piece of 2 B.A. rod to be fastened (by nuts) to the centre of the scale. Then by passing the rod through a hole in the panel a knob could be fitted. With a fret-saw two square holes were cut where the names and readings are to appear. A sectional view of the device is as Fig. 1.

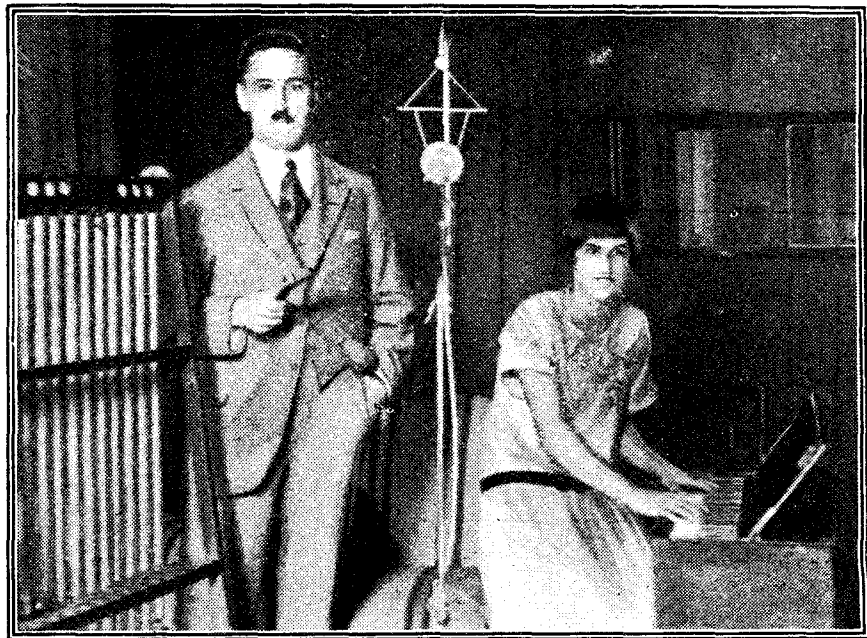
A Loud-Speaker Plug.

A piece of ebonite, 3 in. by $\frac{1}{2}$ in. by $\frac{1}{4}$ in., with pieces of thin brass screwed to each side to which connections are made, composes the plug, and the jack is simply a hole $\frac{3}{8}$ in. by $\frac{3}{8}$ in. cut in the panel and two pieces of springy brass shaped to make contact with the brass parts of the plug. This is more clearly shown in Fig. 2.



Neutralising Condensers.

The very small capacity neutralising condensers used in neutrodyne and similar circuits may conveniently be constructed on the lines indicated in the diagram Fig. 4. The moving plates consist of sheet



Mr. Marshall (station director) and Miss Taylor (Aunt Muriel) of the Edinburgh broadcasting station.

A NOTE ON LONG-WAVE COILS.

MANY listeners are considering the question of winding coils suitable for the new 1,600-metre transmissions, but are deterred by the prospect of getting the values wrong. The following figures may serve as a rough guide. Two brass "spiders," costing $\frac{1}{3}$ each, were obtained, having 11 spokes each around centre discs 1 in. in diameter, and were bolted $\frac{3}{4}$ in. apart in such a way as to have the spokes staggered. Starting at spoke 1 on "spider" A the wire

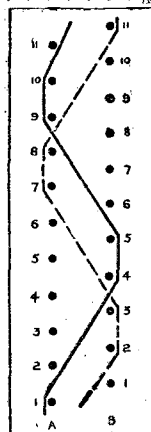


Fig. 3

is taken to spoke 4 of B, passed over 4 and 5 and back to spoke 9 of A, thus finishing 2 spokes behind the commencement. Each turn is therefore two spokes behind the previous one, as shown in Fig. 3, where the first turn is drawn as a thick line and the second as a dotted line. Three coils were wound, using in all $7\frac{1}{2}$ oz. of No. 26 gauge D.S.C. No. 1 had 216 turns; No. 2, 260 turns; and No. 3, 320 turns.

On a 40-foot single-wire aerial, with a 10-foot lead-in, using No. 2 in the aerial and No. 3 in the anode (both condensers .0005 mfd.), Radiola on 1,780 metres came in at about 110 degrees on the aerial and 50 on the anode condenser. On a single-wire P.M.G. aerial, with .00075 aerial and .0003 anode condenser, No. 1 coil required about 40 degrees as aerial coil, No. 2 required about 20 degrees as aerial and about 180 as anode coil, while No. 3 required about 80 degrees when used as anode coil. Exact figures cannot be given, as none of the condensers were calibrated.

A USEFUL TOOL FOR THE CONSTRUCTOR.

By O. J. R.

EVERY seasoned mechanic knows what happens when the head of a small screw is gripped in the jaws of the vice in order to carry out some operation on the shank. No matter if it be a round, cheese, or countersunk headed screw, the result is that two ugly flats are unavoidably produced, and thus the appearance of the screw head is ruined. Now it often happens that (a) a small B.A. brass screw is rather too long for its intended purpose, (b) that the thread is damaged and requires trimming, or (c) that it becomes necessary to convert the thread to the next smallest size; and in order to effect either operation the head of the screw must essentially be held very firmly in the vice.

Not Difficult to Make.

During a lifetime of practical workshop experience, coupled with an intimate knowledge of all the latest and improved tools, the writer has never yet found any available device which would hold the screws in such

and when the small "V" has been filed in the small central projections heat the work in a clear coal fire and bend over the outer ears and the small central pieces at right angles to the strips and in opposite directions.

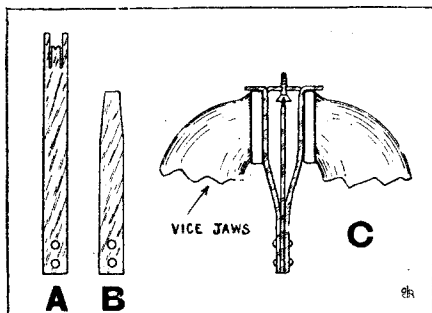
Next, cut out another $\frac{1}{2}$ in. steel strip $2\frac{1}{2}$ in. long, as shown at B, and grind or file off the tapered end so that it fits nicely into the slots of small screws in the same manner as an ordinary screwdriver. Drill two small holes in the opposite end, and then use this piece as a template for marking off the holes in the ends of the other two pieces. Now shape each of the latter as shown, firmly rivet the three pieces together with soft iron rivets, place the whole device in the

fire again until it becomes a blood-red colour and then plunge it into a tin containing ordinary lubricating oil.

For Readers Use Only.

Diagram C shows how to use the device where it will be seen that the outer ears act as supports to prevent it from slipping down between the jaws of the vice during adjustments. The slot in the screw head is made to engage the inverted blade, the screw being placed directly between the small "V" jaws, which are then tightened up by simply screwing up the handle of the vice. If the steel is "spring hardened" in the manner described above, the jaws will open out quite freely every time the vice jaws are released. The device might be made in two sizes; the size just described for small to medium screws, and a larger size for medium to large screws.

The writer would like it clearly understood that this article is intended only to benefit readers who construct apparatus and tools solely for their own use. Manufacturers are kindly requested to note that the design of the device has been registered at H.M. Patent Office.

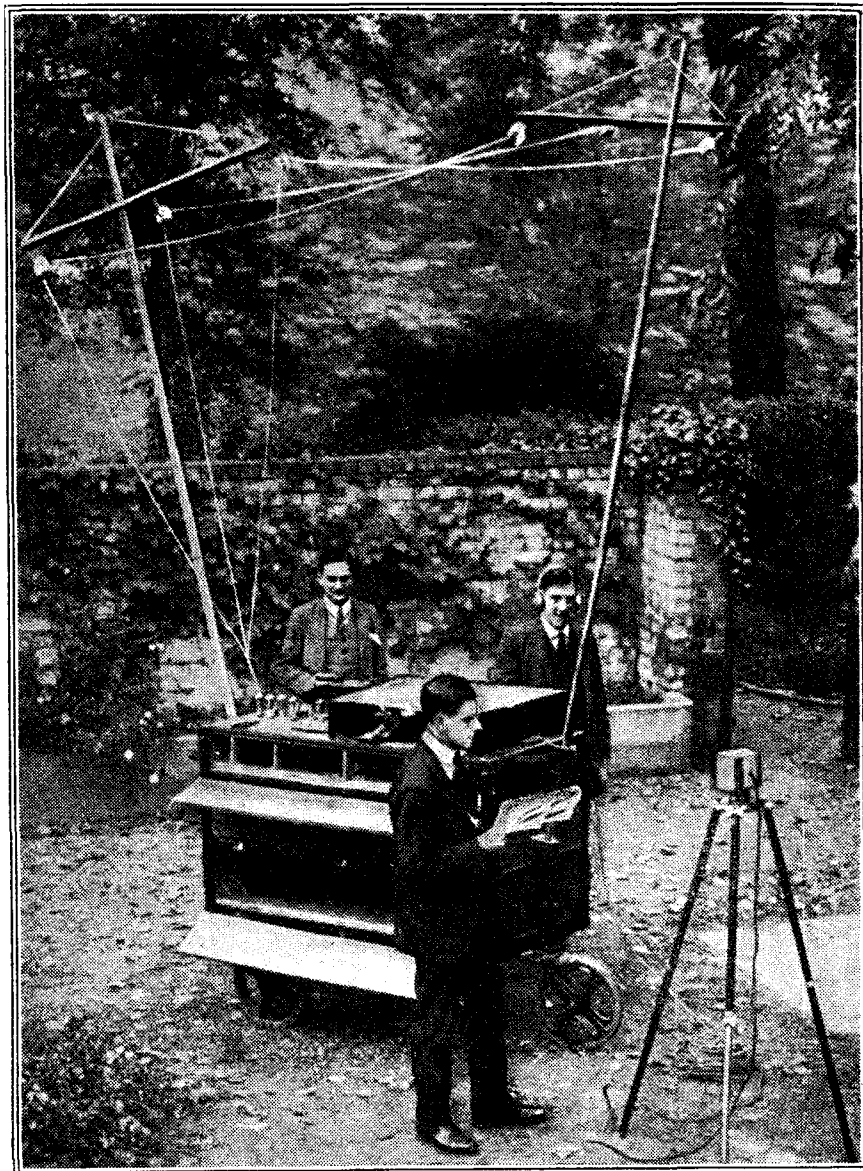


a way as to prevent damage to their heads, except of course the orthodox idea of small lead or fibre clamps, a method which usually necessitates the making of a new pair of clamps for every single operation.

There are other things which might be said against the use of these clamps, and particularly in the case of lead clamps, as every experienced mechanic will know, and so it occurred to the writer that some simple and effective device was badly needed. During an interesting constructional undertaking it became necessary to file rather less than $\frac{1}{16}$ in. off the ends of a large number of countersunk headed B.A. brass screws, and being seriously up against the problem led to the invention of the device to be described in this article. The construction of same will present no difficulties to the average enthusiast with a little workshop experience, and it can be made for a few pence, and will be one of the most useful tools in the workshop.

Hardening the Steel.

Cut out two strips of sheet steel, each $3\frac{1}{4}$ in. long by $\frac{1}{2}$ in. wide, and by means of a fine hacksaw and a small cross-cut chisel shape one end of each piece as shown at A in the accompanying diagram. The saw cuts should be a little more than $\frac{1}{4}$ in. deep,



The B.B.C.'s "wireless pram" in action. Captain West is standing behind the pram on the left.

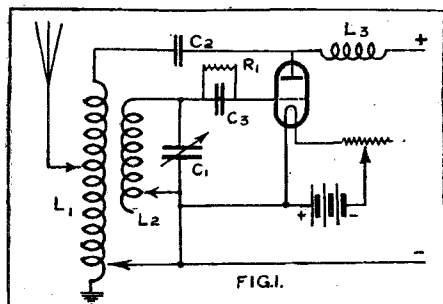
ON THE HIGHER FREQUENCIES.

EXPERIMENTAL RECEPTION & TRANSMISSION ON 3,000 & 6,000 K.C.

By **LLOYD JACQUET**
(20Z of America).

Experimenters will be interested in the following details sent to us by a well-known American amateur Radio experimenter.

IN an attempt to explore the higher frequencies, in the ranges of 3,000 and 6,000 kilocycles, some very interesting and gratifying tests were conducted recently. For transmitting, a special set was constructed, making use of the modified 1 DH circuit. The antenna coil L-1 was wound on a threaded bakelite cylinder, 4 inches in diameter, with 20 turns of bare No. 18 copper wire. This coil was tapped every even turn.



The grid coil, which was wound on a bakelite form $3\frac{1}{2}$ inches in diameter, threaded to take 12 turns of No. 18 bare copper wire, is placed inside of L-1. A condenser, C-1, is used to adjust the grid circuit. It has a capacity of 0.001 mfd., and is variable. The radio-frequency choke coil L-3 is wound on a cardboard tube with No. 28 or 34 wire. No varnish or "dope" should be applied to the 250 turns wound on this form. A honeycomb coil should not be substituted for this, and bank windings should be avoided.

Suitable Aerial Systems.

A fixed condenser of good make is used for C-2, and is of 0.001 mfd. capacity. It should be able to withstand the high plate voltage. With this set, the antenna radiation on 3,000 k.c. (100 metres) was 2.4 amperes. On a frequency of 6,000 k.c. (50 metres), this decreased to 2.1 amperes. Two five-watt W.E. vacuum valves of the "E" type, with 500 volts on the plate, were used.

The antenna for this work was comparatively small. It consisted of a 6-wire 6-inch cage. For 6,000 k.c. work, its length was 20 feet and height 20 feet. For the 3,000 k.c. tests, this was altered to 35 feet for the length and 35 feet for the height. A counterpoise of four wires on ten-foot spreaders and 35 feet long was used for both tests without modifications. The radiating system was so designed as to maintain its rigidity, so as to keep the frequency constant. Both the loop and grid systems of modulation were used for radio telephone work.

The tuning of the circuits of such a

transmitter is naturally not as easy as when lower frequencies are used. In these experiments, the radiated frequency was but one meter above the fundamental of the antenna system. If this relation was not maintained, the transmitter radiated energy, but this did not register.

A special receiving apparatus of novel type was designed for this work. It was made along the lines of a super-regenerative receiver. In this kind of circuit, the amplification increases with an increase in frequency. Hence, the amplification obtainable in the 6,000 and 3,000 kilocycle signals was very great.

Constructional details of the special super-regenerative receiver for this work follows: The antenna coil L-1 is wound on a bakelite tube 3 inches in diameter, with 7 turns of No. 22 D.C.C. wire, with no varnish or "dope" on it.

Short-Wave Reception.

For the secondary and tickler coils, winding of 20 and 19 turns of the same size wire as the primary. These three coils, L-1, L-2, and L-3, are arranged so that they are in a variable inductive relation to each other.

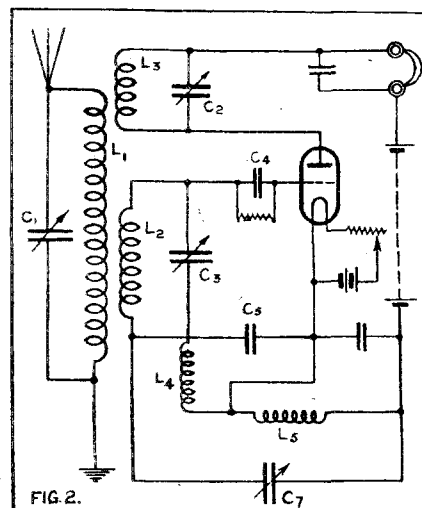
A grid oscillator coil, L-4, and a plate oscillator coil, L-5, consist respectively of a DL-1,500 and a DL-1,250, connected in the method shown. The values for the various condensers necessary are given in the drawing.

To tune the receiving circuits, place L-3 about $\frac{1}{2}$ inch from L-2. Condenser C-2 should be advanced to maximum capacity and C-3 reduced to zero. Coils L-4 and L-5 are placed at right angles. Condenser C-7 is advanced until a thud is heard in the 'phones, later becoming a shrill

whistle. If everything is correctly connected, the audio-frequency hum will be audible. Do not alter these adjustments.

For Receiving.

Adjust the three tuning condensers, C-1, C-2 and C-3, until clear and strong signals are heard. Some practice will be necessary before the best results are obtained.



For receiving purposes, an antenna consisting of a single wire 35 feet in length over-all dimensions, including lead-in and ground, was used. If coils L-4 and L-5 are reduced in size, the audio-frequency noises will disappear, and so will the signals. Static seems to affect the proper operation of this receiver.

A CRYSTAL DETECTOR HINT.

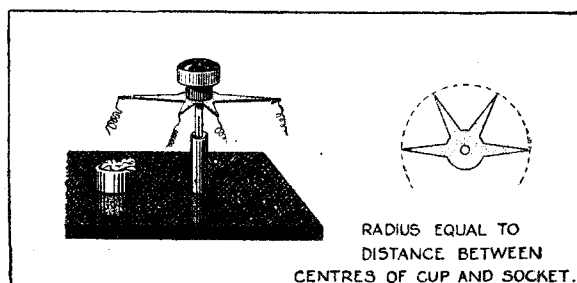
THE annexed sketch shows a simple and efficient crystal detector, which allows various kinds of cats'-whiskers to be brought into use with a minimum amount of trouble. The materials required are of the simplest, consisting of an ordinary crystal cup, a valve socket, valve pin, a small ebonite knob, and a piece of thin copper or brass sheet.

From this latter a star-shaped pattern is cut as

shown and the various whiskers are soldered to the tips of the points.

Varying the Pressure.

The assembly of the parts is easily followed from the drawing, and when erected this arrangement allows of a rotary movement combined with a vertical one by which the pressure of the cat's-whisker on the crystal can be varied.



THE PUBLIC AND BROADCAST CONCERTS.

MUSIC FOR ALL.

By CAPTAIN C. A. LEWIS (of the British Broadcasting Co.).

In this short article Captain Lewis deals with an aspect of broadcasting in a new and interesting light and places before the reader an argument of considerable importance.

SOMETHING for nothing is rather a slogan nowadays. Music for nothing is an attractive variation of this; but the thing I want to write this article about is not quite the obvious interpretation of the idea—i.e. that everyone who has a wireless set is getting music (practically speaking) for nothing, but something projected—an idea by which everyone could hear and enjoy the best in music, in person, for a nominal sum.

Most Londoners are proud of their city, and well they may be. It stands for Britain, for our great Empire, the largest and richest city in the world. But, though London may take the lead in many things, there is one thing in which it certainly does not take the lead, and that is, in Art.

What is the Reason?

In its day, London has held great men—great architects, great poets, great musicians—but, taking a superficial view, there is little to show nowadays that this is the case, particularly in Music.

London does not, as it should, take the lead in every branch of Art.

Has it ever struck you that nearly every musical event of any importance in this country takes place outside its capital?

There are festivals at Norwich and Gloucester, there are singing contests in Wales and Sheffield, there are many activities, but they are all off the centre. Music does not gravitate, as one would suppose it should, to the capital of the country.

What is the reason for this?

Are we Southerners less musical? Are we more apathetic about it? Are we content to do without music? Perhaps we are all these things. But it must be said in our defence that there are not many places where music is to be heard, and *nowhere* can it be heard at a price which would put it within the reach of everybody's pocket.

A Deadlock.

What is the underlying reason for this? Let me try to expound what I consider to be at the root of the matter.

If people are to be induced to listen to music in a public hall, that hall must be central and easily accessible. Now, ground in the centre of London is extremely expensive; rentals are high, and therefore the hall must be *hired out* at a high price if it is going to pay its way. This puts the next move on to the artiste or group of artistes who desire to use the hall. What do they do? They also expect to get their money back, and so they charge high prices. The net result is that concert artistes and concert providers, as far as London is concerned, run their concerts at a loss in the large majority of cases, because the

public cannot afford—and should not have to afford—high prices.

This looks rather like a deadlock. What is to be done, since at the bottom of it all lies the value of ground in London?

There may be many ways out of this, but there is certainly one, and that is found by looking at the next segment of the vicious circle I have depicted above—namely, the hall. It is here that the secret of the trouble lies.

A hall which is nothing but a hall is foredoomed to failure. It *cannot* pay. Concert-giving is a seasonal, spasmodic affair, and never a gold-mine. The hall must contain other things, which give a constant, regular revenue—offices, studios,

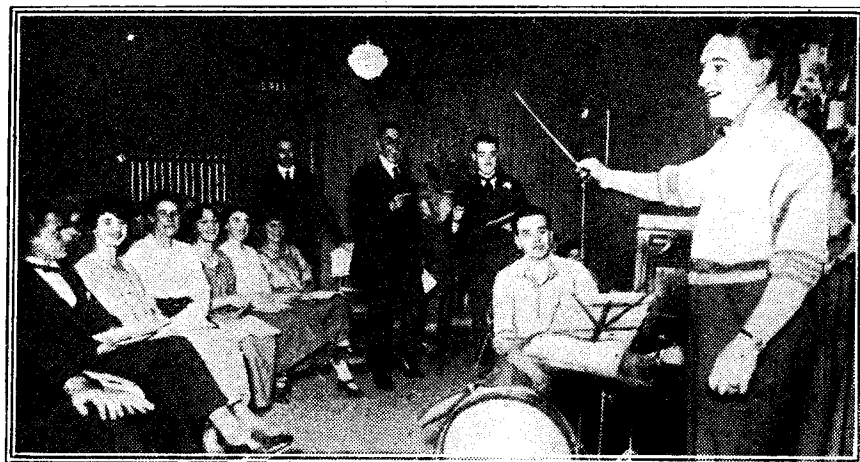
much better chance of putting his art before the public.

Broadcasting Can Help.

You may say that the public does not want to hear concerts. I reply that, since the advent of broadcasting, the public interest in music and their appreciation has increased enormously.

There was no lack of appreciation in the Central Hall concerts at Westminster, and the prices there were twice as high as they would be under this arrangement.

Broadcasting is the means to an end; it stimulates the appetite, but it does not take upon itself to usurp the place of the real thing. For some time there will always



Mr. Joseph Lewis, of 51 T, conducting the first comedy opera given by the Birmingham Repertory Co.

flats, dance-halls, restaurants, anything which can be used to bring in money to cover the deficits which will be made on the halls themselves.

This means a building whose outer and surrounding walls contain all manner of flats, etc., and in the centre, the heart, lie one or more public halls; one, perhaps, holding five or six thousand people, and two smaller ones for recitals holding, perhaps, one thousand people apiece.

What would be the immediate result of a building such as this? It would mean that the high cost of renting the hall would go. Cheap seating would follow as a matter of course.

Sixpence and a shilling ought to be the price of admission to a first-class concert, not prices varying from 7s. to 27s. 6d. The thing is impossible from every point of view.

Lowering the prices in this way immediately increases a thousand-fold the potential public, and, furthermore, gives the young artiste, who has a very difficult time to obtain recognition at present, a

be a good deal of difference between the real thing and the broadcast version of it.

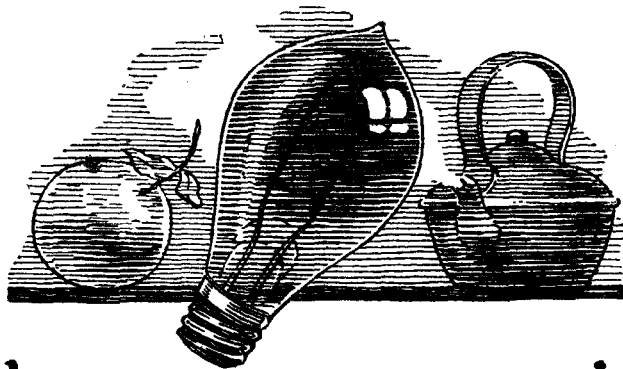
But we have, at least, awakened an appetite. Who is going to take advantage of it, not for his own benefit so much as for the benefit of the public?

This is the democratic age. Here is a chance for someone to come forward and put up a house of music for all, something into which everyone can enter and partake of the best in the greatest of all arts—Music!

My only fear is that it will be done half-heartedly. There are certain things which only succeed and deserve to succeed because of the magnitude of their conception. This is one of them.

The building—this temple, palace, sanctuary of Music—call it what you will—must be on a great scale worthy of London, worthy of the Empire, worthy of the Muse. It should stand up like a monument to reflect our national love of Music. It should be comparable architecturally to the greatest buildings in our great city.

If broadcasting aids in bringing about such a thing, it will have served great ends, and this is an end worth the serving.



What one man saw in a blackened bulb

THE history of progress is tied up with trivialities. Newton made history under an apple tree; Watts saw it in a tea kettle. Modern "wireless" came from a blackened bulb. It was an ordinary carbon filament lamp. Everybody knew that it turned black as it grew older. One man wondered why—and made it his business to find out. What he found was the principle of the thermionic valve. Dr. Fleming was the man

and his experimental valve was made in the Ediswan Laboratories.

That was 30 years ago. Since then many developments have taken place in the evolution of the valve. Ediswan Valves retain the lead they won in the early days of wireless. They are wholly reliable—experienced workers and careful testing see to that.

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An interesting study of early wireless history may be made at the Science Museum, South Kensington, London, where the complete series of Dr. Fleming's experimental valves can be seen.

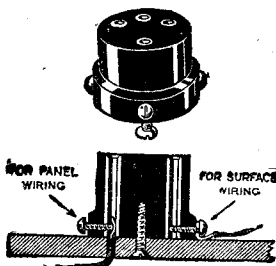
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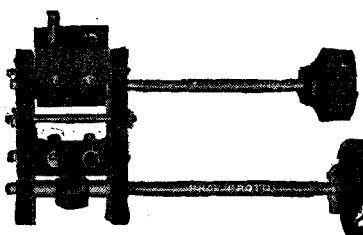
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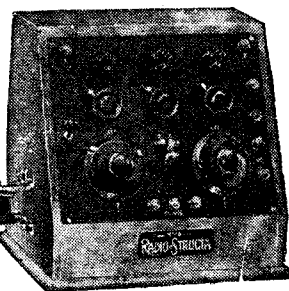
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2 Valves, 1 Detector and 1 Note Magnifier (wired up for Power Amplification).

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Wired up and Tested Ready for Use.

GUARANTEED RESULTS
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100 Miles from high-powered Station.
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These distances may be considerably increased under favourable conditions.

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"The Best
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SPECIAL PANELS,
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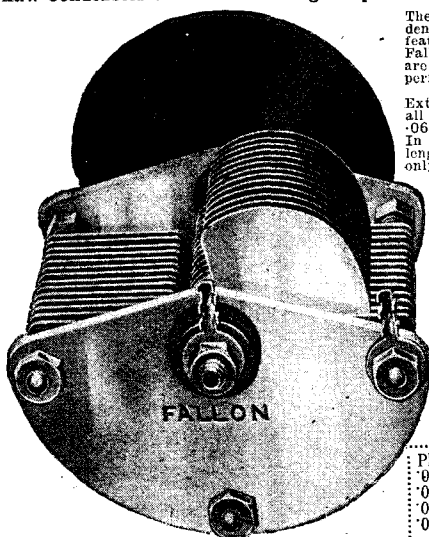
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Extremely handsome appearance, all parts being heavily plated. .068 spacing (the closest possible). In the new model the overall length of the .001 condenser is only 4 1/2" as against 5 1/2" in the old model, and by a new idea in spacing washers, rigidity of construction, never before achieved in any make of condenser, has been obtained.

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.901	3/-	.0002	4/6
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Write Direct for Trade Terms:

FALLON CONDENSER CO., LTD.,

The Condenser People. Tottenham 1932.

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100% efficient Crystal, but
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14/6

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UP to a high efficiency.
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This is our Bond. What does it mean? Why, an assurance for all time to users of Bontone Phones. Compare these advantages over other makes of phones, particularly the cheap, continental type. Have you recognised all the better qualifications which make BONTONE the distinctive type?

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Durability? BONTONE are made of the best materials procurable, and their beautiful finish is highly creditable to skilled craftsmanship.

Comfort? Throughout exhaustive tests we have worn BONTONE and claim a maximum success. BONTONE are easily adjusted. See you buy BONTONE.

Apply to your local dealer or apply direct giving your dealer's name to:—

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Works: GOSWELL ROAD and CITY ROAD, LONDON, E.C.1.
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BONTONE PHONES—
Britain's best, backed by
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10-LINE PORTABLE CORDLESS SWITCHBOARDS. Brand new, containing 20 D.P.D.T. and 10 D.P.S.T. Dewar Switches, Bell, Magneto, 10 Indicators, Hand set, etc. All contained in Case, 16 x 14 x 7 in. £ s. d.
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TENT MALLETS, complete with Shafts each 0 0 6

NEW ARMY RAZORS each 0 0 6

NEW MESS TINS each 0 0 6

BASS DRUMS (in splendid condition) each 3 10 0

PART-WORN GROUND SHEET CAPES, in perfect condition each 0 3 0

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ALL THE ABOVE GOODS ARE SENT CARRIAGE PAID. MONEY RETURNED IF NOT SATISFIED.

3 Additional models to the AMPLION "Dragon" range.

Representing a most important advance in the production of small and medium size Loud Speakers, the three new AMPLION models illustrated and briefly described will be found of exceptional interest to the Technician, the Wireless Enthusiast and to the Listener-in desirous of "Better Radio Reproduction."

Although all the advantageous constructional features distinguishing Standard AMPLION models are provided in these designs, the prices are not merely moderate but extraordinarily low, and possible only by manufacture at the hands of specialists upon the most approved lines experience can suggest.

THE NEW "DRAGONFLY." An Amplion Baby.

A perfect replica on a reduced scale of the famous "Standard" Dragon model. For a miniature Loud Speaker the "Dragonfly" is outstanding in its efficiency—affording considerable volume, coupled with extreme clarity and "full" tone. The electro-magnetic unit incorporating the new "floating" diaphragm, and the non-resonating sound conduit, are exclusive Amplion features.

AR101, 120 ohms; AR102, 2000 ohms; diam. of trumpet, 5½"; over-all height, 9".

Price 25/-

THE "NEW" JUNIOR.

In performance the "New" Junior is actually a "Senior" Loud Speaker, and compares favourably with instruments listed at twice and thrice the figure. All the latest improvements are embodied in the assembly, which reveals an efficiency not previously considered possible in a model so reasonably priced.

AR110, 120 ohms; AR111, 2000 ohms; diam. of trumpet, 10"; over-all height, 15½".

Price £2 : 10 : 0

The "NEW" JUNIOR-DE-LUXE

A Loud Speaker of high degree, the "New" Junior-de-Luxe can best be described as an aristocrat of Loud Speakers sold at a decidedly democratic price.

Corresponding in proportions to the "New" Junior type, the de Luxe edition is provided with a wood trumpet of unique design. In this horn the oak or mahogany panels, as the case may be, are united by a series of metal ribs, affording an assembly of particularly attractive appearance.

AR113, 120 ohms; AR114, 2000 ohms; diam. of trumpet 10"; over-all height 15½".

Price £3 : 5 : 0

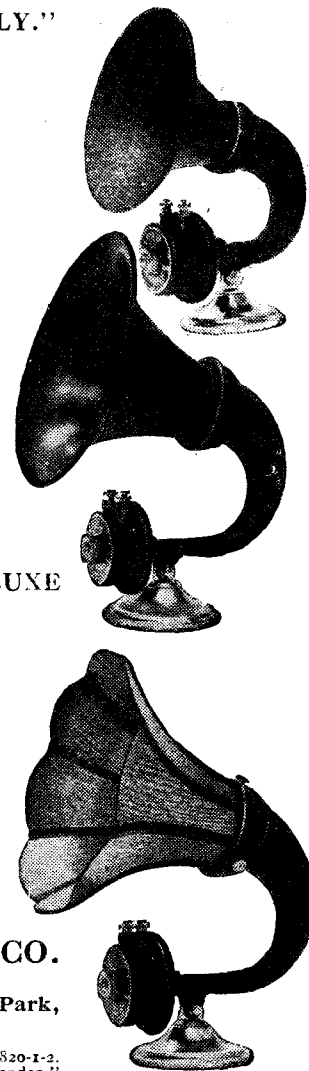
Mahogany Horn 3/6 extra.

Obtainable from all Wireless Dealers of repute.

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St. Andrew's Works, Crofton Park,
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Artistes of the Aether

By "Ariel"

Some of the artistes who have given you pleasure when listening-in.

WITH the advent of wireless, and the everlasting miracle of having your music "laid on" in the house, like light or heat, the expense side was waived. Even the most parsimonious of licensees

could not forbear to pay for a new valve, or to renew exhausted batteries, but like all other miracles of civilisation, familiarity breeds—if not contempt, shall we say at least, contemplation?—and this compels us to admit that the B.B.C. plays its favourite item,

able from a small orchestra of real artistes. The playing of Mayer Gordon (violin) was another triumph of technique and artistry.

The Leaven of Humour.

The very word "humour" recalls to some people the red-nosed comedian or the knockabout so-called "artistes" of the old tenth-rate music-hall days. Wireless has at least done one thing in reviving the art of witty anecdote and dialogue, while on the musical side, also, humour has learnt to take its share. One of the most successful of turns is that of Messrs. A. E. Nickolds and Albert H. Howe. Each is an artiste in his own branch, and together they are irresistible.

As a musician, Mr. Nickolds has ranged through most of the instrumental gamuts, for he started his musical career as an organist at the age of twelve, studied the

seems to change his very voice for each part enacted.

An Ambitious Choice.

"The Immortal Hour," by Rutland Boughton, written round the poems of Fiona Macleod, will be remembered for its huge success at the Regent Theatre, where it had the additional power and attraction of the acting. Over the aether much of its charm is necessarily lost, and the music becomes at times strangely complex.

A good cast was announced in Miss Elsie Suddaby, Miss Gladys Palmer, and Messrs. Arthur Crammer, Sumner Austin, Kenneth Ellis, and William Heseltine.

Well-Known Speakers.

Every week sees more and more well-known people taking advantage of wireless, either to air their views or make appeals. Amongst those who have been heard recently, mention must be made of Sir Henry Walford Davies, LL.D., F.R.C.O., for his talk on "Music," Mr. F. A. Mitchell Hedges, F.L.S., F.R.G.S., on "The Mystery of the Jungle," Sir George Newman's Ministry of Health talk, Miss Dorothy Jewson, M.P., and Miss Violet Vanbrugh, the famous actress.

Manchester.

Noted for its fine programme, 2 Z Y can flatter itself on its very own artistes. One of them is Miss Olive McKay.

She was one of the first provincial contraltos to broadcast when the old station of 2 Z Y was at Trafford Park. In its dramatic company, Manchester numbers, also, another clever artiste in Miss Dorothy Franklin. She is the leading lady in their dramatic productions, and has the emotional capacity that is required for acting, especially before the microphone.



Miss Dorothy Franklin.

"Two minutes, please," rather more frequently than is pleasant for our batteries. These odd "minutes," reckoned up at the close of a none too "perfect day," make a marked difference in their life, and as there is no change of scenery, and we presume the orchestra is still there, it is difficult to understand the cause.

The Winter Programmes.

From the look of the first ones, like our clothes, they look a bit on the heavy side. Maybe it was a cynic who said "Life would be endurable if it were not for its pleasures." Still, I would have liked him to have had just a taste of wireless. A "talk" at 3.15, another at 4 something or other, another in the Children's Hour—and which also, by the way, might be made a special weekly treat instead of a daily expense—another at 6.45, and a so-called comedy that only appealed to the sporting community, followed by still another "talk" before the Savoy Orpheans commenced at ten o'clock, to take the taste away, as it were. Now, B.B.C., "What about it?"



Miss Olive McKay.

Sunday Programmes

These, we admit, are not easy to frame under the present policy. At 2 L O recently, however, the J. H. Squire Celeste Octet were heard, demonstrating once more the good results obtain-



Messrs. A. E. Nickolds and A. H. Howe.

piano and violin, made good as an accompanist, threw in the mandoline, and played at several big London theatres, added the zither-banjo to his effects, and a bagful of good stories, and there you are.

In Mr. Albert H. Howe he found a kindred spirit. Mr. Howe is a West of England baritone with a perfect gift for the piano and finding the words which his partner sets to music. The composite turn is always welcome, and we understand the pair have just returned after four weeks entertaining the British Army on the Rhine. Besides over the aether again, they will be heard at many of the London halls, Queen's and Palladium, etc.

Humour was well represented, also, by the work of a clever actor known as Syd Mac. He has a twenty-five years' experience, commencing his career as a ventriloquist, which possibly accounts for his success over the aether and his ability to give real "character" studies, for he



Miss Violet Vanbrugh.



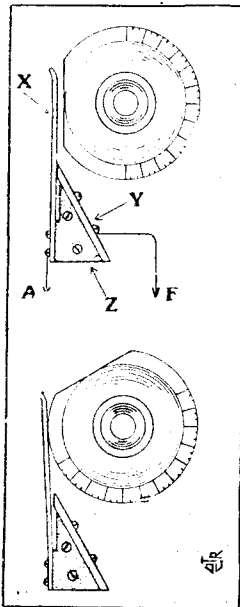
Mr. Syd Mac.

A SIMPLE COMBINATION SWITCH

By O. J. RANKIN.

THE function of the somewhat unorthodox type of switch shown in the accompanying sketch is to short-circuit the aerial and earth terminals of a receiver when not in use, and is operated from any existing control which is fitted with an ebonite dial or similar arrangement. The idea is presented in its most simple form, and no doubt many readers will be sufficiently interested to try out one or two of the modifications suggested in the last paragraphs.

By means of a fine hacksaw and file a flat is provided on the edge of the dial which



stationary strip, Y, in order to earth the

aerial. These brass strips may be about $\frac{1}{2}$ inch wide, and secured one each side of a piece of ebonite or good hard wood, Z, the thickness of which is equal to the width of the strips. The long strip is preferably cut out from fairly heavy hard-rolled brass sheet, and one edge is filed to permit the necessary movement when the ebonite block is secured to the panel.

Capable of Extension.

When the condenser is adjusted from zero to the usual working position the round portion of the dial acts as a cam and breaks contact with aerial and earth by forcing the long strip away from the shorter one and holding it in that position while the average tuning adjustments are made. This will be readily understood by referring to the lower sketch.

As mentioned above this idea may be carried much farther and may eventually lead up to something approaching the much discussed uni-control receiver if given a little thought. If the arrangement of the clips is reversed; that is, if they are normally *out* of contact with each other, the switch would function as an L.T. or H.T. battery cut-out every time the condenser was set at zero. The current would, of course, be switched on simultaneously with the condenser adjustments. To effect this it is only necessary to turn the switch completely over on the panel and shorten the stationary contact strip.

Further Possibilities.

Coming now to the possibilities of combination switching afforded by this idea, one might carry out many interesting experiments with old key switches, making the cam function in the place of the usual hand operated knob and roller. As an example, a six-point key switch could be thus made to

effect the following changes: (1) the H.T. or L.T. current control; (2) aerial to earth change-over; and (3) switching primary tuning coil to aerial—all these simultaneous with the first condenser adjustment.

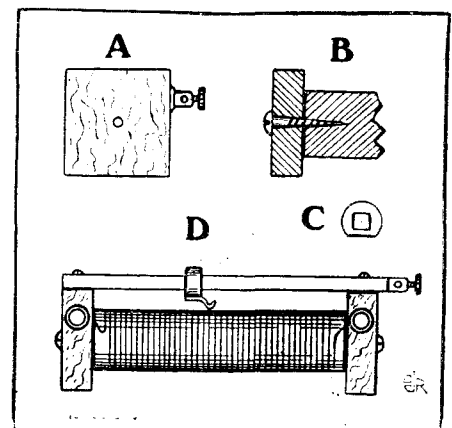
Space will not permit a lengthy description of all the little dodges one could try with such a device, and so the reader is left to experiment along these lines with the assurance that he might easily peruse a much less interesting subject.

MAKING A CHEAP POTENTIOMETER.

HERE is an easily made 300 ohm potentiometer which should not cost more than a shilling to make. The following materials and parts will be required: Two hardwood end pieces (A), each $1\frac{1}{2}$ in. square by about $\frac{3}{8}$ in. in thickness; a piece of round wooden broom handle, 4 in. long by 1 in. in diameter; a 5 in. length of $\frac{1}{4}$ in. square brass rod, a slider, three terminals, some paraffin wax, some screws, and 22 yards of No. 36 S.W.G. enamelled "Eureka" resistance wire.

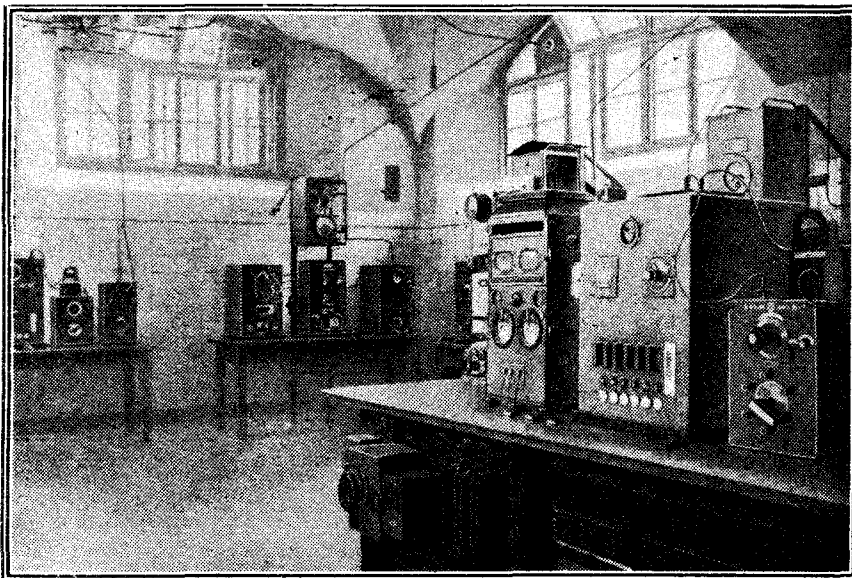
Winding the Former.

Attach the two square end pieces to the ends of the wooden former in the manner indicated at B, impregnate the wood with melted paraffin wax, and fit a small wood-screw terminal to each end piece, as shown



at A. Wind on the wire, keeping the turns close together, and secure the bared ends under the two terminals, taking care to see that a good electrical contact is made to each. Apply a coat of shellac varnish over the whole winding, and after cutting and drilling the slider rod solder a small terminal to one end, and make the slider. This should be of the flat spring type, and the best way to make it is to obtain a 2 B.A. threaded spacer or bush (as used for variable condensers), and file the threaded hole quite square, as shown at C.

A small flat is then filed on the periphery, and to this is soldered a short strip of thin spring brass which is bent as shown at D, which represents a side view of the completed instrument. The insulation is, of course, scraped away under the slider, so that it makes a smooth rubbing contact with any portion of the winding.



Part of the transmitting gear at the German station at Koenigswusterhausen.

A famous name for a famous Valve.

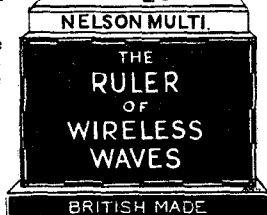
NELSON MULTI

3
FILAMENTS

15
COMPLETE

The "NELSON MULTI" contains three separate filaments, each of which can instantly be brought into use by a switch device incorporated in the valve cap. Adapted to fit any standard Four-pin socket. No loose wires. Three times the life of any other valve. Filament Voltage 4-6

Telephone: Wimbledon 172.



The "NELSON MULTI" will function as a Detector, L.F. Amplifier, or H.F. Amplifier. Owing to its unique construction it is unequalled for pure clarity of tone. Packed in specially constructed boxes. Entirely British Made.

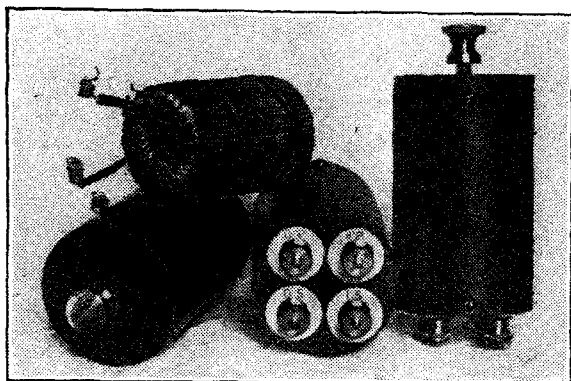
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The NELSON VALVE CO.
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From all Wireless Dealers and Electricians.

THE A.B. ALL BRITISH L.F. TRANSFORMER



This Transformer is made by British labour with British materials throughout.

The Primary circuit is wound with SILK COVERED Wire. This Transformer has 2½ miles of wire in the coil. 11,000 turns of SILK covered wire on the Primary and 33,000 turns of Enamelled wire on the Secondary.

The Coil is baked to exclude all moisture, then placed in its SOLID Steel case, and a special compound is run in until the coil is impregnated and surrounded with this compound, thus rendering the whole coil impervious to moisture.

It has a single hole panel fixing.

A full Guarantee is given with this Transformer.

Price 25/- post free—direct:

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"BELLING-LEE" INDICATING KNOBS

Neatly designed, well finished, of high-class moulded material. Permanent engravings. Stocked in the following:—

Variometer, Filament, Tuner, Aerial Tuner, Anode Tuner, H.F. Tuner, Coarse Tuner, Fine Tuner, Secondary Tuner, Reaction, Coupler, Amplifier, Switch, Rejector, Potentiometer, Tone Control. 2 B.A. Brass inserts.



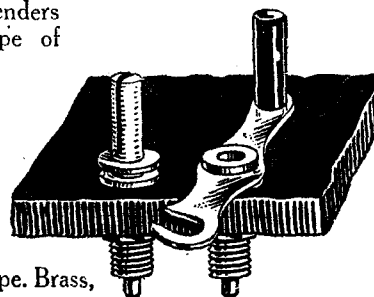
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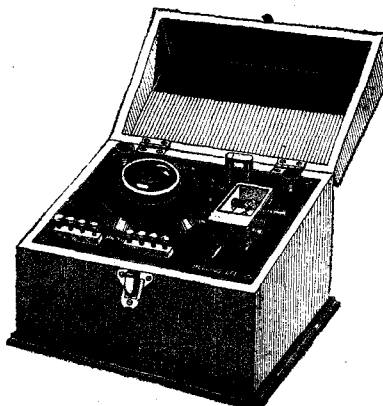
A new line which renders obsolete the old type of shorting plug. By operating the little switch it is possible to receive from a local station or 5XX without removing loading coil.

Complete, with instructions in an envelope. Brass, 6d. N.P., 8d. per set.



CRYSTAL RECEIVERS

1. Rotary Detectors.
2. Best Crystals.
3. Ball Rotor Variometers.
4. Indicating Terminals.
5. Self-shorting Coil Sockets for long wave stations.
6. Bar Terminals to take four pairs of phones.
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Phones and Loading Coil extra if required.

Price 25/- each

Indicating Terminals, Brass 3½d., N.P. 4½d.

Rotating Crystal Detectors, N.P., 3/9 each.

Variometers, Ball Rotor, Cotton Wound, 4/- each.

" " Silk " 4/6 "

If your dealer can't supply, write to

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Queensway Works, Ponders End, Middlesex

INDOOR AERIAL EXPERIMENTS FOR THE AMATEUR.

By OSWALD J. RANKIN.

An article detailing the use of the special "drum" type and indoor aerial described in a recent issue of "Popular Wireless."

READERS who have constructed the novel type of indoor aerial recently described in these columns will no doubt appreciate a few further remarks concerning its use with various types of receivers. Most of the experiments were carried out in the writer's workshop, which is situated in a low-lying district about eleven miles from 2 L O. Model A was tested first, this being connected up to a crystal set employing a tapped coil wound specially for the ordinary 100-ft. outdoor aerial. Tuning was rather

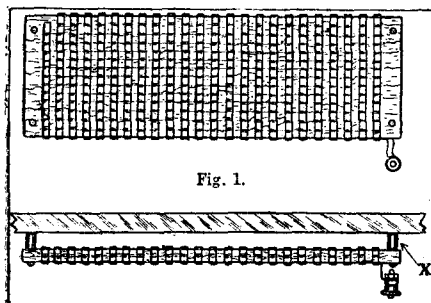


Fig. 1.

flat, and, remembering that the aerial on test contained only about 85 ft. of corrugated copper tape, a small slide inductance was connected in series for loading purposes. About twenty-five turns were loaded before the tuning became really sharp, and a special set was then built to work in conjunction with this aerial. This is shown connected to model A in the accompanying photograph.

The Special Counterpoise.

Briefly, it consists of a variometer-tuned crystal receiver, with the detector and terminals mounted on the lower portion of the stator. No. 30 D.C.C. wire was used for the windings, some 60 turns being wound on the stator and 50 turns on the rotor. The results now left nothing to be desired.

The aerial was then tried on a 1-C-2 valve set fitted with very selective tapped coils, and, when using the loud speaker, signals came through with a remarkable degree of clearness, and with the same amount of volume as when using the outdoor aerial. The valve set was then connected to the outdoor aerial and the earth lead connected to the indoor aerial, which was placed on the floor. Results were excellent. The indoor aerial (model A) was then connected to the aerial terminal of the receiver, while model B, connected to the earth terminal, was placed on the floor. Results were equally satisfactory.

The special "counterpoise" shown in Fig. 1 was then constructed, and this was secured under the table directly below the receiver. This simple device comprises 100 ft. of corrugated copper tape wound over a piece of board, which is attached to the under-side of the table by means of four long wood screws and four tubular spacers, X. Results were in every way equal to those obtained previously.

Models B and C were designed to be used in conjunction with receivers employing standard tuning coils; that is, with coils designed for use with the standard outdoor aerial. Both models worked well with a No. 35 or 50 honeycomb coil, shunted with a .0005 mfd. variable condenser.

The "frame" aerial gave excellent results on a simple crystal set, using a No. 50 Igranite coil and a parallel .0005 mfd. variable condenser; and as it appeared to be directional in any position, it was simply slipped away out of sight behind a picture during tests. This and model C were not tried out on a valve set.

At a later period, models A and C were tested out on crystal sets about half a mile from 2 L O, and, as expected, signals were then very much louder. However, it was

found that when the aerial lead was disconnected from either of the models and held in an upright position, the decrease in signal strength was very slight. In fact, almost negligible.

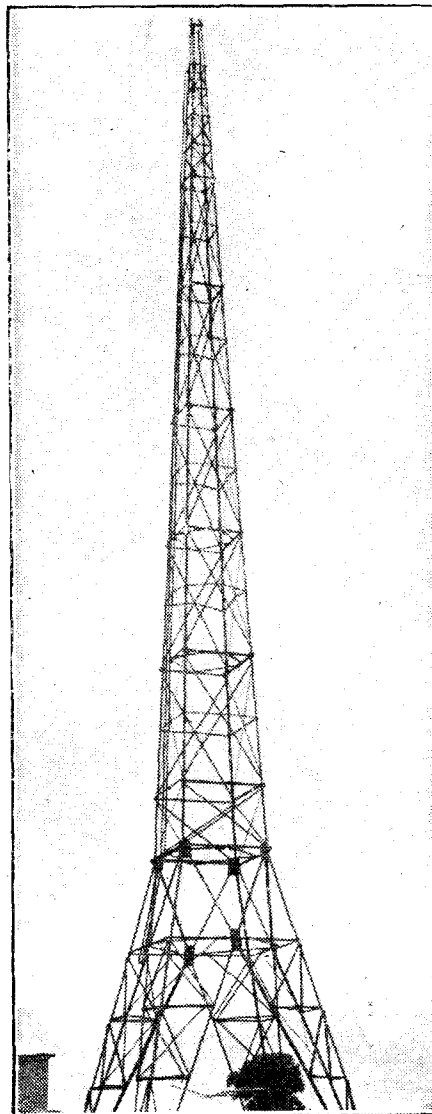
A piece of bell wire stretched round the room gave equal results, and one might have tried many other alternatives had it not been realised that tests were being made in the "swamping" area, and that almost any receiver would, under the circumstances, work quite well without any form of aerial whatever. This was an experience which, indeed, provided much food for thought, and I actually found myself wishing I was a London flat-dweller. Why these enthusiasts complain remains a mystery, for I am sure that acrias should be amongst the last of their troubles.

Scope for Experimenters.

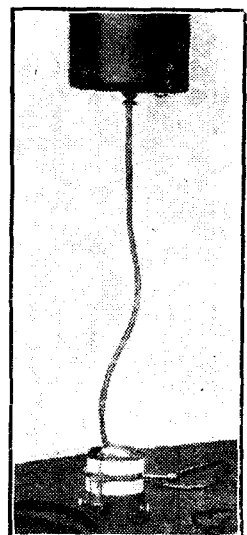
Back again to the "unswamped" area, and the bell wire, no-wire, and several other stunts were tried in turn, but no signals could be heard until the "drums" were again brought into service. Thus it was concluded that where the device was unnecessary for operating a receiver in very close proximity to a broadcasting station, it was, indeed, a very interesting proposition some 10 miles out.

The writer was reluctantly compelled to abandon these experiments just at the time when they were becoming really interesting. but it is hoped that those readers of POPULAR WIRELESS who are fortunate enough to be able to devote a little time to experimenting along these lines will further develop the idea, for there is no doubt that, even in its present form, it is a definite step towards scrapping the outdoor aerial. The scope for experimenting in this direction is practically limitless.

The device could be made much smaller by cutting the tape into narrow strips about one-third of its original width, and experiments with fixed condensers and filter circuits might also be tried. It will be found that the higher the device is hung, the louder will be the signals, and when suspended from the rafters of the roof the signal volume was increased by about 30 per cent. An average suspension of 18 or 20 ft. from the ground floor should be considered the minimum for good results.



One of the masts at the Monte Grande Station, Argentina.



Model A connected up ready for use.



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B.T.H. Headphones are supreme in all respects—in sensitiveness, tone, permanence, and comfort. Although fitting closely to the ears and thus excluding extraneous sounds, very little pressure is exerted and they can be worn for hours without discomfort.

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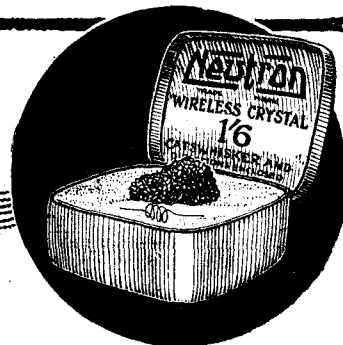
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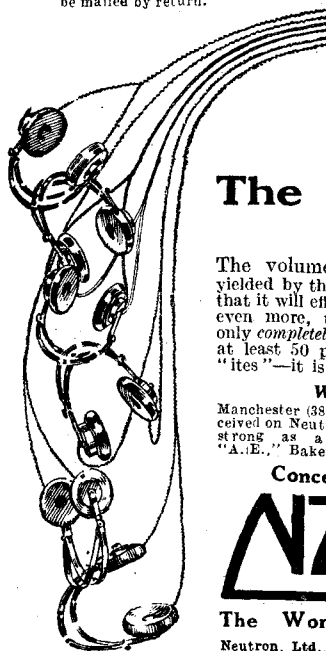
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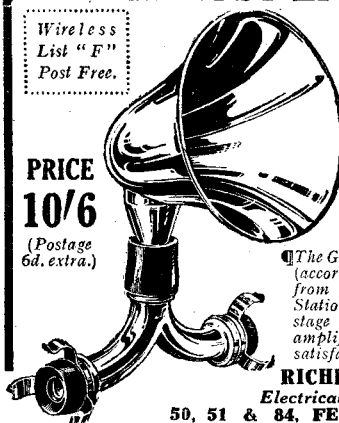
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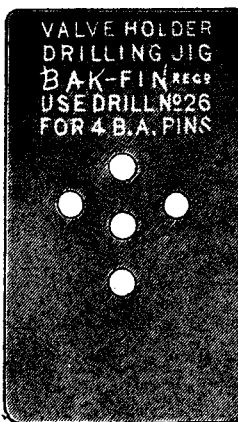
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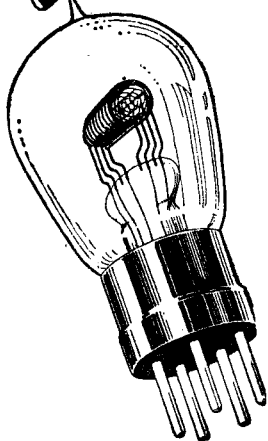
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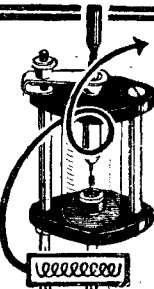
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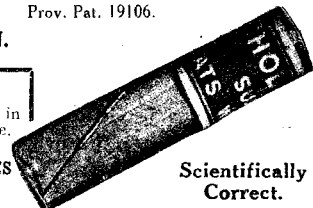
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COIL HOLDERS.—Single, 9d. to 2/6; 2-way, 3/6; 3/8, 4/1; 4/6, 5/6; 3-way 4/1, 4/6, 5/1, 5/8. Cam Vernier, 2 Coil Holders, 9/1; Polar Cam Vernier, 11/1; Polar Universal 2 Coil Holder, 10/6; Coil Plugs for attaching Basket Coil to Plug into ordinary 2 or 3 Coil Holder, 7d. 1/1; 1/3; Coil Plugs for making own Coils, Plain Flat Type, 7d.; Wedge Type, 9d., 10d., and 1/1; Fitted with Ebonite Wings, 1/3.

COILS.—Duplex Waxless Coils, per set of 5, 2/6; Duplex Coil, wound to 1,600 metres for Chelmsford, 2/1; Tapped Coils, d.c.c., 20 Tappings, 1/11; Enamel Wound Coils, 6 by 23, 1/4; O'Keefe, Burn-dept and Igranic Coils always in stock

Mail orders dispatched same day.
Please send ample postage. Excess will be returned.

DIAPHRAGMS, 2d. and 3d.

DIALS, 1/1.

DIALS AND KNOBS, 1/3.

EAR CAPS for all makes of Phones, 6d. to 1/6.

EMERGENCY TAPE, per yd., 1d.

EARTH CLIPS, 4d. to 6d.

EBONITE.—Cut to any size, 1/2 to 1 in., per lb., 3/6.

EBONITE TUBE.—All sizes stocked.

FILAMENT RHEOSTATS.—Velvet Perfecta, 1/6; Ormond, 2/1; Filostat, 2/6; Microstat, 2/9; T.C.B., 30 and 6 ohms, 4/1; Igranic (with Vernier), 7/6; Igranic (Plain), 4/6; Lissarstat Minor, 3/6; Lissarstat Major, 7/6; 30 ohm Special for .06 Valves, 3/3.

FORMERS.—Cardboard, very stout, from 2 in. to 4 in. diameter, 1d. to 4d.

FORMERS, VARIOMETERS, in Black Composition, per pair, 3d.

FLEX.—For Phone Cords H.T. Leads to many other jobs, per yd., 2d.; Red and Black Twisted, per yd., 2d.; Silk Covered, per yd., 11d.

GRID LEAKS.—"Dubilier," 2 meg., 2/6; "Lissen," Variable, 2/6; "Wattmel," 2/6; "Bretwood," 3/1.

HYDROMETERS (ACID TESTERS), 5/6.

HEADPHONE CORDS, 1/6 and 2/3.

HIGH TENSION BATTERIES.—"Phoenix," M.A.L., S.D.H., 15 volts, 2/9; 30 volts, 5/6; 36 volts, 6/6; 60 volts, 10/6; 90 volts, 16/5; 100 volts, 16/6; Siemens, Ever Ready, etc., in stock.

HIGH FREQUENCY PLUG-IN TRANSFORMERS.—All wave-lengths from 150 to 8,000

metres, prices from 3/9 to 5/6; Leslie McMichael H.F. Transformers, 300 to 600 metres, 7/1; 1,000 to 3,000 metres, 7/1.

INSULATORS.—Large Reel, 1d.; Small Reel, 1d.; Egg Type, 1d.; Shell Type, 1d.; Hook (for indoor use), 1d.

CONDENSERS.—Fixed, All Capacities, .001 to .003 and .0001 to .0005, 8d.; "Edison Bell," Fixed Condensers, All Capacities, .002 to .006, 2/1; All Capacities, .001 to .0005, 1/3; "Dubilier," Fixed Condensers, .001 to .006, 3/1; .001 to .0005, 2/6; "Mansbridge," Condensers, .006, 2/6; 25, 2/9; 5, 3/3; 1 mf., 3/6; 2 mf., 4/1.

CONDENSER SPINDLES.—All sizes, 11d. to 4d.

CONDENSERS (Variable).—"Ormond," .001, 8/1; .00075, 7/1; .0005, 6/1; .0003, 5/6; .0002, 5/1; .0001, 4/1; "Vernier," 4/1; Condensers, with "Vernier," .001, 9/6; .0005, 7/6; .0003, 7/1; "Du-Anode," Condensers, .00025, 10/6.

CONTACT STUDS.—5d. per doz., complete with nuts and washers, Nickel, per doz., 1/3.

CONTACT STOPS.—Two for a 1d., complete with nut and washer.

CONDENSER VANES.—5d. per doz.

CRYSTALS.—Small Box Hertzite, 9d.; Large Box Hertzite, 1/1; Midite, 1/1; Tungstallite (Blue Label), 1/6; Geosite, 1/3; Lapisite (Gold Whisker), 6d.; Carborundum, 4d.; Bornite, 6d.; Zincite, 9d.; Crystal Cups, patent screw tops, 21d.; 3 screw tops, 11d.

CRYSTAL SETS.—Excellent results are being obtained on these Sets, which are all guaranteed Square Set, 8/6; Oblong Set, 10/6; Slope Panel, 12/6; "Hawker's," Mark III Set, Maker's Price, 21/1; Our Price, 17/6; "Service Set," splendid value, 30/1, with Variometer, Tuning Plug, 1,600 Meter St.

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Cable No. 1.	Crystal Receiver	10	0	0
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" No. 3.	1-Valve Amplifier	1	10	0
" No. 3a.	As above, but in fancy box with lid	1	11	0
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Filament
Current,
25 amps.

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Explorer of the Ether.

"A Triumph in Valve Manufacture."

"The coming of the 'Six Sixty' dull emitter valve marks a new era in the perfection of the thermionic valve. This valve can be used for either high or low frequency amplifiers, with equally good results, and in the tests we have made has functioned as a detector even better than a bright emitter. On a single-valve reaction set, using an indoor aerial, on a two-volt cell, the signal strength was increased by at least fifty per cent. compared with the bright emitter."

"The valve is very economical in current, one re-charge will suffice where ten or twelve have been necessary with ordinary valves."

The Electron Company Ltd.,

Triumph House,

189, Regent Street, London, W.1.

SOME NOTES ON TRANSFORMERS.

REASONS FOR LOSS OF ENERGY.

By SIR OLIVER LODGE, F.R.S., D.Sc., LL.D.

(Scientific Adviser to "Popular Wireless.")

In this article both the manufacturer and the home constructor will find practical advice about the transformer, and a lucid explanation of the reasons for loss of energy.

IRON, when used as the core of a transformer or any kind of induction coil, has two chief properties, magnetisation and conduction. In that it differs from any of the other ordinary metals, which practically only have the property of conduction. When a varying current circulates round in ordinary metal, it induces short-circuited opposite currents in the substance of that metal, and these secondary currents react on the primary circuit, in a way which is most simply described as increasing its effective or apparent resistance and diminishing its effective or apparent inductance.

In this respect iron has the same properties as other metals, except that it is not so good a conductor as some of them, and hence secondary induced, or so-called Foucault, currents are not so strong in iron as they are in copper; but otherwise they are just the same, in kind though not in degree.

Iron, however, has the additional property of being magnetisable. But so long as these Foucault currents last they tend to screen it from the magnetising effect of the primary current, since they are opposed in direction to that current. They therefore delay the magnetism, and at high frequency might protect it altogether, acting as a sort of screening skin, so that hardly any magnetic lines of force are generated inside the iron.

The Iron Core.

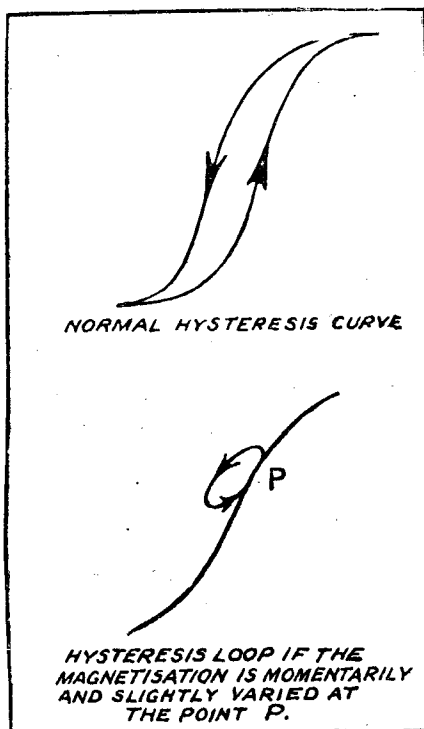
This screening action would certainly take effect at what in wireless practice is known as "high-frequency." But at audio-frequencies the Foucault currents would have time to subside, killed by the high resistance of the thin skin in which they circulate; magnetic lines of force would have time to develop, and the iron core would be magnetised and demagnetised, or reversed in magnetism, in accordance with the fluctuations of the exciting current, though with a certain amount of lag.

Of course, the Foucault currents must be kept to a minimum by subdividing the iron. It would never do to use a solid core, or a core built up of cylinders one inside the other, or of disks screwed up together so as to make a cylinder, because in either a cylinder or a disk the Foucault currents would have a free path for circulation, and the interior of the iron would hardly get magnetised at all. The core must be subdivided laterally, not longitudinally. That is why it is usually built up of a bundle of thin iron wires, which, though incompletely insulated from one another (because insulation would take up valuable room), may yet be varnished, or at any rate slightly coated over with sufficient oxide to prevent free electrical circulation or passage of current from wire to wire. Their longitudi-

dinal continuity is necessary for the magnetic lines of force; their lateral discontinuity is necessary for the stoppage of induced currents.

The Meaning of Hysteresis.

It is true that some transformer cores are made of thin sheet stampings, but the plane of these stampings is always at right angles to the plane of the primary coil. The stampings being in the form of disks with the centre part cut away, the windings of the primary circuit are taken through the centre hollow of the disks and back round outside, so that they are continuous only in a direction at right angles to the



current, and are discontinuous in the direction of the current itself.

All this is probably well understood. Certainly it is understood by instrument makers.

But iron has another property called hysteresis. This means that its rise in magnetism and its fall in magnetism are not quite similar. It rises, as it were, by one path, and it falls by another. The rise of magnetism, when plotted, follows what is called the "magnetisation curve." The fall follows a similar but not identical curve; so that the two curves, when plotted, enclose an area, an area something like this when the magnetisation and demagnetisation are fairly complete.

If the magnetisation and demagnetisation are only partial, the two curves will still enclose an area, but more of this shape:

Now, wherever curves of this kind enclose an area it means that work is done during the magnetisation which is not got back during the demagnetisation. There is loss or waste of energy. If the up-and-down paths were identical there would be no loss. But when they differ from each other it is like imperfect elasticity; you don't get back from the spring all you put into it. You never get more, and you may get less. The difference or the loss at each cycle is represented by the area enclosed between the two curves. The fatter this area is the more the hysteresis. In fact, hysteresis may be considered as the name given to this area, the loss of energy per cycle.

H.F. Transformers.

Some kinds of iron have much less hysteresis than others, but there is always some, and accordingly an iron core does involve some loss. But the advantages due to its extra magnetic lines of forces are so great as to overwhelm this loss and give us a balance of advantage, if the number of cycles is not too great.

The loss in commercial transformers at a frequency of fifty or a hundred per second is by no means insignificant. It results in heat, which is always the outcome of waste energy, and the transformer has to be artificially kept cool. At a frequency of a thousand a second the loss is greater, though, inasmuch as the magnetisation is probably feebler, the area per cycle is likely to be less. And so for audio-frequencies, such as are used in wireless, this source of loss can easily be tolerated; and the transformer with an iron core is more efficient, much more efficient, than one with only an air core.

But when you come to a frequency of a million a second, the slightest loss per cycle is multiplied to such an extent that it cannot be tolerated. Both things, Foucault currents and hysteresis, dissipate energy, and when even a small amount is dissipated a million times a second it naturally mounts up. Hence high-frequency transformers must not have iron cores. An air core has no hysteresis nor Foucault currents; there is then no dissipation of energy, except the inevitable amount due to resistance in the wire; there is no supplementary loss. The effect of iron in a high-frequency core would be to confuse everything hopelessly. The iron would not get properly magnetised; it would be screened by its Foucault currents. Nevertheless, it would dissipate energy, and tend to wipe out or smear out the primary oscillations, destroying their features and making anything like clear speech impossible. There would not only be waste

(Continued on page 482.)



THE UNIDYNE IN TASMANIA.

The Editor, POPULAR WIRELESS.

Dear Sir,—I think the following report of my success with the two-valve (detector and audio) Unidyne circuit might be of interest to you.

I have been interested in the circuit from the very start, and have followed all your descriptive articles carefully. Last night I literally strung the circuit together on my experimental units and tuned in to 2 F.C. (Farmers' Broadcasting Service), Sydney. The music and speech were exceptionally clear, and free from those small noises which I have noticed on H.T. sets. The strength also was equal to, if not better than, my two-valve (H.F. and D.T.R.) H.T. set. Perhaps the following details regarding the values of the various components may be of interest also.

The A.T.I. consisted of a 172-turn honeycomb coil with a Polar .001 condenser in series. A 250-turn H.C. coil was used for the reaction. Two Phillips D.VI valves were employed, and a Kellogg 3-1 audio transformer. The only source of power was a 6 volt car accumulator. 2 F.C. is over 500 miles air-line from here, and is transmitting on a wave-length of 1,100 metres, with a present aerial input of about 400 watts.

In view of the challenge to Senatore Marconi in the latest number of "P.W." to hand, I think the above report will be of interest to some of your other readers.

You are at liberty to use any part, or all, of this letter as you see fit.

Yours faithfully,

P. OAKLEY FYSH.

181 to 187, Charles Street, Launceston, Tasmania.

REAL "O X" WORK.

The Editor, POPULAR WIRELESS.

Dear Sir,—We are eager readers of your paper whenever we are able to procure a copy, and we think that you and the readers of the "P.W." will be interested in the excellent results obtained with our set.

It is a simple one-valve receiver of the "tuned anode" type, not a super of any kind, and without any

amplification. It is not a compact set, but made up of a unit-receiver, etc., all mounted on a board, aerial UNDER roof, lead-in parallel with wall, at least 25 yards long, no connections soldered, electric motor and several hundred yards of electric wiring in the immediate vicinity. Altogether unfavourable circumstances! It has only been in working order since the 13th inst., yet so far we have received the following stations:

Vienna (Ravag), 15 miles away, very good 'phone strength.	
Frankfort-on-Main, 384 miles away, very good 'phone strength.	
Zürich, 372 miles away, very good 'phone strength.	
Berlin, Voxhaus, 342 miles away, very good 'phone strength.	
Berlin, Telefunken, 342 miles away, very good 'phone strength.	
Aberdeen, 1000 miles	good 'phone strength.
Stuttgart, 336 "	" " "
München, 223 "	" " "
Breslau, 220 "	" " "
Cardiff, 905 "	faint 'phone strength.
London (2 L O), 762 "	weak 'phone strength.

We received three other stations clearly but faint, so that we are not sure about them.

They probably are:

Hamburg, 479 miles
Bournemouth, 834 "
Manchester, 890 "

The latter two were certainly English, but perhaps not the two stations named.

Vienna we can get quite loud without an aerial, and using no substitute.

On the 17th of Sept. we got a rather weak reception of speech, then, at 10 p.m., a time signal and what apparently were the Savoy bands afterwards, on about 4-500 m.; on the 24th we got a similar reception of a talk on railways on a somewhat smaller wave-length—in both cases we could not hear the station's name mentioned. On Sept. 25th we got a good reception of an English musical play, from 11-12.15, when all of a sudden they ceased, without having mentioned the station's name.

Chelmsford, Radio-Paris, and Centrale we could not get yet, owing to lack of the correct coils; we ought to get a very good reception of these high-powered sending-stations, especially in the winter.

We trust that the above facts will be of interest to you and your readers, and hope to receive in reply a criticism of our accomplishments.

We remain, Yours very faithfully,

A. LIPSCHITZ,
M. WILLIAMS.

Baden bei Wien (nr. Vienna), Trostgasse 9, Austria.

Re 5 X X AND 2 L O.

The Editor, POPULAR WIRELESS.

Dear Sir,—In your issue of the 4th inst. I observe a letter from Mr. W. J. Winter, of Kingston-on-Thames, complaining that the only thing 5 X X has done for London is to jam the most convenient Continental stations.

May I point out to Mr. Winter that 5 X X was not started for his benefit in any way, but for the many thousands of people such as myself who live outside the normal range of the ordinary stations, and that, therefore, strictly speaking, he is not entitled to criticise this station, as 2 L O is supposed to serve his requirements.

With regard to jamming, I have just returned from a visit to Kingston-on-Thames, and can assure Mr. Winter that when there I had not the slightest difficulty in eliminating 5 X X and receiving Radio-Paris, to which station I presume Mr. Winter refers as now being jammed, and if, therefore, Mr. Winter is unable to do likewise I strongly recommend him to look to the selectivity of his instrument before criticising a station which is serving many thousands of remote listeners.

Yours faithfully,

H. V. PRESCOTT.

Natproban Chambers, Victoria Viaduct, Carlisle.

B.B.C. PROGRAMMES.

The Editor, POPULAR WIRELESS.

Dear Sir,—I did not expect Editorial comment on my letter re B.B.C. programmes such as appears in your recent issue.

I am sure that POPULAR WIRELESS will increase its already wide circulation and value if it will take up the question of the B.B.C. programmes.

Surely the listeners must form by far the greatest number of those interested in wireless, but although constructors are most generously catered for there is no wireless publication that does not treat the programmes as of secondary importance, and several scarcely touch on them at all.

Personally, I am convinced that many thousands of listeners are too indifferent or too lazy to write to the B.B.C., and this is the reason why public opinion does not force the matter on the programme arrangers.

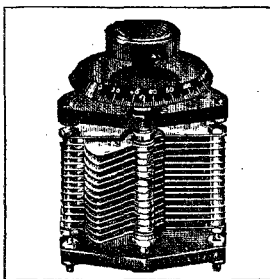
Only this morning in the train and in my office I have heard the most contemptuous criticism of three nights' programmes s.b. this week.

I have addressed many letters to the B.B.C., and acknowledge the great courtesy and attention that they give, but the fact remains that the greater part of the musical items are of a class that appeal to a

(Continued on page 480.)

WHY PAY MORE?

THESE COMPONENTS GIVE YOU FINEST RESULTS OBTAINABLE!

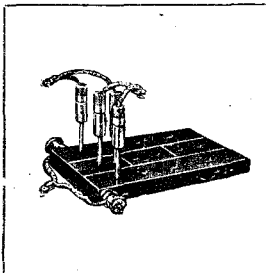


KINGSWAY VARIABLE CONDENSERS

Dead accuracy of assembly and finest materials are responsible for their great popularity. The plates are made from hardest aluminium sheet, and ebonite end pieces, and handsome "Troilite" knob and 3 in. graduated dial are standard.

.001 8/-	.00075 7/-
.005 6/-	.0003 5/6
.0002 4/6	.0001 4/-

3-plate Vernier 3/9



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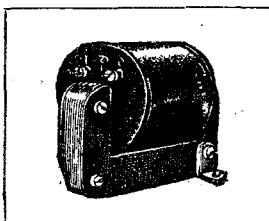
Up to four pairs of telephones can be connected in any combination of series or parallel in a moment with this novel device. The springs inside the ebonite ensure firm grip of "Kwikpins." Neat and quick.

PRICE 3/6 KWIPINS 3d.

SUPRA L.F. TRANSFORMER

Cannot be surpassed for clarity and volume, but extremely low in cost. Each layer of the windings has six insulated sections, cutting out distortion and giving great amplification. Ratio 5:1.

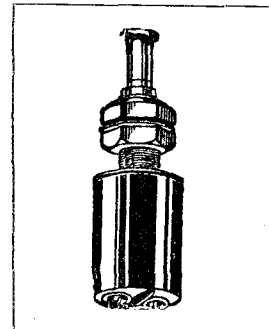
PRICE - - 12/6



83-5-7 PULL-PUSH SWITCH

SAVE CURRENT—don't adjust your valves every time you use them—connect this neat switch in series, adjust your valves once, and then just switch on and off. Heavily nickelled. One hole fixing.

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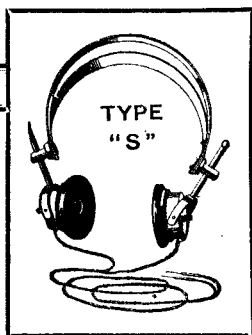
A gigantic show of Sets and Component Parts, including some wonderful new ideas and improvements. In order to make the Exhibition representative of the

Entire British Wireless Industry

every manufacturer of British goods has been invited to exhibit. Come and see ALL that the industry can offer. All goods will be on sale at the stands.

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See this issue



REPRODUCTION
THAT SURPASSES
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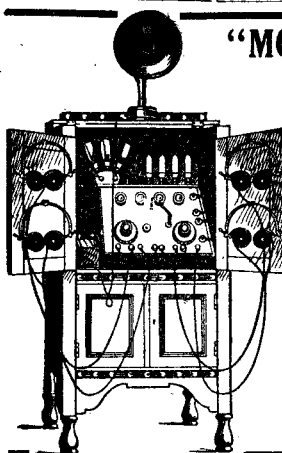
Your usual Dealer will be glad to show you a pair—ask him to let you try them, a test will readily convince you.

Price only 17/6 per pair.

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"MORRIS" Solid Oak Standard Cabnet, with lock,

for any kind of receiver. Bottom cupboard with lock for accumulators and stores. Height 3 ft. 6 in., width 2 ft., depth 15½ in. Inside dimensions of top compartment: width 22½ in., depth 13½ in., height 18 in. Back panel removable.

Further particulars on application.

PRICE £4 10 0.

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SOLID OAK WIRELESS TABLE with large drawer and bottom shelf for accumulator, length 25 in., width 16 in., height 26 in.

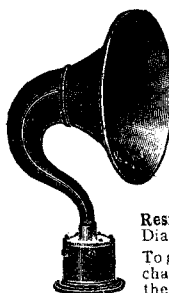
Dismounted in crate, plain (unstained) 20/- Mounted, stained and polished - - 27/6 Carriage paid.

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LOUD SPEAKER. (Pat. appld. for.)



This instrument is NOT A BABY. It is guaranteed to give as much volume as most of the more expensive makes, and the quality of its tone is wonderful. It can be used for private entertainment or public concerts and dances.

Using 5 valves it has been heard from a distance of 1 mile. Will work efficiently on a 3-valve set 30 miles from a B.B.C. Station.

Resistance 2,000 ohms. Height over all: 22 inches. Diameter of Bell mouth: 14 inches. British manufacture.

To give our customers an opportunity of testing before purchase is completed we will return the remittance in full if the Speaker is received back in good order within 7 days.

£3 15 0

Carriage Paid.

THE ACROPHONE COMPANY,
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R.A.F. TRANSMITTING SETS containing 1" Sterling Spark Coil, mica dielectric condenser, tuning helix, spark gap, etc. These sets are all good, only cases are damaged and can be repaired without cost and are the last batch of ex-Government stock to be offered. Price, to clear .. each **8/6** Post 1/3

MICROPHONES for crystal amplifying or transmission of speech .. each **2/6**

MICROPHONE TRANSFORMERS to suit above microphones. Price .. each **3/6**

EARPHONES low resistance, 150 ohms .. each **2/-**

GALVANOMETERS all in good condition for bridge or high-class testing work. Price, to clear .. each **8/6** Post 9d.

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POTENTIOMETER WIRE on cards, 34 Gauge D.C.C. Resistance 18 ohms to the yard. 2,500 ohms resistance on each card. Price **1/-**

500 OHM. CHOKE COILS iron core .. each **1/6**

POTENTIOMETERS by "Paul," ebonite ends, laminated contact .. each **4/-**

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M.II. TELEPHONE SETS complete, in polished cases .. each **12/6** Carr. 1/-

SPARK CAPS on ebonite, adjustable .. each **2/-**

MICA DIELECTRIC CONDENSERS 3 in case, by Marconi, each **3/6** Post 9d.

TRANSMITTING HELIX on ebonite .. each **2/6**

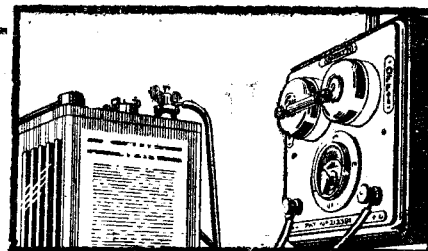
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Why spend good money every week to have your accumulators recharged when you can do them yourself at home. **FREE OF ALL COST?**

Why suffer the annoyance of being left with accumulators run down and the trouble of carrying them to a charging station, when you can keep them always fully charged and in perfect condition in your own home?

If you have a Direct Current supply of electricity of any voltage in your house, either for lighting or heating purposes, all you need to charge your own accumulators at home is the

An Electrical Engineer says:

"Please forward another of your 'Ulinkin' Chargers. The last one I installed gives every satisfaction. It has practically paid for itself already. A splendid little instrument."

ULINKIN

PATENT No. 212391.

THE D.C. HOME CHARGER

which charges your batteries automatically whenever you have lights, radiators, electric irons or vacuum cleaners in use in any part of your house, without consuming any extra current, and therefore free of cost.

PRICE £2:2:0 CARR. FREE

Complete with simple instructions.

Send 42/- for a **ULINKIN** To-day, or write for illustrated booklet and fuller particulars.

Trade Enquiries Invited

The Gran-Goldman Service

(Dept. P.3.), 71, Fleet Street, London, E.C.4

AUTOMATIC IN ACTION.
Requires no attention.
Cannot go wrong.

The Topical Illustrated Sports Weekly

ALL SPORTS is the paper for all who love sport for sport's sake, or for those who specialise in Boxing, Soccer, Rugger, Tennis, Cricket, Racing, Hockey, Billiards, Cycling, or Athletics, etc. Buy a copy TO-DAY. Ask for—

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EVERY FRIDAY, 2d.

LOW FREQUENCY TRANSFORMERS

RATIO 3-1/10-1

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**MAXIMUM
AMPLIFICATION
NO DISTORTION**

Magnetic Circuit consists of
Special "STALLOY" Stampings

Actual Manufacturers

PRIOR & RILEY,

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AGENTS—

JOHN H. LILE
LTD.

4 Ludgate Circus
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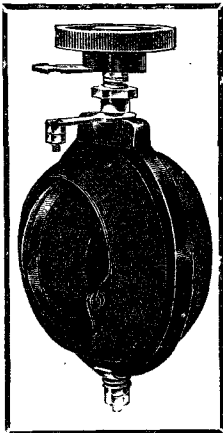
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**"POPULAR
WIRELESS"
HAS THE
LARGEST
SALE OF ANY
WIRELESS
JOURNAL IN
:: GREAT ::
BRITAIN.**

Crystal or valve set greatly improved

Not only inexpensive crystal sets will be greatly improved by fitting the new type Acme Variometer. This highly efficient little instrument is designed to cover 300 to 600 metres wave-lengths (with any aerial up to 100 ft). It is skeleton wound, close coupled and constructed for one-hole fixing. This Variometer is one of the best of all Wireless components. Suitable for use on higher wave-lengths such as Chelmsford with small fixed condenser in parallel.



Regd. No. 704248.

The demand for this variometer is enormous. Ask your dealer for one now; it will better the best set.

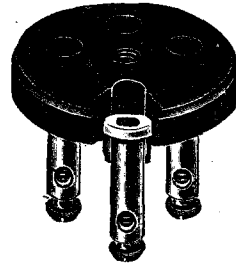
PRICE 6/6

Catalogue Free
The Acme Production Co Ltd
Smethwick
Birmingham

The last word in VALVE HOLDERS is the "MURRAY" (Prov. Pat. 15426/24.)

It fills a long-felt want

Absolute Safety.
Exceptionally Neat Appearance.
Easily Fixed.
Ebonite Cap Serves as Drilling Template.
High Finish with Low Self-Capacity.



PRICE 1/3 each.

(Postage on 1 or 2, 2d. 3 or more, post free.)

Each one is mounted on card, with the very simple instructions necessary for fixing.

From all dealers, or in case of difficulty, from the Patentees:

MURRAY, SON & CO.,
Manufacturers of Wireless Accessories,

387a, High Road, Tottenham, N.17.

Phone: Tottenham 178.

Dealers should write for Trade Terms. "Murray" Valve Holders Sell at Sight.

BUY "F. A. R." THE BEST

"F.A.R." L.F. Transformer.

Acknowledged to be the finest on the Market.

Ratio 1—1, 13s. 3d. each.

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Sole Agent:

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"F. A. R."

L.F.

Transformer

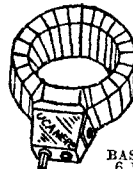
15/-

Ratio 5—1.

Of All Dealers.

"UCANERE" COMPONENTS CALLING A BRAND OF GENUINE QUALITY

SPECIAL WINDING
MAXIMUM INDUCTANCE
MINIMUM SELF-CAPACITY
MAXIMUM AIR SPACING
UNMOUNTED



MAXIMUM WAVE-LENGTH WHEN SHUNTED WITH .001 CONDENSER

25	350	metres	2/9	each.
30	440	"	2/9	"
40	675	"	3/-	"
60	950	"	3/3	"
75	1150	"	3/6	"

Nos. 25 & 30 .. 1/3 each.
40, 1/6. 60 & 75, 1/9 each.

COIL HOLDERS, all Ebonite
2-way, 3/-; 3-way, 3/11
BRASS FITTINGS, 2-way, 2/8; 3-way, 3/6
BASKET COIL HOLDERS, ea. 11d.
COIL PLUGS, Ebonite, ea. 6d.
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BASKET COILS—
6 Waxed, 200/3,600, set 1/7
5 Waxless, 200/2,000, set 1/7
CHELMSFORD, 150 Turns, ea. 1/-
Ditto, Mounted on Std. Plug, ea. 2/2
TAPPED COILS (20 Tappings), ea. 1/6
FILAMENT RESISTANCE, 8 ohms, ea. 1/6
EBONITE VALVE HOLDERS, each, 10 1/2d.

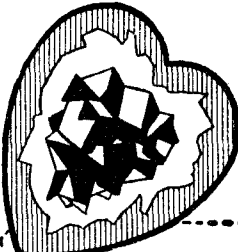
ALL POST FREE. DIRECT FROM ACTUAL MANUFACTURER. SATISFACTION GUARANTEED.

W. EDWARDS, 21-27, Dorset Street, Brighton

Straight from the Heart of Nature

The magic of Wireless is made more wonderful by the introduction of a new natural crystal, "URALIUM."
Each crystal is tested and guaranteed, is consistently active, unaffected by atmosphere and gives perfect reception over the maximum range.

Uralium
NATURE'S WONDER CRYSTAL



Obtainable in boxes including silver cat's whisker.
1/6
of all dealers.

If unable to obtain Locally, send P.O. with name and address of Local Dealer
THE BOWER ELECTRIC LTD.,
15, GRAPE ST., Shaftesbury Avenue, W.C.2. Telephones: Regent 5182 and 5183.

VALVE RENEWALS

We repair, by our patent process (for which we have National Physical Laboratory's report of efficiency), all standard types of valves at

6/6 carriage paid, and

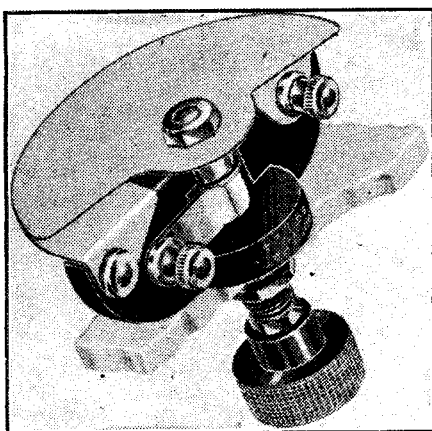
GUARANTEE { at least equal efficiency to new valves.
to return in three days,
or refund your money without quibble.

THE ECLAT ELECTRIC MANUFACTURING CO., LTD.,
WIMBLEDON.



The Technical Editor of "Popular Wireless" will be pleased to receive wireless sets and component parts for test. Reports will be published under this heading.

THE "Colvern" Tuning Condenser, a speciality of the Collinson Precision Screw Co., Ltd., of 150, King's Cross Road, London, W.C.1, of which some samples have been sent us for test, is a neat little fitment which should appeal very strongly to constructors of valve apparatus.



The Colvern tuning condenser, showing the method of mounting it on a panel.

It is a neat little "vernier," designed for one hole mounting. As the maker's point out, it is generally desirable to accomplish final "balancing" with a "vernier" not in too close proximity to the main tuning condenser, as "capacity effects" are so marked in some circuits that "hand capacity" is apt to render the vernier attachment of a combination condenser useless.

At 2/6 the "Colvern" Tuning Condenser should command a ready sale.

We have received a sample "Radion" panel from the American Hard Rubber Co. which is made of their new substance, "Mahoganite." The result is a panel of the insulative value of ebonite, which has the appearance of beautifully grained and polished mahogany.

It is easy to work, and is, in fact, except as to appearance, to all intents and purposes first-class ebonite. "Mahoganite" will appeal to all constructors with artistic inclinations, and *should* tend to increase the popularity of well-finished amateur sets and help to sound the death-knell of "junk"—but in our opinion, it won't!

The earth connection is quite as important as the aerial, if not more so, and if efficiency in reception or transmission is to be obtained, then it is essential that it should be as near perfection as possible.

A means of securing a first-class "direct" earth connection is available in the Hedges

Patent Tubular Earth, manufactured by R. C. Cutting & Co., of Vulcan House, 56, Ludgate Hill, London, E.C.4, and sold retail at 8/6.

We have received a sample for test, and are able to endorse the opinion of our scientific adviser, Sir Oliver Lodge, F.R.S., who has reported that in his opinion the Hedges Tubular Earth possesses considerable advantages over the usual plate earths.

It is interesting to note that the designer of this form of earth has installed a system of similar units for earthing the lightning conductors on St. Paul's Cathedral and many other famous buildings—a clear proof of the efficiency of Tubular Earths.

One has not to worry much about the "finish" of an article that is to be buried, but at any rate the Hedges Tubular Earths are solid and of sound construction, while the design is ingenious and technically sound.

Messrs. Alfred Graham & Co. inform us that owing to the continual expansion of "Amplion" business, and the rapid development of overseas trade, they have decided to organise an independent overseas section. The management of this department will be undertaken by Mr. J. M. Richard, who was, until recently, commercial manager of the Marconiphone Company.

Probably fixed crystal detectors can never be quite so sensitive as the adjustable type, but nevertheless the demand for the sealed-contact type, which can be connected in circuit and left alone indefinitely, is steadily growing. Messrs. A. H. Clackson, of 119, Fleet Street, E.C.4, have forwarded us a sample of their "Catseye" fixed detector, and for the past fortnight this small instrument has been tested against an adjustable detector, and has proved thoroughly sensitive and satisfactory.

Messrs. W. Edwards & Co., of Arc Works, Dorset Street, Brighton, have forwarded several samples of their cheap components, which, notwithstanding the low prices, prove to be quite efficient in operation. For instance, the two-way coil-holder at 3/-, post free, is quite a useful, workmanlike job, and the wire type filament rheostats at 1/6 are excellent. Experimenters will also find this firm's sets of basket coils very useful, and quite efficient inductance units.

An ingenious little device is the Newey Snap Terminal, which resembles a dress-fastener in principle and appearance. It provides a very convenient means of making connections, and on test we discover that contacts so made are electrically and mechanically "A1." They are supplied in

brass for 1½d. each, or in nickel for 2d., or at 2/- and 2/6 a dozen respectively.

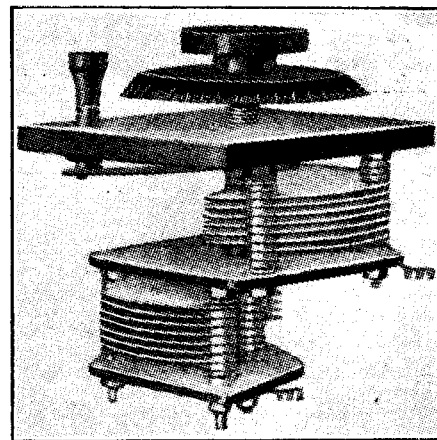
From Messrs. H. A. Hunt & Co. we have received a well-finished crystal detector and a tapped grid leak. The crystal detector is of straightforward design, and is so constructed that an excellent adjustment is possible.

The grid leak is designed for "back-of-panel" mounting, and is fitted with an anti-capacity handle. Special precautions are made to ensure constant resistance values.

Having carefully tested both the above components, we are able to recommend them to the attention of our readers as being in all respects well-made and efficient instruments.

Two interesting booklets have reached us this week. The "Plain to See" Continental Radio Time Table, which is published by E. T. W. Dennis, Ltd., Scarborough, lives up to its title by an arrangement classifying signals according to the time they are received. It is priced at 4d.

The Chronicle Wireless Guide is an ambitious attempt to describe in clear language how the home constructor can make a range of wireless receivers and amplifiers. It is well illustrated, and full of information, and is published by Allied Newspapers, Ltd., Manchester, at the modest price of 6d.



A double condenser for controlling two stages of H.F. with one knob, to which is fitted a vernier attachment (Jackson Bros.)

In reviewing the exhibits at the N.A.R.M. Wireless Exhibition in our issue of the 4th inst.) Mr. Sholl says, "In view of the rather extravagant claims put forward by the makers, we prefer to make a trial—"

Now Mr. Sholl was referring to the C.A.V. Loudspeaker which we had already reported on very favourably in these columns, so we must hasten to point out that the claims in question might sound extravagant to one who has not heard the instrument in operation, but that applies to all really first class components of novel construction.

In the advertisement of Messrs. Hamilton May, Doone Cottage, Weybridge, Surrey, which appeared in our issue of 11th inst., an error occurred. Referring to steel wireless masts 150 ft., 90', should have read 50 ft., 90'.

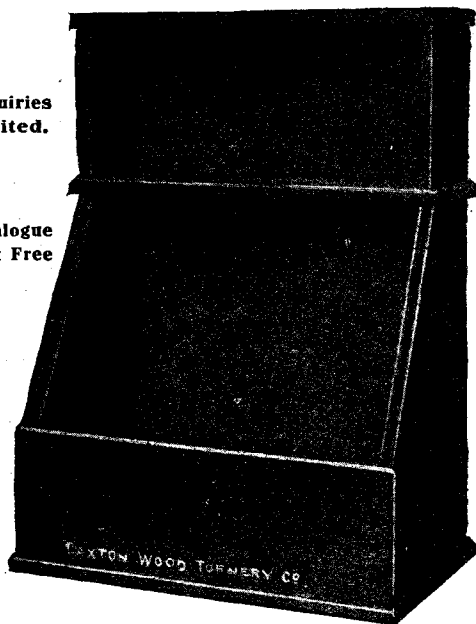
WIRELESS CABINETS

IN VARIOUS DESIGNS, and WOODS

Mahogany. Satin Walnut. White Wood polished Mahogany.

Enquiries
Invited.

Catalogue
Post Free



Delivery
from
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Specials
to Order.

Makers: CAXTON CABINET & WOOD TURNERY MILLS
MARKET HARBOROUGH.

Telegrams & Telephone: Haddon, 59, Market Harborough

“WANDAS”

VALVES AND TRANSFORMERS. SATISFACTION GUARANTEED.

VALVES. High Grade Finish. Low Consumption.

ABSOLUTELY THE BEST HOLLAND CAN PRODUCE.

Specially designed to our requirements. Filament Volts 4, Filament Amps 15, Anode Volts 30-90. Designed to operate as Detector or Low-Frequency Amplifier. Every separate feature of Valve Structure has received the utmost technical consideration. Post Free 8/-.

TRANSFORMERS. First Class Dutch Manufacture.

The windings are of best enamelled high conductivity copper, very liberally designed, and each layer of both the primary and secondary windings is separated by special insulating paper.

AMPLIFICATION ENTIRELY FREE FROM DISTORTION.

Very special attention has been paid to the isolation enabling a guarantee against ALL CLIMATES. Each Transformer thoroughly tested before leaving our factory. GUARANTEED TWO YEARS. Post Free 12/-.

Dull Emitter Radio Valve 1½-2 Volts, 0.06 Amps., 40-100 H.T. Volts, 17/6 post free.

Full refund if not satisfied.

Orders can only be dealt with in rotation.

Scott Brothers & Company, (Wireless Department), Edmund Road, Sheffield.

DON'T PAY MORE!

All the Best Dealers can
now supply you with
(Guaranteed)

**BOWERMAN'S
BEST
BRITISH-MADE
POWER
HEADPHONES**

4,000 ohms

Stalloy Diaphragms.

Highly polished
Duralumin Bands.



Show this advertisement to your Dealer and tell him we
can supply him at the right price.

BUY AND TRY A SET “ON APPROVAL.”

Money Back AT ONCE if these Headphones do not please you
in every way as being the biggest value on the market to-day.

We are out for big sales at a small profit. That's our
idea of helping British Trade and Industry. Is it yours?

If any difficulty in supply, we will send to you direct on
receipt of P.O. 12/6.

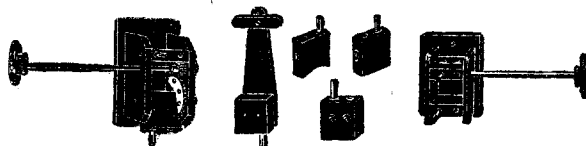
BOWERMAN'S PHONE,

10-12, Ludgate Hill, London, Eng.

IRISH OFFICE 36, Arthur Street, BELFAST

WINDSOR HIGH GRADE

Coil Holders and Fittings.



Best Quality Vernier

Very accurate adjustment
6/6 each:

Coil Plugs

Plain 8d. each,
Curved 9d. each,
Basket Holders 1/3 each.

**All ebonite Matt
finish**

2-Way 3/11 each,
3-Way 5/- each.

Trade enquiries invited—

WINDSOR WIRELESS WORKS,

413a, Brighton Road, S. CROYDON.

CONDENSERS

VARIABLE, EXCELLENT VALUE,
ALUMINIUM THROUGHOUT. Prices each:

Without Vernier

With Vernier

•001 - 7/3

•001 - 8/6

•00075 - 6/3

•0005 - 6/7

•0005 - 5/4

•0003 - 6/3

•0003 - 5/-

•00025 - 5/11

•00025 - 4/8

•0002 - 4/-

•0001 - 3/8

•00005 - 3/8

Carriage paid. Complete with knob and dial packed in strong card-board boxes. Every condenser guaranteed. Cash refunded if not satisfied.

GORDON L. WHITE (Wireless Dept.),

9, Bucklersbury, Cheapside, London, E.C.4.

YOURS FOR 20/-

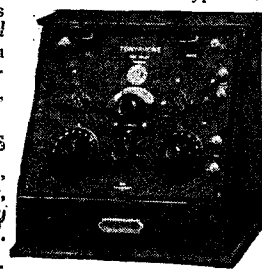
Send 20/- to-day, together with your order for the “Tonyphone,” and this wonderful set, which receives all B.B.C. stations, will be delivered complete, including all accessories. You pay a further £1 each month afterwards. The total cost is only £15 9s., or, if you prefer, £14 5s. cash.

‘TONYPHONE’ SUPER TWO-VALVES

Complete with Accumulator, H.T. Battery, Aerial, 1 pair 4,000 ohms Headphones, and two Valves—one High Frequency and one Detector. All Royalties paid. Send to-day and enjoy broadcasting NOW.

BRITISH ENGINEERING PRODUCTS CO.,

(Valve Dept.), WINDSOR HOUSE, VICTORIA STREET, LONDON, S.W.1.



HULLO EVERYBODY!!

LISSEN.

Variable Grid Leak	2/6
Anode Resistance	2/6
Lissen Minor	3/6
Lissenstat	7/6
Do. Universal	10/6
2-way Switch	2/9
Series Parallel	3/9
T1 Transformers	30/-
T2, 25/-; T3, 16/6	
Coils: 25, 4/10; 30, 35,	
40, 4/10; 60, 5/-; 80,	
5/4; 75, 5/4; 100, 6/3	

POST 3d. each.

DUBILIER.

.001, .002, .003, .004,	
.005, .006, Fixed, 3/-	
.0001, .0002, .0003,	
.0004, .0005	2/6
Type 577, .01	7/6
Grid Leaks each	2/6
Anode Resistance	
50,000, 70,000, 80,000,	
100,000, on stand complete	5/6
Minicap Switch	8/-

POST 3d. each.

IGRANIC.

Coils: 25, 5/-; 35, 5/-;	
50, 5/2; 75, 5/6; 100,	
7/-; 150, 7/10; 200,	
8/8; 250, 9/-; 300,	
9/5; 400, 10/3; 500,	
10/6	
EH. Rheostat	4/6
Potentiometer	7/-
Vernier Rheostat	7/6
30-ohm Rheostat	7/-

POST 3d. each.

STERLING SQUARE LAW CONDENSERS.

with Vernier.

.001	30/-
.0005	25/8
.00025	23/6

EDISON BELL.

.0001 to .0005 Fixed	1/3
.002 to .006	2/-
.001	1/3
.0003 with Grid Leak	2/6
Variometer	10/6
Twin Detector	5/-

POST 2d. each.

WEST END DEPOT FOR

POLAR; JACKSON
BROS.; R.I.; BURN-
DEPT; GOSWELL
ENG. CO.; SILVER-
TOWN; IGRANIC;
LISSEN; RADIO
PRESS ENVELOPES;
DUBILIER; EDISON
BELL; ETC.

POST FREE OFFER.

POST PAGE No. 1.

Not Applicable to Foreign Orders.

DELIVERY. Every endeavour is made to despatch goods by return, but sometimes delays occur which are beyond our control and in which cases customers may rest assured that their orders will be executed in the very shortest period. They will therefore realise that it is not possible to have orders cancelled through above causes. All orders over 20/- post free U.K. only.

RHEOSTATS.

Ormond	2/-
Raymond	1/6
Do. with dial	2/-
Extra value do.	2/6
T.C.B. 6 ohms	4/-
Potentiometer T.C.B.	5/-
Burntapt Dual	7/6

POST 3d. each.

TRANSFORMERS (L.F.).

Radio Instruments	25/-
Igranic, Shrouded	21/-
Powquip, Shrouded	18/-
Formo, Shrouded	18/-
General Radio 83	14/11
Brunet, Shrouded	13/6
Formo, Open	12/6
Powquip, 2-1 or 4-1	14/6
Raymond	10/-
Eureka Concert Grand	30/-
Ditto, 2nd Stage	22/6
Silvertown	21/-

TRANSFORMERS (H.F.).

McMichael, 300/600	7/-
Ditto 1100/2000	7/-
Energio, 250/700	3/11
Ditto 900/2000	4/6
Raymond, 300/800	2/9

Others Stocked.

H.T.C.

POST 2d.

Special valve holder above panel	1/9
Ditto, for under panel	1/6

POLAR

POST 6d.

.001 var. Condenser	10/6
.0005 " "	10/6
.0003 " "	10/6
Micrometer Condenser	5/6
Cam Vernier 2-way	
Coil Holder	11/-

GRID LEAK.

Dubilier	2/6
McMichael	1/6
Edison Bell	1/3
Raymond	1/-

POST FREE

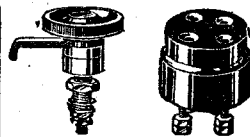
WATMEL

Var. Grid Leak	2/6
Anode Resistance	3/6

BRETWOOD (New Model)

Var. Grid Leak	3/-
Anode Resistance	3/-

POST 2d. EACH.



This first-class Switch Arm, with 12 Studs, 12 Nuts, 12 Washers. By Post 1/6 set.

"POWQUIP" L.F. TRANSFORMERS.

POST FREE

BUCKS. (for Reflex etc.) - 12/6

MANCHESTER (similar to R.I.) 14/11

STANDARD - 14/11

SHROUDED - 18/-

COIL PLUGS.

Single Coil Holder mounted on ebonite base and fitted with terminals 1/4 with terminals 1/8 Ditto, swivel movement 1/8 Post Free.

CRYSTAL DETECTORS 4d. each



Enclosed glass. As Sketch. Ebonite Base.

Brass	1/-, 1/4, 1/6, 2/-
Nickel	1/6, 2/-
Ebonite	1/6
Perikon	2/3

(With Zincite and Bornite.)

NOTE!

OUR WONDERFUL MICRO-METER ADJUSTMENT GLASS-ENCLOSED DETECTOR. WHY PAY MORE?

POST 6d. each. 1/11

"BABY" COIL STANDS (EBONITE)

GRAND VALUE

2-Way, 2/6; by Post, 3/-
3-Way, 4/3; by Post, 4/9
Brass Fittings, Knob Type, on Base.

WATES MICROSTAT

FOR D.E. or R. VALVES 2/9

Post Free.



"ORMOND" L.F. TRANSFORMER

Post Free.

RHEOSTAT

(Ebonite Former)

EUREKA WIRE, KNOB, AND DIAL 1/11

By Post, 2/3

EDISON BELL Shaped Plug

1/- By Post, 1/3

Also with Base, 1/3

By Post 1/6

FINE VARIOMETERS



EBONITE-

4/11 and 5/11

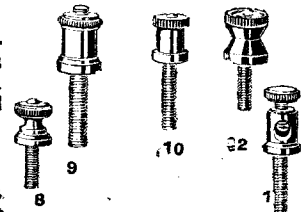
Post 6d. each.

DUPLEX WAXLESS BASKET COILS

Min. Self-Capacity

Set of 5 1/8

By Post 2/- Set



TERMINALS WITH NUT & WASHER

No. 8 per dozen	1/-
No. 9 " "	1/3
No. 10 " "	1/1
No. 12 " "	1/3
No. 13 " "	1/1

POST FREE ALL 4 B.A.

"BUCKS" for Reflex 12/6

EBONITE

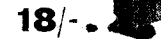
2 for 1/2
2 for 1/4
2 for 1/6
3 Qualities.

BASKET HOLDERS

2 for 2/-
2 for 2/8
2 Qualities.

FORMO SHROUDED

18/-



RAYMOND 10/-

By Post 10/6.

FORMO 12/6

Post Free.



ONE HOLE FIXING

1/3

By Post 1/6

BATTERIES (H.T.) EVER-READY

60v. - 13/6

180v. - 22/6

POST FREE

FIBRE STRIP FOR COILS

3 FEET Lengths

1 inch wide.

12 feet 1/-

Post Free.

GOSWELL ENGINEERING

POST FREE

Patent Valve Holder 1/6

2-Way Cam Vernier

Coil Stand 9/-

3-Way Cam Vernier

Coil Stand 12/6

3-Way Ordinary 7/6

PARTS FOR 2-VALVE "UNIDYNE" RECEIVING SET

THE 4-ELECTRODE VALVE	
Thorpe K4	each 17/6
6 Terminals	for 10d.
2 Microstat Filament Resistances	each 2/9
1 Variable Grid Leak	2/6
1 Single-Pole Double-Throw Switch	1/9 or 2/-
1 '0005 Variable Condenser, with Vernier	7/3
1 Cam Vernier 2-way Coil Holder	9/-
Panel, 5 1/2 in. by 1 1/2 in., drilled to hold 2 5-Pin Valve Holders	for 2/-
2 5-Pin Valve Holders	each 1/6
1 Fixed Condenser, '001	1/2, 2/2 3/-
1 " " '0002	1/2, 2/2 3/-
1 Shrouded L.F. Transformer	20/-
8 yds. No. 18 Gauge Tinned Copper Wire	1/2
Necessary Screws, Nuts, and Washers, Free if above lot purchased.	Post Extra.

RIGHT OPPOSITE
DALY'S
GALLERY DOOR

K. RAYMOND
27, LISLE STREET,
LEICESTER SQUARE, W.C.2

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TWO PAGES MORE OVERLEAF

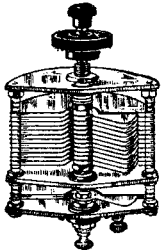
ALL OUR CONDENSERS HAVE BEEN TESTED AND RECOMMENDED BY LEADING JOURNALS UNSOLICITED. } BRITISH MADE } ALL LEADING CIRCUITS SPECIALLY ADAPTED FOR

NEW MODEL

WITH VERNIER

•001	-	9/3
•0005	-	7/3
•0003	-	6/9

With EBONITE DIAL and Two Knobs.
Post 6d. Set.



WITHOUT VERNIER

•001	-	6/6
•0005	-	5/3
•0003	-	4/11
•0002	-	4/6

Vernier, •0005 3/9

Complete with knob and dial
Post 6d. Set.

SQUARE LAW

•0005	..	7/11
•0003	..	7/8

With Vernier.
•0005 .. 10/11
•0003 .. 9/11

Post 6d.
Knob & Dial included.

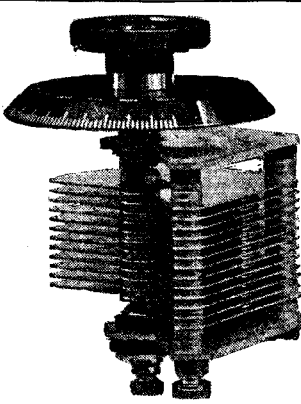
RAYMOND VARIABLE CONDENSERS

Exclusive Design. Stout Vanes. Extra Insulation. Very Compact. Narrowest Spaces (Pressed Aluminium). Centre Rod cannot bend. Terminal Connections Wonderful for Portables. Capacity Guaranteed. Perfect Efficiency. Handsome Design. Takes up very little space in panel. Nickelled Fittings. Beautifully Made. New one-hole fixing method.

COSTS A TRIFLE MORE,

A Few Pence Only, and is Just what You Want.

NICE DIAL and KNOB included.



'DE LUXE' MODEL

AS SHOWN, WITH DIAL, KNOB AND BUSH.

•001	-	7/3
•0005	-	5/11
•0003	-	5/4
•0002	-	4/11

POST 6d. SET.

John Blair, Esq.,
Rezal Pharmacy, Millom.

says:—
Your Condensers are a REVELATION to me as a Dealer. Sept., 1924.

C. Walton, Esq., Andover.
Tested your Condensers on Messer and got "INFINITY."

9/- TWIN CONDENSER POST FREE.



Composed of two equal units of •00025 or •0003 mid., operated by one Knob and Dial, thereby enabling you to tune two circuits by one turn of the dial. Can be used in series or parallel. Complete as shown with aluminium ends, Knob and dial. For Tuned Anode Circuits.

MANSBRIDGE FIXED CONDENSERS

1 M.F.	..	4/6
2 M.F.	..	5/-
•05	..	4/6

Various others Stocked.

Delivery very slow from makers.

"RAYMOND'S FIXED CONDENSERS."

Ebonite Base. •001, •0001 to •0005	..	1/2
•002 to •004	..	1/3
•006	..	1/6
•01 and •02	..	1/9
•05	..	3/3

POST FREE.

W. Kennard, Sig. Telegraphist, H.M.S. Teamington, 2nd July 1924. The Condensers are splendid, and superior to any I have ever seen. Please find repeat order. W. Hale, Esq., 3, Gaye St., Walsall. 30th April, 1924. The last 4 Condensers gave every possible satisfaction—highest quality at extremely low prices. Kindly despatch enclosed further order. E. Shepherd, Esq., 23, Warden Street, Dunedin, 12th May, 1924. Everything came to hand in splendid condition, the quality far exceeding my expectations.

The set used by
Miss Evelyn Laye
in her dressing-room at Daly's is made of Raymond parts.

LOUD SPEAKERS

30/-	STERLING
25/-	"DINKIE" DRAGON FLY AMPLION (Baby New Model.)
55/-	BABY STERLING (Brown Floral.)

ALL MODELS OBTAINABLE.

VARIOMETERS

RAYMOND 8/11



Post 3d. each

FALLON IGRANIC EDISON-BELL

Post free 10/-

ENERGO

H.F. Plug-in Transformers

No. 1.	150-450	..	3/6
No. 2.	250-700	..	3/11
No. 3.	450-1200	..	4/3
No. 4.	900-2000	..	4/6
No. 5.	1800-3030	..	4/9
No. 6.	2200-5000	..	4/11

BRUNET (genuine)

4000 ohm Double	..	16/6
4000 ohm Single	..	8/3
2000 ohm Single	..	7/6

POST FREE.

From S. H. COULTER, Esq.,
55, Court Road, Barry Dock.
30/9/24.

Condenser to hand this a.m. No wonder you are snowed under with orders! IT IS AN EXCELLENT COMPONENT. Please find repeat order.

JACKSON BROS. "J.B." VARIABLE CONDENSERS

	Standard	Super.	Microdenser
•001	8/6	9/6	11/6
•00075	8/-	9/-	11/-
•005	7/-	8/-	10/-
•0003	5/9	6/9	8/9
•00025	5/9	6/9	8/9
•0002	5/-	5/6	8/-
•0001	4/9	5/6	7/9
Vernier	4/-	4/6	

Post 3d. set.

SQUARE LAW SHORTLY.

HIGH GRADE EBONITE

POST PRICES	3/16 in.	1/4 in.
6 x 6	1/6	2/-
7 x 6	1/6	2/-
8 x 6	2/-	3/-
9 x 6	2/2	3/3
10 x 6	3/-	4/2
12 x 6	3/3	4/2
12 x 9	4/3	5/6
12 x 12	5/6	7/6
14 x 10	5/6	7/6

Cut to Size, 3/16 in. at 1d. square inch.
Post 3d. Foreign Post extra.

CALLERS' PRICES ELSEWHERE

D.C.C. WIRE POST PRICES

16 D.C.C. 1/2 lb.	-	2/-	20 D.C.C. 1/2 lb.	-	1/3
16 " 1 lb.	-	3/6	22 " 1 lb.	-	1/4
18 " 1 lb.	-	2/3	24 " 1 lb.	-	1/6
18 " 1 lb.	-	3/9	26 " 1 lb.	-	1/8

28 D.C.C. 1 lb. - 1/10

CALLERS' PRICES ELSEWHERE

FRENCH THOMSON-HOUSTON

4000 ohm 'Phones	
100 pairs at 12/11	

POST 6d.

SUNDRIES Post free

Screw Spade Terminals	doz.	1/-
Pin Screw Terminals	doz.	10d.
Spade Tags	doz.	5d.
Empire Tape, 1/2 in.	12 yds	9d.
Insulating Sleeving	6 yds.	2/-
Ebonite Knobs, 1 1/2 in. 2 B.A.	6d.	
Moulded Knobs 1 1/2 in.	2 for	8d.
Ditto 1 in. 2 B.A.	2 for	8d.
Ebonite ex-handles 6 in.	9d.	
D.C.C., I.R.C. Bell Wire 10 yds.	1/-	
Double 'Phone Cords, 72 in.	1/11	
Porcelain S.P.D.T. Switch	1/11	
Ditto D.P.D.T. Switch	2/6	
Battery Clips	doz.	10d.
Ebonite Valve Holders	1/3 and 1/-	
Lead-in Wire 4 M/M.	10 yds.	2/6
Lead-in Wire	10 yds.	1/6
Twin Flex	12 yds.	1/11
100 ft. 7/22 Aerial Wire with four insulators	3/6	
Nugraving Titles or Scales	8d.	
"R.I." Choke Coil	10/-	
Nickel Panel Switches, D.P.D.T.	1/5	
Ditto, S.P.D.T.	1/2	
Insulating Sleeving 3 yds.	1/4	
Tinned copper sq., 16 gauge, 15ft.	1/-	
Spearpoint Whisker, gold	4d.	
Gold Whisker	4d.	
Set of 5 (one gold)	6d.	
Variometer (250/650)	3/3 and 2/6	
Ditto Ebonite	4/11	
Ditto Ball Rotor	6/11	
Burndept Detector	5/6	
Screw Wander Plugs	pair	6d.
Skindervision Button, Alumin.	5/-	
Seven Twist Drills (H.S.)	1/11	
Taps 0, 2, 4, 6 B.A.	set	2/-
Sorbo Ear Pads	pair	1/9
Neutron Crystal	1/6	
Blue Tungstaltite	1/6	
Geocite (G.E.C.)	1/3	
Tumbler Switches (Ebonite)	1/9	
Valve Sockets, Plain (nut and washer) doz.	1/-	
Sets of Spanners	2/-	

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SEE OVERLEAF EXTRA POSTAGE ON FOREIGN ORDERS. SEE OVERLEAF

The CREAM of the WORLD'S HEADPHONES

4,000 ohms.
STERLING 4,000 ohms
NEW MODEL .. 25/-
BROWN'S (Featherweight) 25/-
B.T.H. (Wonderful Tone) .. 25/-
BRANDES (Matched Tone) 25/-
GENERAL RADIO .. 20/-

TELEFUNKEN 4,000 ohms HEADPHONES

As light as a Feather .. 17/11

Dr. NESPER HEADPHONES

Genuine Nesper-
phone, 4,000 ohms.
Fitted with adjust-
able diaphragm, de-
tachably receivers,
double leather-
covered head-
springs, long flex-
ible cords, nickel-
plated parts. Very
comfortably fitting
to the head.
LOOK FOR THE
TRADE MARK.
4,000 ohms .. 12/6
Post 6d. pair.

GENUINE "N & K" HEADPHONES

Guard against in-
ferior imitations
which are "clever-
ly" got up to de-
ceive. Make sure of
the genuine article,
the original "N &
K," and avoid dis-
satisfaction. See
that the letters
"N & K"—and no
other—are stamped
4,000 ohms. 12/11
6,000 ohms. 13/3
Post 6d. pair.

BEWARE OF "PATTERN" OFFERED CHEAPLY

ACCUMULATORS

MADE BY WELL-KNOWN
FIRM FOR ME.

2 v. 40 amps. 9/6. By post 10/6
4 v. 40 amps. 16/6. By post 17/6
4 v. 60 amps. 19/6. By post 20/6
4 v. 80 amps. 23/6. By post 24/6
6 v. 60 amps. 27/6. By post 29/-
6 v. 80 amps. 33/- By post 34/6
6 v. 105 amps. 38/6. By post 40/6

UNIVERSAL (FRANCO)

Basket Coil Stand, 2-way

POST FREE 5/9

FRANCO, 2-way (plug-in) .. 12/6
Ditto 3-way .. 17/6
The only GEARED COILHOLDER on the
market.

CHELMSFORD (5 X X)

D.C.C. Basket Coil, complete with
adapter, specially made to use with
650 variometer, 2/6. By post 2/9
LOADING PLUG and Socket .. 9d.
D.C.C. COIL for 5 X X, 1/6. By post 1/9

BRASS FORMER TO MAKE YOUR OWN COILS

DOUBLE, 23 spokes each side.
POST FREE 3/11

POST PRICE TINNED COPPER

18 Round $\frac{1}{2}$ lb. .. 2/6
20 Round, $\frac{1}{2}$ lb. .. 2/6
16 Square, 12 ft. .. 10d.
18 Square, 12 ft. .. 9d.

GUIDE FOR CHELMSFORD On 1,600 Metres

Aerial Reaction
Coil No. 150 200
Tuned Anods 250 or 300

"SUCCESS" L.F. TRANSFORMER Super 21/-

"MURRAY" (Prov. Pat.)

VALVE HOLDERS

High finish. Absolutely Safe.
Low Capacity.
EASILY FIXED.
Exceptionally neat appearance
1/3 POST FREE.

RADIO PRESS TRANSFERS 6d.

By Post 8d.

POST PRICES VARIOMETER 250/600 2/6

Ditto with fixing clips
3/-

EBONITE BALL ROTOR 6/11

ALL KINDS STOCKED
at 2/11 3/6 3/9 4/- 4/6
Leave the selection to me and
you won't be disappointed

VALVES

Cossor P.1 and P.2 12/6
Mullard L.F. & H.F. 12/6
Mullard D.F. Ora 21/-
B.T.H. R.4 - - - 12/6
B.T.H. P.5 '06 - - 25/-
Ediswan A.R. - - 12/6
Ediswan A.R.D.E. 21/-
Ediswan A.R. '06 25/-
Marconi R. and R.5 12/6
Marconi D.E.R. - 21 -
Marconi D.E.3 - 25/-
POST FREE

French "R" - - 6/11
Phillips "R" - - 7/6
French '06 - - 15/11
Post 6d. each

ALL VALVES ON
POST SENT AT
PURCHASER'S RISK.

MYERS VALVES

UNIVERSAL DULL EMITTER
12/6 21/-
POST FREE

PHILLIPS D.E. VALVES

'04 Type 1'5 to 1'8
each 17/6
Post 6d. each.

THORPE K4 VALVES

(5-pin) for UNIDYNE 17/6
THORPE K1 .. 10/-
POST FREE
5-Pin Valve-holder - - 1/6

"OOJAH" GRAPHITE

Pile Rheostat for D.E.
or R Valves .. 4/-

N. & K. LOUD SPEAKER A LITTLE GEM 21/- POST 1/-

RADIO PRESS ENVELOPES No. 1 at 1/6 2, 3, 4 at 2/6

COIL STANDS

Ebonite 2-way with
Extension Handles
Nickel Fittings
3/3
By Post 3/9

Ditto 3-way 4/9

By Post 5/3

CAM-VERNIER (2-way) POST FREE 7/6

POLAR (2-way) 11/-

GOSWELL (see elsewhere)

"R.I." NEW MODEL IN SEALED BOX Don't Buy Otherwise Post 25/- Free

NEW LISSEN LINES 5 Point Switch - 4/- Auxiliary Res. - - 1/3 Lissen Choke - 10/- Post Free

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ALL POST ORDERS FROM THE OTHER THREE PAGES

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OPEN
WEEKDAYS
9 to 7.45
SUNDAYS
10 to 1

SUNDRIES.

Legless Valve Holder
Solid Ebonite
Phone Cords (6 feet) 1/-
Nugraving 7d.
Similar Sets (Titles or Scales) 3d.
Good Knobs 1d.
Small Knobs, 2014 B.A. 2d.
Studs, Nuts and Washers doz. 4d.
Switch Arms 8d. to 1/-
Copper Foil 15 ft. 2d.
18g. Sq. Tin Copper 5d.
16g. Sq. Tin Copper 12 feet 5d.
Round Tin Copper, various Sizes.
Insulated Staples 5 a 1d.
Insulated Hooks 4 for 3d.
Rubber Lead in, 30 feet 1/3
7/22 Copper Aerial, 100 ft. 1/10
Extra Heavy Aerial, 100 ft. 2/- & 2/3
Good Valve Holders 8d.
H.T.C. in Stock 1/6, 1/9
H.F. Transformers, 300/600 2/9
Empire Tape, 1/2 in., 2 yds. 1d.
Ditto, 1 in., 2 yds. 1d.
6 in. Ebonite Anticap Handles 8d.
Skinderviken Buttons (Aluminium) 4/6
Connecticut Switches 1/4
1,000 ohm Bobbins 1/3
2,000 ohm Bobbins 1/8
Sorbo Rubber Ear Caps pr. 1/4
Adhesive Tape Roll 2d.
Allen var. Gd. Lk. 1/3
Allen Anode Res. 1/8
Scales, 0-180, 2d., 3d., 4d.
Dial and Knob (Ed. Bell) 1/3
Dial (Ebonite) 10d.
Brunet Headphones 14/6
Twin Flex 4 yds. 6d.
D.C.C. Bell Wire, 10 yds. 5d.
(Indiarubber covered)
Sleeving 1 yd. 4d.
Wander Plugs pr. 3d.
Coloured Plugs each 1d.
(All screw pattern)
Electron Aerial 1/3
Polished Boxes, 8 by 6 3/6
Strong Valve Template 4d.
Egg Insulators 1d.
Reel ditto 1d.
Thick Rubber Lead-in per yd. 2d., 3d.
Ribbon Aerial 100 ft. 1/10
Panels Drilled
Radio Press Envelopes.
Raymond Fixed Condensers
'001, '0001 to '0005, 10d.
'002, '003, '004 1/-
'006 1/3; '01 1/9; '02 1/9
Polar Micrometer Condenser 5/6
2 Meg. Grid. Leak 1/-
Rubber Lead-in 10d. doz. yds.
Valve Windows 6d., 7d., 9d.
R.I. Choke Coil 2/-
Lissen Ditto 10/-
Bretwood Valve Holder 1/9

SWITCHES ON

Porcelain D.P.D.T. 1/7
Porcelain S.P.D.T. 1/3
Ebonite D.P.D.T. 1/8
Ebonite S.P.D.T. 1/3
Min. Panel D.P.D.T. 1/-
Min. Panel S.P.D.T. 10d.
Tungstalite 1/-
Microstat 2/6
Tumbler Switches (Ebonite) 1/4
Fibre Strip (for Coils) 3 feet 2d.
D.C.C. Wire, per 1 lb.—
13 g. 9d. 20 g. 9d.
22 g. 10d. 24 g. 1/-
26 g. 1/1 28 g. 1/3
30 g. 1/6 Etc., etc.
Soldier per stick 2d.
2 Color Flex yard 2d.
Shellac 5d.
Battery Box 4/6
(with clips for 36 v.)
Nickel Pillar Terminals 2d.
Nickel Contact Studs 2 for 1d.
Nickel Switch Arm 1/-
(one-hole fixing)
Loading Coil and plug 8d.
Garnages Permanite 1/-
Condenser Brushes 6d.

BRASS PARTS.

W.O. or Pillar Terminals 1d.
Small Pillar 4 for 3d.
Phone 4 B.A. 1d.
Phone 2 B.A., 2 for 2d.
Valve Sockets 4 for 3d.
(Above with Nut Washer)
Valve Pins and Nuts, 2 a 1d.
Stop Pins and Nuts 2 a 1d.
Plug and Socket pr. 1d.
Spring Washers 4 a 1d.
Spade Screws 1d.
Pin Screws 2 for 1d.
Spade Tags 5 a 1d.
Spring Pillar Terminals 2d.
Nuts, 2, 4, 5, 6 B.A. doz. 2d.
Washers (Brass) 12 a 1d.

DETECTORS, &c.

Enclosed Brass, Large 1/3
Ditto, Nickel or Brass, Large 1/6
Small Brass 9d.
Ebonite, Enclosed 1/-
Burndept 5/-
Easi-Fix Cups 1d. & 1d.
Gold Spearpoint 3d.
Neutron Crystal 1/6
Hertzite (Shaw's) 8d. & 1/-
Midite 6d.

VALVES.

Dutch Detector 4/9
Dutch "R" 5/-
Phillips "R" 7/6
French "Metal" 6/11

TOOLS.

Set of Spanners 1/4
Taps, 0, 2, 4, 6 B.A. set 2/-
Small Soldering Irons 8d.
7-Twist Drills 1/4

SHAW'S HERTZITE.

BEATS ALL OTHER "ITES" 1/-

Impossible to Advertise All the Goods Stocked.

MYERS VALVES.

UNIVERSAL D.E. 12/6 21/-

EXIDE. D.T.9 Type. 2 Volts. (Glass). (For '08) 5/-

EBONITE PARTS.

Good Coil Plugs from 4d.
Edison Bell Shaped 1/-
Raymond ditto 10d.
Basket Adapters 8d.
Also at 1/- & 1/3
2-way Coil Stands 2/6
With Extens. Handle 2/11
Also at 3/6, 4/-, 4/6
3-way 4/3, 4/6, 5/-
Goswell Cam Vernier 9/-
Franco 12/6
Polar 11/-
Etc., etc.
Coil Plug on Stand 1/-
Ditto, Swivel Movement 1/3
Coil Plug and Clips 6d.

H.T. BATTERIES.

Best Made 30 v. 4/6
Best Made 60 v. 7/6
Best Made 66 v. 9/-
Ever-ready 66 v. 13/6
Ever-ready 108 v. 22/6
Siemens "Q" 1.5 3/-
Ever-ready ditto 1/9
B.E.C. 9 volts 3/-
B.E.C. 80 volts 9/6
B.E.C. 36 volts 5/6
B.E.C. 16 volts 2/6

EBONITE STOCK SIZES

6x6 1/4
7x5 1/4
8x6 1/10
10x8 3/-
12x6 3/-
12x8 4/3
12x12 5/6
14x10 5/6
Cut to size WESTOCK 3d. sq. inch. in. EBONITE.

CRYSTAL CALLERS

DETECTOR, only. Glass enclosed. Micrometer adjustment. 1/9

MURRAY VALVE HOLDER (Patent) 1/3

Blue and Red TUNGSTALITE

MIDITE, GECOSITE, NEUTRON Stocked.

"POPULAR WIRELESS."

FREE TO CALLERS. (Limited number, of course.)

BRASS FORMER

(DOUBLE) 23 spokes 2/11
each side. Make your own coils.

BEST SWITCH ARM.

12 Studs THE LOT
12 Nuts. 10d.
12 Washers. 10d.

N and K

GENUINE STAMPED. 4,000 ohms 12/11

'Ware Imitations.

"METAL" (FRENCH) '06 VALVES, 15/11

DR. NESPER

(SEE TRADE MARK) 4,000 OHM 'PHONES 12/6

(NOT DR. "ANYTHING")

VARIOMETERS.

Impregnated Board, Wound D.C.C. and Clips, 200/600 metres 2/6
Very Good Value, Wound D.C.C. and Knob 1/6
Ebonite D.S. Wound, with Ball Rotor and Knob, 200/700 metres 5/11
Ebonite, 200/600 3/11
Raymond Inside Winding 8/11

RHEOSTATS.

Small 5 ohms "C" 1/3
One Hole Fixing 1/3
Ormond 1/9
Ebonite Former 1/6
Ditto and Dial 1/10
Igranite, T.C.B., and all known makes.

16g D.C.C.

USUALLY IN STOCK FIBRE STRIP (For Coils) 3 ft. long, 1 in. wide. 2d. per length.

BREAST DRILLS

0 to 1 chuck Cut Bevel and Gear 5/9

BOXES

7 x 5 9 x 6 12 x 9
8 x 6 10 x 8 12 x 12

BASKET COILS

DUPLEX WAXLESS (5) 1/8
1,200/2,000 metres
WAXLESS SET OF 5 1/11
25, 35, 50, 75, 100
D.C.C. CHELMSFORD 1/- 1/3
ENAMELLED Do. 1/- 1/2
WAXED (6) 200/3,600 1/8
Ditto (7) 150/3,600 1/10
WAXLESS (2) ST 100 1/-
Ditto (2) UNIDYNE 1/-
(For Broadcasting only)
D.C.C. COIL FOR CHELMSFORD complete with adapter (to use with 650 variometer) 2/3

BATTERIES 4'5

4d. 4 1/2 5d. 7 1/2
ALL BEST MAKES.

MANSBRIDGE TYPE

FIXED CONDENSERS

With 2 Fixing Lugs.
'25 Special Price 3/6
2 Microfarad 3/11

"ORMOND" L.F.

A WONDERFUL TRANSFORMER 13/11

"FERRANTI" L.F.

BETTER THAN THE BEST 17/6

PHILLIPS

4 ELECTRODE VALVE 12/6

DUTCH '06

VALVES 12/6

COIL Plugs on base

with terminals 1/-
Swivel movement 1/3

GAMAGES PERMANITE 1/-

Experimenter's Sets of

5 Cat's Whiskers 3d.

OUR WONDERFUL

H.T. BATTERIES

30 v. 4/6 60 v. 7/6

BROWNIE "IMPROVED"

WIRELESS SET 7/6

RAYMOND CRYSTAL SETS

7/11 9/11 12/11

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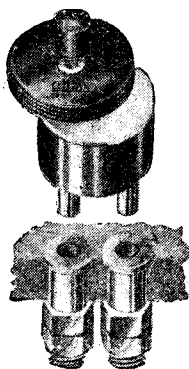
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Phone: GERRARD 4637.

CLIMAX RADIO

START ENJOYING WIRELESS BY
GETTING THE

CLIMAX SURE-SET DETECTOR.



This unique crystal detector operates on an automatic principle by which the rotation of a knob brings into operation the whole series of sensitive points on the crystal.

In addition, the automatic movement has superimposed upon it a vernier control of the Cat Whisker Contact

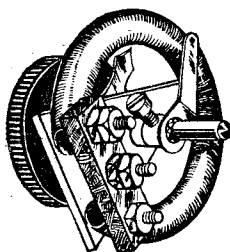
Pressure, thus enabling the absolute maximum of efficiency to be obtained in all circumstances. Setting the crystal is a quick, simple and easy operation, which ensures the whole of the programme being received without annoying interruptions so frequently experienced with ordinary crystal detectors.

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The Climax Sure-Set Detector, finished in highly polished black ebonite, with silver finished metal fittings, complete with Crystal and Cat Whisker, together with Plugs and Sockets for panel mounting.

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"Climax Points."

One hole fixing. Solid rigid coil. Perfect cooling. Insulation stands high temperatures and voltages. Unbreakable bakelite terminal bar. Large and well spaced terminals. Steel grub screw fitting. No lock nuts to work loose. Riveted brush with perfect brush contact. Takes any panel up to 1/2 in. thick. Bakelite knob with blind brush will not work loose.

Price :

Climax Universal Pattern Rheostat for bright or dull emitter valves 30 ohms. 4/6
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Climax potentiometer, 300 ohms. 6/-

Leaflets on Application

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RADIOFORAL.

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The Editor will be pleased to consider articles and photographs dealing with all subjects appertaining to wireless work. The Editor cannot accept responsibility for manuscripts and photos. Every care will be taken to return MSS. not accepted for publication. A stamped and addressed envelope must be sent with every article. All contributions to be addressed to The Editor, POPULAR WIRELESS AND WIRELESS

REVIEW, The Fleetway House, Farringdon Street, London, E.C.4. All inquiries concerning advertising rates, etc., to be addressed to the Sole Agents, Messrs. John H. Lile, Ltd., 4, Ludgate Circus, London, E.C.4. Technical queries should be addressed to the Technical Queries Department, and must in all cases be accompanied by a stamped addressed envelope. Not more than two enquiries can be answered in one letter, and telephone calls or personal calls at this office cannot be dealt with. A copy of the questions must be kept, as it is not always possible to reproduce the query when replying. Number the questions 1 and 2, and answers will be given under each number.

The Editor desires to direct the attention of his readers to the fact that, as much of the information given in the columns of this paper is of a technical nature and concerns the most recent developments in the Radio world, some of the arrangements and specialties described may be the subject of Letters Patent, and the amateur and trader would be well advised to obtain permission of the patentees to use the patents before doing so.

PATENT ADVICE FOR READERS.

The Editor will be very pleased to recommend readers of POPULAR WIRELESS who have any inventions to patent, or who desire advice on patent questions, to our patent agent. Letters dealing with patent questions, if sent to the Editor, will be forwarded to our own patent advisers, where every facility and help will be afforded to readers.

Questions and Answers

F. L. J. (Manchester).—I wish to wind a set of coils to cover the different wave-lengths used for broadcasting. Should the gauge of wire be the same for small coils as well as for those covering 2,000 metres or more?

How many turns are necessary for aerial, anode and reaction coils when used in conjunction with a .001 variable aerial condenser in parallel, and an anode condenser of .0005 mfd.?

I wish to make coils as efficient as possible, and am advised that it is better to fasten off the coil by sewing or tying with thread, rather than by immersing in shellac. Is this correct?

The list of plug-in coils printed herewith shows the coils necessary to tune between 200 metres and 25,000 metres, when used in conjunction with the standard tuning condensers.

The first column gives the size of wire recommended for use in home-made coils, and the second column shows the approximate tuning range in metres. It will be seen that there is a wide overlap between the ranges, so that, for instance, 500 metres, which is in the top range of the second line, is covered by the middle range of the third line, and by the "bottom" range of the fourth line, which tunes from just below 500 metres up to over 1,000 metres.

This flexible tuning is one of the great advantages of condenser-tuned coils, and it not only enables the wave-length to be changed quickly, but covers a very wide range with a limited number of coils.

Nevertheless it must be remembered that in all cases where parallel condensers are used for tuning, it is invariably advantageous to keep the value of the coil high, and the condenser value as low as possible.

Where the aerial tuning circuit is coupled direct to the receiver the "secondary" column may be ignored, and the number of turns for the aerial coil is that shown under "Primary Turns." When loosely coupled tuning is employed the primary or aerial coil remains unaltered, but is coupled (in a coil holder) to a larger coil of the value shown under "Secondary Turns."

The use of shellac to strengthen the coils is very convenient, and it has been widely used for this purpose by manufacturers; but it is really undesirable and should either be used very sparingly, or else avoided altogether. Fastening with thread is decidedly less efficient, and is especially recommended for the smaller coils, which can be securely fixed in this way.

For those who wish to make their own basket coils, a correction factor is given below the table which shows how the wave-length alters when this type of coil is employed.

It should be noted that the reaction coil values are only approximate, and generally it is best to experiment with the different coils on hand until the best combination is found.

PLUG-IN COILS.

Wire for Primary	Wave-length with average aerial	Primary Turns	Secondary Turns	Anode Turns	Reaction Turns (approx.)
24	260-375	25	35	35-50	35-50
24	310-515	35	50	50-75	50-75
26	370-730	50	75	75-100	50-75
26	460-1030	75	100	100-120	75
26	580-1460	100	150	150-200	75
26	790-2200	150	200	200-250	75
26	1060-2850	200	250	250-300	75
26	1430-4000	250	300	300-400	75-100
28	1680-4800	300	400	400-500	75-100
28	2180-6300	400	500	500-600	100
30	3130-8500	500	600	600-700	100
30	4100-12000	600	700	700-800	100
32	5100-15000	750	850	800-900	100
32	6300-19000	1000	1100	1100-1200	100-150
34	7100-21000	1250	1350	1350-1450	100-150
36	8300-25000	1500	1600	1600-1700	100-150
		.001 mfd. in parallel	.0005 mfd. in parallel	.0002-.0003 mfd. in parallel	

For basket coils allow about 20 per cent. off the maximum wave-length. Wind on a former of 11 slots, with centre diameter of 1 1/2 in. For a .0005 mfd. condenser instead of .001 mfd. allow 35 per cent. off. Many well-known coils are subject to letters patent, and the amateur and trader would be well advised to obtain permission of the patentees to use the patents before doing so.

A. N. (Oundle, Northants).—What is meant by the term "permeability"?

Permeability is the capability of a material for conducting magnetic flux. The permeability of air is taken as unity, so that the permeability of any

(Continued on page 478.)



The Spirit of Progress.

WUNCCELL DULL EMITTERS.

W.1 for Detector and L.F. use **21/-**
W.2. (with red top) for H.F. use, operating at 1.8 volts **21/-**
Types W.R.1. and W.R.2. as above, but with resistance incorporated to operate off 2, 4- or 6-volt accumulator **23/6**

THE same spirit of progress which was responsible for the design of the Cossor Valve still dominates the research workers responsible for the new Wuncell—the Cossor Dull Emitter.

Instead of merely producing another Valve of similar characteristics to any already on the market, the Cossor Research Staff went boldly to the root of the problem and succeeded in producing a Valve which will be as popular in its class as the wonderful P-type Cossor Bright Emitter.

Operating at a temperature of only 800 degrees (as against the '06 type of Valve operating at 2,000 degrees) its filament glow is barely noticeable in daylight. And owing to its extremely low current consumption and robust filament design (in diameter the Wuncell filament is approximately the same as the standard bright Valve) its life should be almost indefinite.

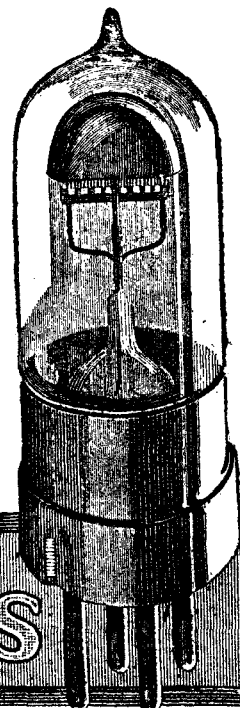
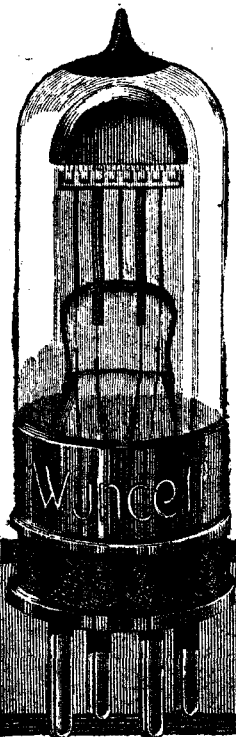
But true progress does not end with Valve design—service counts for something,

too. In the new Cossor packing scheme every Valve will be finally packed in its wrapping of cotton wool and sealed in its carton. Your Dealer will not find it necessary to break the seal to prove to you that the filament is intact. His Cossor Showcard will prove it by a flash when the carton is placed in contact with it.

Thus every Cossor user is guaranteed an absolutely new and unused valve.

BRIGHT EMITTERS.

P.1. The standard Detector and L.F. Valve **12/6**
P.2. (with red top). The standard H.F. Valve **12/6**
Now packed in new sealed Cartons.



Cossor Valves



Dampness!

—the arch-thief of signal strength.

THE wonderful Eureka Concert Grand was not evolved in a day—nor a week—nor a month—nor, for that matter, in a year. It was the direct outcome of much intensive study of the problem of Low-Frequency amplification and the possibility of obtaining "power" results without the necessity of using power valves.

From the first, the radio engineers who designed the Eureka worked on original lines. In fact, apart from the fact that the Eureka has a primary winding and a secondary winding it has little in common with ordinary Transformers. Take its superb insulation, for example. In the Faraday House Test Report (sent free of charge to all interested) it is recorded that the tremendous pressure of 2,000 volts was necessary to break down the insulation between windings and between windings and case.

But that is not all. This tremendously high insulation safety factor is permanent. No matter how old your Eureka, its insulation will always be perfect because the Transformer is hermetically sealed up after its last test report.

Dampness cannot affect it. Many L.F. Transformers absorb moisture (see Dr. Roberts' article in "Popular Wireless," August 30), and naturally signal strength is considerably reduced. If your Set is not as loud as it was, say, six months ago, it is quite likely that your Transformer is the cause. Discard it and instal a Eureka Concert Grand. You will get greater purity of sound, increased volume, and freedom from trouble. Remember that the Eureka is the only Transformer that can be suspended in water for fourteen days and used immediately without any harmful effects.

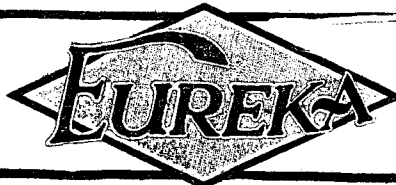
Concert Grand - 30/-
(For first stage.)

Eureka No. 2 - 22/6
(For second stage.)

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Eureka House, Fisher Street, London, W.C.1.

Scottish Agents: Fuller, Blackie & Russell, Ltd., 30, Gordon Street, Glasgow.

*Transformer
De Luxe*



Gilbert Ad. 1638

RADIOTORIAL QUESTIONS & ANSWERS.

(Continued from page 476.)

material is the ratio of the flux density produced in the material by a given magneto-motive force to the flux density that would be produced in an air path of the same length, by the same magneto-motive force. The permeability of magnetic substances decreases as the flux density increases: for instance, at a flux density of 10,000 lines per square cm., the permeability of transformer stampings is about 2,000, while it is only 200 at a flux density of 17,500.

N. B. (Lockwood, Huddersfield) and others.
—What size of coils should be used in order to get the different B.B.C. stations? Should the aerial coil be smaller than the secondary or other closed circuit coil used in conjunction with it? I notice that in the instructions for making sets the coil in the aerial circuit is always given smaller in size than the other coils, but I am not certain as to whether this difference always applies, or only in the first instance before the set is "loaded." Is there a table showing the correct number of turns on coils to use for different wave-lengths?

See reply to F. L. J. (Manchester).

"NOVICE" (Dukinfield), A. A. R. (Southall), A. E. E. (Mexborough), "A LISTENER" (no address), S. H. P. (Edinburgh), F. T. R.

READERS' QUERIES.

IMPORTANT ANNOUNCEMENT.

Owing to continued heavy pressure upon the Technical Queries Department a revision of the Rules has recently been made.

The number of queries which can be submitted in one letter is now limited to TWO only. These two queries should be stated briefly and concisely, and they must relate to genuine technical difficulties.

The Query Department cannot undertake the design of switching arrangements such as can be solved by reference to any good book of circuits; nor can they enter into long theoretical explanations, which can be found by readers in any textbook on wireless.

Diagrams and layout of components should NOT be submitted for wiring-up, but, of course, any particular difficulty which arises can be accompanied by a sketch to illustrate it.

Remember—
(1) DO NOT ASK UNNECESSARY QUESTIONS.

(The queries you raise may be dealt with on the next page, and by raising them again you are only delaying answers to other queries.)

(2) Two questions only are allowed, which should be numbered, and stated as briefly and concisely as possible.

(Tonbridge), C. S. (Baldock), H. A. W. (Hull), H. A. H. (Clerkenwell), H. F. (Bow), A. J. E. (Cardiff), W. C. (Glasgow), J. T. E. (no address), F. E. C. (Salisbury), L. W. (S.W.7), C. D. (Chester Moor), J. A. L. (Clapham Park), W. S. T. (Anfield), T. A. D. (Westonsuper-Mare), A. E. C. (Willesden), W. A. (Keighley), F. S. (Lausanne), C. J. M. (Swindon), G. H. V. C. (Godalming), R. W. F. (Harrow), J. B. (Bishop Auckland), J. H. (Bingley), A. S. B. (Blyth).

In sending your queries unaccompanied by a stamped addressed envelope you disregard the rules of the Query Department. As the questions are not of sufficient general interest to answer through these columns (or else have already been dealt with) replies can only be sent through the post. For this purpose a stamped and addressed envelope should be enclosed.

Foreign readers—whose postage stamps cannot be used for prepayment of letters to be posted in this country—can send "Reply Coupons," which are obtainable at their local post-offices, and can be exchanged here for British stamps. The queries should be repeated, and should in all cases be numbered. Replies to each question will then be given under the appropriate numeral.

(Continued on page 479.)

RADIOTORIAL QUESTIONS & ANSWERS.

(Continued from page 478.)

J. B. (Hounslow).—I am very interested in wireless, but quite a novice, and should like to get all the information I can upon it. Is there any book, such as an Encyclopedia of Wireless, and if so, where can it be obtained?

The "Harmsworth's Wireless Encyclopedia" has just been completed. It was published in 24 parts, which can now be obtained bound in three volumes, price 16s. 6d. per volume. Inquiries should be addressed to The Amalgamated Press (1922), Ltd., Back Number Dept., Bear Alley, Farringdon Street, London, E.C.4.

"TWO READERS" (Beckenham, Kent).—When anyone is oscillating is it possible to obtain clear reception? We have a single-valve receiver with reaction, and we notice that the receiver does not appear to oscillate during 2 L O's transmissions, although the coils are very close together, but when 2 L O is not sending the set appears to oscillate very easily.

When a receiver is oscillating, clear and loud reception of music and speech is impossible. If your signals are pure you may rest assured that you are not causing interference.

J. G. (Radlett).—I believe that experiments with the Unidyne took place in my village and that certain results were obtained. Can you let me know whether loud-speaker results from Loudon were ever obtained on one valve?

No, the capabilities of the Unidyne do not exceed those of ordinary "straight" circuits.

I have never constructed a valve set before. Would the reflex Unidyne present any great difficulties?

To you it would; in view of the fact that you have no previous valve experience, we would not advise you to tackle anything more ambitious than the single-valve Unidyne.

B. E. M. (Herts).—My crystal seems to have gone dead. Is there no way of reviving it so that it can be used as before?

This can be done in different ways, though none of them can be said to be a certain cure for all crystals. You do not give the name of your crystal, but the galena and treated galena type of crystal (hertzite, perovskite, etc.) can generally be improved by soaking for about ten minutes in a saturated solution of alum. About a dessertspoonful of alum (obtainable at any chemist's) is placed in a wine-glassful or similar quantity of warm water, and left overnight. In the morning a small quantity of alum should be still undissolved. If not, add a little more of the solid. Finally pour off the liquid into a small vessel, and the solution is ready for use.

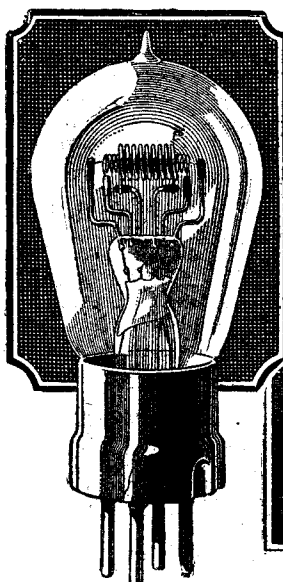
After soaking the crystal for 10 to 15 minutes, remove it, and allow to dry (not in front of a fire). It will then be seen to be dull instead of bright as is usual. The dullness is due to a thin coating of alum, and this covering should have the effect of providing many more sensitive spots, and in rendering the crystal much more efficient. Avoid touching the crystal with the fingers at any time.

"LOUDSPEAKER" (Wolverhampton).—I wish to receive loud-speaker signals from several B.B.C. stations, and as the set will be used in a very large room I should like to use a power-valve for the last L.F. stage. What set do you recommend, and could I make it at home? I have already made an excellent one-valve and crystal set.

A suitable set was recently described in POPULAR WIRELESS 122, under the title, "How to Construct a Power-valve Loud-speaker Set." It is a straightforward circuit, and with previous experience you would probably not find any particular difficulty in construction.

The Back Number describing this set can be obtained from:

The Amalgamated Press (1922), Ltd., Back Number Dept., Bear Alley, Farringdon Street, E.C.4. Price 4d. Post Free.



Loudon



Have you noticed it?

10/-

If you listen intently to your gramophone you will become aware of the light scratching of the needle. But although you hardly notice it unless you listen specially it is there all the while.

Once you could hear gramophone music against a background of complete silence you would never be content to return to the obnoxious of scratches and hisses which you now cheerfully endure.

It is the same with Wireless Reception; you hardly notice the continuous breathing sound going on in your loud speaker but—unless your set is fitted with Loudon Valves—it is there, and it is preventing you from getting the best possible results from your set.

The Loudon Valve has been designed specially with the object of eliminating all those "mush" or breathing sounds so prevalent with valves of the ordinary type. If you would care to know how this is achieved your dealer will supply you with a folder giving full information.

But we feel that you are concerned with *results* rather than with *reasons*, so our advice is that you should not consider your present reception perfect, but fit Silver Clear Loudon Valves and see how much better it can be.



The plain Loudon for detecting and Low Frequency Amplifying.
The Blue Loudon for H.F. Amplification.
Filament Volts 4.8-5.
Filament Amps 0.4.
Anode Volts 40-80.

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LOUD SPEAKER CRYSTAL SYSTEM

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32c, CRAVEN STREET, CHARING CROSS, W.C.2.

SKINDERVIKEN MICROPHONE BUTTON, PRICE 5/-

CORRESPONDENCE.

(Continued from page 466.)

small minority, and I should doubt if the most educated and cultured listener thinks much of the hybrid entertainments frequently arranged.

I hope your "Complimentary and Uncomplimentary" column is going to be introduced, although quite prepared to find that the stolid indifference of the man in the street will not let him take the trouble to express himself—he lays down his 'phones.

So long as there is no competition and music publishers cannot arrange to have their songs and instrumental music broadcast as the finest advertisement they could have, it will be impossible for the B.B.C. to provide for 365 days a year. No one can please everybody, but thousands more could be pleased than are with broadcasted programmes.

Yours faithfully,

GEORGE E. HOLLOWAY.
Wilbury, 71, Sydenham Road, North Croydon.

ROUND THE CONTINENT.

The Editor, POPULAR WIRELESS.

Dear Sir,—With regard to the reception of German and Danish broadcasting, my experiences are as follows. Using a two-valve (H.F. and Det.) set constructed from instructions given in POPULAR WIRELESS, I have received the following stations: Berlin, 430 m.; Breslau, 415 m.; Hamburg, 400 m.; Leipzig, 452 m., at strength sufficient for them to be heard with 'phones five or six feet from the head. Also, I have received Stockholm, Frankfurt-am-Main, Stuttgart, and Madrid at comfortable 'phone strength. The Hamburg and Frankfurt stations end their concerts with an anthem set to the tune of Praise the Lord. Last week I heard a station on about 600 m. quite clearly, but was unable to catch any call sign. This station also finished up with the anthem. Would this be Vienna? With the same set I am able to receive Birmingham (30 miles) and Nottingham (relay) (40 miles), with sufficient strength on speaker to be understood perfectly anywhere in the room. London and Manchester can be heard about six feet from the loud-speaker. If I disconnect the earth lead signals from these stations are just the same, but with the other B.B.C. stations there is a decrease in strength. My aerial is unscreened, except for lead-in, and 30 feet high. I trust that this will be of some interest to your readers.

I remain, Yours sincerely,

M. S. WOODHAMS.

P.S.—I am using B.T.H. B5 valves with 40 volts H.T.
90, Railway Terrace, Rugby.

ALTERNATIVE PROGRAMMES FROM 5 X X.

The Editor, POPULAR WIRELESS.

Dear Sir,—I quite agree with your correspondent with regard to the alternative programme. Capt. Eckersley's promises appear rather like the proverbial pie-crust, and it is a pity he cannot carry out some of them, instead of flitting off to America in search of new ideas.

His excuse that London must be relayed because they give the best programmes is as weak as his argument that 5 X X must be within 40 miles of London to come through properly. Mr. Palmer's "Round the Stations" evenings show clearly that excellent entertainment is provided everywhere, and that as a general rule all come through very well indeed.

It would be a great pleasure to crystal users if 5 X X were to take the stations in turn, wherever

an especially good programme is offered, so that they could have their choice of that or their own local station—as many must be able to get both, under good conditions.

Yours faithfully,

Minford Gardens, W. J. THOMSON.

CRYSTAL RESULTS EXTRAORDINARY.

The Editor, POPULAR WIRELESS.

Dear Sir,—Re above, if Mr. Blackwood is not leg-pulling, then I consider he has a most marvellous set. The thing that I cannot understand is how he manages to cut out Belfast. Now, if he is not leg-pulling, I think it would be of great interest to you and your readers to know the circuit he employs to get nine stations and one of the Continental stations. Really, these results make one think!

Yours truly,

L. I. EWIN.

35, The Close, Newcastle-on-Tyne.

SIX AMERICAN STATIONS RECEIVED.

The Editor, POPULAR WIRELESS.

Dear Sir,—It may interest you to know that on the morning of Oct. 4th I received the following six American broadcasting stations on five valves, 2 H.F., 1 Det., 2 L.F.

W G Y, Schenectady, N.Y.; W J Z, New York, N.Y.; W E A F, New York, N.Y.; W B Z, Springfield, Mass.; W D A R, Philadelphia, Pa.; K D K A, Pittsburg, Pa. I have also received W G Y on your excellent simplified one-valve "Unidyne."

Wishing your paper every success,

Yours faithfully,

H. A. MAXWELL WHYTE.

Burtleigh, Church Road, Forest Hill, S.E.

THE ONE-VALVE UNIDYNE.

The Editor, POPULAR WIRELESS.

Dear Sir,—I have just been trying a one-valve Unidyne set, eliminating the transformer, and hasten to congratulate the inventor for his great achievement. I have attained splendid results, having heard all the B.B.C. stations and also Radiola and Ecote Supérieure very loudly.

I am yours truly,

J. ENGLEHEART.

St. Edmund's College,
Challoner House,
Old Hall,
Ware, Herts.

MORE UNIDYNE RESULTS.

To the Editor, POPULAR WIRELESS.

Dear Sir,—I am writing to thank you for information received regarding my one-valve "Unidyne" set, from which I am receiving good results. I have received a number of distant stations, but last night I was listening to a station from which music and speech was coming in quite clear on 'phones, and was surprised to find it was the Manchester station, which closed down about 10.35 p.m.

It might be of interest to you to know that I am using a .002 fixed condenser attached to the earth wire one side to wire, and other side to earth terminal, which greatly improves the reception of the set.

I am still using the 10-1 ratio transformer in the set, and could you kindly inform me if I could use this transformer in any other two-valve set (Unidyne)? (Afraid not.—Tech. Ed.)

You may use this letter or any part for publication if you wish. Wishing POPULAR WIRELESS and inventors every success.

Yours faithfully,

W. DUTCH.

43a, Hammond Road East, Southall, Middlesex.

CONCERNING TELEPHONE CONNECTIONS.

The Editor, POPULAR WIRELESS.

Dear Sir,—I have just read in the current issue the excellent remarks by Mr. Rankin on the above subject, in which he urges the importance of correctly connecting the 'phones to the proper pole terminals on the panel. It would, however, in many cases, puzzle a new hand at the wireless game to fix upon the positives and negatives of his set. The following method is, however, so simple that no one could easily make a mistake in applying it.

Procure from your dealer a book of polarity paper, price twopence. Attach a short piece of wire to each panel 'phone terminal, take a small piece of the paper, moisten it with water, and apply the free ends of the wire to it, of course, not touching each other, but about half an inch apart. In a few seconds the paper turns red where it is in contact with the current from the negative pole.

All that remains to be done is to make a little cross near the terminal which carries the positive current and the usual little dash near the other.

I should advise my readers to test the paper by the H.T. battery so as to make sure it is the right sort, as dealers sometimes are apt to give one the ordinary chemical litmus paper, which will answer the purpose in experienced hands only. I advise readers to peruse Mr. Rankin's remarks in No. 123, page 246, and they cannot very well go wrong with their connections when that new set comes along.

Yours faithfully,

GEORGE E. COX.

14, Jesse Road, Leyton.

(Continued on page 481.)

CORRESPONDENCE.

(Continued from page 480.)

THE ONE-VALVE UNIDYNE UNDER ADVERSE CONDITIONS.

The Editor, POPULAR WIRELESS.

Dear Sir,—In conjunction with an aerial of 100 ft. (Electron) 20 ft. high, I am able to get all B.B.C. stations, including a few relays, France, Spain, and two other foreign stations (unknown to me) any night; 6 B.M., 5 W.A., 2 L.O., and Manchester in daylight. All the above stations were brought in on one valve without any earth connection whatever. The set is situated at the base of a hill 600 ft. high, which screens all stations except Belfast. Aerial directional to America. The down lead comes right through a large pear-tree. Every word could be understood using three pairs of 'phones in series. Perhaps this may be of interest to readers of "P.W."

Wishing your valuable paper continued success.

Yours faithfully,
D. J. JENKINS.

Gellinudd, Pontardawe, Swansea.

P.S.—The H.T. batteries seem to find a liking for the rubbish heap in this district lately.—D. J. J.

WIRELESS SOCIETY TESTS UNIDYNE.

The Editor, POPULAR WIRELESS.

Dear Sir,—It may interest some of your readers to know the results obtained with a single-valve Unidyne set tested at a recent meeting of this society. I would mention that the set in question was roughly made, and only an experimental set, but the results were a surprise, I think, to most of us.

Bournemouth was received with wonderful clearness, also Cardiff. London was quite good, considering it fades badly here. Manchester and Birmingham were very clear, and Newcastle was particularly good. Glasgow also came in well, and some foreign stations. When one considers everything this is very satisfactory, especially with four pairs of 'phones in use. With one pair of 'phones the circuit equals some of the single-valve H.T. sets. It may not be quite so loud in some stations, but the advantage is the very quiet working. We found that the condenser across the 'phones is of very great importance and critical, in fact, to obtain the best results it requires careful adjustment generally. During the evening we tried the effect of connecting up the loud speaker in place of the four pairs of 'phones, and music could be heard clearly several yards away. What we should like to test now is a two- or three-valve Unidyne set.

Yours faithfully,

LEONARD CUTBUSH,

Hon. Sec. The Jersey Radio Society.
54, David Place, St. Helier, Jersey.

THE "P.W." ULTRA-CRYSTAL SET.

The Editor, POPULAR WIRELESS.

Dear Sir,—I have just completed the original Ultra-Crystal set, as described recently in POPULAR WIRELESS. On Tuesday, the 2nd, I donned 'phones for the first time, and I was surprised to be able to tune-in Glasgow, though very faintly. The vocal items were unreadable, but the band of the Gleneagle Hotel was clear.

At first I thought this was due to reradiation, but I have tuned-in this station every night this week at the same strength, and I now consider it is due to the efficiency of the circuit.

My aerial is 55 feet-long and 35 feet high, and I have two earths, waterpipe, and a plate sunk in the soil.

Thanking you and your staff, and wishing POPULAR WIRELESS the best of luck.

I remain,

Yours sincerely,

D. L. CAMPBELL.

99, Duncairn Gardens,
Belfast.

A NEW INDOOR AERIAL.

The Editor, POPULAR WIRELESS.

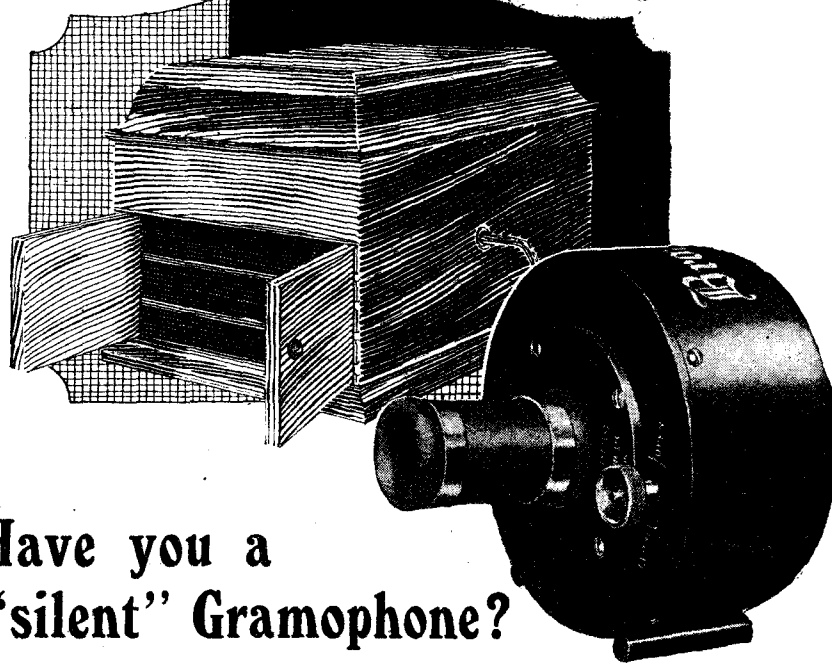
Dear Sir,—With reference to Mr. O. J. Rankin's article on a novel aerial in this week's number of your paper, I take this opportunity of informing you that in June, 1923, I submitted the idea of crimping metal by means of gear-wheels to Mr. F. O. Read, and some months later, between us, we produced what is now on the market and known as the "True-wave Form" aerial. This is being sold by Mr. Read's firm, Mead and Morris, 31, East Castle Street, W.1. The provisional patent for the idea was taken out several months ago by Mr. Read on our behalf, and I have written evidence in my possession to substantiate the whole of the above.

Possibly Mr. Rankin was unaware of the provisionally patented copper wire corrugated aerial, the joint invention of Mr. F. O. Read and myself. As a matter of fact, so long ago as last May or June, I presented some of these aerials to several staff editors of a contemporary paper, and also to Captain Eekersley, of the B.B.C., for private use.

Yours faithfully,
W. P. AVELING.

34, Putney Park Lane,
S.W. 15.

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Have you a "silent" Gramophone?

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In some cases when the H.I. type (illustrated above) is used it may be necessary also to lift off the turntable, but apart from this no alterations to the Gramophone are required.

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TYPE H.1. (as illustrated)
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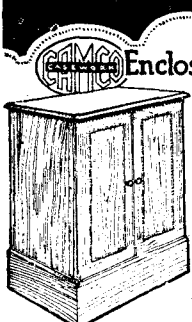
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Philips "R" & "D.2." Valves..... 7/6 each
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Loud Speakers, Headphones, etc., etc. All standard lines in stock. TRADE TERMS on application.
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ALL MAKES and Ex-Army 'Phones rewound 4,000 ohms, 4/6 per pair; 8,000 ohms, 1/- extra. Postage, 6d. Remagnetizing, 1/- per pair. Transformers rewound, any ratio, from 5/-.
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This book gives more practical information about building wireless instruments than others at ten times the price.
HOW TO ERRECT, CONNECT AND MAKE all kinds of wireless apparatus including crystal and dual amplification sets, one and two valve amplifiers, also the latest two, three, and four valve tuned anode receivers. 160 pages, including 28 diagrams.
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Will withstand 5,000 volts. Black finish. Will not fracture. 6 x 6x 3/16, 1/4; 7 x 5, 1/2; 8 x 5, 1/2; 9 x 5, 1/4; 9 x 6, 1/6; 10 x 9, 2/2; 12 x 10, 2/9; 14 x 12, 4/-, post paid. Other sizes and thickness pro rata.
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BURGE, WARREN & RIDGLEY, Ltd.,
91/92, Great Saffron Hill, London, E.C.1.
Phone: Holborn 50.

SOME NOTES ON TRANSFORMERS.

(Continued from page 465.)

of energy, but there would be distortion. The resistance of the wire would be practically increased by the complicated reaction effects of the core.

It is rather surprising that these effects are not deleterious even in the case of audio-frequencies. It must have some bad effect, though it appears not to matter in practice. At the same time, the cores of all transformers should be very carefully made, and these bad effects kept to a minimum by special selection of the quality of iron and by thoroughly subdividing it in the lateral direction.

On these considerations is based the familiar fact that high-frequency coils are made without iron; though in low-frequency coils the use of iron is permitted, and on the whole found advantageous, though it should always be used with circumspection; and it seems to me possible that sets and the articulation of loud speakers might be improved by dispensing with it, for instance, by using moving coils in a steady magnetic field. Permanently magnetised iron does no harm at all. All the effects spoken of are characteristic of varying magnetism under the influence of fluctuating currents.

SATISFYING A NATION.

(Continued from page 423.)

a special degree of understanding is expected of them.

The thing is far too big and too involved and too far-reaching to meet the views of any individual or any group of individuals all the time. I submit that commonsense demands that all sides be reviewed, and criticism directed only when one is sure of the ground. There are many more profitable ways of dealing with such a service than by criticism, though I quite admit that it is at times required, and at times a great help as well.

This B.B.C. is a public service where everyone concerned is working to the limit of endurance, sometimes beyond it, to make and keep our national broadcast service the best and greatest in the world, and the most useful in every respect. It is too full of "potential" to be ignored or misused on the one hand, or confined on the other. All its functions, entertaining or informing, have to be handled with the same care, although many might like it to be all of one and none of the other.

Perhaps it may be imagined that we have, not only all the money we need, but more than we need. Money enough or too much! If the revenue is doubled it will be needed if we are to keep in sight of all that we have to do—so much still remains—and more still if we are to keep up with the vision of what ought to be done. The broadcasters have not been given to talking about their difficulties or their accomplishments or their expectations. Such is not a national characteristic of ours anyhow. But sometimes I believe they err in the other direction. We shall see what the chief engineer says when he returns from America.

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Steel Masts, 20 ft., 10/-; 30 ft., 14/- Wave-meters, 50/-; Recorders, 46/5/-; Transmitting Sets, 15/6; Amplifiers, 22/6; Valve Cabinets, 10/-; Control Panels, 10/- REDUCED PRICES. Bigger Stocks.

6/6 Edisonan Valves, R.A.F. "C" Type (as illustrated). The finest all-round English Valve. Osram "C.R." with 4 legs, 8/6. Alternators, 200 watts, 70/-; 500 watts, 43/10. Accumulators from 4/6. Hydrometers, 2/- Milli-ammeters, 6 m/a, 30/-; 50 m/a, 35/- Wire, all types, tons stocked. Amplifiers, 5-valve, 23/-; 5-valve, 28/-; 6-valve, 27/-; 7-valve, 28/- Buzzers, 1/6; 3/6. Valve Boxes and Coil Boxes, 1/6. Cabinets, 10/- Condensers up to 24 mfd., all types, .001, 6d. Dynamos, 6v. and 12-v., 6-amp., 60/-; H/T 1,000-v. Hand, 25/- M.C. 12 to 1,200-v., £22. Earth Clips, 6d. Mats, 15/- Spikes, 1/3. Ebonite Panels, 3/6 lb. Meters, fine selection, all sizes from millivolts to 2,000-v., low prices. R.A.F. Insulators, 14d. Loud Speaker Units, 7/6. Microphones, 1/- Phones, 2/- to 32/6. Plugs, 3d. Potentiometers, 3/6. Receivers: Crystal, 5/-; 17/6; 19/6; 37/6; 2-valve, 22/-; 3-valve, 23/15; 5-valve, 25/5/- Switches, Dewars to 200-amps. Special: 2-valve C.W. Transmitters, 23/10. Ammeter, Panel for do., 17/6. 1-valve Trench Transmitters, 65/- Spark Sets, 100/600 metres, 15/6. Large 52B 100 watts do., 35/- Telephony Sets, No. 34, 25/- Turners, R.A.F., 8/- to 40/- Valves, all types: Dull Emit., 17/6; Marconi Rounds, 3/6. Variometers, 3/- Sy. Panel Wire, 24 in. rod, Wire, Rubber Flex, 1d. per yard. Thunderstorm Arresters, 3/- Prompt delivery by mail all over the world. Send 4d. stamps for Illustrated Catalogue of Radio Bargains.

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TECHNICAL NOTES.

(Continued from page 428.)

manner in which two samples of a substance may be chemically identical and yet physically very different, one being in the crystalline form and the other being in the amorphous form, may be illustrated by the case of carbon: graphite and diamond are both pure carbon, and therefore chemically identical, but graphite is in the amorphous condition and diamond in the crystalline.

In using the "perikon" detector, which consists of zincite opposed to bornite, copper pyrites, or tellurium, it should be borne in mind that the substances are brittle, and when making a contact between two crystals they should not be ground hard together, but should be carefully removed out of contact and replaced in different positions until a sensitive spot is found, the minimum pressure always being employed.

Perforated Diaphragms.

With reference to the note I made on the above subject some time ago, I have received a letter from M. de Brandner, President of the Cercle Belge d'Etudes Radiotelegraphiques et Radio Club de Belgique, in which he says: "The improvement of a telephone receiver by piercing a small hole in the diaphragm has been known for some time. I put perforated diaphragms in my telephones and loud speakers two years ago, and found the results really excellent. A hole $\frac{3}{8}$ of an inch suffices, and I drill it $\frac{1}{2}$ inch or $\frac{1}{4}$ inch from the centre. The tone and quality of reception are distinctly improved."

Non-Interfering Circuit.

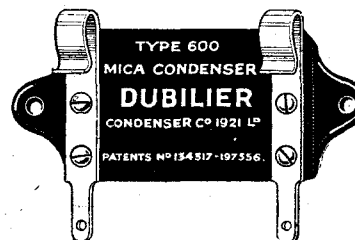
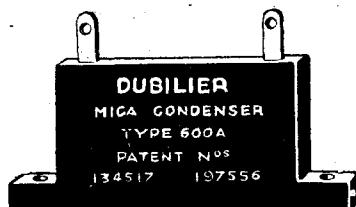
The circuit which forms the subject of patent No. 220,765/24 (N. P. Hinton) is so designed that should oscillation take place, no interference is thereby caused. The principle of the circuit is to employ two high-frequency transformers, the primaries being connected together in series in the aerial circuit, whilst the secondaries are connected together in series in the oscillatory circuit. The common point of the secondaries is connected through a reaction coil to the two opposite ends of the secondaries, two similar condensers being introduced into these two return paths.

Detecting Crime.

The finger-print method of identification of suspected criminals was introduced by a Frenchman named Bertillon, and more recently the famous French scientist Belin has succeeded in adapting his well-known method for the transmission of pictures to the transmission of finger-prints by wireless. It is easy to see that the ability to circulate the picture and description of a suspect, together with a facsimile of his finger-prints, within the space of a very few hours, will be a great aid in the apprehension of the fugitive.

Physiological Radiations.

The much-discussed question as to whether living organisms are the source of certain kinds of ether vibrations has been given a new interest by the suggestion of a French physician that it might be possible, if the character of the supposed radiations were properly understood, to employ the

**THE EFFICIENT WORKING OF YOUR SET**

is dependent almost entirely on its components. The saving of a few pence on a small and apparently unimportant condenser may easily prevent an otherwise efficient set from giving its best results. You yourself have no means of testing the capacity of condensers you buy or of knowing whether their capacity remains constant when in use. Your only safeguard lies in purchasing products which carry the guarantee of a firm with a reputation to maintain.

All Dubilier fixed condensers are guaranteed to be within 15 per cent. of their stated capacity and, where desired, they can be manufactured and guaranteed within still closer limits. The types 600 and 600a, illustrated here, are practically universal among manufacturers of complete sets, whilst experienced home constructors continually assure us that they can feel complete confidence in the working of their sets when—and only when—they have fitted Dubilier Condensers.

See that they are in your set as well.

Type 600:

For all purposes in connection with receiving apparatus. With or without clips for grid leak. '0001-'0009 mfd., 2/6 each. '001-'006 mfd., 3/- each.

Type 600a.

As Type 600 but for vertical panel mounting. '0001-'0009 mfd., 2/6 each. '001-'006 mfd., 3/- each.



(Continued on page 484.)

TECHNICAL NOTES.

(Continued from page 483.)

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6,000 Crystal Cups, 5,500 Crystals in Cups, 4,000 Gramophone Variometers.
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same for the destruction of undesirable organisms, such, for example, as disease germs. It is already known that short waves, such as X-rays and the gamma-rays from radium, have the effect of destroying living tissue, but it is presumable that the supposed characteristic radiations considered above are of a different nature and that their action, if they could be re-directed against the organisms in question, would be of a different, in particular of a more selective kind.

On the general question as to the emission of radiations from living organisms, there is a large amount of presumptive evidence that such radiations exist, for it is known that the vital processes, if not of a chemical nature, are at any rate accompanied by chemical changes, and it is presumable that all chemical changes are accompanied by the production of ether waves. It is probable that in the near future an important and fascinating branch of scientific inquiry will be opened up on the lines indicated above.

Current From A.C. Mains.

In the "Western Wireless" (Perth, W. Australia) is an interesting account of the experiments of an amateur, Mr. T. J. Jewell, in the use of alternating current from the electric mains for the purpose of heating his valve-filaments. This has, of course, already been accomplished in one or two ways. The method adopted by Mr. Jewell is to use an ordinary single-valve tuned anode (H.F.) and crystal detector, the 40-cycle A.C. being applied to the filament by means of a transformer. He has tried many other circuits, but has been unable to attain success when using a valve as detector or L.F. amplifier.

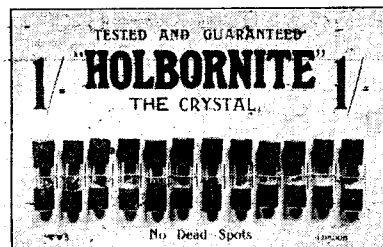
An unusual feature is the position of the filament resistance, this being placed on the transformer secondary side and in circuit before the filament leads commence from the potentiometer. This the inventor considers to be important, and possibly to some extent responsible for the elimination for the A.C. hum. The resistance is used purely for regulating the filament voltage and for obtaining a negative bias for the grid. In order to eliminate the A.C. ripple, it is necessary to find a neutral point on the potentiometer with the grid return. A good deal of detailed information is given in the article referred to, which lack of space prevents our reproducing here. But, according to the editorial remarks, the set has been tried out and found highly satisfactory.

The Unidyne Abroad.

The Unidyne has, of course, created a stir in many different parts of the world, but I must confess to being a little surprised to read an account of it in the "Radio-Bladet" (Stockholm). Quite a considerable amount of space is devoted to the discussion of the theory, and the opinions of eminent scientists thereon.

I also noticed an account of the Unidyne in the "Radio Rundschau" (Vienna) as well as in many other European and foreign journals.

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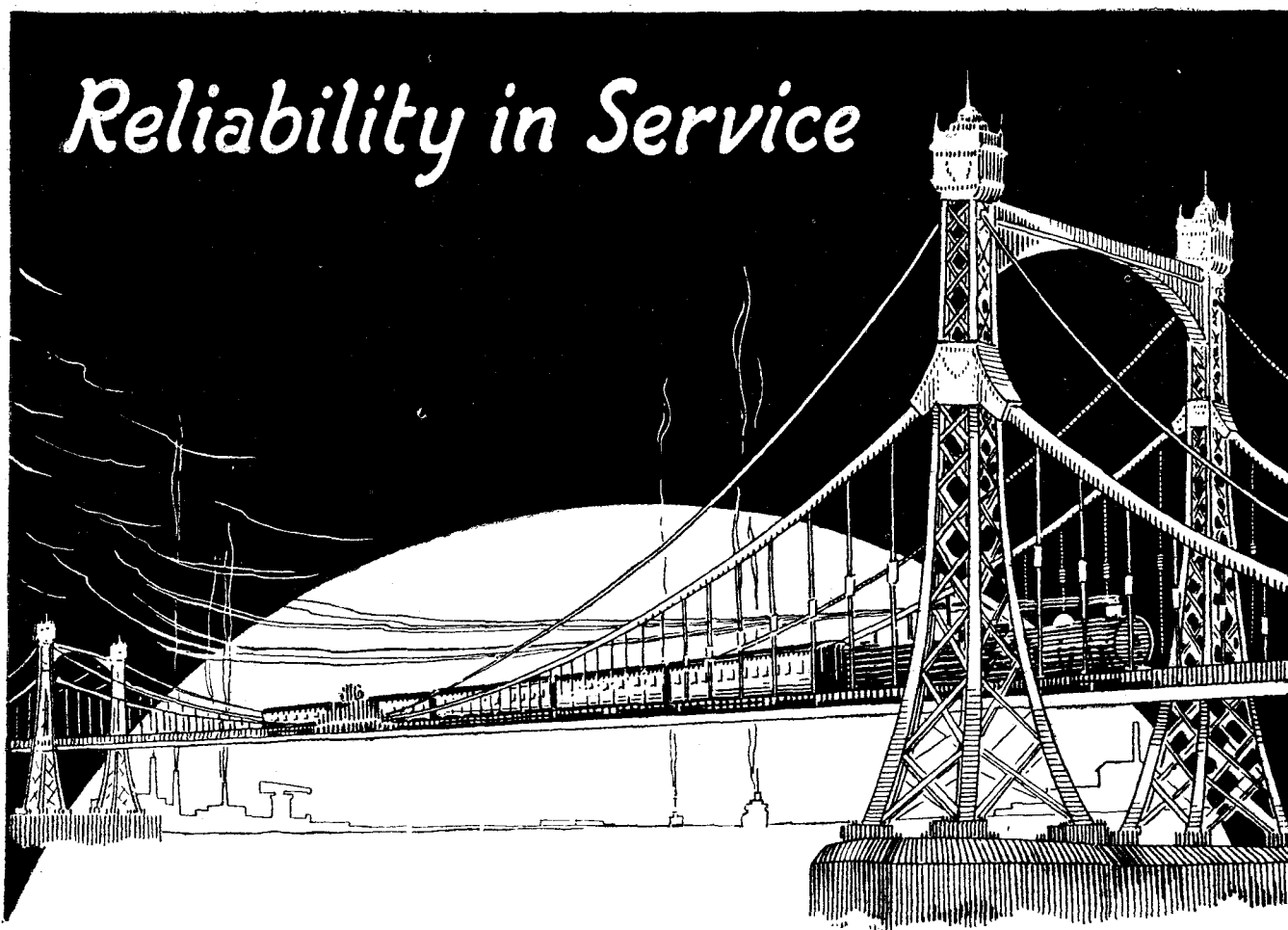
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