POPULAR WIRELESS AND WIRELESS REVIEW, February 28th, 1925. REGISTERED AT THE G.P.O. AS A NEWSPAPER.

THE WIRELESS BILL: Write To Your M.P. About It.

Popular Wireless

and Wireless Review

PRICE 3d. EVERY THURSDAY.

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

Some of the transmitting gear at the Nash Point, South Wales, wireless beacon station.

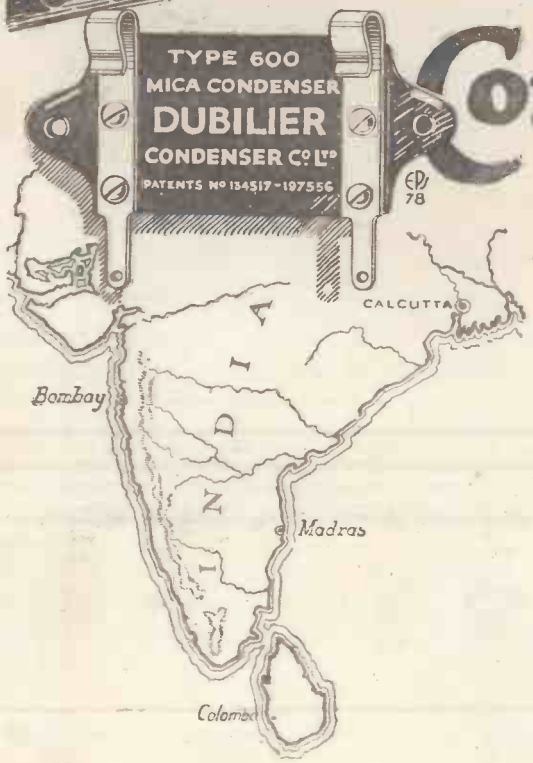
FEATURES IN THIS ISSUE.

HOW TO BUILD THE "SUPER-SELECTIVE" RECEIVER.

More About Oscillating Crystals.
Electric Television.
Loud Speaker Reception.
"Getting Beyond."
The Amateur's Portable Set.
A DX Crystal Circuit.
Technical Notes.
The "P.W." Time Table.

No. 144. Vol. VII. February 28th, 1925.

A consignment of Indian Ruby Mica for Dubilier Condensers arriving at the London Docks.



Concerning Mica

THE "Dielectric" in all Dubilier fixed condensers is of the best Ruby Mica, specially imported from the quarries of India.

It has long been recognised that there are numerous reasons, both mechanical and electrical, which account for the superiority of Mica over other dielectric materials employed in Fixed Condensers of small capacity.

Perhaps the best known of these are high insulation resistance and high dielectric strength which enable an exceedingly thin sheet of Mica to withstand very high voltages.

The Mica sheets in Dubilier Condensers measure only a few thousandths of an inch in thickness, yet each one of them before it can qualify for a place in a condenser has to withstand an alternating current pressure test of 5,000 volts.

A condenser made up of such sheets will resist, for example, the continued application of the full voltage from a high tension battery, whereas a condenser with an inferior dielectric may develop a short circuit, a fault which may possibly ruin a succession of high tension batteries before it is located.

Apart from insulation resistance, however, there are still very powerful arguments in favour of the Mica Condenser. The use of Mica enables Condenser losses (due to hysteresis, leakage, etc.), to be reduced to a minimum, especially as Mica has a high "specific inductive capacity," so that the volume of the dielectric in a condenser in which losses can occur is reduced to a minimum.

From the above it will be seen that for every receiving circuit the best condenser is a Mica Condenser; and you will be assured of obtaining the best Mica Condenser if you

Specify Dubilier.

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CONDENSER CO LTD

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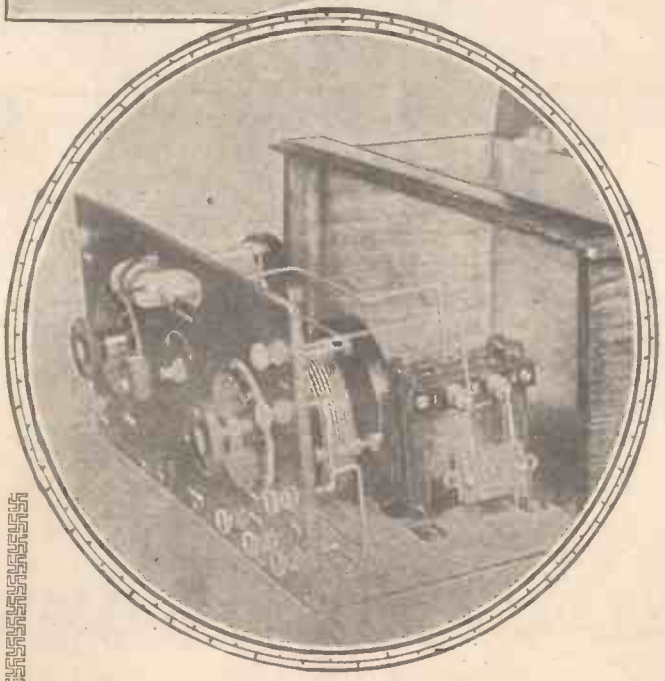
Telephone: Chiswick 2241-2-3.

E.P.S. 78.

Wiring up the One-Valve Reflex Set fully described in "How to Make Wireless Sets," "Best Way Book" No. 162.



The One-Valve Reflex Receiver complete and ready for use.

An Aristocrat of LOUD SPEAKERS

Illustration shows Swan Neck Model, fitted with highly-finished mahogany horn.
A.R. 15 **£6 : 5 : 0**
Also the same instrument, but with oak horn **£6**
Other models from 25/-

AESTHETIC in appearance and ranking highest in technical efficiency as a Loud Speaker—the AMPLION may be especially recommended to discriminating purchasers.

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Demonstrations gladly given during broadcasting hours at these showrooms:—
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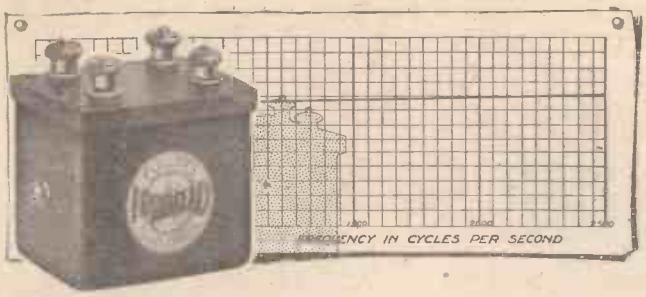
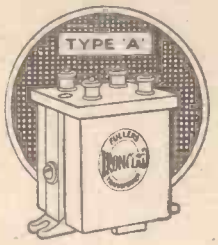


What an amplification characteristic curve shows



Type "A" Intervalve.
Ratio 1—5.
Size 2 × 2¾ × 2⅝ ins.
Price **20/-**

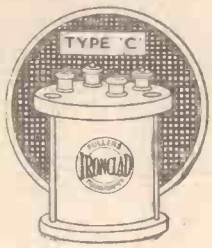
Type "TA" Telephone.
Ratio 1—10.
Price **18/-**

When an artiste sings a note or an instrument is played, the quality of the tone depends upon the proportion in which the "natural harmonics" of that tone are present. Middle C, for example, has a frequency of 512, and the natural harmonic one octave higher has a frequency of 1,024. Thus, the fidelity of reproduction of the singer's note depends on the evenness with which all the harmonics present in that particular tone are amplified in the receiving set.

Glance at the characteristic curve of the Type "B" Ironclad Transformer—note the flatness throughout practically the whole range of audible harmonics. This shows why its amplification is so extraordinarily *natural*.

Then there are all manner of constructional refinements. It is completely enclosed mechanically and screened magnetically, preventing inter-action. Layer-wound, moisture proof, spaced coils are employed, which, in conjunction with the special form of insulation, successfully prevents turns becoming loose.

For the music-lover, for the man who is only satisfied with reproduction in all the purity of its original rendering, there can only be one amplifying instrument — the "Sparta" Ironclad Transformer.



Type "C" Intervalve.
Ratio 1—4.
Size 2⅞ ins. diameter × 2¾ ins. deep.
Recommended for Power Amplifiers.
Price **24/-**

Type "TC" Telephone.
Price **24/-**

Type "B" Intervalve.
Ratio 1—4. Size 2 × 2⅜ × 2½ ins.
Recommended for Power Amplifiers.
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Type "TB" Telephone for Loud Speakers.
23/-

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IRONCLAD TRANSFORMERS

FULLER'S UNITED ELECTRIC WORKS LTD., WOODLAND WORKS, CHADWELL HEATH, ESSEX.

FALLON SQUARE LAW CONDENSER

Features include: **One hole fixing, tag connections, heavy aluminium top and bottom plates.** Metal to metal adjustable bearings, stout, well-cut aluminium vanes. Complete as illustrated

The New Fallon Square Law Condenser is absolutely the last word in perfect condenser construction.
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 4⅛ in. as against 5½ in. 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.

SQUARE LAW TYPE
(As illustrated.)

Price.		Price.
·001 .. 9/6	·00025 ..	6/9
·0005 .. 8/6	·0002 ..	6/-
·0003 .. 7/-	Vernier, 3 or 5	4/6

STANDARD TYPE
With Ordinary Vanes.

Price.		Price.
·001 .. 8/9	·00025 ..	6/-
·0005 .. 7/-	·0002 ..	5/6
·0003 .. 6/6	Vernier, 3 or 5	4/-

FALLON FIXED CONDENSERS

—improve results in all Sets

Made of the highest quality mica and copper foil; each one tested and guaranteed. FALLON Fixed Condensers are right up to FALLON standard. Fitted with soldering tags and nuts for making clean connections. **British Reputation.**—Your Condensers are not FALLON'S unless the name FALLON appears on same.

Fixed Condenser and Grid Leak COMBINED.
(As Illustrated.)
2 or 3 megohms, **2/6** each.

FALLON Fixed Condensers
Capacities up to ·001, 1/3 each.
Capacities up to ·004, 2/- each.

FALLON'S —*The Premier* VARIOMETER

Inside winding, suitable for broadcast reception on any P.M.G. Aerial, extraordinary close coupling ensuring large tuning range. Inductance, the highest possible—9·5 to 1. Metal feet can be adjusted to four different positions. As used in the Single Valve receiver for all wave-lengths, described and illustrated in "Modern Wireless," July issue.

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POPULAR WIRELESS

The Radio Weekly with the Largest Circulation

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

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

Technical Editor: G. V. DOWDING, Grad.I.E.E.

RADIO NOTES AND NEWS.

8 L S CALLING—NEW STATIONS TO AUSTRALIA

The Savoy Band's Surprise.

I HEAR there is to be a somewhat sensational musical surprise about the third concert of the Savoy Bands which is to be given at Queen's Hall, W., on Tuesday, March 10th. This is a new syncopated symphony which is to be played for the first time, and it has been specially written for the Savoy bands by a famous musician whose name for the moment is being kept secret. I am assured, however, that it will be revealed immediately after the concert, and will come as a big surprise. The only hint I can give now as to his identity is that he is the son of a musician whose name was known all over the world. There is not much doubt that for the third time the Savoy bands will again fill Queen's Hall—some achievement, when you remember all the distinguished soloists who more often than not have to face rows and rows of empty seats. But then, of course, the Savoy bands would never be able to give enough concerts to satisfy all their friends of the ether.

* * *

Listen for 8 L S.

SHORT-WAVE broadcasting is now being tested in France, and a station at Montpelier (8 L S) is transmitting daily on low power. Programmes are sent from 8.30 to 9.0 p.m. on a wavelength of 186 metres, and have been picked up all over France. If any British listeners succeed in logging 8 L S, the Société Languedocienne, Montpelier, would be very glad of a report.

* * *

Better and Better.

NEVER since broadcasting started has the outlook for the future been so promising as it is to-day. I wonder how many people realise that there are about a dozen new stations in Europe alone which will be on the air in a few weeks, and the total number contemplated for the future must run into hundreds? Any night that you are searching round you may find a total stranger on your condenser dial, with a name you never heard before, such as Graz, or Strasnice, or Pic-du-Midi.

A Popular Octette.

LISTENERS mired the the J. H. Octette will be know that it institution, foreigners are J. H. Squire is figure in metro- being connect- Adelphi, house, and Theatres, as rector.

*

Relaying from

THE Stutt- has re- experi- relaying, and ed in present- ence with from three of stations, and Newcastle,

One of 2 L O's new masts now erected on an Oxford Street store.

HEAR—THE WAR ON "PIRATES"—IN A TRAIN!

who have ad- broadcasting of Squire Celeste interested to is a British from which all excluded. Mr. a prominent politan music, ed with the Apollo, Play- St. James' musical di-

*

Stuttgart.

gart station cently been menting with has succeed- ing its audi- programmes the British from K D K A. Chelmsford,

and London were the British Stations chosen, all of whom were relayed upon 443 metres with great success.

* * *

New Station Testing.

AMONGST the new stations actually carrying out tests at the present time are Oslo (Norway), Sundsvall (Sweden), Glenwitz and Telefunken (Germany), and Graz and Innsbruck (Austria). In Portugal, Lisbon and Monsanto are in operation, whilst Hongg (Switzerland) and Strasnice (Czecho-Slovakia) are also waiting to be stalked by the wary "D X" fiend, who explores every strange carrier-wave he hears.

* * *

"Mayday."

HAVE you heard a "Mayday"? Aeroplanes or airships do not send out S.O.S. when in distress, but instead use the word "Mayday" to clear the ether of all interfering traffic. Officially adopted as the international signal of distress for airships and 'planes, the word "Mayday" is derived from the French expression "m'aider."

* * *

L.S.D.

LISTENERS' licence fees collected by the Post Office in 1923-4 amounted to no less than £250,055. Of this amount £189,183 was paid to the B.B.C. under the arrangement whereby the Postmaster-General deducts a certain proportion for expenses, etc. I believe that in several cases members of the public were thanked when paying in their money.

* * *

War on "Pirates"?

THE Government's Wireless Telegraph and Signalling Bill has now been issued, and a very formidable document it is. A summary conviction for unlicensed installations, formerly punishable by a £10 fine, may now be punished by three months' hard labour or a £50 fine, and other penalties have been stiffened up in like fashion. Most members of the

(*Continued on next page.*)

NOTES AND NEWS.

(*Continued from page 5.*)

House of Commons listen-in, so we may hear some diverting technical talk at Westminster before the Bill becomes law. I believe the Editor has something to say about this Bill in "Mainly About Broadcasting."

* * *

The Latest B.B.C. Recruit.

THE appointment of Mr. George Grossmith to be Advisory Director of Programmes to the B.B.C. is one that listeners will view with satisfaction. Not only will Mr. Grossmith undertake the arranging of special programmes periodically, but his position and prestige will tend to develop liaison with the entertainment industry in general.

Mr. Grossmith has unofficially been assisting the B.B.C. since January, and he tells me that none of his theatrical engagements will be affected by the new arrangement.

* * *

Australia in a Train.

PICKING up Australian and American stations whilst travelling at top speed in an express train is the latest feat of M. Menars, the well-known French experimenter. He was using a two-valve set, without aerial, but connected by a short lead to the electric-light bulb. For 35 miles, whilst the train swept through tunnels and over bridges, reception was perfectly clear.

* * *

The Super-Het.

THE super-heterodyne is steadily becoming more popular in this country. A Harrow reader tells me that his "super-het." is getting quite nicely now, and he has managed to tune in *eighteen* American broadcasting stations up to date. Can any other owner of a similar set beat this?

* * *

What the Inventor Says.

"REFRIGERATION by radio" is the essential claim made by a Scandinavian inventor, whose radio-ice can be tuned-in by means of a special receiver, which will keep food, etc., perfectly cool in the hottest weather. The receiver is installed in an ice-box and tuned-in to the central station, and will then freeze away for one year at a cost of about two shillings—at least, that is what the inventor says!

* * *

Plymouth Gets Busy.

FIRED by the phenomenal long-distance feats recently recorded, and burning to emulate same, the staff at Plymouth Relay Station recently dusted up their transmitter very carefully, cleaned all contacts, and "took the air" on full power, with the idea of shaking up the universal ether and making 5 X X feel jealous. They certainly succeeded in astonishing a Vienna listener who was searching round on Det. and 2 L F; but the most appreciative man in their audience was a New-Yorker, who had no idea that Plymouth had a radio station (until he heard it), and who had only known of the Devonshire port as a place famous for its export of Pilgrim Fathers.

2 L O's Aerial.

THE new aerial for 2 L O will take the form of two "sausages" spaced by a spreader 15 ft. long. Each "sausage" will have five wires spread out on 3 ft. 6 in. hoops, and the lead-in from the aerial to the transmitter will be 220 ft. long.

* * *

The Transmitting Hut.

BOTH of the masts on Selfridge's roof are earthed to the framework of the building, and they are both fitted with lightning conductors. Besides the main hut on the roof which contains the actual transmitter and the batteries required for filament lighting, there is a second hut. It stands near the base of one mast, and contains the running machinery—i.e., alternators for the transmitter and the dynamos for battery charging.

SHORT WAVES.

". . . When B.B.C. gives a concert at Covent Garden it gives a very fine concert indeed, and the silent listeners do not begrudge the storms of applause which come over. But if B.B.C. broadcasts loud applause from an unseen audience for some of the very thin fare which is sometimes provided from its own studio it will only annoy the public."—The "Star."

* * *

"People coming round from the anæsthetic after an operation say some odd things. A doctor friend tells me that a day or two ago one of his patients returned to consciousness by crying out in a loud voice, 'Is that London calling?'"—A Writer in the "Daily News."

* * *

When television comes shall we be asking "What can the B.B. See?"—The "Star."

* * *

". . . Up to the present I cannot discern any signs of a policy at all behind the programmes provided by that institution. (The B.B.C.) They seem so far to be trying to please everybody; and that, as we all know from our school-room days, will result in their pleasing nobody. . . ."—"Barabbas," writing in "Musical Opinion."

* * *

". . . Five years from now there should be ten million valve-set users in these islands. The best way to help with this growth is for the (wireless) industry to continue control of the British Broadcasting Company.—Mr. R. Ferguson (General Manager of the Radio Communication Co.).

* * *

The B.B.C. recently took part in a Rugby match at Lower Sydenham. I understand that as soon as one of their opponents was on the point of scoring a try several voices were heard announcing an interval of three minutes.—A writer in the "Sunday Pictorial."

* * *

THE WEEK'S QUERY.

"Why didn't you send me a series-parallel switch for the anode condenser?"

On 21 metres.

JOHN L. REINARTZ, the well-known American amateur, has succeeded in setting up a new short-wave trans-Continental record for American amateurs to beat. On a wave-length of 21 metres, Mr. Reinartz, from his home in Hartford, Conn., communicated with Newkirk Willis, in Santa Monica, California, the remarkable feature of the performance being that it was carried out in full daylight.

* * *

Beam Station Sites.

I HEAR that one of the new beam stations which will link up this country with the Dominions will probably be erected on a site near Bridgwater. Negotiations are now proceeding with landowners there, and if successful, two aerial systems, each half a mile long, will shortly be erected upon 300-ft. masts.

From America.

HAVE you heard the story of the young lady who completely lost her memory and who was taken by the police to the nearest broadcasting station? It is said that the announcer explained the situation to listeners, and then the young lady asked everybody through the microphone, "Who am I?" Three hundred miles away her aunt happened to be listening-in, recognised her niece's voice, and within a few hours the girl's identity was established. I hardly need add that the story comes from America.

* * *

Changes at Sheffield.

I HEAR that the Sheffield Relay Station will have a new studio shortly. The existing one is very small, and is separated from the transmitting room by only a few feet. Although no definite site has been announced at the time of writing, it is probable that the new studio will be housed on the top floor of the Old Imperial Hotel on Castle Street. The transmitting gear will remain at Corporation Street, the two buildings being connected by land line.

* * *

Broadcasting in Italy.

ITALY is planning a radio chain, with stations at Palermo, Naples, Florence, and Venice. In addition to the Rome station—which is often heard in this country—another station is already under construction at Milan. When the scheme materialises there should be plenty of chances to receive broadcasting from Italy, which hitherto has been among the backward European countries, as regards radio entertainment.

* * *

When the Heart is Young.

ARISING out of the Children's Corner, Nottingham has organised a Radio Circle, the membership of which has reached over 4,200. The oldest member is "Grannie" Greensmith, of 10, Fenton St., Sneinton, who is 92 years of age, and a very keen listener!

* * *

"Mespot Calling."

HAVING apparently tried all the official channels without success, and failing to get a reply from the Government wireless stations, a resourceful wireless operator in Mesopotamia broadcast the following message: "Will some British amateur help to get an urgent message through to the Air Ministry immediately?" Mr. G. Leslie Morrow, of Berkhampstead, Herts., who happened to be listening-in on the short waves, promptly gave "Go" on his transmitting set, and within a few minutes he had copied down the message and given "O.K.—Stand by 30 mins."

* * *

The Value of the Amateur.

MR. MORROW hurried to the police-station through the Hertfordshire mud, and a few minutes later was 'phoning the message through to the headquarters of the Air Ministry. Meanwhile the operator at Mosul, Mesopotamia (which is 3,000 miles away), was no doubt picturing to himself the progress of his message, and anxiously guarding his tuning controls?

ARIEL.

LOUD-SPEAKER RECEPTION AND REPRODUCTION.

By K. D. ROGERS.
(Assistant Technical Editor.)

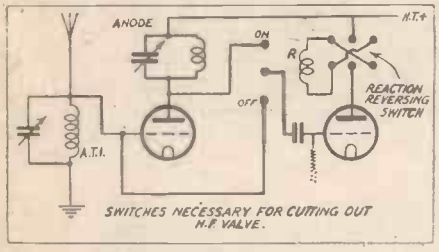
The amateur will find valuable advice in this article concerning the correct method of handling a set for good, clear, loud-speaker reception.

Mr. T. H. Studley, of Harrow School, who has received signals from 9 T C. of Chili.

RECENTLY I was invited to spend the evening at a friend's house, and was "treated" to 2 L O on the loud speaker. Asking if I was interested in wireless, my friend took me to have a look at his set, of which he was very proud.

It was certainly a magnificent instrument, in a beautiful cabinet, and covered with awe-inspiring yet fascinating knobs. So enthusiastic was the owner that he allowed me to see the inside, and finding that I was interested explained how the set worked, what valves he used, and what he could get on it.

A glance at the inside, the types of valves he was using and the H.T. battery, together



SWITCHES NECESSARY FOR CUTTING OUT H.F. VALVE.

with a further look at the loud speaker fully explained the reasons for the peculiar mixture of asthmatical wheezing and hoarse, guttural sounds that I had been told was the "London station," and with which I had been greeted as soon as I entered the house. The set, by the way, was situated at about 12 miles from 2 L O, and all the valves were doing their utmost.

Causes of Distortion.

Let us consider the possible causes of the frightful distortion that was being pushed out under the guise of wireless "reception."

In the first place the loud speaker, though of a very well-known make, was far too small for the task that had been set for it. It was doing its best, but you cannot, or rather should not, expect a small loud speaker to handle energy enough to fill a hall. Properly treated, the loud speaker would no doubt give excellent reproduction, but when overloaded, let alone being supplied with the output of a badly constructed and worse handled four-valve set, you can hardly expect anything but "bad gramophone" results.

Now let us consider the set which, while giving loud results, was perhaps the worst thing that could have been used for the purpose.

As the idea of this article is not so much a discussion upon the ideal loud speaker set as a guide by which amateurs may be able to improve their existing results without having to scrap their apparatus, we shall consider the more usual types of faults, and those that are confined to the most popular form of L.F. amplification, namely transformer coupled.

Admittedly, resistance coupling is the best if ultra purity is desired, but with both transformer or even choke amplification excellent results can be obtained and really enjoyable reproduction secured, though the former is preferable as a rule.

The set under consideration was of the usual type, namely tuned anode H.F., detector, and two stages of L.F. amplification. Though a switch was included for cutting out the first valve, this was not being properly used, and all four valves were going "all out."

Faulty Grid Leak.

The first valve at 12 miles from 2 L O was, of course, unnecessary, and should have been cut out. Reaction was being used, and this accounted for a certain amount of the distortion, as did a poor grid leak. However good the rest of the set may be, if the detector valve is giving out distorted currents the total output will be still further distorted, as all the distortion given by the detector will be amplified by the succeeding valves.

It is best if possible to avoid the use of reaction altogether when loud-speaker results on the local station are desired. I mention the local station because it is impossible as a rule to obtain clear reception from any other station, the music or speech always being interrupted by some other station, or those peculiar noises so familiar to amateurs that go in for DX work.

The next and most fruitful source of distortion is the L.F. side of a set, so that the first stage of L.F. amplification must be examined.

If this consists of a transformer-coupled valve, as my friend's set did, the effect of changing over the primary leads to the transformer should be tried. Most transformers work best when OP goes to the plate or reaction coil of the preceding valve, IP going to H.T. positive, while IS goes to the grid of the next valve.

There are exceptions, however, so that although the foregoing may be taken as a general rule, and the set connected up in that way, it is always advisable to try reversing both the primary and secondary leads, first alternately and then together.

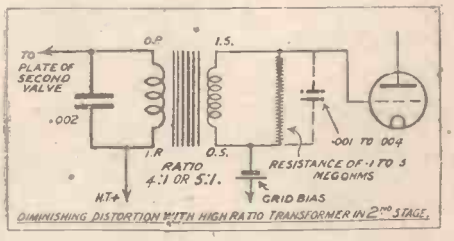
Need for Grid Bias.

A ·001 fixed condenser should be placed across the primary terminals for the time being, and attention can then be paid to the valve wiring, which should be so arranged as to have the filament rheostat in the negative lead of the L.T. battery. This ensures the grid of the valve being kept at a negative potential, and as this is the first stage of L.F. amplification it is probable that no other negative bias will be necessary. At any rate, we can leave this stage and have a look at the next.

If transformer or choke coupling is used it is generally advisable to make this, the second, stage the last, unless special power amplification is desired, for open-air demonstrations or large halls. In the average set this should be the final stage and when properly used and constructed will give ample volume, even for a small hall.

As I expected, the set I was examining used a transformer-coupled last stage, and also had an ordinary 5-1 ratio transformer of doubtful design included in it.

This, coupled with unsuitable valves and



DIMINISHING DISTORTION WITH HIGH RATIO TRANSFORMER IN 2ND STAGE.

no grid bias, was the cause of the majority of the distortion I had been enduring.

Readers who desire good loud speaker reception from a set with two transformer-coupled L.F. valves will have to go very carefully over the circuit of the last valve in order to cut out any distortion that may be present in the output of the set.

If, as is often the case, an ordinary L.F. transformer is used, the effect of changing over the leads as before should be tried

(Continued on page 8.)

LOUD-SPEAKER RECEPTION.

(Continued from page 7.)

and then grid bias should be given due consideration. This will vary with the valve used, which, by the way, should be a power valve, either of the dull or bright emitter type. It is useless to expect an ordinary valve to carry the energy supplied to it with any degree of success, and although the extra volume obtained by the use of a power valve may not be desired, the use of this kind of valve is very strongly recommended, the set being *detuned* to cut down the volume to the desired intensity.

Choice of Transformers.

The grid bias should consist of a small dry battery of either 1½, 3, 4½ or 6 volts—this will have to be found by experiment—connected in series between the negative L.T. terminal and the transformer secondary connection remote from the grid of the valve. This will probably be the OS terminal. The negative of the battery goes to OS, while the positive goes to the L.T. negative.

The best thing to do now is to replace the transformer by a proper "second stage" transformer such as the Eureka No. 2, or the Marconi Ideal 2·7–1, but if this alteration is not desired, though for really good results it is advisable, the use of a few little "wangles" may be beneficial.

First of all, vary the fixed condenser across the primary of the first transformer till least distortion (with both valves going) is found, adjusting the H.T. and filament at the same time, of course. Separate H.T. for the last valve will be useful here, though it is not absolutely essential. Next try a ·002 or ·003 fixed condenser across the primary of the second transformer, and then turn your attention to loading the secondary.

This is an expedient that often has the desired effect, though it is apt to cut down the volume somewhat. It is based on the fact that the majority of L.F. transformers, when not designed properly for the task they have to undertake, have a certain resonance about them, much as a bad loud speaker has.

Preventing L.F. Resonance.

This resonance is electrical, however, and in the same way that the loud speaker magnifies certain notes or frequencies of sound more than others, so the transformer steps up the voltage of certain frequencies of current more than others. Obviously the result of this is to produce uneven amplification, some frequencies being over amplified and others not receiving enough magnification. The result makes itself known by distorted results, the high notes being harsh, while orchestral pieces in particular are blurred, and the various instruments jumbled up in an indistinguishable medley of unmusical sounds.

There are two easy methods of loading the transformer, and both should be tried until best results are obtained. The first consists of placing a resistance across the secondary terminals, and the second in connecting a condenser across the same points.

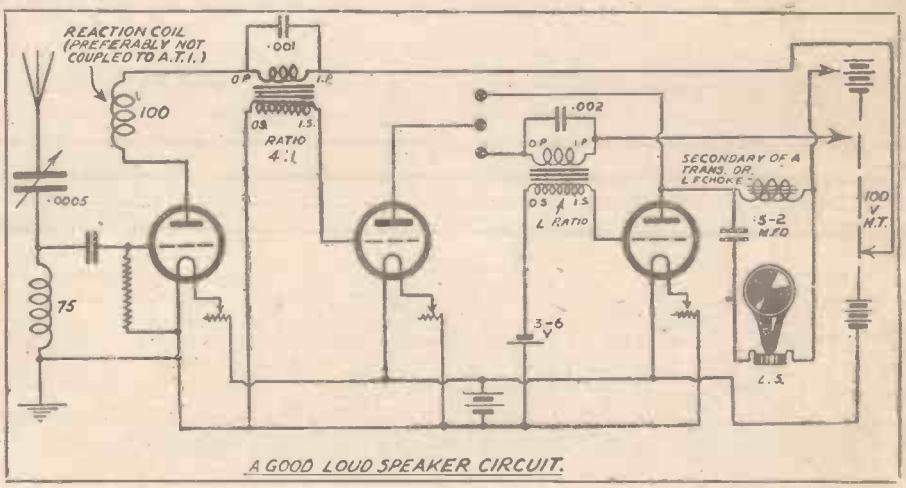
A resistance of about 500,000 ohms across the IS and OS terminals of the transformer should have the desired effect, though various resistances should be tried until the best value is found. In the same way different fixed condensers should be tried until the most satisfactory results are obtained. As a guide, a ·001 mfd. and one of ·002 mfd. may be tried first.

It will be found that the pitch of the received signals is lowered by the addition of capacity or the decrease of resistance across the transformer, but at the same time the harshness is reduced and a more mellow tone results.

Suitable Valves Essential.

If the amateur has nearly succeeded in eliminating the distortion by the various means suggested in the foregoing, he will do well to look at his valves, H.T. control, and tuning.

In the former case all valves, in whatever set they are to be used, should be chosen for the purpose they are to fulfil. For instance, it is sheer waste of money to buy a valve designed for H.F. or detector work and to expect it to give good service in the second stage of an L.F. amplifier.



A GOOD LOUD SPEAKER CIRCUIT.

With regard to the four-valve set of which we were speaking, i.e. a typical four-valver; the first valve should be one suited for H.F. amplification, not that it should be used at all for short range work, and this valve should not be expected to operate as an L.F. valve unless the makers claim that it is suitable for that purpose. A good detector valve should be chosen and *kept* as a detector. It very often ruins the sensitivity of a good rectifier to use it elsewhere in a set, and this valve especially should be detailed for one job, and that one job only.

Use a Power Valve.

Any good L.F. valve will do for the first L.F. stage, but in the last stage the valve should be carefully chosen. A power valve, either of the dull emitter or ordinary type should be used, and as it is easy to get a valve to suit the filament voltage of the battery used for the others, there should be no difficulty in picking out a satisfactory one. The power valve will be more expensive than the ordinary type, but the capability to handle strong signals makes it desirable and well worth the extra outlay. The extra cost of upkeep is negligible now that D.E. power valves are available. A separate H.T. tapping is advised, and this and careful adjustment of grid bias should give really good results.

Handling the Set.

Careful control of the H.T. should be used in all stages if clear music and speech are to be obtained, and all the valves should be worked at their best values of H.T. and L.T. It is a mistake to turn down the filament, or cut down the H.T. of a valve in order to make the reproduction "softer." This should always be done either by cutting out a stage of amplification altogether, or by detuning the set. This latter always results in an improvement of tone where loud-speaker reproduction is required, and it assists in preventing "blasting." Reaction should be avoided wherever possible, especially when loud results are required. On the local station, within a distance of 20 miles, it should not be necessary at all, and if the set will not work a loud speaker without it the best thing to do is to add another valve.

Finally, always remember that a loud speaker should never be overloaded. The larger the loud speaker the less it has to be loaded to fill the room for which it is intended, so that it is much better to have a moderate-sized speaker and just let the sounds "fall out" as it were, than to have a small one and have to force it in order to get a sufficient volume of sound.

The diagrams given should be quite self-explanatory, though a few words about the one on this page may not be amiss.

The circuit shown is one very commonly in use, and is a good loud-speaker circuit for general purpose use. By this I mean that it need not be confined to loud-speaker reproduction of the local station, but can be used very satisfactorily for telephone reception of distant stations.

The choke is provided to keep the steady plate currents away from the 'phones or loud speaker, the L.F. impulses only going through them. The valves are chosen for the positions they will occupy, the last valve being a power valve.

A final refinement not shown would be a series of 1 mfd. condensers across each H.T. tap to H.T. negative, and these would assist in cutting out any H.T. noises due to a heavy discharge of that battery or a faulty cell.

MORE ABOUT OSCILLATING CRYSTALS.

By LESLIE MILLER.

The author of this article has made experiments with oscillating crystals a special study, and some new and interesting facts about them are revealed in this article.

A CRYSTAL, suitable for generating oscillations, may, at the present time, be taken to be a specially selected one, of zincite, with the point of a thin steel wire pressing on it, as cat's-whisker. In the case of pieces of zincite suitable for oscillation purposes, if no battery current is used, this combination makes a very poor rectifier, though some

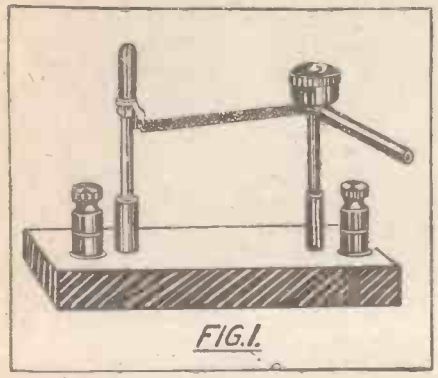


FIG. 1.

samples of zincite rectify very fairly with steel. There seems to be no connection between the properties necessary for rectification and those for oscillation, though, as will be mentioned later, the latter must be very similar to the requirements for microphonic action.

The great distinction between a crystal used for rectification, and one for oscillation, is that the former, offering a high resistance, always absorbs energy, and weakens the received signal; whereas the latter, when used properly, gives out energy derived from a local battery. Consequently, it can be employed to strengthen reception, or for transmitting purposes. This will, of course, be evident to valve users, but not to those crystal experimenters who know nothing of valve work.

It is the act of forcing current through the contact on the crystal, from a local battery, that completely alters the state of affairs, and turns some small percentage of zincite into a sort of cold valve, although the difference in the degree of coldness between the two electrodes exerts a marked influence on the result.

Similar to an Arc.

When a rising voltage is applied to the contact, the resistance of it, till then reaching hundreds of ohms or even more, vanishes when a certain strength of current is reached (the top of its voltage-current curve); and, if the voltage is still further increased, becomes what is termed negative. This merely means it is neither positive nor zero. A lower voltage than was used to make it become so will then drive a large current through it. The contact can now usually be set in oscillation, like the make-and-break of a buzzer, when the current through the electro-magnet becomes strong enough, by very gently flicking the flexible steel cat's-whisker. The resistance again goes up and the crystal will at once cease to absorb any more energy from the battery uselessly; on the contrary, it will give some out. This may take the form of low, or high frequency oscillations, or both, in suitable circuits, shunted across the contact. A small spark can often be seen there, and this behaves almost exactly like a very short arc. The zincite, where the steel touches it, becomes luminous, and weak whistles and gurgles can be heard. The oscillations are, however, not influenced by a magnetic field, and they can readily be stopped and restarted by breaking-and-making the battery circuit, as well as the oscillating one.

Research has now reached a point where there is no longer any difficulty in making a crystal oscillate, and keep on doing so for hours, or even days. A convenient circuit for this purpose is shown in Fig. 1. It will be seen that it is similar to that for a buzzer wave-meter, and practically the same as for a short arc generator, or for obtaining alternating current from a Neon lamp.

Ten per cent of the zincite on the market, at most, will generate oscillations freely, and only ten per cent of this will be good enough for heterodyning with success. Of this, nearly the whole would be rejected

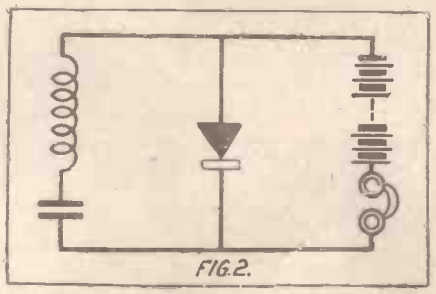


FIG. 2.

by anyone of experience, choosing it simply for rectification. Pieces suitable for oscillation can be bought, but if amateurs having zincite in their possession would like to see if it is of the oscillating variety, they should break up the blackest looking, non-transparent pieces into rather small fragments, and set each in fusible metal so deeply that only a few sharp points or a sharp ridge stands out.

Special Detector necessary.

On the sharp edge, or point of the crystal, some kind of steel wire point, about No. 32, should be arranged to touch, with a pressure slightly heavier than would be right for rectification of rather strong signals. Steel is best for the actual contact, but the spring that presses it on is another matter. For this, the writer naturally prefers his own type of cat's-whisker (prov. patent), consisting of a strip of silver, copper, or other metal gauze, used sideways on. This is shown in Fig. 1. For oscillating purposes, half an inch of steel wire should be fixed across the gauze at the acting end.

A straight piece of steel wire, about ¾ in. long, with the end just bent round at right angles will also answer very fairly, but is rather liable to vibrate in two planes. The Russian physicists employ the ordinary spiral cat's-whisker, but this will be found very difficult to set in oscillation. Steel is not the only metal that will work with zincite. The writer finds silver and nickel

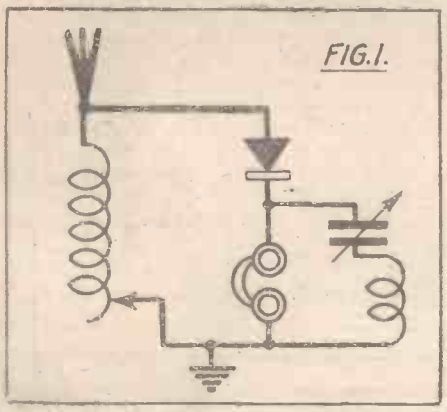
(*Continued on page* 10.)

An operator at the Nash Point Station adjusting the wave-length of the C.W. sets by means of a wave-meter.

A "DX" CRYSTAL CIRCUIT.

By PHILIP MASON.

QUITE a number of wireless enthusiasts at the present time claim to be able to pick up distant broadcasting on a crystal set, but these are still only a small minority in comparison with those who can only receive their local station. Generally, the causes of long-distance crystal reception are a more than usually sensitive crystal, a high and efficient aerial, a good earth, or a combination of these. What is



wanted is a circuit with which distant stations can be received, using an ordinary crystal in conjunction with an aerial and earth of average efficiency. The writer claims that the circuit described here supplies this want.

Connecting an Ordinary Set.

The "Long Range" circuit is shown in Fig. 1. It will be noticed that the circuit differs from the conventional type in that an inductance and condenser are connected across the telephones. This inductance, hereafter referred to as the 'phone inductance, should have a wave-length of about a hundred metres or so more than the aerial tuning inductance. Any of the usual types of inductance may be used. The variable condenser should have a capacity of ·0005 mfd.

Theoretically, you may use a variometer, coil and condenser, slider or tapped inductance, or loose coupler, with equal effect for the aerial tuning. In practice, however, the method which gives the finest tuning will be the best.

A crystal set using the ordinary type of circuit may be quite readily converted to the "Long Range" circuit by the method shown in Fig. 2.

The mode of operation of the circuit is not at all complicated. The station to be received is first tuned in with the aerial inductance in the usual manner. After this the condenser, which tunes the 'phone coil, is adjusted until loudest signals are obtained.

Some Results Obtained.

Using the "Long Range" circuit, the writer has succeeded in receiving Bournemouth, Newcastle, Cardiff, and Glasgow, at Birmingham, using an indoor aerial and a water-pipe earth. The reception of Bournemouth and Glasgow was fairly regular, but the other two stations could only be received when conditions were especially favourable. In order to test whether this reception was due to the circuit used, the writer had a switch connected so that the 'phone coil could be short-circuited. Transmissions which were received quite clearly when the 'phone coil was in circuit, disappeared entirely when it was cut out.

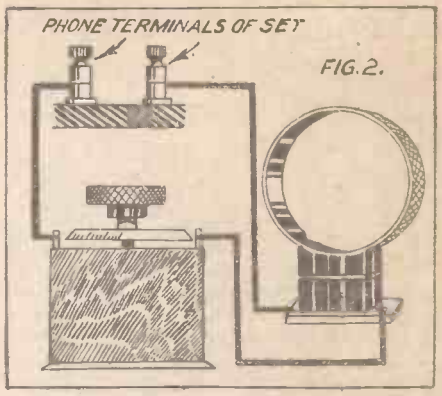
Well Worth Trying.

Providing that the aerial and earth are of the average efficiency, and a good crystal is used, any listener should be able to receive distant broadcasting stations, using this circuit.

Long-distance reception is not the only interesting property of the circuit, for it will also make the signals from the local station louder. The farther away from the station the set is situated, the greater the increase in signal strength will be. At one or two miles distant the improvement may be so small that it is scarcely noticeable, while at ten miles or so the signals will be markedly improved in strength.

In conclusion, the writer would like to invite those readers who are inclined to be sceptical to try the circuit for themselves.

A 4-valve set (1 H.F., det., 2 L.F.) made by Mr. L. Hook, of the Streatham Radio Society. WGY and all B.B.C. and many Continental stations have been heard.



MORE ABOUT OSCILLATING CRYSTALS.

(*Continued from page 9.*)

quite good, and no doubt other metals also, but copper is bad.

The subject has not been half investigated in this country, though Dr. Eccles was the first to discover that crystals oscillated. As usual, we have left other countries to try to make practical use of our discoveries. The Russian research workers especially should be thanked for throwing open their results to the world.

Referring to Fig. 2, which is a diagram of the simplest circuit for generating low-frequency oscillations, a dry-cell battery of the usual H.T. type will be needed, to give up to about 15 volts (or 30 volts, if required), with a contact to each cell after about 8 volts. A potentiometer connected across four or more cells is, of course, better, when it is necessary to adjust the volts on the crystal very accurately. In series with the battery is a resistance of 2,000 to 4,000 ohms. One regulating by means of a screw thread is very convenient, as it affords an additional means of adjusting the voltage across the crystal contact. This will normally be about 6 volts.

Using a Chelmsford Coil.

Instead of a resistance, an ordinary pair of headphones may be used, but these are of course inductive. Inductance is wanted to block oscillations and prevent them being wasted in this circuit, but very little of it, or it will react on the real oscillation circuit shown on the left, and cause beats, which may be as slow as two or three a minute. As a telephone put in this circuit acts not only as resistance, but as a detector of oscillations, it is often convenient to use it in this position.

Otherwise it may be connected across a secondary coil coupled to the inductance in the oscillating circuit, for which purpose an ordinary subdivided tuning solenoid with a sliding secondary for the telephones is useful. The inductance, in millihenrys, should have a ratio to the capacity, in microfarads, of about 1 : 3 to start oscillating most easily, and a coil for Chelmsford or Paris, in series with a 2 mfd. paper and tin-foil condenser, or one of the Mansbridge type, will approximate to this. The ratio is not at all critical. For a refinement, two condensers of one microfarad each may be used in series or parallel as required.

(*Continued on page 51.*)

STARTING AN EXPERIMENTAL RECEIVING STATION.

By OSWALD J. RANKIN.

PART IV.

AS the above title implies, the main purpose of these articles is to indicate a simple and practical method of *starting* an experimental receiving station.

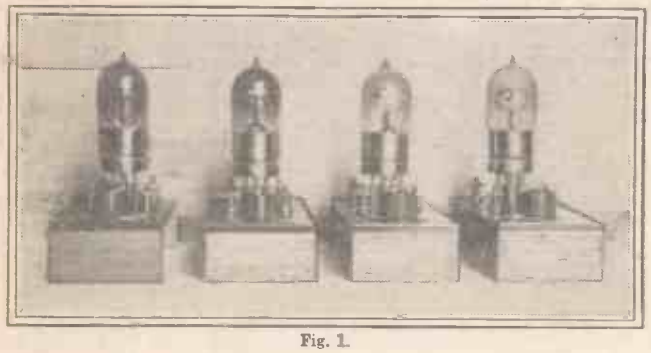


Fig. 1.

The present instalment deals with simple valve apparatus, and some single valve amplifying circuits, but this by no means signifies that previous experiments with crystal circuits have been exhausted. It should be remembered that all circuit diagrams are intended only as simple examples; the reader should experiment with all the possible modifications of each example before passing on to the next.

Construction of Valve Panels.

Fig. 1 shows a set of experimental valve panels which should now be made up. The ebonite panels are ¼ in. in thickness and 7½ in. long by 3 in. wide, these being marked off and drilled as shown in Fig. 2 and fitted with four terminals, a set of valve sockets, and filament rheostat.

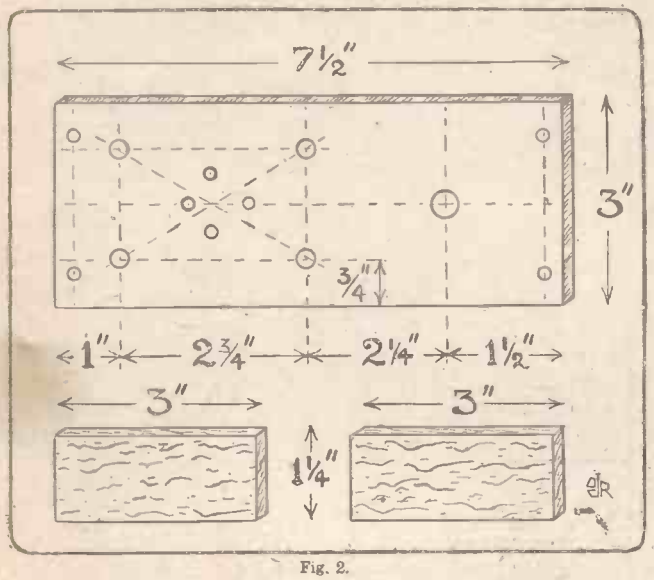


Fig. 2.

Two strips of wood, each 3 in. long by 1¼ in. wide, form the supports, or a complete cabinet may be fitted to each panel if desired. The panels are wired up in the manner indicated in Fig. 3, which shows the back and front views of one of the completed panels. Viewing the panel from the front, or top (right-hand photograph, Fig. 3), the two top terminals are (left to right) grid and plate, and the two lower terminals (left to right) L.T. negative and positive.

Fig. 3.

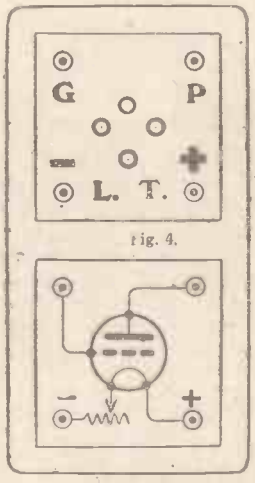


Fig. 4.

The filament rheostat is placed in the negative lead; that is, between the terminal marked L.T negative and one of the filament valve sockets.

All panels are identically wired, the first made being used as a pattern for the others. The fact should not be overlooked that when the panel is reversed (left-hand photo

(*Continued on page* 12.)

In order to gain *knowledge*, which is best acquired by practical experience, the reader is left to think out many problems for himself—to experiment, in fact. For instance, in the preceding article we were mainly concerned with inductively coupled crystal circuits employing honeycomb or basket coils. There the reader was left to think out and try other methods of coil coupling; the loose-coupler or vario-coupler, for example.

Even with a very simple form of crystal circuit it is possible to effect many changes; is there a limit, therefore, to the scope presented in the multi-valve stage? This is a question to be answered by the reader himself. He will think there is a limit if his *knowledge* is limited, but if he becomes thoroughly acquainted with the many modifications of a comparatively simple circuit, then he will feel confident that his scope for experimenting is increased at every step towards the multi-valve stage.

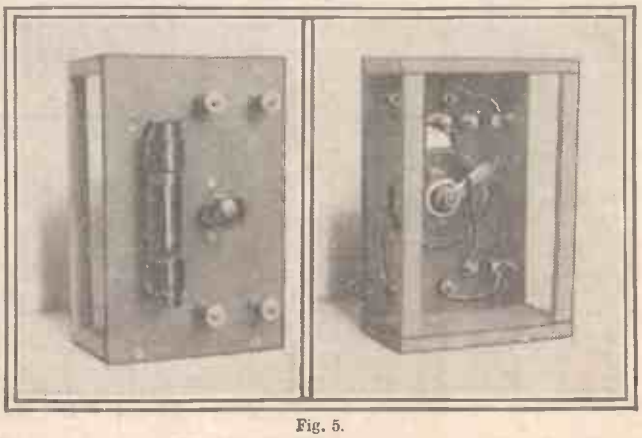


Fig. 5.

STARTING AN EXPERIMENTAL STATION.

(*Continued from page 11.*)

in Fig. 3) the plate and L.T. positive terminals will then be on the left-hand side. The terminals may be marked by means of transfers, or either of the small charts may be used as shown in Fig. 4. The chart shown in the lower diagram is probably the most instructive, and this should be marked out on paper and fastened to the operator's table. Both charts represent front or top views of the valve panel, one with the wiring diagram wiring connections. After a very short time, however, such a guide will not be required, for the operator will soon memorise the connections.

Different Types of Valve.

Fig. 5 shows the front and back of panel views of an experimental valve panel for the Myers type of valve. The ebonite panel is 5 in. long by 3½ in. wide, this being supported in an upright position by the simple wooden structure as shown. A complete cabinet would, of course, improve the appearance of the instrument, but the author prefers to arrange experimental apparatus on the easily "get-at-able" system portrayed in this and other components described in these articles. Viewing the panel from the front the terminals are arranged to correspond with the position of the valve clips as given in the template provided with this type of valve—i.e. top (red end of valve), plate and L.T positive; and bottom, grid and L.T. negative.

Fig. 6 shows a simple holder for plug-in H.F. transformers, and the reader is advised to make up at least two of these. The ebonite panels are 3 in. square by ¼ in. in thickness, these being fitted with four valve sockets or a valve holder, and four terminals which are wired up to same. The sockets should be fitted in a direct line with the terminals, from corner to corner of panel, as shown. The terminals are marked I.P., O.P., I.S., and O.S. to correspond with the markings on the transformers, the panel then being screwed down to a small wooden base which is well recessed to accommodate the terminal and socket nuts and the connecting wires.

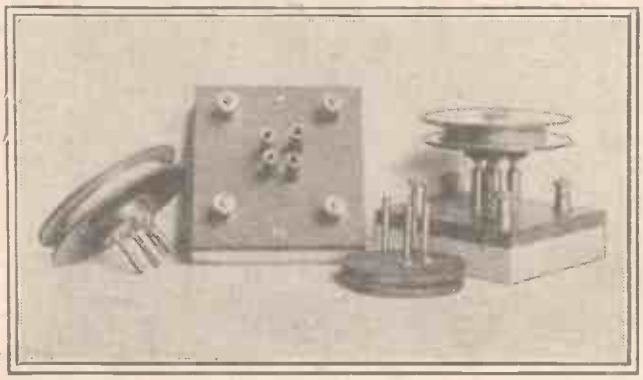


Fig. 6.

Now in most circuit diagrams the symbols are arranged progressively from the aerial and earth on the left, to the telephones and H.T. battery on the right, and therefore, if we adopt the same system in actual practice and arrange our experimental components to correspond as near as possible with the positions of the components in the diagram, the wiring up of any circuit will be a very simple matter. On the other hand, should we commence to wire up the circuit from the right, while reading the diagram from the left, then naturally we create an unnecessary difficulty which will result in confusion and consequent loss of time. A glance at the circuit shown in Fig. 7 should make this quite clear. The correct position for the aerial tuning coils and condensers is on the left-hand side of the operator's table; the H.T. battery and telephone terminal block should be on the extreme right, and the accumulator should be placed on the floor, under the table.

Having now arrived at the early valve stage, the beginner will want to know something about the best types of valves, the capacity of the accumulator, etc. I would advise him to purchase any ordinary bright-emitter valve, a 4-volt 60-ampere hour accumulator, and a 60-volt variable H.T. battery. If the accumulator is of a larger capacity then so much the better, and it will not matter very much if it is a 6-volt accumulator providing the filament rheostats are capable of cutting down the voltage to about 4 volts.

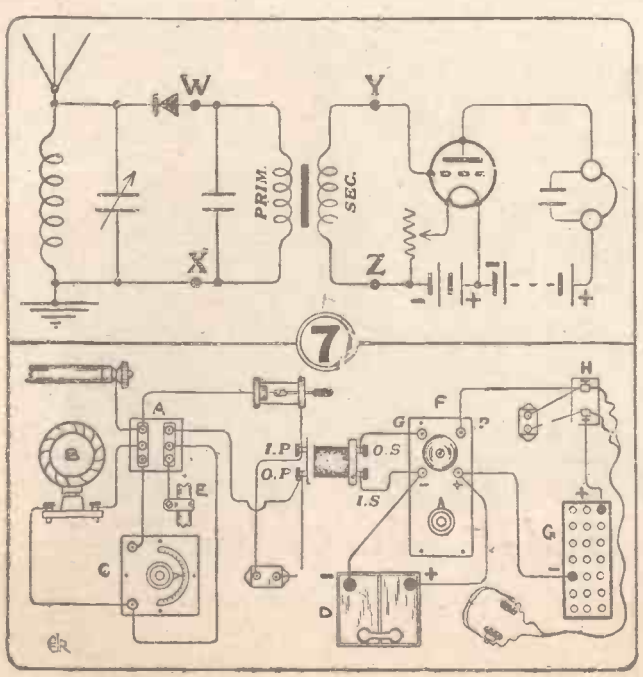
So far we have dealt exclusively with direct and inductively coupled crystal circuits where the headphones were connected to the points marked W X in Fig. 7. We will now connect these points to the primary winding of an L.F. intervalve transformer, place a ·001 mfd. fixed condenser in shunt with same, connect the secondary winding to the grid of the valve and the L.T. negative, and place the telephones in series with the plate of the valve and the positive wander plug of the H.T. battery. The negative side of the H.T. battery is connected to the L.T. positive, and a ·002 mfd. fixed condenser is connected in shunt with the telephones. We have now added a single stage of audio or L.F. amplification, or *note magnification*, to a crystal detector circuit, and providing the L.T. and H.T. current is properly applied the volume of sound in the headphones should now be considerably increased. The circuit may be tried minus transformer by connecting W to Y and X to Z. Any of the crystal circuits previously described may be used in conjunction with this single valve L.F. amplifying circuit. The actual lay-out of the components is shown in the lower diagram, where it will be seen that the large terminal block, A (described in Part 1), is now a very important piece of apparatus. B is the plug-in unit coil which is tuned by the ·0005 mfd. variable condenser, C; D is the accumulator; E represents the earth; F is the valve panel; G the H.T. battery, and H the 'phone terminal block. The components not marked should be obvious.

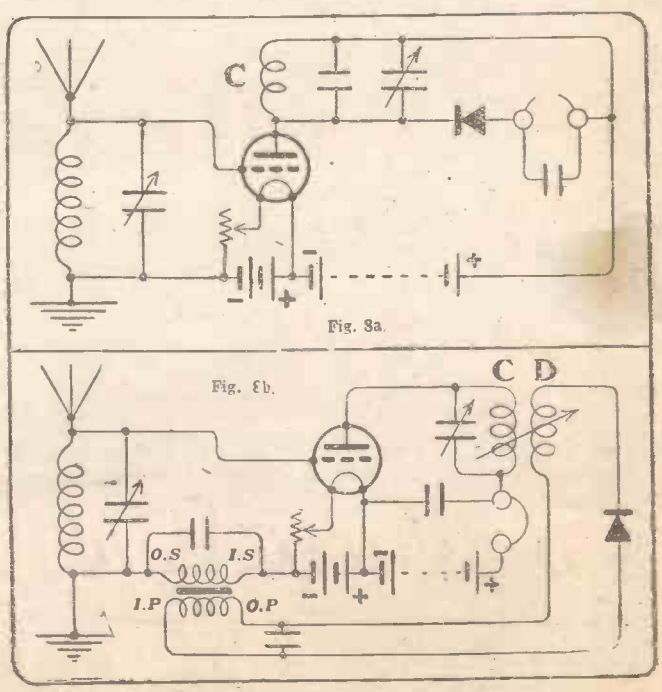
Now, for increased range or *distance* the valve should be made to function as a radio or high-frequency amplifier by arranging the circuit as shown in Fig. 8a. Here the valve precedes the crystal detector circuit and magnifies or *strengthens* the oscillations in the aerial circuit prior to rectification. The "tuned anode" coil C, which is shunted with a ·0003 or ·0005 mfd. variable condenser, should be one size larger than the coil used in the aerial circuit, and in order to balance out the capacity o the aerial it is often necessary to load the variable condenser (or, in effect, the coil) with a fixed condenser of ·0003 mfd. capacity, as shown. A ·002 mfd. fixed condenser is connected across the telephones.

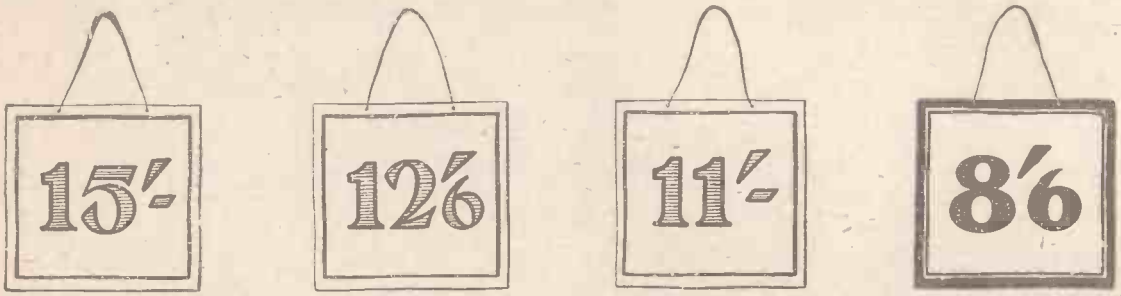
Useful Reflex Circuit.

In the lower diagram (Fig. 8b) the valve is made to function as a high and low frequency amplifier simultaneously. This is a simple single valve "reflex" circuit which might also be tried. The coils C and D are mounted in the two-coil holder, their best values being found by trial. Alternatively an H.F. plug-in transformer may be used, the ·0003 mfd. variable condenser being connected across the primary winding which then replaces the coil C. The primary and secondary windings of the L.F. intervalve transformer are shunted with ·001 mfd. fixed condensers, and a ·01 mfd. fixed condenser shunts the telephones and H.T. battery. Alternatively the ·01 (or larger) condenser may be connected across the H.T. battery and a separate ·002 mfd. condenser provided for the telephones. Both arrangements should be tried and experiments should be carried out with condensers of various capacities until maximum results are obtained. The positive pole of the telephones should *always* be connected to the positive H.T., otherwise the 'phone magnets will soon become depolarised. The positive tag is easily distinguished by small portions of red cotton interwoven in the covering.

The reader is now advised to obtain a reliable selection of circuit diagrams. I would recommend the supplement of pictorial diagrams recently given away in "P.W." (Jan. 24th).







When bright filament valves cost 13/6, the Silver Clear Louden was put on the market at 10/-.

In the last 4 months it has more than trebled its sales.

New prices are now in force for valves, and once more the Silver Clear Louden maintains its lead. From February 23 the price of the Louden Valve is reduced to 8/6.

LOUDEN 8/6 VALVES

Louden Valves - Silver Clear

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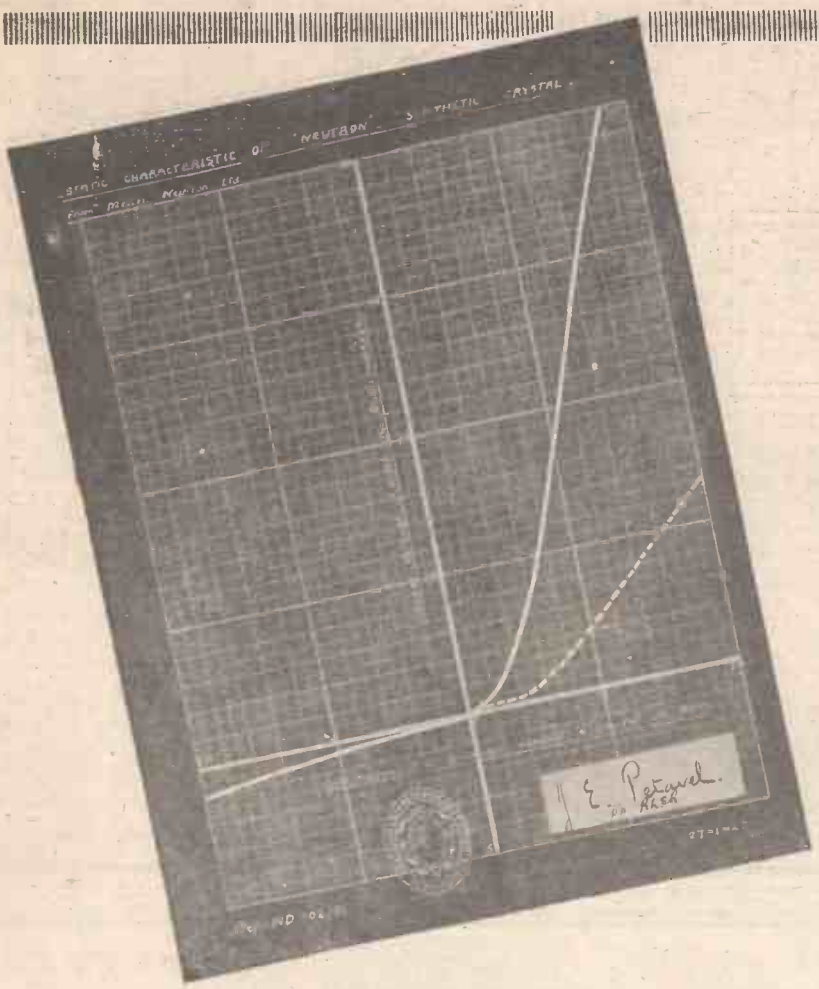
Advt. of the Fellows Magneto Co., Ltd., Park Royal, London, N.W.10.



THIS is a photographic reproduction of a curve supplied by the National Physical Laboratory, Teddington—part of a complete report, the other sections of which will be published from time to time. The only addition made to this photograph is the DOTTED curve, which is explained below.

What this Curve means to every Crystal User

THE Neutron Curve is the solid white line. Vertically, the reading is representative of the strength of current operating your head-phones; horizontally, the reading represents the strength of the incoming signal.

The *dotted* Curve represents an average taken from six Curves of other Crystals which have been published in the Press; and since these other curves have been obtained by similar methods of testing, it will be seen that Neutron Crystal passes more than twice as much current to operate your headphones.

Inferior Crystals (dotted line) whilst sensitive to *strong* signals, are insensitive to *weak* signals, as shown by the "kink" in the lower part of the dotted "curve." No known crystal is proportionately sensitive to weak signals as to strong signals; in other words, no crystal shows the ideal *straight line*; but it is claimed that Neutron Crystal presents the *nearest approach* to the "straight line curve" that it is possible to attain. Neutron detects, and makes audible in your 'phones, weak, distant transmissions that other Crystals are powerless to detect.

A *Laboratory proof* of what every Neutron user knows; great sensitivity, particularly to weak *distant* signals.

Put Neutron Crystal in your Detector, and you will discover that not only does Neutron give you the fullest possible volume from your local Station, but also its remarkable sensitiveness enables you to listen (if your aerial equipment and other apparatus are efficient, of course) to two, three, four, or even five stations at will.

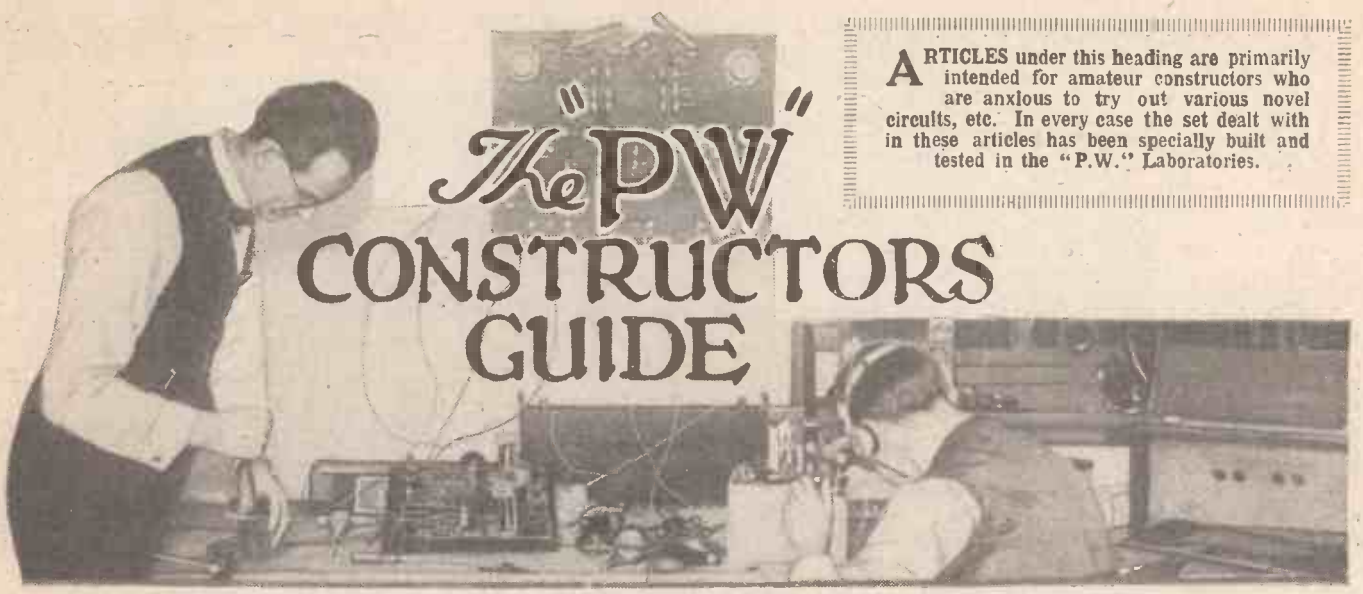
Stocked by the Best Radio Dealers. Packed in tin, with silver cats-whisker. Insist on Neutron, in the Black and Yellow Tin. If unable to obtain, send 1/6 with dealer's name, and this wonderful crystal will be mailed by return. **1/6**

NEUTRON
TRADE MARK

Concert Tested and Guaranteed Radio Crystal

Sole Distributors for United Kingdom:—**V. ZEITLIN & SONS, 144, Theobald's Road, London, W.C.1.** *'Phones:* Museum 3795 & 6841.

Produced by:—NEUTRON, LTD., Sicilian House, Southampton Row, London, W.C.1. *'Phone:* Museum 2677



"P.W." CONSTRUCTORS GUIDE

ARTICLES under this heading are primarily intended for amateur constructors who are anxious to try out various novel circuits, etc. In every case the set dealt with in these articles has been specially built and tested in the "P.W." Laboratories.

THE "SUPER-SELECTIVE" RECEIVER.

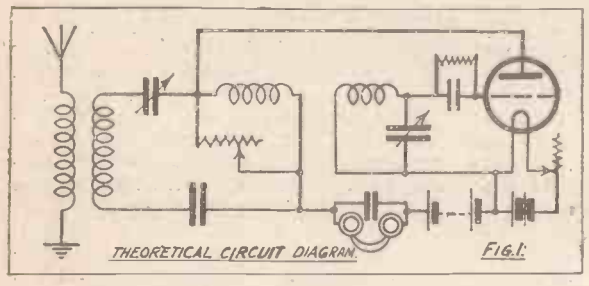
Specially Built and Described by G. V. DOWDING, Grad.I.E.E.

(Technical Editor "P.W.")

SUPER-SELECTIVITY cannot be obtained with present-day apparatus without employing a "super" number of valves, a "super" number of controls, or controls of a "super" critical nature. That is my own personal opinion, but, of course, I am open to be corrected.

The "super-selective" circuit recently published with full details for the first time in this country by POPULAR WIRELESS, is, anyway, no exception to such a rule, although it has certain advantages which render it a "hook-up" that can be very useful in certain circumstances.

For instance, no receiver could be made that would provide greater possibilities of instruction in "tuning sense," but the amateur must not endeavour to obtain this during broadcasting hours, as the circuit is a very bad "oscillator."



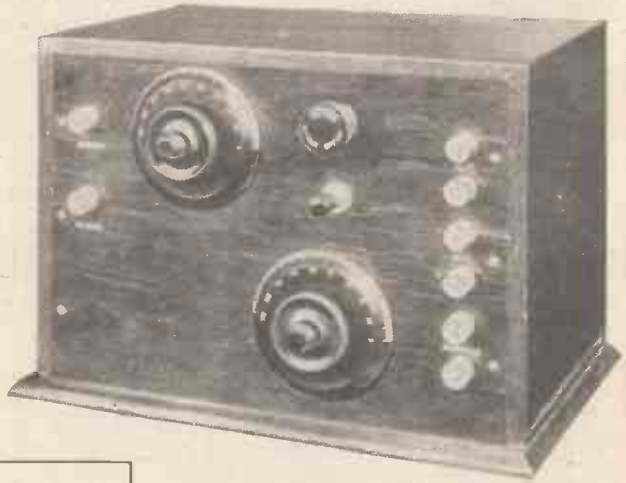
Then, again, it is hardly a set that a novice could or should be allowed to handle. It can be assembled with comparative ease—there are no outstanding constructional "snags" to be encountered.

It is a rather difficult circuit to handle, but when it is thoroughly mastered its selective properties are surprising. A local station really can be entirely cut out, even if it is only a mile or so away, and distant stations whose wave-lengths vary but 15 or so metres from the local station can be tuned in.

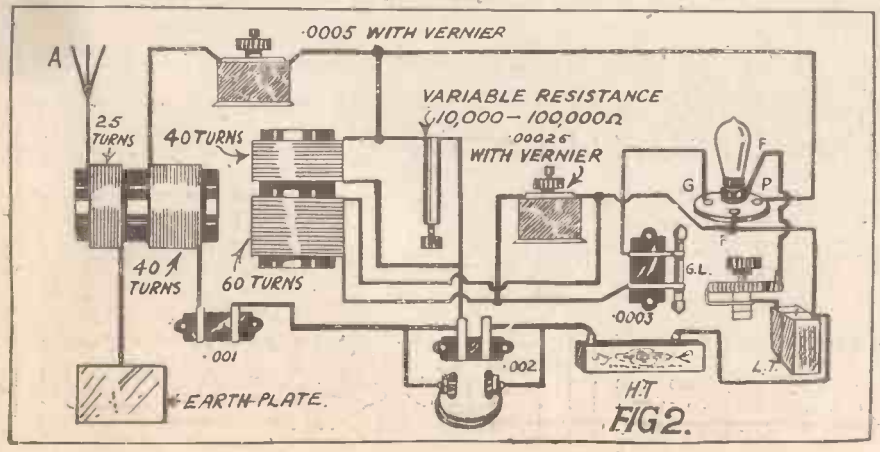
Signals are Loud.

It takes a few minutes to do this—it is a question of resolving carriers by skilfully balancing the three main tuning controls, and it is impossible to explain exactly how it is accomplished—it is purely a question of "tuning sense," a vague term which covers such requirements as the compensating hand capacity adjustment, etc.

The "super-selective" is, apart from being selective, rather a "super" in respect of volume obtainable, and if handled with care it is possible to get louder signals with it than is possible with a "straight" one-valve circuit.



A front view of panel of the Super-Selective Receiver. An L.F. amplifier can be added, but tends to cause great instability unless separate batteries are used.



Up till quite recently readers have experienced a difficulty in obtaining the 10,000 to 100,000 ohm variable resistance that is required. This variable resistance, by the way, is a very necessary item and it is essential that it should be capable of providing the specified range.

The "Watmel," "Bretwood" and "Enterprise" people are now supplying special resistances for the circuit. In

(*Continued on page* 18.)

THE "SUPER-SELECTIVE" RECEIVER.

(*Continued from page* 17.)

the model illustrated an ordinary Lissen anode variable resistance is employed.

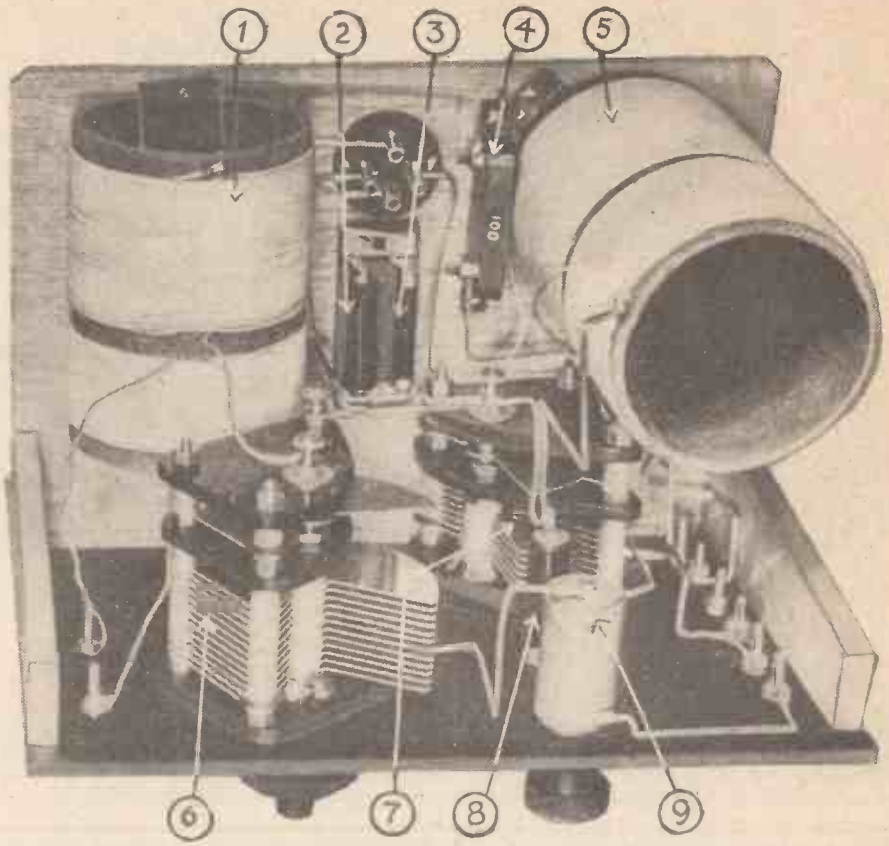
This component has, however, been rendered suitable for the purpose by having five of its pellets removed. It was found to be quite a simple matter to do this. The metal base was unscrewed, five of the little black discs and their accompanying metal separators extracted, and a small piece of brass rod inserted to make up the requisite length of the resistance element.

To Obtain Good Results.

Experiments proved that even if the question of general "lay-out" is not of great importance, strict attention must be paid to the details concerning the winding and disposition of the coils if it is desired to obtain good results. Three-inch diameter formers are essential, and so is 20-gauge D.C.C. wire.

For the benefit of readers a pictorial diagram of the circuit is again given, Fig 2. and this explains more clearly than could words exactly how the coils are wound. In each case the two windings on the former should be separated by a space of ¼-in. The aerial and first filter coil require a former 4 in. long and the secondary and its filter coil require one of 6 in. in length.

It is distinctly advantageous to employ a Lissenagon *Major* filament resistance, which, although rather expensive, provides the perfect filament control which the really



The view looking down on the baseboard behind the panel. (1) Aerial and filter coils; (2) Grid condenser; (3) Grid leak; (4) ·001 mfd. fixed condenser; (5) Secondary and filter coils; (6) ·005 mfd. variable condenser; (7) ·00025 mfd. variable condenser; (8) Variable resistance; (9) Filament resistance.

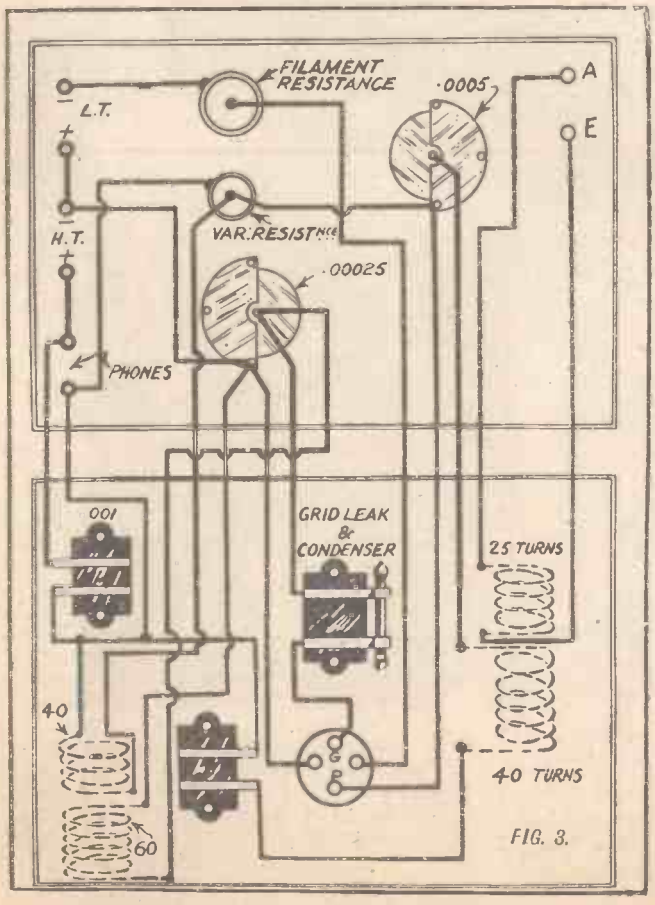


FIG. 3.

successful operation of the circuit necessitates.

Vernier condensers are absolutely essential, and when it is stated that a station even at fairly close range can be tuned in and totally lost again with but a slight movement of but *one* of the verniers, perhaps the necessity of such will be realised. ·0005 and ·00025 mfd. J.B. square law vernier condensers are obtainable and are to be advised.

The mounting of the two coil formers is liable to present difficulties, for they must be at right angles to each other. The method adopted in the set illustrated can be clearly seen, and it will be agreed that it is about the only method that can be adopted to ensure adequate spacing and yet permit the set to be confined within a case of reasonably compact dimensions.

Suitable Valves.

It will be noticed that the valve holder is placed centrally between the two coils, while the grid leak is situated immediately behind it. Referring to the panel, accessibility has been given preference at the expense of true symmetry, but after handling the receiver the constructor will agree that it is wise to do so.

We have found that almost any general purpose valve can be used with the "super-selective" with varying degrees of success. We used for testing this set Cosmos D.E.11, Cossor "Wuncell," and a B.T.-H. B.5, all of which, it will be noted, are dull emitters; but bright emitters can be used, too, and

(*Continued on page* 20.)

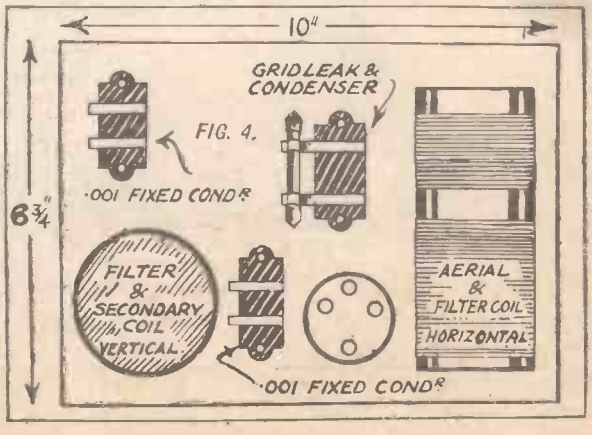


FIG. 4.

THE "SUPER-SELECTIVE" RECEIVER.

(Continued from page 18.)

very good results were obtained with an Edison A.R., a Marconi "R.," a Mullard, and a foreign valve of doubtful origin.

Varying H.T. voltages were employed according to the valve in use. The fixed condensers were experimented with and we have an idea that slightly better results were obtained with one of ·001 mfd. capacity across the 'phones, instead of ·002 mfd., as was originally specified.

A "Worth-While" Circuit.

Capacity effects are rather noticeable, and it is fairly certain that the stability of the receiver could be improved by introducing a telephone transformer.

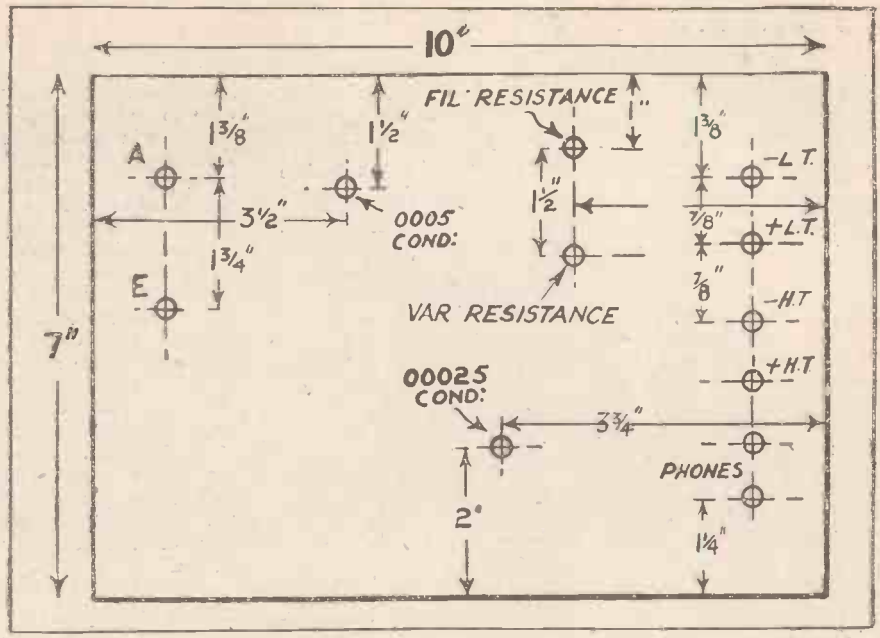
Referring to the diagrams, Fig. 1 shows the theoretical circuit which is given in Fig. 2 in pictorial form as well in order to make the coil and other connections perfectly clear.

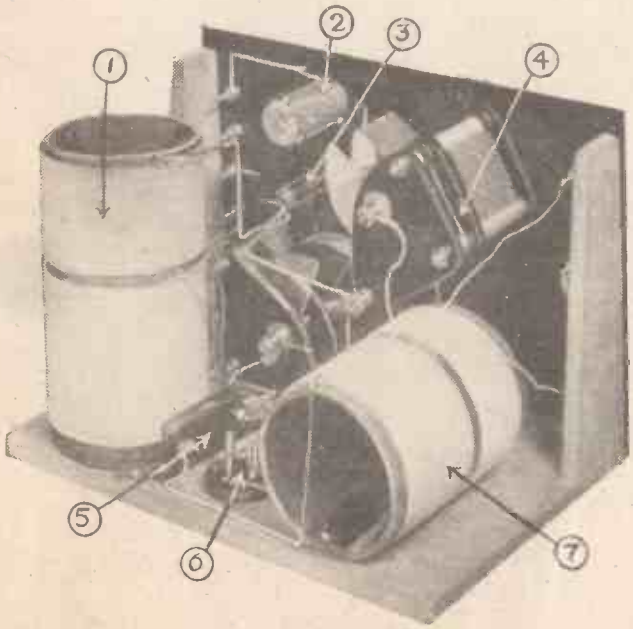
Fig. 5 gives panel drilling details, and Fig. 4 the lay-out of the baseboard. It will be noticed that one coil is mounted horizontally and is fixed in position by means of a strip of ebonite which, passing right through it, is screwed at each end into the baseboard.

The vertical coil is mounted by means of two small brackets bolted to the bottom of the former and screwed to the base, by these it is held firmly and rigidly.

Fig. 3 is a wiring diagram and with the assistance of this and the pictorial diagram it should be impossible for the constructor to go wrong. As a matter of fact, I would almost go so far as to say that this last diagram is unnecessary, for the constructor who is unable to wire up a set directly from a theoretical circuit is not likely to be able to handle the "super-sclective" with much success.

Finally, and to summarise my opening remarks, the "super-selective" is a really worth-while circuit, but our New York correspondent was at fault in saying it is a set any amateur can handle with ease. For really good results it does require skilful handling.





Another view behind the panel. (1) Filter and secondary coils; (2) Filament resistance; (3) Variable resistance 10,000-100,000 ohms; (4) ·0005 mfd. variable condenser; (5) ·001 mfd. fixed condenser; (6) Valve holder; (7) Aerial and filter coils.

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

What is Hysteresis?

I HAD a letter the other day from a reader wanting to know what was meant by magnetic hysteresis. Well, a full account of hysteresis and the effects which it produces, would take the whole of this journal several times over. But briefly the answer is this. When a piece of iron is placed in a magnetic field, there is a certain intensity of magnetisation produced in the iron. If the strength of the field is increased the magnetisation of the iron is also increased but not necessarily in the same ratio. Eventually, there comes a point when the iron is "saturated." Now, if the strength of the field is reduced, the magnetisation of the iron does not exactly follow suit: there is a "lag," and when the strength of the field has been reduced to zero, the magnetisation of the iron still has an appreciable value. In order to bring the magnetisation of the iron to zero the field has, in fact, to be reversed. It is easy to see that if the iron is taken round a "cycle" of changes, that is, the magnetic field raised to a given value, then reduced to zero, then taken to the same value in the opposite direction, then to zero, and so on, a certain amount of energy will be lost in the iron. If a piece of iron is surrounded by a coil through which an alternating current is passing, the iron is evidently going through this cycle many times per second. In these circumstances, a considerable amount of energy is lost, owing to this property of lagging, or "hysteresis"; this energy appears mostly as heat, and the iron core is raised in temperature. Losses of this kind are known in electrical engineering as "hysteresis losses." Of course, different specimens of magnetic material vary enormously in their hysteresis, and a low hysteresis is, for most purposes (though not for all), a desideratum of considerable importance.

The Derivation of Electron.

The word "electron" is now so common, one might almost say a "household word," at any rate, in households where wireless has established itself, that it is interesting to trace its origin. This subject was brought up by a recent discussion between some wireless enthusiasts who held widely different opinions as to its origin. It is certain that it had something to do with the Greek word for "amber" (a fossilised gum) which was one of the first substances known to have the property of becoming electrified by friction. But in reference to a fundamental particle or unit of electricity, the word "electron" appears first to have been proposed by Dr. Johnstone Stoney about 1891, and mentioned in a paper before

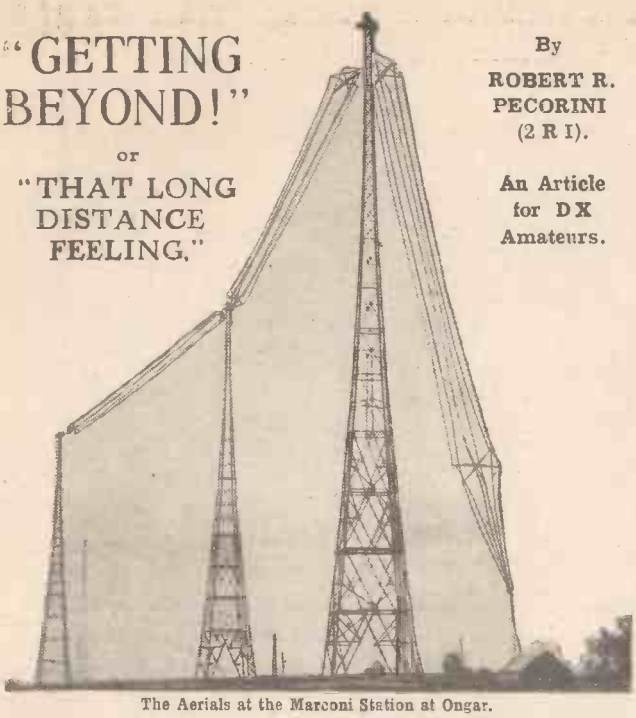
(Continued on page 55.)

"GETTING BEYOND!"

or "THAT LONG DISTANCE FEELING."

By
ROBERT R. PECORINI
(2 R I).

An Article for DX Amateurs.



The Aerials at the Marconi Station at Ongar.

THE numerous letters from POPULAR WIRELESS readers on the subject of the "P.W." Telephony Time Schedules, have kept me busy during the last few days. The general query seems to be a big "HOW?" To that I really must crave the indulgence of a general reply. Presumably the set is O.K.—aerial and earth system O.K.—'phones and valves O.K. Then we must not be dud on the human factor of personal patience. The knob-swisher will never get "Beyond." DX work is a matter of patient and loving search. Whilst on the subject of search I would like to issue a warning.

The majority of broadcast listeners' trouble is caused by the fiend who *will* search out on the heterodyne method. He might occasionally beat himself by getting into the No-Man's-Land of the overlap, but more often than not he beggars his neighbour. Reaction should not be a means of search, it should be used to strengthen obtained signals. That is where patience becomes a long suit. It is more than a virtue. Patience is better than 2 H.F. stages.

Ultra DX Work

I have been offsetting my southern extraction by a gruelling and deliberate course of patience in radio work. During the last week a new system designed especially for POPULAR WIRELESS work has been in course of preparation at 2 R I. Misfortune attended the old system, which was temporarily thrown out of commission. My infant son had also dismantled my pet loop for his own nefarious experiments in transmission by means of an "osculating cristal!" I therefore spent the evening curing a bad temper by trying to get them in without aerial or earth. The first result was Hamburg, then 2 L O, then Hilversum. I concluded a thoroughly exhausting evening by getting in Iberica with its "here-we-go-gathering nuts-in-May" programme. Physically, I could not stand up to a trial for K D K A, so quit, satisfied that I had made progress along the placing of a vernier upon my patience.

Times are very favourable for reception of Continental stations just now. A few of the German stations particularly seem to be pumping out the watts in great style. Hamburg is a great big fellow in this respect, and, personally, I have no difficulty in putting him on the loud speaker without an under-current of 2 L O. Actually in some cases the Bremen relay is found easier to pick up because it gets below the British band. Iberica is quite a good turn after 2 L O goes to bed. Hilversum roars in. Zurich has an orchestra that I consider one of the best in Europe—that of l'Hotel Baur au Lac.

Esperanto?

What a pother there is just now about Continental call signs and the international language. Whilst it is desirable that the DX listener should be able to recognise the station, and then go on to further conquests, what about the locals who object to their "uncle" continually telling the world who he is? That is where the wave-meter comes in when accurately calibrated. One is independent of language or call signs. The question of the international language is also a wee bit selfish. Why English? Why Ido?

NEXT WEEK—

An Exclusive Article on

"The Ether"

Sir OLIVER LODGE, F.R.S.

Every amateur who has followed Sir Oliver Lodge's broadcast "talks" on the Ether should read this article, which will be used as an Epilogue to his forthcoming book on the Ether.

Why Esperanto? Radio broadcast is essentially democratic. The Tower of Babel rather messed up the tongues of the world, and we have to stand by it. Merely to gratify my sense of having achieved a DX record, I cannot see why my tongue should be inflicted upon the peasant of Komarov with his crystal set. I candidly confess that I do not understand half the stations I pick up—save in the international language of music—but I derive great benefit from the announcers I partially understand, because my language "ear" is becoming tuned in. That and my wave-meter put me right as to where I am.

P.S.L. Cards.

I append my specimen reception card. I think this embraces all the station director wants to know, and I give a free translation into French, Italian, Spanish, and German. These four will do to go on with. I propose to give you Dutch, Swedish, and Danish on another occasion. I cannot tackle Japanese yet.

How to Write to a Foreign Station Director.

ENGLISH EXAMPLE.

Sir,—Your telephonic signals heard here at a.m.
p.m. Greenwich mean time on .... H.F., Detector, ... L.F.
weak,
Strength of signals medium,
strong.
Fading nil,
badly.
Yours faithfully,
(Signed).....

FRENCH EXAMPLE.

Monsieur,—Vos signaux téléphoniques entendus ici à .... matin, temps moyen de
soir,
Greenwich, sur .... Haute Fréquence, Détecteur,.... Basse Fréquence.
faible,
Force moyenne,
forte.
Evanouissement du son nul,
extrême.
Salutations distinguées,
(Signed).....

ITALIAN EXAMPLE.

Signor,—I vostri segnali telefonici sono stati uditi qui alle ore .... a.m. tempo medio di
p.m.
Greenwich con .... Alta Frequenza, Detettore, ... Bassa Frequenza.
debole,
Forza medio,
forte,
Indebolimento nulla,
grande.
Devotissimi vostri,
(Signed).....

GERMAN EXAMPLE.

Euer Hochwohlgeboren,—Ihre Telephon-Signale wurden hier vernommen um .... vormittags,
nachmittags, nach Greenwich Zeitangabe, mit.... Hochfrequenzröhren, Detektor, ... Niederfrequenzröhren.
schwach,
Starke mittelstark,
stark.
Abschwächung keine,
sehr gross
Hochachtungsvoll,
(Signed).....

SPANISH EXAMPLE.

Señor,—Oido aqui vuestras señales telefónicas a .... a.m. tiempo medio de Greenwich
p.m.
en .... Alto frecuencia, detector, ... baja frecuencia.
debil,
Intensidad mediana,
fuerte.
Desvanecimento nada,
mucho.
De Usted atento y S.S.,
(Signed).....

THE "POPULAR WIRELESS" CONTINENTAL BROADCASTING TIME-TABLE

Specially compiled by ROBERT R. PECORINI, 2 R I.

Transmission Starts G.M.T	Transmission Ends G.M.T	Station and Call Sign	Wave-length in Metres	Days of Week	Nature of Transmission
06.00	06.06	Koenigswusterhausen (L P)	4000	Daily ..	News during day to 20.00
06.25	07.00	Hamburg (*See below*)	395	Weekdays	Time, Weather, News.
06.25	07.00	Hanover	296	,,	Relay Station.
06.25	07.00	Bremen	330	,,	,, ,,
06.30	07.35	Koenigswusterhausen	2450	Daily ..	Press Service (Woolf).
06.40	06.46	Eiffel Tower (F L) ..	2600	Weekdays	Weather.
06.45	06.53	Eberswalde	293	Daily ..	Press Service (U. Telegraph) and during day
06.50	06.55	Buda-Pesth (M T 1) ..	950	,, ..	News, Bourse, etc., at frequent intervals.
06.55	08.15	Münster	410	,, ..	Time, News, Women's Talk.
07.00	08.00	Hamburg	395	Weekdays	Dramatic critique.
07.05	07.12	Lausanne (H B 2) ..	850	Daily ..	Weather, Markets, News.
07.30	08.00	Leipzig	454	Sundays	Concert. [Music.
07.30	08.30	Frankfurt-am-Main	470	Sun., Fri.	Religious Service and
07.30	08.30	Cassel (*See below*)	228–288	,, ,,	Relay.
07.30	07.40	Rome (I R O) ..	425	Daily ..	News.
07.40	07.50	Toulouse (M R D) ..	1525	Daily ..	Weather for 'planes.
07.45	07.52	Buda-Pesth (M T I) ..	950	,, ..	News, Bourse, etc.
07.55	10.00	Hamburg	395	Sunday	Time, Weather, News, Drama.
07.55	10.00	Hanover	296	,,	Relay Station.
07.55	10.00	Bremen	330	,,	,, ,,
07.55	08.05	Amsterdam (P C F F)	2100	Daily ..	News, Markets, etc.
08.00	08.09	Vienna (O R V)	530	,, ..	Markets.
08.00	09.00	Voxhaus (Berlin)	505	Sunday	Religious Music.
08.00	09.00	Leipzig	454	,,	,, ,,
08.00	09.00	Dresden	280	,,	Relay Station.
08.00	08.45	Koenigsberg	463	,,	Religious Music.
08.15	08.20	Buda-Pesth	950	Daily ..	News, etc.
08.20	08.30	Marignane(S.W.France)	1525	,, ..	Weather. [Concert.
09.00	11.50	Voxhaus (Berlin) ..	505	,, ..	Market, News, Weather.
09.00	09.12	Kbely (O K P)	1150	,, ..	Weather, News.
09.00	10.05	Komarov (O K B) ..	1800	Sunday	Sacred Concert.
09.42	09.50	Toulouse (M R D) ..	1525	Daily ..	Weather.
09.55	10.03	Amsterdam (P C F F)	2100	,, ..	Time Signals.
10.00	11.00	Blümendaal	332	Sundays	Church Service relayed.
10.00	11.45	Hamburg	395	Sunday	Sacred Music.
10.00	11.00	Leipzig	454	,, ..	Educational Talk.
10.00	11.45	Buda-Pesth (M T I) ..	950	Daily ..	Concert and News.
10.00	11.00	Kbely	1150	Sunday	Concert.
10.00	11.00	Koenigsberg	463	Daily ..	Concert.
10.00	11.30	Stockholm .. 427–	440	Sunday	Church Service.
10.00	11.50	Vienna (O R V) ..	530	Daily ..	Concert.
10.00	10.15	Gothenburg	700	Daily ..	Fishing Report.
10.00	11.50	Graz	692	Daily ..	Relay from O R V, experimental stage.
10.00	11.55	Breslau (G F U) ..	418	Sunday	Concert, Market, W'ther.
10.10	11,30	Malmoe	270	,, ..	Religious Service.
10.10	10.56	Frankfurt-am-Main ..	470	Daily ..	Bourse.
10.10	11.10	Amsterdam (P C F F)	2100	Mon., Sat.	News, Bourse (at intervals). [Concert
10.15	11.55	Breslau (G F U) ..	418	Weekdays	Market, News, Weather.
10.15	11.55	Koenigsberg	463	Daily ..	Bourse.
10.15	10.35	Norddeich (K A V) ..	1088	,, ..	W e a t h e r (following spark transmission).
10.30	irreg.	Pic du Midi	350	Weekdays	Tests on Music.
10.30	11.30	Stuttgart	443	Sunday	Concert, [sional Music.
10.30	11.30	Munich	485	,,	Religious Talk, occa-
10.30	11.30	Nuremberg ..	340	,,	Relay from Munich.
10.30	11.45	Lyons-la-Doua	470	Daily ..	Concert and Bourse.
10.30	11.45	Voxhaus, Berlin ..	505	Sunday	Educational Talk.
10.30	11.40	Kbely	1150	Weekdays	Bourse.
10.30	11.50	Koenigswusterhausen (L P)	2800	Sunday	Concert and Lecture. (Esperanto).
10.55	12.08	Leipzig	454	Daily ..	Bourse, Concert, and Time Signals.
10.55	11.06	Frankfurt-am-Main ..	470	Weekdays	Time and News.
11.00	11.10	Zurich—Höngg	*515	,,	Weather (*also sends on 645 occasionally).
11.00	11.50	Eiffel Tower (F L) ..	2600	Tu. to Sat.	Markets. [News.
11.00	11.50	Münster	410	Sunday	Religious Music and
11.10	11.30	Amsterdam	2100	Weekdays	Market and News.
11.15	11.22	Koenigswusterhausen (L P)	2450	Weekdays	Markets.
11.15	11.55	Hamburg	395	,,	Markets and Lecture.
11.15	11.19	Eiffel Tower (F L) ..	2600	Daily ..	Time and Weather.
11.15	11.20	Voxhaus	505	Weekdays	Bourse.
11.30	11.50	Münster	410	,,	News, Bourse, Weather.
11.30	12.05	Stockholm .. .. (427–	440		Weather, Bourse, Time.
11.45	12.40	Hamburg	395	Sunday	Chess.
11.55	12.05	Hamburg	395	Daily ..	Time Signals.
11.55	12.05	Münster	410	,,	,, ,,
11.55	12.05	Breslau	418	,,	,, ,,
11.55	12.00	Koenigsberg	463	Daily ..	Time Signals, Weather.
11.55	12.08	Zurich	515	Weekdays	Time Signals, Markets.
11.55	12.05	Voxhaus	505	Daily ..	Time Signals, Markets.
12.00	12.15	Amsterdam	2100	Weekdays	Market and News.
12.05	12.08	Vienna (O R V)	530	Daily ..	Time Signals.
12.10	12.35	Hamburg	395	Weekdays	Language School.
12.15	12.50	Geneva (H B I)	1100	,,	Lecture.
12.20	12.25	Vienna (O R V)	530	Daily ..	Weather.
12.25	12.30	Breslau (G F U) ..	418	Weekdays	Weather and Bourse.
12.30	12.45	Lausanne (H B 2) ..	850	,,	Weather, Markets, Time and News.
12.30	14.15	Radio-Paris (S.F.R)*	1780	,,	Concert, News, Bourse.
12.30	12.40	Vossegat (B E)	1050	Daily ..	Weather.
12.45	12.52	Kbely (O K P)	1160	Weekdays	Bourse.
12.45	13.30	Hamburg	395	Sunday	Concert.
12.45	14.00	Radio-Paris*	1780	,,	Concert, News.
12.45	12.54	Amsterdam	2100	Daily ..	Market and News.
12.45	13.30	Moscow	1500	Weekdays	Talk.
13.00	13.15	,, ...	,,	Sunday	News.
12.45	13.15	Leningrad	1450	Daily ..	News.
13.00	13.10	Munich	485	,, ..	News, Weather, Time.
13.00	13.10	Brussels (B A V) ..	1100	,, ..	Time, Weather.
13.00	13.25	Komarov (O K B) ..	1800	Weekdays	Bourse, News, Weather.
13.10	13.22	Voxhaus	505	,,	Bourse.
13.15	13.30	Koenigsberg	463	,,	Markets.
13.30	13.42	Hamburg	395	Th. & Fri.	Markets.
13.45	14.00	Hamburg	395	Mon., Tu., Wed.	Markets.
14.00	14.10	Breslau (G F U) ..	418	Weekdays	News.
14.00	15.00	L'Ecole Superièure de P T T	458	Thurs. ..	(Irregular) Lecture.
14.00	17.00	Munich	486	Sunday	Concert, Lecture.
14.00	15.00	Voxhaus	505	,, Weekdays	Lecture. Bourse.
14.00	15.00	Kbely	1160	Sat. ..	Concert.
14.00	15.05	Hamburg	395	Weekdays	Politics and Bourse.
14.30	17.00	Münster	410	,,	Markets, Weather, Lecture, Concert, Children (Saturdays).
14.30	14.40	Vienna (Q R V)	530	Daily ..	Bourse.
14.30	15.30	Voxhaus	505	Sun., Wed.	Children.
14.40	14.50	Amsterdam (P C F F)	2100	Weekdays	Bourse and News.
14.45	14.54	Eiffel Tower (F L) ..	2600	,,	Bourse.
15.00	16.00	Ryvang	1100	Sunday	Concert.
15.00	15.30	Voxhaus	505	Saturday	Educational Talk.
15.00	17.00	Münster	410	Sunday	Concert and Children.
15.00	17.00	Leipzig	452	Mon., Tu., Wed., Fri., Sat.	Markets and Concert.
15.00	16.00	Hamburg	395	Sunday	Children.
15.00	15.45	Breslau (G F U) ..	418	Sun., Fri.	Children and Concert.
15.00	17.00	Stuttgart	443	Sun., Wed. Th., Fri.	Time, Concert.
15.00	15.08	Vienna (O R V)	530	Daily ..	News.
15.00	15.10	Centocelle (I C D) ..	1800	,, ..	,,
15.00	17.30	Frankfurt-am-Main ..	470	,, ..	Markets, News, Concert. Children (Sunday). 15.30 Weekdays.
15.00	17.00	Zurich	515	,, ..	Concert.
15.10	17.00	Vienna (O R V)	530	,, ..	,,
15.30	16.15	Moscow	1500	Daily ..	News.
15.30	17.00	Leipzig	452	Sun., Th.	Markets, Concert. Children (Wednesday).
15.30	16.05	Hamburg	395	Weekdays	Lecture.
15.30	16.30	Koenigsberg	463	Daily	Concert.
15.30	16.35	Munich	486	Mon.toSat	Concert.
15.30	17.00	Voxhaus	505	Daily ..	,,
15.35	15.40	Eiffel Tower (F L) ..	2600	Weekdays	Bourse.
15.45	16.45	Rome (U R I)	425	Daily ..	Children, Orchestra.
15.45	16.30	L'Ecole Supr. de P.T.T.	458	Wed. ..	Lecture.
15.50	15.58	Brussels (O P O) ..	1100	Daily	Weather.
15.55	16.10	Amsterdam (P C F F)	2100	,, ..	Market, News.
16.00	17.00	Hamburg	395	,, ..	Concert. [(Wednesday).
16.00	16.30	Breslau (G F U)	418	,, ..	Time (Sunday). Children
16.00	16.40	Stockholm .. (427–	440	Sunday	Children.
16.00	17.00	Lausanne (H B 2) ..	850	Wed. ..	Children.
16.00	16.10	Kbely (O K P) ..	1150	Weekdays	Bourse.
16.00	17.00	Kbely (O K P) ..	1150	Wed., Sat.	Concert.
16.10	16.14	Amsterdam (D C F F)	2100	Daily ..	Time Signals.
16.15	17.00	Moscow	1500	Daily ..	Concert.
16.30	17.30	Leipzig	452	Tues. ..	Lecture.
16.30	16.45	Stuttgart	443	Daily ..	Market, News, Weather.
16.30	16.40	Eiffel Tower (F L) ..	2600	Tu. to Sat.	Bourse.
16.30	18.00	Radio-Paris (S F R) ..	1780	Daily ..	Bourse, Concert, News.
16.45	17.30	Rome (U R I)	425	,, ..	Dance Music.
16.45	17.50	Blümendaal	332	Sundays	Church Service relayed.
16.45	18.00	Stuttgart	443	Daily ..	Concert. Children (Wed. and Saturday)

NOTE.—Bremen and Hanover relay Hamburg, Nuremberg relays Munich, and Cassel relays Frankfurt, so that when Hamburg, Munich, and Frankfurt are transmitting, the relay stations are also "on."

(*Radio-Paris—contemplating wave 1125 metres.)

(Radioraldo and Lyons (*pro. tem.*) ceased transmitting.)

THE "POPULAR WIRELESS" CONTINENTAL BROADCASTING TIME-TABLE

(Continued from page 21).

Transmission Starts G.M.T	Transmission Ends G.M.T	Station and Call Sign	Wave-length in Metres	Days of Week	Nature of Transmission
16.45	16.55	Eiffel Tower (F L) ..	2600	1st & 15th	Bourse.
16.50	17.00	Brussels (B A V) ..	1100	Daily ..	Weather. [Games
17.00	18.15	Breslau (G F U) ..	418	Wed.,Sat.	Educational Talk and
17.00	17.30	Frankfurt-am-Main	470	Sun.& Th.	Concert.
17.00	17.25	Munich	486	Monday ..	Time.
17.00	17.12	Kbely (O K P)	1150	Weekdays	Bourse.
17.00	17.45	Radio-Paris (S F R) ..	1780	Saturday	Concert.
17.00	18.10	Radio-Belgique (S B R)	265	Sun.,Mon. Th., Fri.	Concert and News.
				,, Tu., Sat.	Dance.
				,, Wed. ..	Children.
17.00	18.00	Hamburg	395	Tu.,Wed., Th., Fri., Saturday	Educational Talk.
				,, Wed. ..	Concert.
17.15	18.00	Zurich	515	Mon., Wed., Fri.	Children.
17.15	18.45	Komarov (O K B) ..	1800	Thurs. ..	Concert.
17.30	19.00	Barcelona	325	Sunday	Lecture, Band, Opera.
17.30	18.30	Frankfurt-am-Main	470	Mon.,Tu., Th.,&Sat.	Lecture, English, etc.
				Sunday	Opera relay [etc.
17.30	19.30	Voxhaus	505	Daily ..	Women's Talk, Lecture,
17.30	17.45	Belgrade (H F F) ..	1650	Mon., Wed., Fri.	News. [Languages.
17.30	20.40	Munich	486	Tu.toSat.	Concert, News, Lecture,
17.40	20.00	Boden	2500	Sunday	News, Weather, Concert.
17.40	18.10	Voxhaus ..	505	Tues. ..	Educational Lecture.
17.45	18.55	Hamburg	395	Sunday	Educational Talk.
17.45	18.30	Belgrade (H F F) ..	1650	Tu., Th., & Sat.	Concert.
17.55	18.05	Lausanne (H B 2) ..	850	Daily ..	Weather, News.
18.00	18.05	Stuttgart	443	Sun.,Mon. Th., Fri., Sat.	News, Weather.
18.00	21.00	Madrid (E A J 2) ..	310	Daily ..	Concert, News, Dance.
18.00	19.00	Barcelona (E A J 1) ..	325	Weekdays	,, ,, ,,
18.00	19.00	Hamburg	395	Wed. ..	Educational Talk.
18.00	19.15	Zurich	515	Weekdays	Weather, News, Concert.
18.00	18.10	Kbely (O K P)	1150	Daily ..	Weather.
18.00	19.10	Eiffel Tower (F L) ..	2600	,, ..	Concert, News, Weather.
18.15	19.30	Seville (E A J 5).. ..	350	Mon.,Tu., Wed.,Sat.	Concert, News.
				,, Thurs. ..	Lecture, Concert, News.
18.15	19.00	Leipzig	452	Mon., Tu.	Educational Talk.
18.20	18.30	Lyngby (O X E) ..	2400	Weekdays	News.
18.25	19.00	Hamburg (R)	395	Weekdays	Language School, W'ther
18.30	19.30	Frankfurt-am-Main	470	Friday ..	Educational Talk.
18.30	19.00	Breslau (G F U) ..	418	Mon. to Wed.	,, ,,
18.30	19.30	,, ,, ..	,,	Th & Fri.	,, ,,
18.30	19.00	Stuttgart	443	Daily ..	Lecture.
18.30	19.00	Koenigsberg	463	Mon.Wed. to Sat.	,,
18.30	18.45	Copenhagen .. .. also relay "Aalborghus"	775 470	Daily ..	Programme and Tests.
18.35	18.45	Münster	410	Daily ..	Time, News.
18.40	18.50	Toulouse (F N T) ..	1525	,, ..	Weather.
18.40	20.00	Boden	2500	Tu., Fri.	Concert.
18.45	18.55	Eiffel Tower (F L) ..	2600	Wed., Sat.	Dress Talk (English).
18.45	19.00	Vienna (O R V)	530	Daily ..	News.
18.45	19.00	Stockholm	427-440	,, ..	News.
18.45	20.30	Copenhagen	775	Sun.,Mon. & Th.	Concert.
18.55	20.10	Hilversum (H D O) ..	1050	Monday ..	Children.
19.00	20.30	Kbely (O K P)	1150	Daily ..	Concert.
19.00	20.00	Ryvang	1100	Tu. &Fri.	Concert.
19.00	20.15	Stuttgart	443	Daily ..	Concert, News, Time.
19.00	21.00	Stockholm	427-440	,, ..	Concert.
19.00	21.00	Hamburg	395	,, ..	News, Weather, Concert.
19.00	19.30	Münster	410	,, ..	Talk.
19.00	23.00	Breslau (G F U)	418	Sun.,Mon. Tu.,Wed.	Concert, Weather. News.
,,	,,	,, ,, ..	,,	Saturday	Opera.
19.00	20.00	Stockholm (Svenska) ..	445	Mon. and Thurs.	Concert.
19.00	21.00	Gothenburg (S M S B)	700	Sun., Tu., Fri.	Concert, News, Lecture. Stockholm Relay.
19.00	19.07	Eiffel Tower (F L) ..	2600	Weekdays	Weather.
19.00	19.15	Leipzig	452	Tuesday	Educational Talk.
19.00	20.30	Koenigsberg	463	Daily ..	Concert and News.
19.00	19.30	Frankfurt-am-Main	470	Sun. and Monday	Lecture and Educational Talk.
19.00	20.30	Vienna (O R V)	530	Daily ..	News, Concert.
19.00	20.00	Jorcks Passage	775	Sun., Wed., Th.	Lecture, Concert, News.
19.00	21.30	Lausanne (H B 2) ..	850	Tu., Sat.	Concert or Dance.
19.00	21.00	Malmoe	270	Mon., Th.	Concert, as Stockholm.
19.00	20.00	Moscow	1500	Daily ..	Concert and News.
19.00	20.00	Leningrad	1450	Daily ..	Concert.
19.05	21.00	Barcelona	325	Sunday ..	Concert, Sport, etc.
19.05	19.25	Voxhaus ..	505	Monday ..	Educational Talk.
19.15	22.00	Zurich	515	Sun., Tu. to Sat.	Concert, News, and Weather..
19.15	21.00	Leipzig	452	Daily ..	Concert.
19.15	22.15	,, ...	,,	Wed. ..	,,
19.15	21.30	Lausanne (H B 2) ..	850	Sun., Mon. Wed. Th., Fri.	Concert, Dance, Music.
19.25	19.30	Soesterberg	1050	Daily ..	Weather.
19.30	22.00	Zurich	515	Monday ..	Concert.
19.30	21.15	Voxhaus	505	Daily ..	,,
19.30	20.30	Munich	486	,, ..	,,
19.30	22.00	Frankfurt-am-Main	470	,, ..	Concert and News.
19.30	21.00	Münster	410	,, ..	Lecture, Concert.
19.30	19.40	Centocelle (I C D) (Rome) ..	1800	,, ..	News. [Lecture.
19.35	20.10	Rome (U R I)	425	,, ..	Concert, Weather,
19.40	19.50	Amsterdam (P A 5) ..	1050	,, ..	News.
19.40	22.10	Hilversum (H D O) ..	1050	Sunday ..	Concert.
19.40	19.50	Vossegat (B E) ..	1050	Daily ..	Weather.
19.40	Irreg	Christiania (Oslo) 448	475	,, ..	Testing.
19.45	23.30	Breslau (G F U) ..	418	Tu. & Fri.	Concert, Weather, News.
19.45	22.30	L'Ecole Superièure de P.T.T	458	Sunday ..	Concert.
19.50	20.50	Amsterdam	1050	Wed. ..	,,
20.00	20.15	Stockholm (Svenska)..	445	Mon., Th.	News.
20.00	20.15	Radio-Belgique (S B R)	265	Daily ..	Time, Lecture.
20.00	21.30	Prague (P Q R) ..	1000	Daily ..	Concert, News.
20.00	20.13	Koenigswusterhausen (L P)	2450	,, ..	News.
20.00	20.05	Lyngby (O X E) ..	2400	Weekdays	News, Weather, Time.
20.00	22.00	Mont de Marsan	365	Wed.	Concert.
20.10	21.40	Ijmuiden (P C M M) ..	1050 to 1100	Saturday	Concert.
20.10	22.30	Rome (U R I)	425	Daily ..	Lecture, Concert.
20.15	22.15	Radio-Belgique (S B R)	265	Sun., Tu., Fri., Sat.	Concert, News.
20.15	22.15	Radio-Belgique (S B R)	,,	Mon. and Wed.	Opera.
20.15	21.00	Radio-Belgique(S B R)	265	Thursday	Concert, News.
20.15	21.30	Stuttgart	443	Daily ..	Concert, Cabaret (Sun. and Wed.)
20.15	21.00	Stockholm .. .. .. (Svenska)	445	Mon. and Thurs.	Concert.
20.30	22.30	L'Ecole Superièure de P.T.T.	458	Mon. Wed. Thurs.	Concert.
20.30	22.30	L'Ecole Superièure de P.T.T.	,,	Tu. & Sat.	Talk.
20.30	20.40	Munich	486	Daily ..	News, Weather, Time.
20.30	21.30	Jorcks Passage	755	Sun., Th.	Dance Music.
20.30	22.00	Radio-Paris (S F R) ..	1780	Daily ..	News Chat, Concert, Dance (Sun., Thurs.).
20.40	22.10	Hilversum (N D O) ..	1050	Friday ..	Lecture, Concert.
20.45	22.30	L'Ecole Superièure de P.T.T.	458	Sun. and Friday	Concert (occasionally).
20.50	22.30	Munich	486	Sun.& Tu.	Concert.
21.00	21.30	Münster	410	Daily ..	Educational Talk and News. Sunday : Concert and News.
21.00	21.15	Radio-Iberica	392	,, ..	News and Weather.
21.00	23.00	Barcelona (E A J 1) ..	325	Weekdays	Concert, News, Dance.
21.00	22.10	Radio-Belgiquo (S B R)	265	Mon., Thurs.	Dance.
21.00	21.50	Hamburg	395	Daily ..	Weather, Market, News, Concert, Dance(not Mon.)
21.00	22.00	Zurich	515	Weekdays	News, Concert.
21.00	22.30	Vienna	530	Mon., Tu., Wed., Saturday	Dance Music.
21.00	22.00	Munich	486	Tu., Sat., Sun.	Concert, Lecture.
21.00	21.15	Lyngby (O X E) ..	2400	Weekdays	News, Weather, Time.
21.15	24.00	Radio-Iberica	392	Daily ..	Talk, Concert, News.
21.15	23.00	Rome (U R I)	425	,, ..	Dance. Thurs. at 21.00 Sunday at 24.05).
21.30	23.30	Le Petit Parisien ..	345	Sun., Tu., Thurs.	Concert.
,,	,,	,, ,, ..	,,	Saturday	Dance.
21.30	24.00	L'Ecole Superièure de P.T.T.	458	Sunday	Concert.
21.30	23.00	Voxhaus	505	Sat.Sun.,Th. Mon.	Dance. Chess.
22.00	22.45	Radio-Paris (S F R) ..	1780	Wed. ..	Concert.
22.10	22.18	Eiffel Tower (F.L) ..	2600	Weekdays	Weather.

THE "MULTIDYNE."
ADDING AN EXTRA VALVE.

Designed and Built by B. W. WILLANS.

PART III. (Conclusion).

In this last article the author explains how a valve can be added to the "Multidyne" receiver, and concludes with further details of tests carried out with this ingenious set.

WHILE the tests previously described were in progress on the valve and crystal Multidyne, it became increasingly clear that a material addition to the number of possible circuits could be made if another valve were added, and, further, that these would be of a more generally useful type than circuits employing only a valve and crystal, the latter,

22	15				
14	13	23	*FIG. 3 B.*		
16	20				
30	24	11			
25	10	27	28		
37	18				
17	36				
33	32	31	21	26	12

though very frequently giving remarkable results, being troublesome to adjust and somewhat critical in performance.

Accordingly, consideration was given to the possibilities in this direction, the main object of simplicity being borne in mind, both from the standpoint of the construction of the set and also from the point of view of the user.

Useful Two-Valve Circuits.

The original connections to the Multipanel are shown in Fig. 1 (Pt. 1). It will be noted that two condensers are shown, each of value ·001 mfd., these being required for the purpose of certain reflex circuits. It was evident on consideration that one of these must be connected permanently to the transformer primary, as whenever the latter was used it would be in a first stage of amplification. This releases two contact points for other purposes, and accordingly it is possible to employ a second valve in the set by attaching its grid and filament to these points.

The revised connections to the Multidyne are thus shown in Fig. 1 in this article, the second valve being always connected in circuit by external filament leads. This is entirely satisfactory, as when one valve only is being employed it can just as readily be the second as the first, and the latter is only lit when the appropriate leads are connected up on the Multilink.

We now have at our disposal, therefore, all the circuits which can be set up with two valves and a crystal, and foremost among these are the standard "straight circuits" which are found most generally useful in wireless practice, viz.:

H.F. amplifier and valve detector, as shown in Fig. 2.

Valve detector and L.F. amplifier, as shown in Fig. 3.

H.F. amplifier, crystal detector, and L.F. amplifier, as shown in Fig. 4.

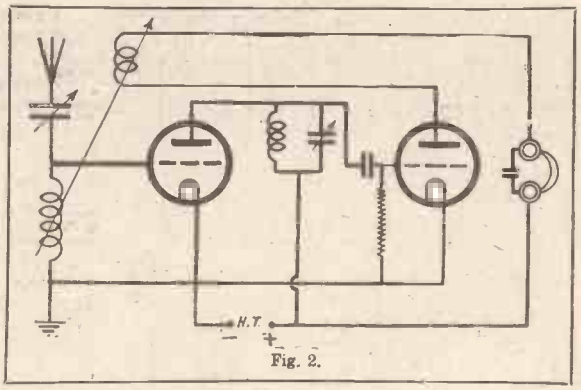


Fig. 2.

Two have been reproduced in the form of practical Multilink wiring diagrams in Figs. 2a and 4a, the latter indicating the manner in which the Multilinks are to be connected up so as to give the corresponding circuits in the Multidyne.

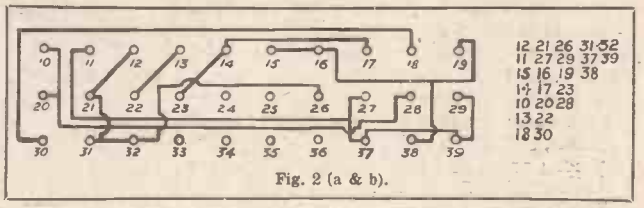


Fig. 2 (a & b).

I am proposing to add two more convenient terms to the present list of Multidyne, Multipanel, and Multilink. The first of these is Multigram, which represents, as its name implies, the Multilink wiring diagrams referred to in previous paragraphs. Examples of Multigrams are thus given in Figs. 2a and 4a.

The second term, Multicode, I propose to use in respect of an entirely novel method of providing in a condensed and readily comprehensible form the exact information which is required to enable the user to connect up his Multilink.

In the previous articles a system was adopted whereby each of the Multipanel and Multilink points was designated by a two-figure number. According to the Multicode, any group of points that are connected together are simply represented by a row of figures, each pair of the latter denoting one point, according to the standard system, and the user in interpreting this code has only to take each group of figures separately and join the corresponding points by a suitable lead.

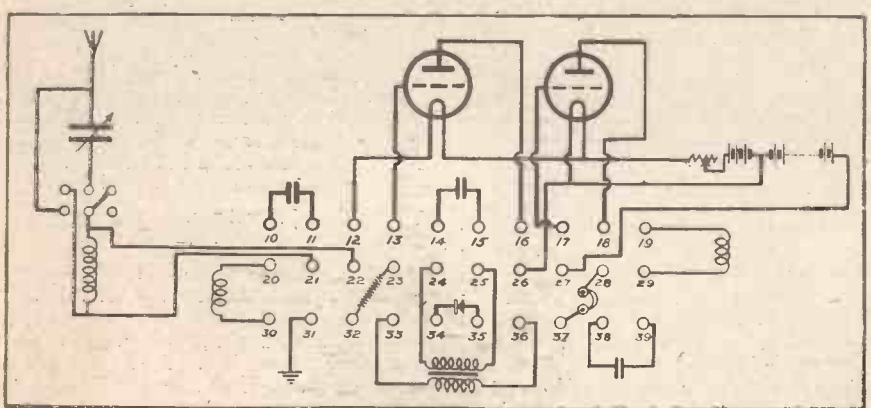


Fig. 1. Diagram of connections for 2 valve multipanel. Note, however, that the condenser, 38-39, should be variable and not fixed, as shown.

Results on Test.

The Multicodes corresponding to the above circuits are shown in Figs. 2b, 3b, and 4b. It is convenient to arrange these as indicated, with the largest group of points in the top or bottom row and the successive groups arranged in order according to the number of points which each comprises.

The tests carried out on these two Multidyne circuits again gave a number of interesting comparative results. On this occasion all the testing was done at Westcliff-on-Sea, and, in consequence, the general behaviour of the circuits was similar to that observed

(*Continued on page* 23.)

THE "MULTIDYNE."

(Continued from page 27.)

previously in the case of the analogous circuits with the valve and crystal Multidyne.

The circuit of Fig. 2 (H.F. and valve detector) was the best for the reception of distant stations, the results being admirably clear and the selectivity all that could be desired. A number of Continental stations, as well as practically all the British broadcasting stations, were received with very little interference, notable results being achieved from Madrid, the signals from which station were easily readable with the telephones on the table.

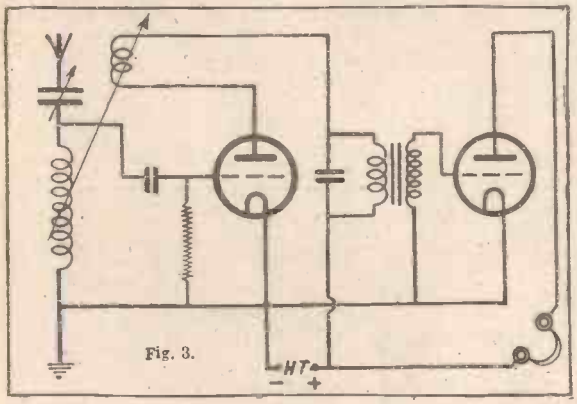


Fig. 3.

Effects of Local Conditions.

On changing over to the circuit of Fig. 3 (valve detector and L.F.) louder results were obtained from short range stations, as, for instance, London and Chelmsford, but the results from the distant ones were not quite so satisfactory. Madrid was also very strong, but not quite so strong as with the previous circuit, and the signals were accompanied by slightly more noise.

The circuit shown in Fig. 4 turned out to be less satisfactory, its behaviour being closely in accordance with that shown by the H.F. and crystal detector circuit described in our previous issue. The reasons in both cases for this result are probably the same, and dependent upon some local conditions prevailing at the testing station at Westcliff which were not found when the set was tried out in London.

So much, then, for the experiments. My experience up to date has indicated the exact requirements which a satisfactory Multidyne set must fulfil. Letters from readers giving their experiences will be welcomed. It would also be interesting if they send up details of any further circuits they may have tried and found successful, so that other amateurs may have the benefit of their experiences. The use of the Multidyne system will enable all wireless enthusiasts, whether they are experienced in the technicalities of the subject or not, to enter into the delights of experimental work under their own conditions and at their own convenience, and without the necessity for laborious mechanical operations.

Multidyne Parts.

It is not intended to lay down the law with regard to the efficiency of the circuits which are suggested, though it is proposed to publish from time to time results of tests which readers have carried out. My wish is to put each owner of a Multidyne in a position to judge for himself and to form his own opinions as a result of his personal achievements in the art, and I feel that in bringing forward this new principle, under which circuit-testing can be carried out with a degree of ease and precision hitherto unattainable, it is possible to serve the interests of wireless users as a whole. At any rate, it is to this end that these efforts have been directed, and I anticipate with confidence that my belief in this principle will be increasingly shared as time goes on by an ever-growing crowd of Multidyne enthusiasts.

All inquiries with regard to the Multidyne sets and parts should be addressed to The British Radio Valve Service, Ltd., Hazlitt House, Southampton Buildings, Holborn, W.C.1, by whom I am informed that supplies of Multipanels and Multilinks are now available, and the manufacture of Multidyne sets is well in hand. These parts, I understand, will be sold at reasonable prices that will be inclusive of royalties.

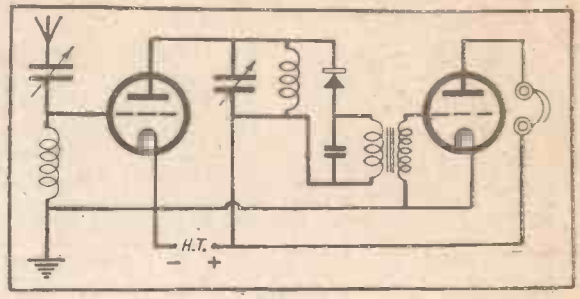


Fig. 4.

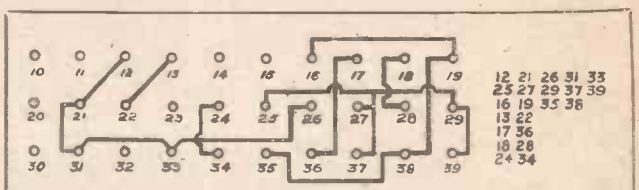


Fig. 4 (a & b).

UNIDYNE VALVE HOLDER CONNECTIONS.

IN constructing Unidyne sets with the "valve tray" mounted on a baseboard, the writer, like many others, found some difficulty in making the connections to the five pins under the valve tray, and after trying many methods the following was found to be very satisfactory.


Fig. 1.

Take a piece of ebonite of the required size for the valve tray, drill this to take the five-pin valve holder, and, after fitting this, screw the nuts up tight. Mount five terminals, two at one side of the holder for the filament connections, and three at the other side for the plate and the two grids as shown in Fig. 1. Turn the tray over, and after filing the ends of pins and terminals flat, "tin" them with the soldering iron, and make soldered connections with short pieces of square section tinned copper wire, as shown in Fig. 2. The tray can now be mounted on the wood base, and the various connections made easily to the five terminals on top by soldering to the tags of the spade terminals, or the latter can be dispensed with, and the wire bent and screwed down with the terminal nuts in the usual manner.

This method possesses the advantage of allowing the constructor to change connections over, if necessary, without disturbing the valve tray or any other connections.

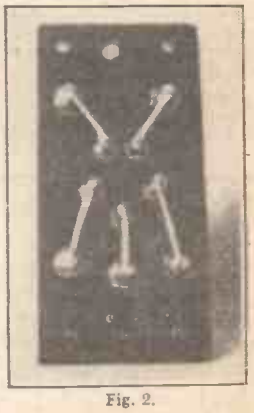


Fig. 2.

While discussing "Unidyne" valve holders the writer would like to point out that it is *essential* that the proper grids be connected to their correct portions of the circuit. For instance, the inner grid (on the left looking down on the valve holder with filament connections at the bottom) must be connected to L.T. + and the other grid to the input from the aerial or previous valve. If these precautions are not carried out, failure with the L.F. amplifier is certain, while it is more than probable that the detector also will fail to function.

Wrong Grid Connections.

It has been found in rare cases, however, that the detector valve will only operate when its grid connections have been reversed, but this operation is very unsatisfactory, and as a rule it is impossible to get the valve to oscillate. All amateurs constructing "Unidyne" sets should make absolutely sure about those grid connections and see that all joints are well made.

Mainly About Broadcasting

by

The Editor

WIRELESS LAW—THE NEW BILL—INTOLERABLE POSITION—WRITE TO YOUR M.P.

THE Bill to amend the law relating to wireless telegraphy, as presented by the Postmaster-General, Sir Wm. Mitchell-Thomson, M.P., the other day, is one which every owner of a wireless set should do his utmost to protest against. The powers sought by the Government, under this wireless telegraphy and signalling Bill, have aroused indignation and apprehension among the public.

A Strong Clause.

One clause in the Bill proposes that:

"If a justice of the peace is satisfied by information on oath that there is reasonable ground for supposing that a wireless telegraph station has been established, or is being maintained, without a licence in that behalf, or that any apparatus for wireless telegraphy has been installed, or is being worked or maintained in any place, or on board any ship or aircraft within his jurisdiction, without a licence in that behalf, he may grant a search warrant to any police officer or any officer appointed in that behalf by the Postmaster-General, the Admiralty, the Army Council, the Air Council, or the Board of Trade, and named in the warrant, and a warrant so granted shall authorise the officer named therein to enter and inspect the station, place, ship, or aircraft and to seize any apparatus which appears to him to be used, or intended to be used, for wireless telegraphy therein."

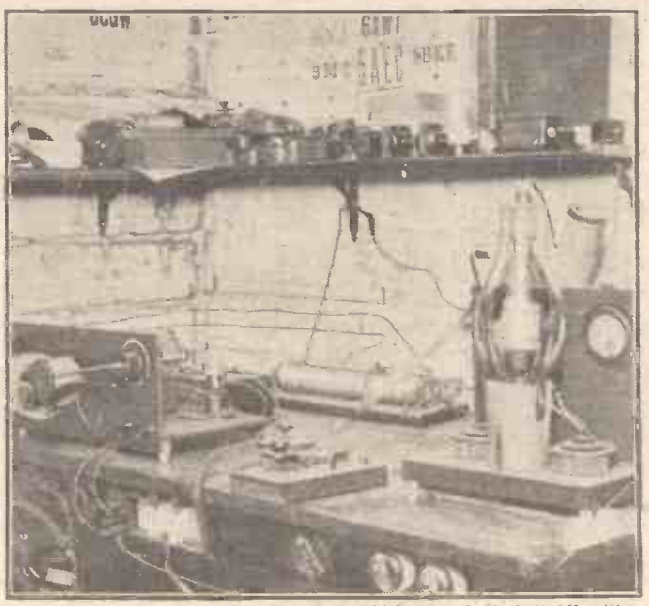
And in the clause following it is obviously meant that wireless telegraphy can be interpreted as wireless telephony, as transmitted by broadcasting stations. Any amateur fixing up a wireless set in his house can, for the purposes of the Bill, be regarded as working a wireless station, and, if he has not taken out a licence, the Bill proposes to enforce penalties ranging up to 12 months' imprisonment or a £100 fine.

An Absurd Idea.

But the most surprising thing about this Bill is that it is suggested that means should be provided for officials to be allowed to enter and search the home of a man who has no wireless licence. This is frankly a suggestion which no listener-in should tolerate. An Englishman's home has always been regarded as his castle, and the mere thought of an official having powers to demand entrance into one's home, because he has a suspicion that one has a wireless set installed is absurd.

Admittedly the wireless pirate is deserving of little sympathy, and a practical and reasonable scheme for bringing to book the people who are mean enough to refrain from taking out a licence should be encouraged. But the present proposals as put forward by the P.M.G. are "outside the bounds," and I strongly advise every reader of POPULAR WIRELESS to make a point at once of sending a postcard to his M.P., protesting against this Bill. I cannot stress this point sufficiently, but, if every reader of POPULAR WIRELESS was to make up his mind to send a postcard to his Member of Parliament, strongly protesting against this Bill, there would be little chance of it ever becoming law.

The sympathies of every honest listener are naturally with the Government and the B.B.C. No doubt the latter may eventually find themselves in a very serious position if some means are not taken to enforce the payment of the wireless licence fee; but that is no excuse for the Government attempting to impose on the public such absurdly stringent regulations. Under the present Act (of 1904), which this new Bill seeks to repeal, an offender is liable on summary conviction to a penalty not exceeding £10, but the new Bill proposes that the liability on summary conviction should be imprisonment with or without hard labour for a term not exceeding three months, or a fine not exceeding £50, and, in the case of a further offence, another fine not exceeding £5 for each day on which the offence is continued. If guilty on indictment the term of imprisonment may be up to 12 months, or a fine not exceeding £100.



The famous Australian station, 3 B Q, which recently "chatted" with Mr. Simmonds, of Gerrard's Cross.

As a matter of fact, readers are no doubt aware that only a few weeks ago a listener challenged the P.M.G. to prosecute him for non-payment of his licence fee to the Government. No steps were taken, and it is a curious fact that counsel's opinion for the Crown has never been taken on the question of the validity of the 1904 Wireless Telegraphy Act as regards offences by listeners-in in respect of not taking out a licence. It would seem that the recent action of this amateur in challenging the P.M.G. has been primarily responsible for bringing matters to a head, and one does not blame the P.M.G. for wishing to strengthen his powers in the matter of wireless licences.

But the powers he seeks are beyond the boundary line which the public might justifiably allow him to approach, and very vigorous steps should be taken at once to make it quite clear that the public will not tolerate an imposition of the nature suggested by this new Bill.

One is not treated with such extraordinary harshness (as is proposed in this new Bill) when one forgets, or deliberately forgets, to take out a dog licence, or a gun licence, and the difference in the penalties is out of all proportion when one compares the "crime" of not taking out a wireless licence and not taking out a dog licence.

A Possible Alternative.

Many people will accuse the Government, if this Bill is passed, of supporting the B.B.C. monopoly, as it is called, and the accusation will undoubtedly be justified. It would be much better if the present form of licensing sets was entirely scrapped. The present system never will work well because, however much one might appeal for fair play, there are always a large number of people who, quite apart from the fair play aspect of the case, are always forgetting little things of this nature. I am quite convinced that of the thousands of pirates in this country many of them have not taken out licences because they have been too lazy to take the trouble, or else too forgetful.

When one listens-in, in ninety-nine cases out of a hundred one has to use a crystal or a valve set, and it might be feasible to revive the regulation in force two or three years ago that anybody buying a valve must first of all produce the licence granted him by the P.M.G. to work a valve set. There is no reason why this regulation could not be enforced in respect of crystals, so that, if any listener wished to buy a new valve or a new crystal he could not do so unless he produced his licence. After all, motorists have to carry their licences in their pockets, and it would not be a great imposition to make it compulsory for listeners to do the same. But that is by the way.

THE MAIN THING IS THAT READERS OF "POPULAR WIRELESS" MUST ADDRESS A PROTEST TO THEIR MEMBER OF PARLIAMENT.

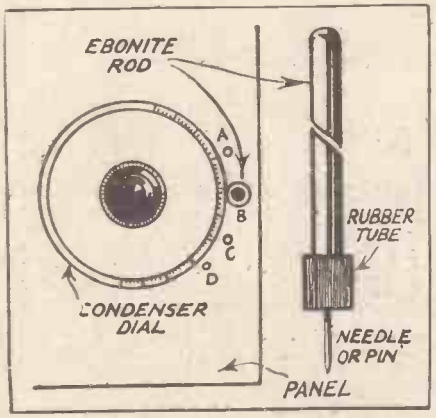
Constructional Notes

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

Vernier Control.

HERE is a little idea which will be found very useful for exercising a vernier control on condensers, and for avoiding hand capacity trouble when tuning in distant stations.

The apparatus consists of an ebonite or wooden rod about eight inches to a foot long, and preferably stiff enough not to bend easily. Into the end of this a needle, or pin with the knob cut off, is forced. A small hole is then drilled near the edge of the condenser dial,

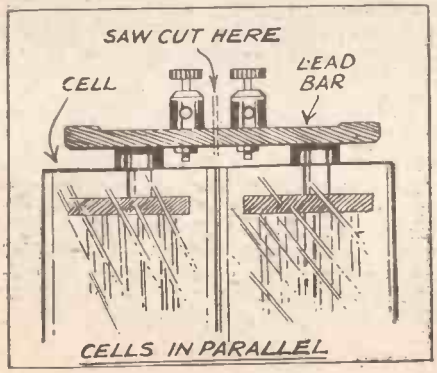


nearer or farther away, according to the thickness of the rod used, as shown at A, B, C, D.

By inserting the needle in this hole and lightly pressing the rod against the dial, minute adjustments can be made, while the hand is kept well away from the condenser. An improvement is the addition of a small piece of rubber tube, as shown, but this is not absolutely necessary.

Cells in Parallel.

A number of resistances in series can be converted to parallel (without disconnecting) by connecting alternate connections to opposite terminals, but this cannot be done with cells, as it would result in short-circuiting them. Suppose you have a 6-volt accumulator and you wish to use it for 2-volt dull emitters. If it is of the kind in which the separate cells can be disconnected, you have only to connect the three cells in parallel. But in many cases there are no separate terminals for the individual cells, the cells being permanently connected together by lead bars. In such a case you have either to separate the cells for yourself, or use a rheostat to reduce the voltage; the latter course means wasting a large proportion of the energy of the battery.



If you should decide on the somewhat bold procedure of separating the cells, the illustration will show you the best way to do it. First drill two holes in the lead bar, and secure two terminals in position. Then with a hacksaw, very carefully and slowly saw through the lead bar. It is very important that the drilling of the holes shall be done before the sawing through; after the sawing, no further operations should be carried out on the lead bar.

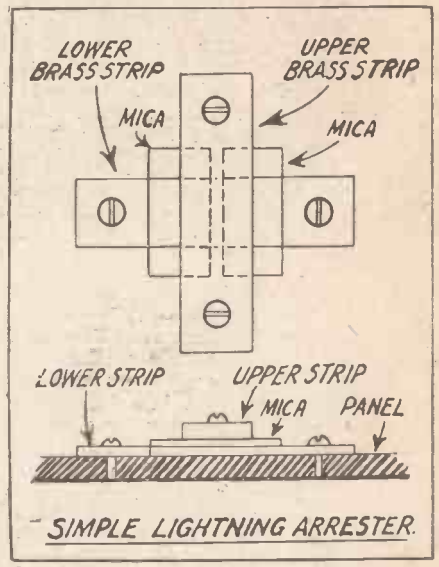
If you are averse to sawing through the lead bar, the only other way is to put a clip round each bar, after the style of an earthing clip, and use first one cell, until it is discharged, then the next, and so on; but this is a good deal of trouble, and is not very satisfactory. The method of sawing the bar is sent to me by a correspondent, who says he found it quite easy and satisfactory.

'Phone-Hook Switch.

The little device illustrated in the diagram herewith provides a hook for the headphones, and at the same time ensures that the aerial shall be connected to earth when the set is not in use. The essential part of the device is the strip or arm of brass forming the hook. This may be $\frac{1}{4}$ in. thick and from $\frac{1}{4}$ to $\frac{1}{2}$ in. in breadth; the length of the projecting portion should be at least 2 in. The strip is drilled with a small hole, through which a short piece, say 1 in. in length, of brass rod or stout wire is passed, and soldered to form the axis or shaft on which it pivots.

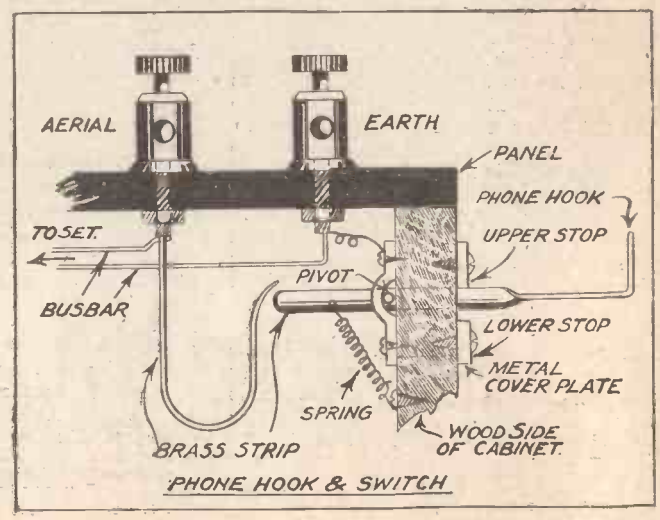
A short strip of brass (which may be the same as that used for the arm) is bent as shown, and slotted for the arm to pass through; this strip is secured by two wood screws upon the inner side of the cabinet, and serves to hold the shaft. A similar strip is slotted and screwed to the outer side of the cabinet, as a cover-plate, and also serves to limit the up-and-down motion of the arm. The arm is given a right-angle twist, as shown, so as to enable the end to be bent at right-angles to form the hook. Two terminals are secured into the panel, and to the aerial terminal is soldered a strip of brass, which in this case may be $\frac{1}{8}$ in. thick. This strip is bent in the manner indicated, so that the arm makes contact with it when the 'phones are hung on the hook, but does not make contact when the 'phones are removed.

Another small hole in the arm enables a small spiral spring to be secured to it, to keep the arm down when phones are removed.



Simple Lightning Arrester.

A lightning arrester is an important adjunct to a receiving set, and the one shown here would be difficult to beat for simplicity. It consists of two pieces of brass strip, identical in every way, crossed as shown, and screwed to the panel or baseboard. These are separated by means of two small pieces of mica, with a gap left between them beneath the upper brass strip. In case of X's the discharge will jump across from the aerial strip to the earth strip at the exposed part between the two pieces of mica. One of the brass strips is, of course, connected to the aerial terminal and the other to the earth terminal of the set.



ECONOMY —real and false

THE point is just this: Can you afford *not* to use Wuncell Dull Emitters.

Or, let us put it in another way. You own, perhaps, a 3-valve Set. Now the average bright emitter valve consumes about .7 of an ampere every hour. Three of them, therefore, will consume 2.1 amps. every hour you are using them. If your accumulator is rated at 6 volts 30 amp. hours (that is a good average size) you will get about 15 hours' use from it on a charge.

The cost for this may be anything up to 2/-. Eight shillings for a month's broadcasting—practically £5 per year. Not much when compared with the pleasure you obtain, but still quite an appreciable item in the family exchequer.

* * * * * *

Now let us see what you would be paying if you used Wuncells. First of all you would re-connect your accumulator to give 2 volts only by connecting all the cells in parallel instead of series. This will triple its capacity and give you 2 volts 90 amp. hours, but the charging cost won't be any higher.

Wuncell Valves function best at 1.8 volts and consume .3 of an amp. per hour—your 3-valve Set, therefore, will consume .9 amp. per hour, and your accumulator will last six weeks on one charge.

In other words, you get 5 weeks' broadcasting for nothing every time you get your accumulator charged if you are using Wuncells. And they will save their cost in a couple of months or so.

* * * * * *

That is not all. The filament of a bright valve is naturally incandescent. It glows at a white heat and becomes brittle. No matter how careful you are, sooner or later the filament breaks and your valve is useless . . .

But see the Wuncell working. You'll have to look pretty hard before you will realise that the filament is glowing. In daylight it is almost invisible. In fact, it is the nearest approach to the cold valve yet produced.

Isn't it obvious that such a low temperature must mean an exceptionally long life? And to make the Wuncell even stronger, we have inserted a centre support to the filament. No wonder *Amateur Wireless* reported that its filament "is practically unbreakable."

* * * * * *

So you'll readily admit that not only do you save quite a considerable amount in running costs, but you get a valve that is likely to last at least three times as long as the ordinary bright emitter. Surely this is real economy.

Wuncell exclusive advantages featured:

No. 1

THE man with a multi-valve Set using bright emitters can replace his valves one by one as they become useless by Wuncells W.R.1 and W.R.2. These are the only dull emitters on the market that can be used with a 2-volt, 4-volt or 6-volt accumulator without any alteration to the Set.

Every W.R. type of Wuncell has incorporated in its base a special resistance which can be short-circuited when not required by the screw shown above. When *all* the bright valves have been replaced by Wuncells these resistances can be short-circuited and the accumulator altered to give 2 volts with a greatly increased capacity. Full instructions for this simple alteration are supplied with every Wuncell valve:

Prices:

W.1 For Detector or L.F. Amplifier

W.2 (With red top) for long distance reception

18/- each

*W.R.1 Corresponding to W.1

*W.R.2 Corresponding to W.2

20/- each

* *Fitted with internal resistance as above.*

Cossor Wuncell Valves

THE ONLY DULL-EMITTER VALVES SOLD IN SEALED BOXES

Advertisement of A. C. Cossor Ltd., Highbury Grove, N. 5

Portmanteau Words

I'm afraid I must confess a distinct weakness for Portmanteau Words; chiefly, I suppose, on account of their descriptive convenience. They always seem to mean exactly what they say, and, except perhaps in a rare case such as that of the immortal "Brugglesmith," their meaning is evident at sight.

Take, for instance, the word Volutone. No doubt can rest in anyone's mind as to what that means. Volume and Tone—the two essentials of a first-class Loud Speaker. Full Volume and Perfect Tone, a joy to listen to and a treasure to possess.

But even this all-embracing word fails to convey its handsome appearance. The instrument's pleasing lines have a beauty rarely found in something that hitherto has usually been regarded purely as a piece of mechanism.

Go and have a look at a Volutone. Your local retailer is almost certain to have one in stock.

And when you have satisfied yourself as to its appearance, make a point of hearing it as well.

I think you'll agree then that I was quite right when I coined that essentially accurate word—VOLUTONE.

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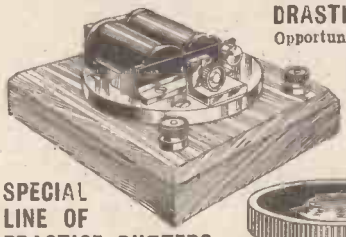

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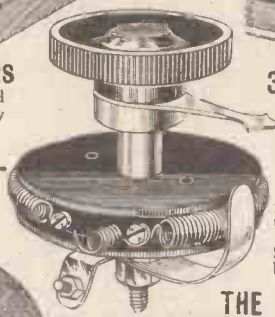

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Smooth contact ensures extremely smooth action. Secure connection with the wing is obtained by the phosphor-bronze strip attachment. Usual Price 2/6. Sale Price **2/-** Post 6d.

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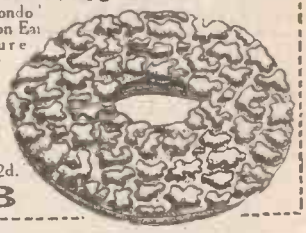
150 ft. Coils of Best Quality Enamelled Aerial Wire. A limited number of coils only is available—therefore, order by return. Sale Price per coil **5/7** Post 6d.

PNEUMATIC EAR PADS
The Macondo Air Cushion Ear Pads ensure absolute comfort when using headphones. Try them. Price per pair. Post 2d. **1/3**



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The Best Crystal on the market is Gamages famous "PERMANITE"
Clear, powerful results, remains in adjustment longest. Highly sensitive. Price per large piece. **1/6** Post free. Smaller size to fit the Cup 1/-

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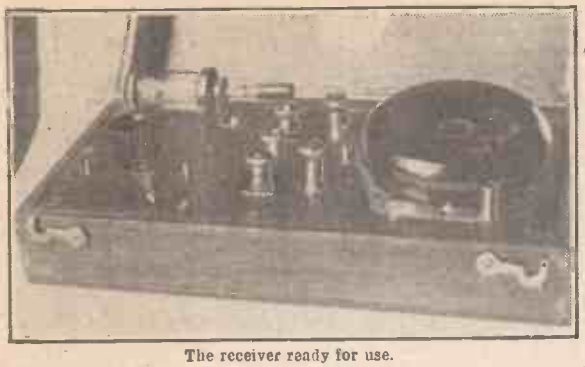
GAMAGES, HOLBORN, LONDON, E.C.



The receiver ready for use.

THE AMATEUR'S PORTABLE CRYSTAL SET.

Full Constructional Details.

By J. CHUGHTAI, B.Sc.

Compactness and efficiency are the chief characteristics of this very handy and useful crystal set, and the cost of the parts, etc., is extremely small.

THE receiver to be described was designed with the object of keeping its size as small as possible. Its external dimensions are $7\frac{1}{4}$ in. by $3\frac{5}{8}$ in., and $2\frac{3}{16}$ in. high, including an aerial 65 feet long, a single earphone and an extra length of wire. The aerial employed can be classified as a single-wire inverted L type aerial, although when out of use it is contained in the cabinet of the receiver itself. It consists of a brass ribbon $\frac{1}{4}$ in. wide and 65 feet long, which is kept wound on an ebonite disc. One end of the ribbon is in metallic connection with the aerial terminal of the set, while the free end is connected to an ebonite handle. This insulated handle can be attached to anywhere in a room or to a tree if the receiver is being used out-of-doors.

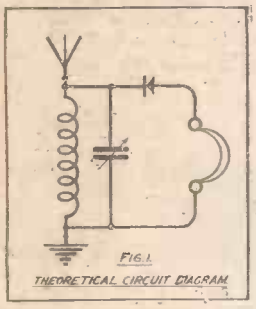


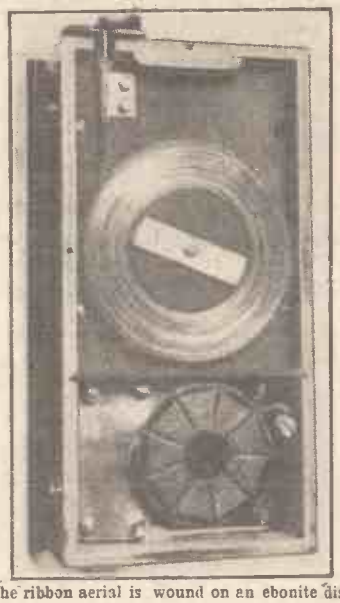
FIG. 1.
THEORETICAL CIRCUIT DIAGRAM.

The tuning circuit of the receiver consists of a basket coil inductance shunted by a variable condenser of about ·0005 mfd. capacity. This condenser, due to the limited space available, consists of a single moving vane, working between two fixed vanes separated by mica sheets. The vanes are fixed so close to one another that practically no air space is left between them, thus providing a high capacity.

The lay-out of the panel is shown in Fig. 2, drawn to the given scale, from which the positions of the necessary holes can be marked on the ebonite sheet, which is $3\frac{1}{4}$ in. by $4\frac{3}{8}$ in., and $\frac{3}{16}$ in. thick. The panel is given a matt finish, after necessary drilling, by rubbing its surface with fine glass paper.

The components, which will be described later, are fitted on the panel, which is then wired with No. 18 S.W.G. square tinned copper wire. Fig. 3 shows the actual wiring of the panel, while the theoretical circuit diagram is shown in Fig. 1.

A medium-sized soldering iron will be found more useful than a larger one, as the latter is liable to make the components too hot and affect the insulating properties of the ebonite parts. Care should be taken that as little flux as possible is used, in fact, it will be much better to solder the terminals and the ends of the connecting wires separately, and to remove the extra flux with a rag before making the actual joint.



The ribbon aerial is wound on an ebonite disc.

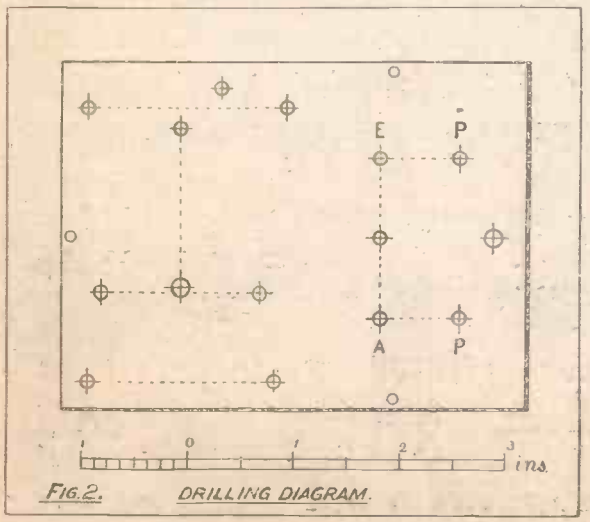


FIG. 2. DRILLING DIAGRAM.

The inductance consists of 50 turns of No. 32 S.W.G., D.C.C. copper wire, wound on a thin ebonite former of 2 in. diameter with 9 slots cut in it each $\frac{3}{8}$ in. deep. When wound the coil is coated thinly with shellac varnish to keep the wires in position and free from the accumulation of dust. The exact shape of the coil is given in Fig. 3, and is shown in dotted lines to avoid confusion.

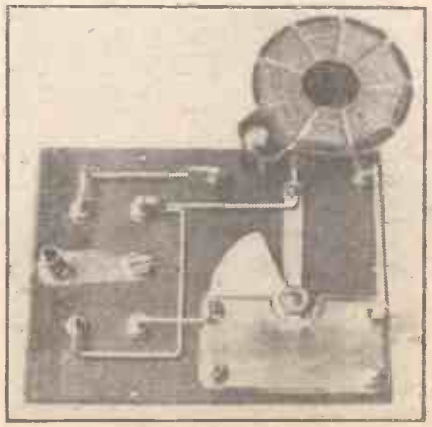
Close up view of the panel.

Fig. 6 shows the constructional details of the variable condenser. The moving vane, V, is fixed to the central 2 B.A. rod by means of two nuts, to which is also attached the pointer, I, and the adjusting knob, Q. The fixed vanes, F, of brass are cut rectangular in shape, and are separated from the moving vane, which is also of brass, by thin sheets of mica, M, projecting $\frac{1}{16}$ in. beyond the fixed vanes.

The Variable Condenser.

These vanes are fixed to the panel by two screws and nuts, N, and separated from the panel by small pieces of ebonite tube, L, $\frac{1}{4}$ in. long, but nuts can be used instead as shown in the enlarged diagram, which gives the details of fixing the condenser to the panel. The free corners of the fixed vanes are kept in position by soldering brass clips, S, which also serve for soldering the connecting wires to the fixed vanes. The connection to the moving vane is made by soldering the connecting

(*Continued on page* 34.)



Back of panel wiring.

AMATEUR'S PORTABLE CRYSTAL SET.

(Continued from page 33.)

wire to one end of the brass strip, O, as shown in Fig. 3.

Using thin mica sheets and a little skill, it is possible to get a capacity more than ·0005 mfd., but a condenser ordinarily made will give a capacity of about ·0005 mfd. Stops must be fixed on the panel in such a position that the vane can only move through 165° and in the lowest position of the pointer; about one-tenth of the moving vane should be inside the fixed vanes. This is essential as the moving vane will not go in between the mica sheets if completely taken out. This means a permanent small capacity in parallel with the inductance which is consequently wound with only 50 turns of wire.

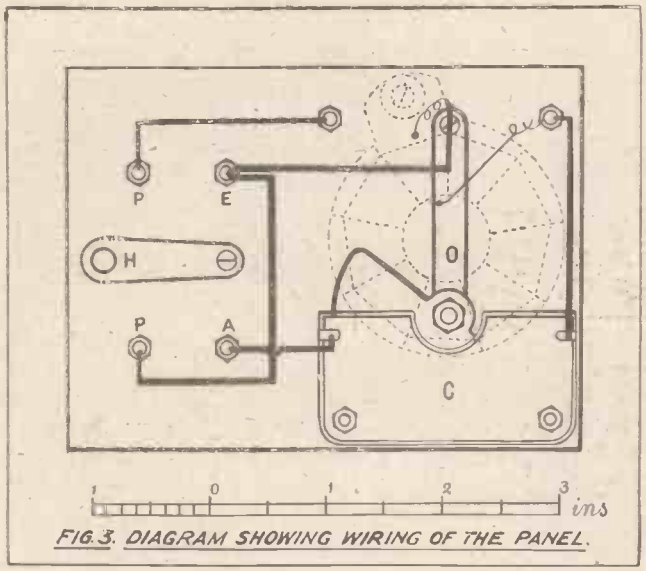
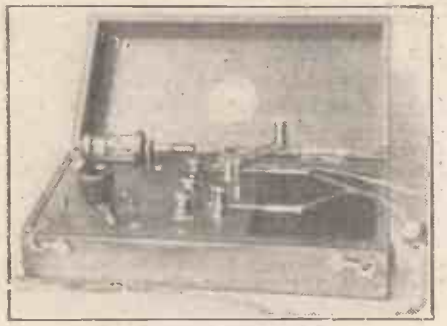


FIG. 3. DIAGRAM SHOWING WIRING OF THE PANEL.



The set connected with 'phones.

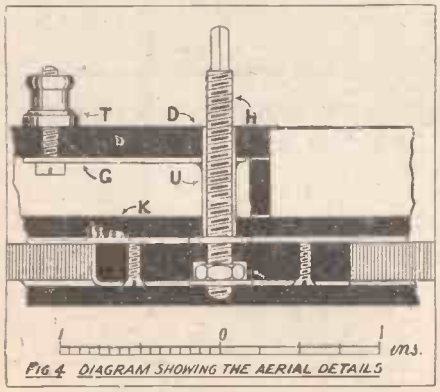


FIG. 4. DIAGRAM SHOWING THE AERIAL DETAILS

The details of the aerial are shown in Fig. 4. It consists of an ebonite disc 1⅝ in. diameter and ¼ in. thick, fixed at one end of a 2 B. A. rod, H. A brass strip ½ in. wide, soldered to the end of the rod with a nut to strengthen the soldered point, is screwed to the ebonite disc. One end of the strip is bent over the disc to which is soldered one end of the brass ribbon serving as an aerial.

Thus, the ribbon is in electrical contact with the central rod, H, which fits in a short length of brass tube, U, connected to the terminal, T, by means of a brass strip, G.

The terminal, T, where necessary, can be connected to the aerial terminal of the receiver either by a flat brass strip, as shown in the diagram, or by a short length of copper wire.

For winding the aerial ribbon on to the ebonite disc, a detachable handle is used, which in its simplest form may consist of a brass strip with a square hole at one end to fit the squared end of the rod, H, and a valve socket soldered at the other end. Fig. 7 also shows the method of fixing the aerial and the details concerning the ebonite handle, R, fixed to the free end of the aerial ribbon. The handle is provided with a forked brass strip which fits into two narrow vertical strips, B, in order to keep it in position. The vertical strips, B, also prevent the brass ribbon from twisting.

The components, when fitted on the panel, should have an appearance as shown in Fig. 5. The aerial and earth terminals are marked A and E respectively, while those marked P are used for the 'phones. H is the central rod of the aerial, to which is attached the handle for winding the ribbon. The variable condenser for tuning is marked C, while the crystal detector is fitted on the left-hand top corner of the panel.

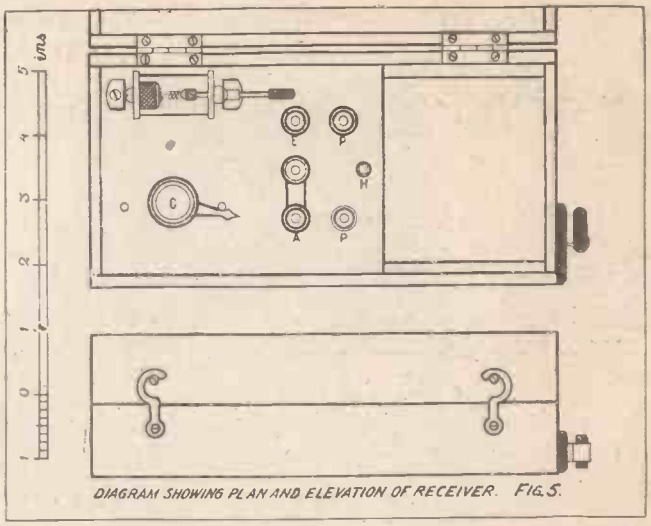


DIAGRAM SHOWING PLAN AND ELEVATION OF RECEIVER. FIG. 5.

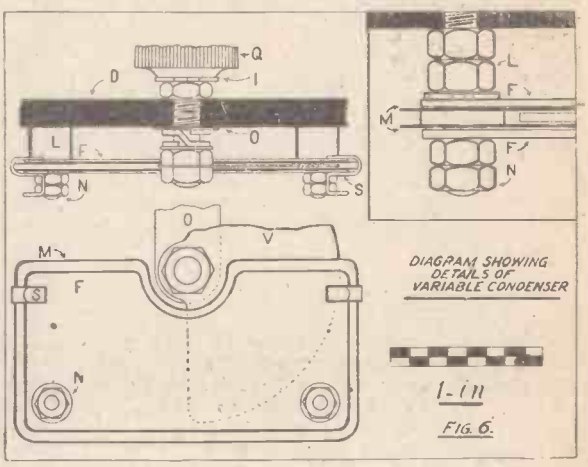
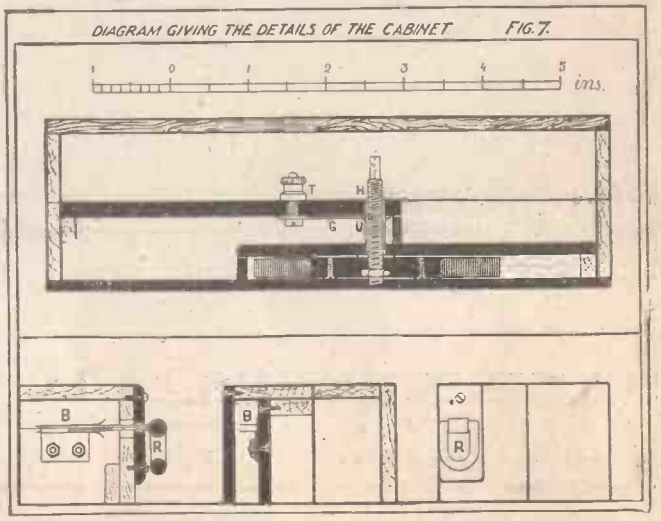


FIG. 6.

In order to make the cabinet compact it was necessary to use an ebonite sheet, ⅛ in. thick, as its bottom. The constructional details are better shown in Figs. 5 and 7, all the ebonite parts being

(Continued on page 37.)



ELECTRIC TELEVISION.

The Position To-day.

By W. S. SHOLL, A.M.I.E.E.

THE problem of reproducing visible images at a distance by electrical means is one that has appealed to the inventor as the logical outcome of the transmission of speech and music which is now so popular a development of wireless telephony. The man in the street has a most confused idea as to what television really is, which, after all, is not surprising.

There has been a quite understandable mistake current in the confusion of electric telephotography, the mere copying of a fixed picture, and television, which is, of course, the art of seeing the living scene in its actuality.

Years ago photography was a great marvel, and the ultimate development of the art has materialised in the production of living pictures.

These, as is well known, are a reproduction of past scenes, and bear the same relationship to television as the gramophone does to wireless telephony—i.e. the reproduction of permanent records of bygone events.

What the inventor is attempting to achieve is the simultaneous transmission and reception of scenes at the living moment, which factor undoubtedly makes wireless telephony so fascinating, and so far ahead of any reproduction of "back numbers." Just as in radio telephony we must have the "electric ear"—the microphone—so in television we require the "electric eye" which nature has bestowed upon us in the element selenium.

A ten-valve super-heterodyne receiver of novel design. It includes a special four valve resistance complex amplifier.

This mineral possesses the remarkable quality of changing its electrical resistance in response to the action of light, very much as the microphone varies in resistance in response to sound. Very considerable progress has been made in the Baird system of television, which in its present state is capable of transmitting images and reproducing them in visible form by electrical means.

The Baird System.

In this system the image is picked up by a revolving disc, on which is mounted an optical system of sixteen lenses arranged in spiral form.

These lenses traverse the image and feed it piece by piece through a revolving serrated disc, which sets up "beats" of light, on to a light-sensitive cell.

A local battery in this circuit therefore sends feeble currents which naturally vary in intensity in proportion to the intensity of the light-waves.

These feeble currents are passed through six stages of low-frequency amplification, and if a telephone is placed in circuit varying notes are audible, ranging from a deep note at the darker end up to a shrill whistle at the lighter end of the scale.

If a neon, or other suitable lamp, is put in circuit, in place of the 'phones, a pulsating illumination is set up, varying in intensity with the light which is reflected from the various portions of the transmitted image. At this point we naturally receive only a series of light waves which, while representing the light values of the image, convey no meaning to the eye.

To build up the disintegrated image we have to fall back upon the physical property of the human eye known as "persistence of vision."

This property is taken advantage of in the optical illusion known as cinematography which gives the beholder the impression of seing "living pictures."

In the Baird system a third revolving disc is employed in which slots pass in rapid succession between the eye and the illuminant.

This "integrating" disc builds up the image again which, after being passed through the circuit as a series of electrical impulses, appears to the eye in its original form. So far as the principle has been seen demonstrated, by the writer, conductors have been used between the transmitter and the receiver.

The system, however, has been reduced to two wire working, and, as it is only necessary to send "notes" representing light values, the transmission of the image by wireless over distances within the bounds of pure telephony appears to be perfectly feasible.

For projection on a screen the slots in the integrating disc would be replaced by an optical system similar to that employed in the transmitting disc and a high-power illuminant used.

This, briefly, then, is the principle of this interesting contribution to the science of television, which in the near future promises to bring the distant scenes into our homes by the agency of wireless.

In conclusion it should be particularly borne in mind that the system described is capable of transmitting images by *reflected* light and not silhouettes or shadows only.

This elementary stage has been passed and, while the results are at present admittedly crude, and produced by apparatus which leaves much to be desired, the system does at least demonstrate the practicability of its claims in reproducing actual images; which crude facts are worth any amount of the academic speculations so often voiced by the high-brow and the dreamer.

AMATEURS' PORTABLE CRYSTAL SET.

(*Continued from page* 34.)

sectioned black. The lower half of the cabinet is $1\frac{1}{8}$ in. high, while the lid has a height of $1\frac{1}{16}$ in., thus making the total height of the receiver $2\frac{3}{16}$ in., which is $7\frac{1}{4}$ in. long and $3\frac{5}{8}$ in. broad. The wood used for the cabinet was three-ply mahogany $\frac{3}{16}$ in. thick. Further constructional details are given in the accompanying photographs and diagrams, which are drawn to the given scales, and no difficulty should be experienced in making the receiver.

For listening purposes the brass ribbon is stretched across the room, using an ordinary nail or a hook as the support, while a water pipe can be used as an earth. The tuning can be affected by adjustment of the condenser until the loudest signals are heard.

A Good Earth Essential.

The receiver can be successfully used on the river or on other outdoor trips up to a distance of about twelve to fifteen miles from a broadcasting centre. The earth connection employed should be efficient, as this is vitally important for satisfactory reception. In case of the river the earthing question is easily solved by tying a weight to the end of a bare copper wire and letting it sink in the water, while the other end is attached to the earth terminal of the receiver.

The finished set closed up.

Where no river is available a long brass rod sharpened at one end can be driven into wet or moist soil, and the wire attached from the end of this to the receiver.

The receiver has been made extremely compact, so that it can be easily carried in the pocket, and it is for this reason that a single earphone is included in the box, as a pair of 'phones will probably require a space equal to the complete receiver itself.

The receiver, when used in a room worked a pair of 'phones, when 20 feet of the aerial ribbon was outside it; the earth used was an ordinary gas pipe.

Artistes of the Aether

By "Ariel"

CHAMBER MUSIC—"SAMSON AND DELILAH" AT 2ZY—NEXT WEEK'S STARS.

EVERY week sees the gradual broadening of the various programmes, and as the prejudice of agents and managers is replaced by the belief in wireless as a sheer epic in advertisement, the scope and variety increases.

Classical Music.

Notwithstanding the sneers, and possibly just a few plaints for more "jazz," classical music is superabundant throughout the various stations, and 2LO once more chose one of the best in The Kutcher String Quartet, already well known to listeners, with whom it has attained as high a reputation as with the patrons of the classical concert halls. It was formed in 1923 by Samuel Kutcher, a virtuoso violinist, formerly a pupil of Albert Sammons, and a member of the Philharmonic String Quartet. Associated with him was the brilliant young 'cellist, John Barbirolli (who is now also conductor of the Guild of Singers and Players Chamber Orchestra), Mr. George Whitaker, and Mr. Leonard Rubenstein. At their first performance in London their rendering of the big quartets of Delius and César Franck established them amongst the chief of quartet players, and "The Times" likened their playing to that of the famous Joachim Quartet.

Mr. Samuel Kutcher.

Amongst the Vocalists.

2LO is also to be depended upon for its soloists, and last week again was heard Miss Elsie Suddaby. She is a great favourite, too, at Manchester, where she was one of the first artistes to broadcast at that station. Intended for a pianist, Miss Suddaby commenced her career by winning the Gold Medal of the Associated Board of the Royal College of Music, then finding herself possessed of a voice of exceptional range and tone, she settled down to perfect it, and her work before the microphone alone proves her wisdom.

Old-World Music.

Chamber music has become so marked a feature of our concerts that it is not surprising that some of the old-time instruments have been tried again, and have vied well with their modern prototypes. Everyone remembers the spinet and harpsichord solos of Mrs. Gordon Woodhouse at 2LO and the viola d'Amour solos by Percy Frostick at Leeds-Bradford station. The programme of Tuesday last of Old English Music was particularly appropriate, preceding as it did the "tabloid" version, if we may use the term, of the Lyric, Hammersmith, success, "The Beggar's Opera," with the music arranged by Frederick Austin, and the cast including the name of Frederick Ranalow. For the former part of the programme was engaged "The Chaplin Trio."

Mr. Edward Clark. (*Photo. Hay Wrightson.*)

These three sisters have become famous for this type of music, and Miss Nelly Chaplin at the harpsichord, Miss Kate at the viola d'Amour, and Miss Mabel with the viola de Gamba, may be said to have united two centuries in music.

Modern instrumental playing was represented on Friday by the well-known classical pianist, Phyllis Emanuel, and Peter Yorke on Saturday, the latter taking the place of the well-known pianist, Miss Toni Farrell.

Newcastle's Programmes.

Some excellent concerts have been given at this station, and one of the best announced was that of Monday when, instead of from the studio, it was to be broadcast from the Old Assembly Rooms. Some of the best known artistes in the musical world were included in the programme, amongst them the names of Miss May Blyth and Mr. Joseph Farrington of the B.N.O.C., Grace Ivell and Vivian Worth, and Mr. Percy Merriman of "The Roosters," with a play by the 5NO Repertory Theatre and solos on violoncello from Miss Hetty Page. We understand that all profits were divided among local charities.

Newcastle has, too, a fine musical director in the person of Mr. Clark. Son of Mr. James Clark, famous for his interest in Northern and provincial music, he has had the advantage of travelling and studying all over the world. Amongst his numerous recitals will be remembered those at Queen's and Wigmore Halls, London, last year.

Miss Phyllis Emanuel.

"Dramatic Wireless."

2ZY may be really called the pioneer of dramatic wireless, for most of the important plays have been broadcast from this station. As a change from the more serious drama Mr. Victor Smythe, assisted by Eric Fogg, produced a belated but nevertheless charming fairy pantomime, "Cinderella," on Friday last, with the 2ZY Repertory Company in full force.

To-morrow (Friday) the company present their sixth play of the series of monthly plays, "The Case of Lady Camber," by Horace Annesley Vachell. Playgoers will probably remember its success at the Savoy in 1915, and as it depends more on witty dialogue than actual situation, it is an excellent choice for broadcasting purposes. The play serves to introduce a new recruit to the 2ZY Dramatic Company in the person of Miss Mary Eastwood, who recently scored a success in a performance of "Discovery," given by the Unnamed Society.

Miss Elsie Suddaby.

On Saturday Manchester reverts to grand opera with a performance of "Samson and Delilah" (via 5XX also), the latter part being taken by a known favourite, Miss Enid Cruickshank, who also sings at 2LO next week. Included in the cast is Mr. Walter Widdop of the B.N.O.C., and Mr. Lee Thistlethwaite, the brilliant singer who has been so long connected with the musical side of Manchester's station.

Birmingham.

There is a distinct high-brow atmosphere at Birmingham for to-morrow (Friday), when the first act of "Boris Goudonov," by Alexander Pushkin, will be broadcast.

Stars of Next Week.

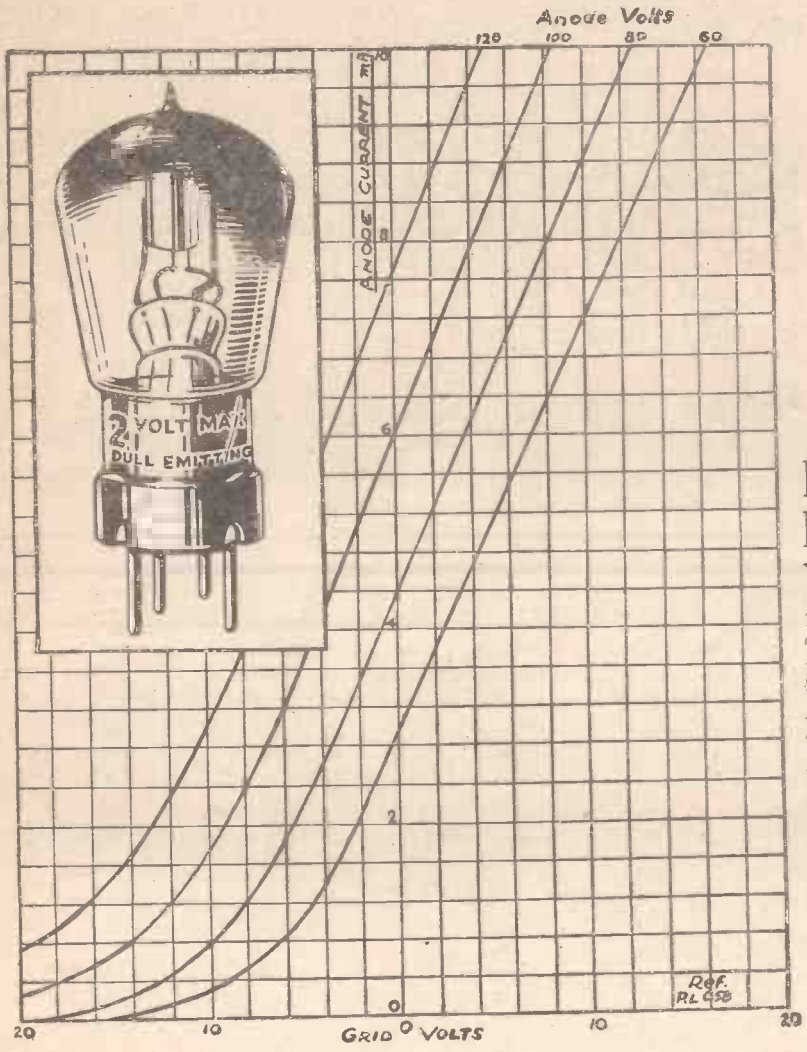
Amongst the artistes down for next week are Mr. Olly Oakley, the banjoist, with Mr. Frank Colley.

On Tuesday, Miss Vivvien Chatterton.

On Wednesday, The Philharmonic String Quartet, and Miss Wynne Ajello, Leonard Lovesey, and Joseph Farrington.

On Friday, Mr. Sydney Russell of the B.N.O.C., and on Sunday the great Wagnerian singer, Mr. Horace Stevens.

The handwriting of a valve



EDISWAN'S LATEST VALVE

These four curves illustrate the amplification given by the latest Ediswan valve, the P.V.6D.E. for four different anode voltages. The abrupt climb to the point of saturation indicates in each case the high amplifying power obtained.

P. V. 6 D. E.

The characteristic curves shown are those of the Valve illustrated—Ediswan type P.V.6D.E., which has been especially designed for use with standard dull emitter valves and batteries.

Filament Volts 1·8—2·0
Filament Amps. 0·4
Amplification Factor 6·0
Anode Volts 60—120
Price - - 22s. 6d.

A CHARACTERISTIC CURVE is the handwriting which shows the "character" of a valve. It tells more than many pages of print.

Every amateur knows that the addition of each volt to the grid potential increases the flow of current from the anode. After a point the increase of anode current becomes relatively large and remains steady until the second or saturation point is reached.

The amplifying capacity of the valve lies between these two points. The *degree* of amplification produced is indicated by the steepness of the curve lying between them.

EDISWAN VALVES

THE EDISON-SWAN ELECTRIC CO., LTD., QUEEN VICTORIA STREET, LONDON, E.C.4

162.49

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

WITH the assistance of "Glazite," a new product of the London Electric Wire Co. and Smith's, Ltd., the wiring of a wireless set can be made quite striking in appearance. Glazite is a tinned copper wire, covered with an insulating material of a highly glazed nature. It is obtainable in four colours—red, blue, yellow, and black—at 1/6 per coil of 10 ft. Glazite is damp-proof and flame-proof, and its covering possesses excellent insulating properties. Samples have been sent us, and we have tested them very thoroughly and find the product to be well up to the standard expected of its very well-known makers. A receiver wired up with "Glazite" will look very nice, and doubtless it will be very easy indeed to follow the connections, but we trust it will not tend to make constructors careless in this most important part of their work. One thing about bare square section tinned copper wire, it does tend to make the amateur do his wiring slowly and methodically.

* * * *

We are informed that the firm of Cook and Co., of 76, Estcourt Road, S.E.25, has ceased to operate as such, and that the business has come under the sole proprietorship of Mr. George P. Cook, who will carry on its activities at 23, Brockenhurst Road, Addiscombe, Croydon. Mr. Cook sent us further samples of "Receptite" and "Hertzite" crystals, and these on test proved to be quite as sensitive and generally satisfactory as previous samples received, so that it is evident the quality of the products has not been affected.

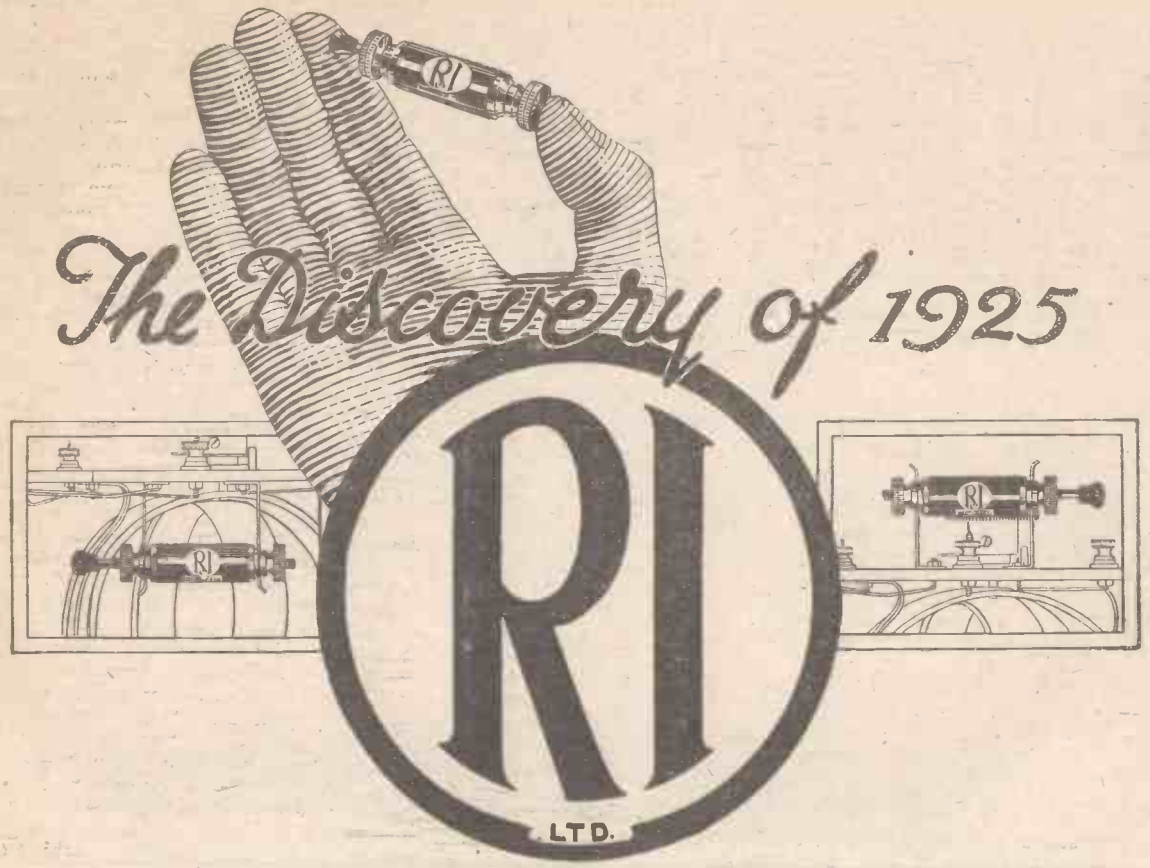
The L. and P. universal coil holder.

Messrs. The London and Provincial Radio Co., Ltd., recently sent us an "L and P" universal coil holder. It is a component particularly designed for baseboard mounting "American fashion," the moving coil falling backwards from the panel instead of sideways. The movement, which is particularly positive and smooth, is obtained by means of a "worm" gear, which, of course, is a reducing gear and enables a "vernier" action to be obtained; also it is impossible for the moving coil, however heavy it may be, to move a fraction of an inch unless the control knob is turned. It is very well made, and well worth 11/6—its retail price.

* * *

A permanent crystal detector originating from the famous house of Radio Instruments, Ltd., is sure to create more than usual interest. For some considerable time we have known of the existence of the R.I. P.M. (permanent mineral) detector, and to some extent the lengthy tests to which it was subjected before being placed on the market. The P.M. comprises two crystals, one of which is of a highly refractory nature, and of which but a small, sharp splinter is used; the other being a special alloy. These two crystals are kept in contact by means of a spring and plunger. The whole detector is quite small—being something of the size of a variable grid leak of average dimensions. Two types are obtainable, the one which is quite "permanent," and the other which is provided with a small "trigger" adjustment. The addition of this latter is, in our opinion, most commendable, and we strongly advise purchasers to choose the model that embodies it. Even the most perfect of

(*Continued on page 44.*)



THE DISCOVERY OF 1925

A CRYSTAL DETECTOR THAT DOES NOT REQUIRE ADJUSTMENT.

Only a wonderful scientific discovery, backed by the R.I. reputation, could have made this permanent mineral detector a possibility.

So many vain attempts have been made to attain the ideal of a detector, free from all adjustment, that the radio public have doubted that it could be ever achieved.

HERE IS THE WAY OF IT.

The combination of a new mineral of high refractive index, and another suitable mineral, were found to give perfect detection irrespective of surface condition and free from the bane of catswhiskers.

There is no question of hunting for the sensitive spot. It is always everywhere on this wonderful discovery. However, the spirit of the experimenter demands satisfaction, and so one of the elements is mounted with a trigger action to change the point of contact *if desired*, not if *necessary*.

As a proof of this, the manufacturers are prepared to supply the detector without the trigger adjustment.

The advantages of the P.M.

Absolute permanency under vibration.
Extreme sensitivity always everywhere.
Easy operation of any circuit in which it is employed.
Elimination of distortion if used as a rectifier.

Its inherent stability makes it particularly suitable for all valve and reflex circuit users. If you are interested, write for descriptive leaflet. If you are keen, buy one to-day.

The R.I. reputation is behind it.

Everybody is talking about this sensation of 1925. They will ask you if you have got one.

PRICE: including metal brackets and necessary screws for mounting 6/-

RI LTD

Contractors to the Admiralty and all Government Departments.

Radio Instruments Ltd
12 Hyde Street, Oxford Street
Telephone: REGENT 6214 (3 lines) W.C.1. Telegrams "Instradio London."

APPARATUS TESTED.

(*Continued from page 42.*)

permanent detectors are apt to become insensitive, or, at least, there is always a possibility or the *belief* that there is a possibility of such happening, whereas the mind is set at rest for all time by the inclusion of that little trigger which permits a new setting to be obtained should it be thought necessary.

We have tested the numerous samples of both types sent us by the R.I. people, and there is no doubt that the "P.M." is a good proposition. Not only is it a good *permanent* detector, acting perfectly well in both crystal and valve circuits, but it is a better all-round detector than the average. The combination is one of the most sensitive and stable ones yet devised. The R.I. people have undoubtedly scored another success, and we predict a popularity equalling that of the famous R.I. L.F. transformer for the R.I. P.M. crystal detector.

* * *

From Messrs. The Electron Co. Ltd., we have received a "Six-Sixty" dull emitter valve, fitted with the new thorium-covered molybdenum filament. It will be remembered that this was developed by Dr. Leonard Levy, M.A., and Mr. D. W. West, A.C.G.I. The "Six-Sixty" always was quite a good valve, and undoubtedly anything that tends to increase its efficiency is deserving of special note. On test very good results were obtained, and there was every evidence of quite extraordinary filament emissivity. The valve operates well in all three positions (H.F., det., L.F.) on an H.T. as low as 15 volts and up to considerably over 100 when used in a second L.F. stage. In this last position amplification proved to be such that the "Six-Sixty" could almost be termed a power valve.

* * *

For some reason transformer-coupling has hitherto been far more popular than resistance-capacity coupling, but lately the adherents of the latter method have grown rapidly in numbers, and there is every sign that the advantages of the system are becoming more and more widely appreciated. Most listeners have favoured transformer-coupling because of the voltage step-up obtainable in this way, but as low-ratio transformers are necessary for the final stages the gain here is less than is often supposed. Resistance-capacity coupling cannot give a voltage step-up, but it *can* give almost perfectly-distortionless amplification. We have just tested the new Polar resistance-capacity coupling unit, and the results were certainly very gratifying. Mounted upon an ordinary-sized fixed condenser, and standing only about 3 inches high, the instrument is not only compact in itself, but it has no large magnetic field to cause spacing troubles. The resistance is wire-wound, and is arranged so that the voltage difference between adjacent turns is small. The unit embodies a Mullard leak and a Dubilier condenser, and its terminals are arranged so that symmetrical wiring can connect the units and their valves with a minimum of trouble. On test the units gave perfectly clear L.F. amplification, and when three units were connected after the detector, the volume was just about equal to that given by two stages of L.F. transformer coupling. The price of the complete unit is 15/-, which compares very favourably with that of an L.F. transformer, but, of course, an extra H.T. voltage is necessary with resistance-capacity coupling (generally of the order of 120 volts, instead of the normal 60 or 80). Certainly the tone obtained is delightful, and the Polar resistance-capacity coupling unit will be warmly welcomed by those who prefer pure reproduction to volume, and the ease of symmetrical units to the difficulty of matching transformers.

* * *

Mr. Guy Vandervell, son of "C.A.V.," has been appointed head of the newly established wireless department of the famous firm identified by the above initials. He is a well-known racing motorist.

* * *

Messrs. Siemens Brothers and Co., Ltd., announce a reduction in the price of double headphone receivers to 20/-. This applies to any of the usual resistances, viz., 120, 2,000, and 4,000 ohms.

* * *

We regret to have to announce the death which occurred recently of Mr. J. S. Brown, one of the original managing directors of Brown Bros., Ltd., wireless manufacturers and wholesalers.

Made in three sizes

80/-
48/-
30/-

Don't just say "a loud speaker" —ask for a REVO *and be satisfied!*

THERE are loud speakers *and* loud speakers. Some are merely headpieces attached to a horn, some are just poorly sounding "gramaphones." Above all these towers the REVO in construction and performance. Carefully made with special non-resonating horn and superb magnets. Ask to hear one at your local dealers—you'll be amazed at its bell-like purity and absence of distortion. The Senior at 80/-, the Junior at 48/-, and the Baby at 30/-, we claim to be the best things in Loud Speaker value on the market, and guarantee them for 12 months.

The Telephones we guarantee for 12 months

So confident are we of the satisfaction that REVO Lightweight Telephones give that, like our Loud Speakers, *we guarantee them for 12 months.* Wonderfully sensitive, comfortable and robust, they are ideal headphones for long listening-in periods.

Price 19/6

If unable to obtain REVO goods locally write us direct :—

THE CABLE ACCESSORIES CO., LTD.
Tividale, Tipton, Staffs.

"Revo"

"The Name for Perfect Radio"

Prove this by your own knowledge

The reasoning behind the Bowyer-Lowe Square Law Condenser is so conclusive that it convinces every experimenter who follows it.

Your own experience tells you that the wave-length range of a Condenser depends on its capacity ratio ; that is, the ratio between its maximum and minimum capacity. Reduce the minimum capacity and up goes the ratio.

Now, the fixed plates of the Bowyer-Lowe Square Law Condenser present so little edge to the moving plates in the minimum position that the capacity ratio is equal to 150 to 1, the highest in wireless.

You know, too, that low losses make for richness and purity of reception. See how losses are reduced to a minimum in the Bowyer-Lowe Square Law Condenser through the use of Grade "A" Ebonite, careful design and scrupulous manufacturing methods. These things *must* result in better reception.

You understand how the square law effect makes a set selective and easy to calibrate. The Bowyer-Lowe Square Law Condenser is *no* larger than ordinary condensers. You can fit it in your sets without altering them in any way. *Therefore*, by installing this condenser you must be able to increase the efficiency of any set.

The Bowyer-Lowe Square Law is the ONLY Condenser which obtains the square law effect with INCREASED selectivity and REDUCED losses. Insist on having it in every receiver you make.

All good dealers sell it at prices from 11/6.

Bowyer-Lowe Tested SQUARE-LAW CONDENSERS

For best results use Bowyer-Lowe Condensers in conjunction with Bowyer-Lowe MATCHED H.F Transformers. Every one is guaranteed to match perfectly every other in the same range. All ranges and Neutrodyne model at uniform price of 7/-.

Write for our FREE Catalogue

containing 36 pp. of information about all the Bowyer-Lowe Tested Components with blanks for your notes. Send 1½d. stamp to cover postage.

Bowyer-Lowe Tested Radio Components

BOWYER-LOWE Co., Ltd., Letchworth.

-HULLO EVERYBODY!!-

ALL THESE GOODS SENT POST FREE (U.K. ONLY) EXCEPT WHERE MARKED. FOREIGN POST EXTRA. ORDERS DESPATCHED IN STRICT ROTATION AT EARLIEST POSSIBLE MOMENT.

AERIAL 7/22 100 ft. 3/-
Copper Strip 3/-
Allen Var. Grid Leak 1/9

BURNDEPT Detector 4/6
Basket Holders 1/3. 1/6
Battery Links. doz. 1/2
Bushes Ebonite 1/3

CRYSTALS each 1/6. Gilray, Permanite. Blue Label. Tungstalite

COIL STANDS 2-Way—
Vernier .. 4/6, 5/-. 5/6
Geared 5/11 Polar 6/-
Shipton Vernier .. 4/6
" Baby " ordinary 3/3
With ex. handles 3/6
Nickel " 4/-
Baby 3-way 4/3
Nickel " 5/6
Vernier 3-way .. 6/6
Shipton V. 8/-

COILS D.C.C.
For Chelmsford .. 1/11
With Adapter .. 2/8
Extra Large Air-Spaced Set of 5 Duplex D.C.C. Coils, 25,35, 50, 75, 100 2/9
Coil Plugs, Wedge, pr. 2/-
Edison Bell 2 for 2/6
Plugs with Fibre 1/-

DETECTORS (Enclosed)
Micrometer 2/6
Nickel. Large.. .. 2/6
Brass 2/-
Burndept 4/6
Mic. Met. 6/-

FIXED CONDENSERS
EDISON BELL—
·001 to ·0005 each 1/3
·002 to ·006 each 2/-
Grid Leaks and clips 1/6
Dubilier ·001 to ·006 ea. 3/-
·0001 to ·0005 each 2/6
Grid Leak, 2 meg. 2/6
·01 for L.S. 7/6
Anode Resistance on stand, 70,000, 80,000, or 100,000 each 5/6
McMichaels' 2-meg. Leak and Clips .. 2/6
100,000-ohm Res. 2/6

RAYMOND (Ebonite Base)
·001 to ·0005 each 1/1
·002 to ·006 each 1/3
·01 or ·02 each 1/9
(Mansbridge Elsewhere.)
Flex, 2 colour, 12 yd. 2/6
Lighting .. 12 yd. 2/-

COSWELL QUALITY
Valve Legs, Set 4 .. 1/3
Valve Holder 1/9
2-way Cam Vernier 9/-
3-way Cam Vernier 12/6
3-way Ordinary .. 7/6
2-way Panel 3/-
3-way Panel 5/-
Basket Holders .. 1/4

H.F. TRANSFORMERS
McMichael's 300/600 10/-
" 1100/3000 10/-
Energo. 250/700 .. 3/11
" 450/1200 .. 4/3
" 900/2000 .. 4/6
Raymond B.B.C .. 2/9
" 5 X X .. 2/9

IGRANIC—Rheostat .. 4/6
30 ohms 7/-
Potentiometer .. 7/-
Variometer 10/6
Coils (all numbers)
25 .. 5/- 35 .. 5/-
50 .. 5/3 75 .. 5/6
100 .. 7/- 150 .. 7/10
200 .. 8/8 250 .. 9/-
300 .. 9/5 400 .. 10/3
500 .. 10/6

LISSEN—Minor .. 3/6
Stat 7/6
Universal 10/6
Switch 2-way 2/9
Series Parallel 3/9
Anode Res. 2/6
Var. Grid Leak .. 2/6
Choke 10/6
L.F. T.1 .. .. 30/-
T.2 .. .. 25/-
L.F. T.3 .. .. .. 16/6
Coils—
25 .. 4/10 35, 40, 4 10
50 .. 5/- 60 .. 5/4
75 .. 5/4 100 .. 6/9
150 .. 7/- 200 .. 8/5

LOUD SPEAKERS
C.A.V. Tom Tit .. 30 -
C.A.V. Junior .. 55/-
Sterling Baby .. 55/-
Sterling Dinkie .. 30/-
Amplion Junior .. 27/6
Amplion Dragonfly 25/-
All models stocked of leading makers.

POLAR CONDENSERS
·001, ·0005 or ·0003 10/6
Micrometer .. 5/6
2-way Junior .. 6/-

RHEOSTATS
One hole fixing .. 1/6
C. & S. do. 1/5
De Luxe and Dial .. 2/6
Burndept 4/6
McMichael Dual .. 7/6
Shipton Strip—
7 ohm (with fuse) 3/6
30 or 60 ohm .. 3/6
Potentiometer 600 ohms 4/6
Crown for DE or R 2/6
L.E.S. Micro Control 3/6
T.C.B. 6, 13, 30 ohms 4/-
Potentiometer 300 ohms 5/-

SWITCHES
Panel DPDT 1/6
Panel SPDT 1/4
Ebonite DPDT .. 2/6
Ebonite SPDT .. 1/9
Simplex Lead in .. 1/9
Sq. Bus Bar 1/-
Switch Arms 1/6
(Inc. studs and nuts.)

TERMINALS
Phone or W.O. doz. 1/9
Pillar large .. doz. 1/9
Pillar medium .. doz. 1/3
Nickel 6d. doz. extra.
(All with nuts)

TRANSFORMERS L.F.
Ferranti 17/6
Igranic 21/-
R.I. 25/-
Ormond 14/-
J.R.C. 83 .. .. 15/-
Super Success .. 21/-
Standard Success .. 16/-
Brunet Shrouded .. 13/6
Formo Shrouded .. 18/-
Formo open 12/6
French 9/3

VALVE HOLDERS
Murray Anticap .. 1/3
Legless Anticap .. 1/3
Bretwood 1/9
Solid Rod Standard 1/3
Goswell 1/6

VALVES
Myers Universal .. 11/-
French " R " .. 7/6
Dutch Detector .. 5/6
Dutch " R " 5/11
Metal ·06 .. .. 13/11
Radio Micro ·06 .. 13/11
Marconi, Ediswan, B.T.H., Cossor, Mullard, etc.
BRITISH VALVES.
All bright emitters.
11/-
D.E.R. all makes 18/-
·06, all makes .. 21/-
Power valves 22/6 to 30/-
AS PER MAKERS' LISTS.
Valves posted buyer's risk.

" FINSTON "
Fixed Condensers. Wonderful Line.
·001 to ·0005 .. 1/3
·002 to ·006 .. 2,1
" FINSTON "
Filament Rheostat with dial 2/-

WATMEL
Var. gd. Leak .. 2/6
Anode Res. .. 3/6

WATES MICROSTAT
New Improved Model. Post Free. **2/9**

BRETWOOD
New Model, variable grid leak 3/-
Anode Resistance .. 3/-
Anti-Cap Switch .. 5/-

TELEPHONE DISTRIBUTION BLOCKS. Table Pattern, takes 4 pairs of 'phones 3/6

ENERGO L.F. TRANSFORMER. For supreme Results, Efficiency, Finish, and Permanent Reliability. For 1st stage 15/-

THE MIC-MET SUPER CRYSTAL DETECTOR .. **6/-**

STERLING
Square Law and Vernier Variable Condensers.
·001 .. .. .. 30 6
·0005 .. .. .. 25/6
·00025 .. .. 23 6

GENUINE " BRUNET " L.F. Transformers.
Shrouded type.
Ration 5 : 1—5,000 Primary, 25,000 Secondary. 13 6 Post Free.
3 to 1 Ratio can be obtained.

BRETWOOD
Valve Holder .. 1/9
100 p.c. Efficiency. Eliminates poor reception. No soldering stop over or under panel.

HEADPHONES.

ERICSSON E. V.
CONTINENTAL.
Your favourite 'phones. Entirely NEW MODEL. Most beautifully finished, exquisite tone. Ridiculous Price. per pair (4000 ohms) **13/11**

BRUNET
New Model " TYPE D." Hygienic Horn Headbands. Nickel-plated Stirrup. Black and White Cord. Each receiver stamped with trade mark. 4000 ohms. per pair **16 6**

For the MAGIC HOUR ! When Fairyland becomes reality. Let the kiddies wear Featherweight 'phones.
BROWN'S "F" TYPE. 4000 ohms. **25/-** pair.

N and K
LATEST MODEL
Stamped N and K.
4000 ohms. **17/6**
(Price U.S.A. £2)
Limited number old model Stamped N and K. Post 6d. **12/11**

TELEFUNKEN (GENUINE). Adjustable. 4000 ohms. Price **17/11**

SUPER L.F. (5-1) TRANSFORMER
Windings have insulated layers of 6 sections each, wonderful for amplification. Made in France, by the world's foremost firm. SPECIAL PRICE .. **10/-**

Genuine BRUNET L. F. TRANSFORMER
(Shrouded)
5-1 : 5,000 Primary turns, 25,000 Secondary turns. Post free 13/6

PERFECT RHEOSTATS
Shipton New Type Strip Rheostat, 7 ohms (with fuse) 3/-
Shipton New Type Strip Rheostat, 30 ohms .. 3/-
Shipton New Type Strip Rheostat, 60 ohms .. 3/-
Shipton Potentiometer, 600 ohm. 4/6

B.T.C.
Valve Holders.
Under panel 1/6
Over panel 1/9
Now Stocked.

THORPE K 4
5 pin valve
For Unidyne Circuit
Post Free **17/6**
5-pin holder **1/3**

" UTILITY " SWITCHES
2 Pole c/o Knob .. 4/-
2 Pole c/o Lever .. 5/-
4 Pole c/o Knob .. 6/-
4 Pole c/o Lever .. 7/6
Post 3d. each.

TELEFUNKEN TYPE
So Near to Originals You can scarcely tell the difference except not adjustable. 4000 ohms. Pair **10/9**

£50 REWARD !
given if the
DR. NESPER
PHONES SOLD HERE ARE NOT GENUINE ! BEWARE OF FRAUDULENT IMITATIONS ! !
(Injunctions obtained)
Adjustable diaphragm, detachable receivers, double leather-covered head-springs, long flexible cords, nickel plated parts. Very comfortable fitting to the head. Per Pair. **12/11** Post 3d. pair.

Brandes Matched Tone.
4,000 ohms .. 20/-
B.T.H., ditto. .. 20/-
Siemens, ditto. .. 20/-
Sterling, ditto .. 25/-
G.R.C., ditto. .. 20/-
BROWN'S Featherweight 4,000 ohms 20/-

QUALITY (GOSWELL) RADIO COILS
Far more efficient than honeycomb or any other type of coil. Exceedingly strong and rigid, mounted on standard ebonite plugs. Brown finish, no wax or shellac used. MOUNTED

25 .. 1/6
35 .. 1/9
50 .. 2/0
75 .. 2/3
100 .. 2/9
150 .. 3/0
175 .. 3/6
200 .. 3/9 Post 3d. Coil

MANSBRIDGE CONDENSERS
Octupus, Tested at 350 v.D.C.

·01 ..	2/3	T.C.C.	
·25 ..	3/-	2 mfd.	5/-
1 mfd.	3/8	1 mfd.	3/1
2 mfd.	4/6	·25 ..	3/6

Post 2d. each.

" WONDER " AERIAL WIRE
49 Strands Special Alloy Phosphor Bronze.
For Frame, Indoor, or Outdoor Aerial.
100 feet 3/6
Post 2d.

RAYMOND
"LIGHT AS A FEATHER"
4000 ohms.
Post 6d. **8/11**

ACCUMULATORS
FOR CALLERS ONLY at present.

Rheostat with Dial, extra value, 2/-
Bretwood Valve-holder. 1/9

Manchester, " Powquip," 15/6
Ormond 14/6

Shrouded "Powquip," 18/-
Standard "Powquip," 14/6

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

FERRANTI L.F.

BETTER THAN THE BEST **17/6**

IMPORTANT NOTICE
TRADE COUNTER OPEN
will oblige you with any lines in stock, less 20% on Proprietary articles.
NO POST ORDERS TRADE.

EBONITE PANELS
3-16th in.
6×6..1/8 10×8..3/6
7×5..1/8 12×9..5/-
8×6..2/6 12×12..5/9
9×6..2/9 14×10..5/9

CRITERION CONCERT COILS.
Low Self Capacity. Every turn and layer airspaced. Perfect for Reaction. Mounted on Plug.
25 .. 2/- 50 .. 2/6
35 .. 2/3 75 .. 2/9
100 .. 3/-
SET OF 5 (25, 35, 50, 75, 100) 10/- Post 3d.

RIGHT OPPOSITE DALY'S GALLERY DOOR

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

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SUNDAY - 10 to 1

'Phone: GERRARD 4637.

HULLO EVERYBODY!!

RAYMOND VARIABLE CONDENSERS SQUARE LAW

One-hole fixing. EBONITE Bushes. Aluminium ends. Highly recommended.

Prices include Knob and Dial.

Post 6d. Set.

WITH VERNIER		WITHOUT VERNIER	
·001	8/9	·001	7/7
·0005	7/9	·0005	5/9
·0003	7/-	·0003	5/3
Ebonite ends 1/- extra.		Ebonite ends 1/- extra.	

DE LUXE ORDINARY

Complete with Knob & Dial

·001	alum. ends	6/11
·0005	,, ,,	5 6
·0003	,, ,,	4/11
·0002	,, ,,	4/6

POST 3d. Set.

TWIN CONDENSERS

Equal parts of ·0005, ·0003 and ·00025.

With Knob and Dial. Ebon te Ends.

·0005	ebonite ends	18/11
·0003	,, ,,	12/6
·00025	,, ,,	12/6

LONDON'S LARGEST Stockist of **JACKSON BROS.'**

J.B. Variable Condensers, complete with Knob and Dial.

SQUARE LAW		STANDARD	
·001	9/6	·001	8/6
·0005	8/-	·0005	7/-
·0003	6/9	·0003	5/9
·0002	5/6	·0002	5/-

Other sizes as advertised by "J.B." Post 4d.

CALLERS! THESE 4 COLUMNS FOR YOU NO POST ORDERS FROM SAME

Warning! Note name RAYMOND on windows. You will not be able to buy these goods otherwise. Nearest Tube Leicester Square. This address is at the back of Daly's Theatre. Open Weekdays 9 to 8, Saturdays 9 to 8.45, Sundays 10 to 1.

ACCUMULATORS

2 v. 40 amps.	9/6
4 v. 40 amps.	16/6
4 v. 60 amps.	18/6
4 v. 80 amps.	23/6
6 v. 60 amps.	27/6
6 v. 80 amps.	33/-
6 v. 105 amps.	38/6

Hart's Stocked. All High Quality.

EBONITE, 3/16 in. Stock Sizes.

Cut to size	½d. sq. in.
6×6	1/4
7×5	1/4
8×6	1/10
9×6	2/-
10×8	3/-
12×6	3/-
12×9	4/3
12×12	5 6
14×10	5,6

¼ in. also Stocked.

Switch Arm, 12 Studs, 12 Nuts, 12 Washers. Lot 10½d.

TAPPED INDUCTANCE COIL

for Chelmsford. A Real Bargain 1/6

WEDGE COIL PLUGS

Fitted Fibre	7d.
Various	7d., 8d., 9d.
Edison Bell	11d.
Plaincoil Plugs	4½d.
Also 5d., 6d., 7d. each.	
Fibre Strip	2d.

(36 in. by 1 in.).

Empire Tape, doz. yds. 6d.

RAYMOND FIXED CONDENSERS

·001, ·0001 to ·0005 10d.
·002, ·003, ·004 .. 1/-
·006, 1/3; ·01, 1/9; ·02, 1/6

Ebonite Base Terminals.

DETECTORS (Enclosed).

Micrometer	1/6
Half Opal	1/-
Small Brass	8d.
Large Brass	1/-, 1/3
Nickel	10d. to 1/6
Buradept	4/-

Crystals Stocked.
Blue Tungstalite, Permanite
Shaw's Genuine Hertzite 10d.
Uralium 1/-
All known makes.
4 Whiskers (1 gold) 2d.
Gold and Silver do. 2d.
7 Waxed Coils 1/8
5 Waxless Coils 1/3
For B.B.C.

SPECIAL!

Vernier 2-way Coil Stands 3/6
Geared do. 5/3

BOXES from 1/11

7×5 9×6 12×9 14×10
8×6 10×8 12×10 etc.

H.T. BATTERIES

60 v.	7/6
30 v.	4/6
60 B.B.C.	8/11
30 B.B.C.	5/6
9 v. B.B.C.	2/6
1·5 (D.E.)	1/9

Eveready 66 v., 36 v., 108 v. stocked.

D.C.C. WIRE per ½ lb.

18 or 20 g.	9d.
22 g.	10d.
24 g.	11d.
26 g.	1/-
28 g.	1 2

16 D.C.C. 2,6 lb.

BASKET COILS

Chelmsford 11d.
Also at 1/-, 1 3, 1/6
B.B.C. Duplex Waxless set of 5 1/6
Extra air space, ½ in. (25, 35, 50, 75, 100).
Wave-lengths given.

GOSWELL QUALITY COILS

Mounted on Plug.

25	1/6	100	2/9
35	1 9	150	3/-
50	2/-	175	3/6
75	2 3	200	3/9

Why pay high prices?

SWITCHES

D P D T, china base	1 4
S P D T ,, ,,	10½d.
Panel D P D T	1/-
,, S P D T	10½d
Ebonite D P D T	2/3
,, S P D T	1/3
Tumbler	1/-
On and off	10½d.

VALVE HOLDERS

Legless	1/-
Solid Rod	1/-
Climax	1/6
Murray	1/3
Under Panel	1 3
Templates	1½d.

NEUTRODYNE CONDENSERS

Ormond	2/-
Colvern	3/6
Success	3/6
Vernier (Colvern)	2,6

WARNING!

Customers entering premises adjoining without seeing the name RAYMOND on windows, do so at their own risk.

SPECIAL!

Leatherette Boxes with Lid 2/3 and 2/11
Re-echo Crystal Sets 13/11

VARIOMETERS

Inside Winding	6/11
Edison Bell	10/-
Igranic	10/-
Very good value	1/6

Many others

HEADPHONES

N & K Model 4,000	8/11
Telefunken Type	8/11
Lightweight	7/11
Dr. Nesper	11/9
Ericsson EV	11/9

VALVES

Dutch Detectors	4/6
"R" type	4/6
·06 Dutch	11/-
Phillips "R"	6 6
French "R"	5/11

RADIO MICRO ·06 THE WONDER VALVE

H.T., L.T., or D. 3 volts. 11/-

METAL ·06

Be sure "METAL" is Stamped on Valve and avoid imitations.

One to each Customer at 10/- Regular Price 11/-

ALL VALVES REDUCED

(Marconi, Ediswan, Mullard, Cossor, Myers, etc.

VARIOMETERS

Very Special 200/650 metres. All ebonite. Double silk wound, callers only 4/-

TERMINALS (Complete)

W.O., Pillar, 'Phone, brass, 1d. each; nickel, 2d. each; stop and valve Pins, ½d.; nuts, various, 6 a 1d.
Valve Sockets 1d., 1½d.
Flush panel do. 1d.
Spade Tags 6 a 1d.
Do. Terminals 2 for 1½
do. Pins 2 for 1½d.
Screws and nuts 2 a 1d.
Switch arms 7d.
Nickel arms 10½d.
Studs, complete 2 a 1d.
'Phone connectors 1d.
2 B.A. Rod ft. 2d.
4 B.A. Rod ft. 2d.
Valve windows 4d.
Washers 12 a 1d.
Shorting plug and socket 3½d.
Shellac 5d.

H.F. TRANSFORMERS

For Chelmsford 2/9
For B.B.C. range 2/6
Energo, McMichael, Bowyer-Lowe stocked.

MANSBRIDGE FIXED T.T.C. GREEN

·25	2/9
1 mfd.	3/6
2 mfd.	4/6

CALLERS' SNIP SQUARE LAW VARIABLE CONDENSERS

·0005	5/-
·0003	4 11

Complete with Knob and Dial.

Var. gd.-Leaks	1/-
Fixed 2 meg.	9d.
Battery Links	3 for 2d.
Ins. Hooks	2 for 1½d.
Egg Insulators	1d.
Reel ,,	2 for 1½d.
Ins. Staples	5 a 1d.
6ft. 'phone cords	1/-, 1/3
Sleeving	3 yards 9d.
Tinned Copper 18 g.	5d.
⅛ Bus bar, hank	6d.
Knobs, 2 B.A.	2d.
Wander Plugs	1½d.
Strip Aerial, 100 ft.	2/-
7/22 Heavy, 100 ft.	1/10

COIL STANDS

Ebonite, 2-way	1/9
With ex. handles	2/3
Nickel ,,	2/8
3-way	from 3/11
Basket Holders	8½d.
Best quality	1/-
Basket spikes	7d., 9d.
Anti cap. handles	9d.
Lead-in Tubes	6d.
Sorbo Ear Caps pr.	1/3

2-col. Flex, 36 ft.	1/6
Lighting do. 36 ft.	1/6
Twin silk doz. yds.	1/-
Lead-in, thick, yd.	3d.
Do., good, 10 yds.	1/-
Rheostats, C. & S.	1/-
Ormond	1/9
Ebonite Former	1/6
With dial	1/11
Shipton, Igranic, Burndept, McMichael, etc.	

SPECIAL!

Customers purchasing 20/- worth of our own goods (at full prices only) are allowed to buy a first-class pair of phones for 5/-, 4,000 ohms, as an advertisement. One pair to each customer. This offer must be taken advantage of at time of purchase.

VALVES for UNIDYNE Circuit 11/-

RIGHT OPPOSITE DALY'S GALLERY DOOR

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RADIOTORIAL.

All Editorial Communications to be addressed The Editor, POPULAR WIRELESS, The Fleetway House, Farringdon Street, London, E.C.4.

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 are answered by post at a charge of 6d. a query and 1/- per full wiring diagram. All queries must be addressed to the Technical Query Dept., POPULAR WIRELESS, The Fleetway House, Farringdon Street, E.C. 4, and must be accompanied by a stamped and addressed envelope. Copies of the queries sent should be kept, as the original question cannot be reproduced in the answer. Cash should be sent in the form of postal orders.

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 specialities 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

R. M. L. (Manchester).—I have built the "Household Loud Speaker Set" described in "P.W." of Feb. 7th, except for the purchasing and wiring up of the L.F. transformers. As no particular makes seemed to be advised I decided to write and ask whether it was an important feature or whether any type of transformer would do.

The exact make, so long as it is a good one, is not important, but for best results the transformers should be chosen for the task they have to perform. For instance, the second transformer should be properly designed for second stage amplification, or distortion may occur. You should stipulate a second stage transformer when ordering, or else buy one of about 2·7 or 3 to one ratio. If distortion occurs a ·002 mfd. fixed condenser across the primary of the second transformer may help, while a power valve should be used for the last valve if good reproduction is to be obtained.

* * *

D. M. T. (Chesham).—I wish to build a valve set capable of picking up most of the B.B.C. stations on 'phones. As this place is situated in a hollow a 3-valve receiver will probably be necessary. I should like to use the tuned anode method of H.F. coupling, and separate H.T. tappings for each valve. What apparatus shall I require (apart from H.T., L.T., valve and coils), and how shall I connect it up?

The necessary components are as follow: 3 fil. rheostats, 3 valve holders, 1 two-coil holder, 1 single coil holder, 1 L.F. transformer, 4 : 1 or 5 : 1 ratio, 1 grid condenser and grid leak, arranged so that the grid leak can be connected to L.T. instead of across the condenser, ·0005 mfd. variable condenser, ·00025 variable condenser, 1·001 mfd. fixed condenser, 4 H.T. wander plugs, 1 D.P.D.T. switch, and about 10-12 terminals and wire for connecting up the set. The point to point wiring is given below, the series parallel switch being included. Aerial terminal to centre of ·0005 variable condenser, and to top right of D.P.D.T. switch. (The switch is pictured as lying on the panel so that its 6 connections form three vertical columns of 2 points each. The arm therefore moves from left to right and vice-versa.)

Other side of condenser to top left of switch and to bottom centre.

Top centre of switch to aerial coil and grid of 1st valve, and bottom right of switch to aerial coil (other end) and earth terminal. The bottom left of

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RADIOTORIAL QUESTIONS & ANSWERS.

(*Continued from page* 48.)

switch is not connected to anything. (Double coil holder used for aerial coil and reaction, of course.)

Continuing the circuit we have plate of 1st valve to one end of single coil holder (anode coil), and to one side of ·00025 variable condenser, and to one side of grid condenser. Other side of anode coil to other side of ·00025 condenser and to H.T. pos. wander plug. Other side of grid condenser to grid of second valve and to one end of grid leak.

Plate of second valve to one end of reaction coil, other side of which goes to O.P. of transformer. I.P. to H.T. + wander plug No. 2. The ·001 fixed condenser is connected one side to O.P. and one side to I.P. of L.F. transformer. I.S. of transformer to grid of third valve, plate of third valve to 'phones, and 'phones on to H.T. + wander plug No. 3. H.T. − to L.T. + and to earth. L.T. + to one side of two of the 3 fil. rheostats, and the other side of these two to one fil. connection on either of the 1st and 2nd valves. The remaining filament connections of the 1st two valves go to L.T. −. L.T. + goes also to free end of grid leak and to filament connection of 3rd valve. The remaining fil. leg of this valve is then connected to the fil. resistance (No. 3) and thence to L.T. −. The final connection is O.S. to L.T. −.

* * *

E. B. W. (Weston-super-Mare).—Having built a two-valve Unidyne, I am having trouble in making the valve oscillate when the L.F. valve is switched in. With the detector only, everything is quite O.K., but on switching the L.F. in I find very tight reaction coupling is necessary before the set will oscillate. Amplification seems to be O.K., and changing the connections of I.P. and O.P. and O.S. and I.S. of the transformer only decrease the amplification without assisting in the oscillation problem.

In all probability you would find that a ·002 mfd. fixed condenser across the I.P. and O.P. connections of the transformer would assist matters, while the reversal of the transformer itself may be beneficial. This means leaving the *connections* to the transformer as they are at present, but moving the whole instrument so that the secondary side faces where the primary used to face, and vice-versa. It has been found that occasionally the field of a transformer will oppose reaction, and until the transformer has been reversed all efforts at obtaining satisfactory reaction have been fruitless.

* * *

J. M. H. D. (Cheltenham).—Having a 3-valve set (H.F., det., and L.F.), I wish to add a 2-valve resistancecoupled amplifier. The last valve, of course, is now transformer

(*Continued on page* 51.)

The "P.W." Technical Queries Department.

REVISION OF RULES.

Owing to the extraordinary growth of the POPULAR WIRELESS Queries Department, the Editor is compelled to revise the regulations governing the answering of readers' queries, and the following new arrangement is now in force:—

(1) A charge of 6d. is made for every query sent to the POPULAR WIRELESS Queries Department. The "three for a shilling" regulation is cancelled.

(2) A charge of 1/- is made for supplying full wiring diagrams.

(3) All queries, together with postal orders and stamped addressed envelope, to be addressed to—

TECHNICAL QUERIES EDITOR,
POPULAR WIRELESS,
The Fleetway House, Farringdon Street,
London, E.C.4.

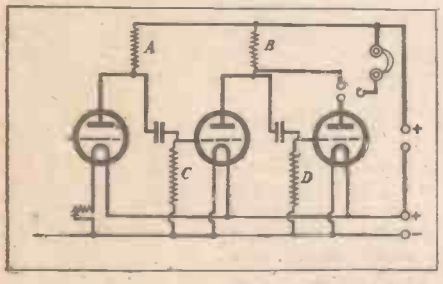
(4) Technical queries will not be answered by telephone.

RADIOTORIAL QUESTIONS & ANSWERS.

(*Continued from page 50.*)

coupled, so that I presume the plate of that valve will go to the resistance coupling for the first resistance coupled valve. Will it be possible to switch off the last valve so as to use one resistance-coupled valve only ?

The required circuit is enclosed, and the grid of the first valve shown is the grid of your present L.F. valve, coming from the L.F. transformer, of course. Its plate should now be taken to A instead of to



'phones, and thence to H.T.+. This H.T.+ can have a common tapping with the other resistance-coupled valves, but should not be common with the H.F. and det. valves, as the resistance-coupled amplifiers need a much higher voltage than is necessary for H.F. and det. stages.

As regards the values of resistances and condensers, the following should be about correct :- A = 70,000 to 100,000 ohms, B = 70,000 – 100,000 ohms, C = ·5 – 1 megohm, D = ·5 – 1 megohm. The grid condensers in each case should be about ·02. mfd.

* * *

P. K. (Colchester).—I have made several ultra coils, and have used them with very good results. They certainly increase both signal strength and selectivity, but can an ultra coil be used as a wave-trap additionally to another coil-ultra or ordinary—for tuning ?

Yes, an ultra coil can be used in several ways purely as a wave-trap and additionally to an existing circuit. It can be placed in both series and shunt positions and it is both interesting and instructive to experiment with it in this manner. Further articles describing the numerous applications of an ultra coil will shortly appear in this journal.

* * *

A. D. P. (London, E.).—Are vernier condensers essential in the Super-selective circuit ?

Absolutely, and they should also be of the square-law type if possible.

OSCILLATING CRYSTALS.

(*Continued from page 10.*)

On switching in the 15-volt battery, a current of 4 to 10 milliamperes may pass through the contact. Sometimes oscillations will commence at once, and be heard in the telephone like the note of a very distant steam syren, or the whistle that announces 2 L O is about to broadcast. Sometimes these can be heard many yards away, with the telephones lying on the table, but a convenient position for them is round the neck. More often it is necessary to stir up the steel contact for a minute or two, with the point of a pen or anything handy, in order to start the oscillations.

To raise the note, cut out inductance or capacity in the oscillating circuit, or reduce the blocking resistance, so as to add to the volts on the crystal. It will be noticed that the oscillating are itself gives out the musical note, and when suitably mounted on a diaphragm, no ordinary telephone is wanted. In general, it will be found more difficult to keep the frequency constant than the amplitude ; or, in other words, the pitch than the loudness.

(*Continued on page 52.*)

OSCILLATING CRYSTALS.

(Continued from page 51.)

High-Frequency Oscillations.

Up to this point no difficulty will have been met with that a fairly able experimenter cannot easily overcome, but L.F. crystal oscillations are of no known use, except perhaps to make a buzzer wave-meter. The L.F. must be turned into high frequency before it can be used to amplify weak signals and to heterodyne. Also, it must be generated in a steady stream, not in bursts, even if the waves are of the right frequency and amplitude. We cannot amplify with a buzzer wave-meter, although we can tune-in with it. Steady sine wave oscillations from the crystal are most essential.

This difficulty of generating constant H.F. oscillations seems to be entirely one of obtaining a good point on a good crystal. It should be borne in mind that H.F. amplification, even with valves, is not easy. It will be found a simple matter to start a tuned H.F. circuit in oscillation when joined in parallel with an L.F., but not to switch off the latter without stopping the H.F. A two-stud switch should be used, with an idle stud in between, and neither inductance nor capacity should be common to the two circuits. Unless the L.F. is switched off, the H.F. can only be used for tuning-in purposes, not for heterodyning.

Amplification.

There can be no doubt the best purpose an oscillating crystal can serve would be to amplify weak broadcast telephony, so that it could be heard perhaps for another ten miles radius. If this could be done without alteration to existing crystal sets it would be an advantage, and luckily this is possible of accomplishment.

If the wireless signal is so weak as to be almost, or quite, inaudible—i.e. below the strength at which the galena or other rectifying crystal begins to rectify, the added energy from the crystal, though small, may cause the signal to be amplified many times, and heard when it would not be so otherwise. If then we put our oscillating crystal direct in the aerial circuit of an ordinary crystal receiver and shunt it with a battery and blocking resistance, on slowly and gradually raising the volts on the crystal we shall finally reach the top of the curve, where the resistance vanishes, and amplification will be called into operation by each H.F. wave that comes down the aerial, positively or negatively.

Any rectifying action there may be at the zincite should not oppose the rectifier in the set. The zincite should be joined to the aerial, the negative (zinc) pole of the battery to the zincite, and the steel to the galena of the ordinary rectifier.

It will be seen that the aerial current does its own tuning by a kind of trigger action in this circuit, but, of course, there remains amplification by means of a separately tuned, coupled oscillation circuit; and reception by slightly detuning one circuit so as to give a beat note of audible frequency. This method brings in C.W. signals, and probably explains why they have occasionally been heard with a crystal not known to be oscillating.

Low resistance crystals are said to work best for giving the necessary continuous stream of waves without which heterodyning is impossible.

Various circuits have been devised for rectifying and amplifying with one crystal only. Theoretically, it can be done by working just on the top of the curve, but it must always need great delicacy of adjustment, and may well be left out of consideration at present.

Transmission.

To anyone able to obtain a licence for transmission, there is no need to explain how to use an oscillating crystal for the purpose, after heterodyning with it has been mastered. The energy available must be small, as switching the oscillating circuit on or off makes very little difference to the current taken from the cells which give out, perhaps, one-twentieth of a watt when the crystal is oscillating freely.

Oscillation can seldom be started till the tick of a watch, placed close to the oscillator, can be heard microphonically; and when the oscillation note ceases the tick does also. With one particular crystal, a low note could be heard in the telephone with 3 milliamperes and became too high to be audible when 12 ma. was reached. An exceptional low-loss specimen began with 1½ ma. and became inaudible with 10 ma. With still more current it might be possible to tune-in some of the very long-wave stations without switching over to a separate H.F. circuit. L.F. crystal amplification still remains untried, so far as the writer is aware.

"D.X." WITH A UNIDYNE.

The Editor, POPULAR WIRELESS.

Dear Sir,—Up to a week ago I regarded my Unidyne set as a common radio receiver, just about equal to an ordinary H.T. one-valve set. To-day I regard it as worth ten one-valve H.T. sets.

My set is a two-valve Unidyne in construction, but as yet I only use *one* valve. Owing to some slight defects I re-wired it, and now receive most excellent results. Last evening, after ten o'clock, I tuned in to Cardiff (twenty miles away), Bournemouth, Belfast, London, Petit Parisien, and two unknown foreign stations. All came through quite loud; in fact, all were as loud as I have usually got Cardiff, which means to say that every syllable was plain enough to be heard, without stopping the usual household talk.

Taking into consideration that I live in an area where it is considered a miracle almost to get 5 W A on a crystal, and no mean feat to get a one-valve H.T. set working, this is extremely good.

With a suitable transformer I hope to get my two valves working, and then I'll start a sort of S.P.U. (Society for the Propagation of Unidyne) in this area.

Thanking you for your most valuable discovery, and helpful articles in "P.W."

Yours respectfully,
N. LUKEY-DAVIES.

75, High Street, Mountain Ash, Glam.

(Continued on page 53.)

CORRESPONDENCE.

(Continued from page 52.)

EIGHT U.S. STATIONS IN ONE NIGHT.

The Editor, POPULAR WIRELESS,

Dear Sir,—I cannot allow the post-script to Mr. W. J. H. Croom's letter, in your issue for January 1st, to go unchallenged. In October I received the following eight American stations in a single night from 2.30 a.m. to 4.30 a.m.: W G Y, Schenectady, N.Y., 380 m.; W B Z, Springfield, Mass., 337 m.; K D K A, E. Pittsburg, Pa., 326 m.; W J A X, Cleveland, Ohio; W F I and W I P, Philadelphia, 395 and 509 m. respectively; W M A F S, Dartmouth, Mass., 360 m.; W E A F, New York City, N.Y., 492 m.; and in addition four others which I was unable to identify, owing to shortage of time. All were of good 'phone strength on two valves, W G Y, W B Z and W J A X coming in on the loud speaker, and with an extra stage of L.F. W B Z could be heard upstairs, and all the others, except W I P, were comfortably audible. In addition to these I have had W T A M, Cleveland, Ohio, 395 m.; W O R, Newark, N.J., 405 m.; C K A C, Montreal, Can., 425 m.; and another station, presumably on the west coast, of which I could only get the letters K W. Perhaps one of your readers may be able to identify it for me. Its wave-length was 330-340 m., date about 5 a.m., Dec. 14th last, and it was giving orchestral selections.

I can receive W G Y at almost any time after dark. The earliest time I have heard it is 7.15 p.m., and for the past week I have regularly had it at 11 p.m.—I experience no interference from either 2 Z Y or 6 B M.

The circuit is a special regenerative one with two stages of L.F. (with a switch for one or two at will). The last valve is very little used, as most of the B.B.C. come in quite loud enough on an Amplion Junior Loud Speaker for most rooms on the two valves (M O, D E R'S). Speech from 5 I T and 5 N G, the two nearest, can be distinctly and easily heard 100 yards from the mouth of the instrument.

Yours faithfully,

The Cot, Oxendon, Market Harborough. E. A. BLAND.

SAFEGUARDING OF BRITISH INDUSTRIES.

To the Editor, POPULAR WIRELESS.

Dear Sir,—Concerning the scheme proposed by the Government for safeguarding certain industries, we beg to state that we have extremely pronounced feelings in regard to this matter, as it is one of the very greatest importance to the radio industry. The writer has for some time been collecting information with regard to the highly serious position with reference to loud speakers and headphones which are coming from the Continent, particularly Germany.

Quite recently a manufacturer called and handed to the writer a sample pair of headphones, and offered to supply 20,000 from London stock at 4s. each. Two days previously a German manufacturer who had already sold 200,000 offered at 5s. 3d. In the same week an Italian instrument was quoted at 5s. These instruments are comparable with the average British made headphone which sells at four times the price.

If some serious steps are not taken immediately we are convinced that the new industry which is being built up in this country and giving employment to tens of thousands of people who would otherwise be unemployed, will gradually be lost to the foreigner, thus involving the manufacturer who has embarked his capital in very heavy losses.

At the present moment, still taking headphones to support our argument, there are probably ten foreign instruments sold out of every twelve in this country. When one remembers that the British manufacturer shouldered the original financial burden which enabled broadcasting to become possible in this country—the Germans paid nothing—it will be seen that the radio industry has a very strong claim to rank as one of the proposed protected industries.—Yours faithfully,

C. A. VANDERVELL & Co., Ltd.
(Signed) F. S. Hooker,
Director and General Manager.

Acton, London, W.3.

IMPROVING "P.W." SET TONE.

To the Editor, POPULAR WIRELESS.

Dear Sir,—Among various sets with which I have experimented, I have had a "P.W." Combination Set in use practically ever since the little book in which it is described was published, but never until a quarter of an hour ago have I heard the bottom notes of the organ boom out as they should do.

This result was achieved by putting a ·006 mfd. (two noughts six) condenser across the secondary winding of the transformer, in place of what I believe was originally ·001 mfd. The result is astounding. I am listening to the Hallé Concert relayed from Manchester whilst writing this, and apart from the bottom notes of the organ crashing forth as they should do, the clapping sounds like clapping—not that usual cracked sound.

If any of your other readers are interested in this point, they may find that ·005 mfd. is preferable to ·006 mfd., as I have rather overdone the suppression of the higher notes.

I am impatiently waiting to hear the boom of Big Ben.

Yours faithfully,

S. H. DENNINGTON.

52, Hemberton Road, Stockwell, S.W.9.

(Continued on page 54.)

CORRESPONDENCE.

(Continued from page 53.)

THE TWELVETREES REFLEX.

The Editor, POPULAR WIRELESS.

Dear Sir,—I have constructed Captain Richard Twelvetrees' three-valve reflex set, as published in P.W. No.'s 140-141, and am writing to you to let you know how grateful I am to have such a set. I have been two years looking for this circuit. These are some results, living about one and a half miles from 2 L O:

*2 L O. Terrible roar on Amplion A R 19.
*2 German stations loud on Amplion A R 19.
*School of P. and T. loud on Amplion A R 19.
F.L. France loud on Amplion A R 19.
Newcastle loud on Amplion A R 19.
*Birmingham, very loud on Amplion A R 19.
Chelmsford, same as London on Amplion A R 19.
Radio-Paris, not very good, but put this down to coils not being correct for wave-length, as I had not two the same so loaded one.

*This means with 2 L O working, using a wave-trap.

Well, I think that you will agree with me that this is very good for one evening, and one hour on Sunday. Some components used:

R.I. Transformers (old type).
Gambrell coils.
Ormond condensers, ·0003.
Raymond condensers, ·001 A.T.C.
Neutron crystal, very important as to crystal.
Edison Bell fixed condensers.

Thanking you once again,
I remain, yours faithfully,
W. O. MANNERINGS.

27, Richmond Crescent,
Barnsbury, N.1.

A YEAR'S D X WORK.

To the Editor, POPULAR WIRELESS.

Dear Sir,—Your readers may perhaps be interested in the following:

On a detector and 1 L.F. set, during 1924, I logged over 1,000 different American and Canadian amateurs. About 5,000 log entries were made during that time. I have also received signals from Mexico, North Greenland (W N P), Argentine, Australia, New Zealand, etc. The Americans often come in at midday here when the whole of the Atlantic is in sunlight. The earliest I have heard them is 6.30 p.m., G.M.T. One-day, at 3.40 p.m., I heard G H H, Mosul. His signals were much weaker than usual. Signals from my own station, 6 L J, have been received in many parts of North America, including San Leandro, California. The best D X is Z 4 A B, Dunedin, New Zealand. I have worked with 30 Americans and two Canadians (44 times) in one month. On Christmas Day I worked with G H H, Mosul, operated by Capt. Durrant, and took a message from him for his relatives.

My station is located in a valley and the aerial is very short, and is 10 to 20 feet below the tops of the neighbouring trees and houses.

Yours faithfully,
S. K. LEWER,
G 6 L J.

32, Gascony Av., West Hampstead, London, N.W.6.

THE "TWO-FOUR" VALVE SET.

To the Editor, POPULAR WIRELESS.

Dear Sir,—I feel I must send you a line in praise of the "Four Circuit" two-valve set published in your issue of 17th January. I wired it up as a "dual," omitting the switches, and the results are much better than any I have yet tried.

Just within two miles of the Hull relay station, it gives more than I want on the loud speaker. Further, I am able to get Manchester when Hull is working, and this without any wave trap. I may say that with circuits I have previously tried Hull has drowned everything up to 400 metres.

Last night I got Birmingham at very good 'phone strength—a station I have found very difficult to hear in Hull. I also got Hilversum, and several German stations.

The tuning of the secondary condenser is extremely sharp, and I was also a bit puzzled as to the correct coils to use, but this is only a matter for experiment, and no doubt I shall get further results.

I can without hesitation say it is the best two-valve circuit.

Yours faithfully,
E. W. GRESSWELL.

16, Arnold Street, Hull.

W G Y ON UNIDYNE.

The Editor, POPULAR WIRELESS.

Dear Sir,—You may be interested to hear that at one a.m. on Tuesday morning last (February 3rd) I picked up W G Y, Schenectady, N.Y. (380 metres), on a one-valve Unidyne set which I built about two months ago from particulars given in POPULAR WIRELESS. A mixed concert programme came through at quite good strength, with the call sign of the station given clearly between each item.

There was very little distortion—far less than when I have heard American stations relayed through a British station—neither was there much fading.

I listened until about 1.45 a.m., and then switched off.

Yours faithfully,
HUGH OVENDEN.

Holmfield, Whitestake, Preston.

TECHNICAL NOTES.

(*Continued from page 19.*)

the Royal Society. It was by no means certain, at that time, that such a thing as an electron, in the modern meaning of the term, really existed.

Electrons in Valves.

Talking about electrons, the question is often asked as to how many electrons travel across from the filament to the plate in a wireless receiving valve. Obviously, it depends upon the current which is passing in the plate circuit, but I believe that for each milliampere there are something like 6×10^{15} electrons per second (that is, 6 with fifteen noughts after it). I haven't troubled to work it out, but all you have to do is to look up the electronic charge and divide it into the current (in the same units). I believe, if I remember rightly, the actual value is more like 6·13 multiplied by 10 to the power 15. Somebody with a passion for popular statistics once made the computation that the number of electrons that pass every second through the filament of an ordinary 16-candle-power electric lamp is so great that it would take two-and-a-half million people, each counting two electrons every second, twenty thousand years, of 24-hour working days, to count an equivalent number. So it is evident that quite a number of electrons pass over per second from the filament to the plate of your valve.

Thunderstorms.

A French scientist, M. l'Abbé Gabriel, has put forward a theory, with a good deal of evidence to support it, that thunderstorms have a definite cycle of maxima and minima of activity. He claims to have discovered that, for a period of seven years, electrical storms will be at a minimum, then for twenty years they will occur at a more or less average rate, and this period will be followed in turn by ten years of exceptionally heavy rain and electrical disturbances. In order to reassure wireless listeners, it should be mentioned that M. Gabriel states that we are just entering upon a period of *minimum* activity.

Musical Valves.

The singing arc was a favourite scientific toy many years ago, and during more recent years the singing valve has been much experimented with. In fact, one inventor in America actually made a miniature "organ" with different valve circuits, differently tuned, so that when set into oscillation they produced different notes in the reproducer. In this field of research, although it does not appear to be of great importance at the moment, it should be noted that Dr. Lee de Forest was probably the pioneer, as he was in so many other branches of wireless development. He described experiments with singing circuits some years ago.

Short Waves.

I have remarked on previous occasions in these notes upon the growing importance of short-wave wireless, and now comes the news from France that the cathode-ray oscillograph has been successfully used for the detection and examination of wireless waves down to 30 cm. (about one foot)

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TECHNICAL NOTES.

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wave-length. The frequency of these waves is about one thousand million vibrations per second. The shortest wireless waves which have ever been produced by wireless methods, and detected by similar methods, were of a wave-length of ½ mm. This work was carried out by Nichols and Tear about a year or two since, but the waves were not used for the transmission of messages. It seems very probable that short waves will become of extreme importance in the future of wireless transmission, and the serious experimenter should keep a careful watch in this direction.

Saving Time.

The experiment suggested in the following (quoted from "Popular Radio," N.Y.), although it is simple in the wireless sense, is an interesting example of the great facilities introduced by radio. "Mr. Paul Specht, an American musician who recently completed an English concert tour with his band, has recommended some additional American bands and orchestras for English engagements. In order that the British agents may hear these bands and judge of them without the necessity of crossing the Atlantic, Mr. Specht will arrange, it is announced, that the performance of these bands shall be broadcast in New York, picked up in England, and submitted to the English agents in that way."

Tuning Signal.

To correspond with the tuning note used in this country, the Breslau (Germany) broadcast station uses a loud-ticking metronome. This is operated for some time before the regular programme is broadcast. The ticks enable listeners to distinguish clearly the loudness of their reception and so to finish their tuning arrangements before the programme starts.

Another Method.

The Hamburg station employs a brass gong, which after being struck continues to sound for some considerable time. After each number, two-minute intervals are recorded by two strokes on this gong to assist listeners in tuning. These are followed by a single stroke which indicates the commencement of a new selection.

New Sodion Valve.

The sodion "tube" which has been referred to in these columns on several occasions, has now been produced in a new and improved form. It will be remembered that the sodion valve contains sodium metal, which is heated by means of a special heating coil so as to cause it to emit ions, upon which the functioning of the valve depends. The original form of this valve would not oscillate, nor could it be used in most ordinary circuits without some modifications to the circuits. The new sodion valve will oscillate, and may be introduced into standard circuits without any adjustment, moreover, it has been made so that it will plug into standard valve-holders. A full account of this new valve, together with results of tests, will be found in "QST" (the Journal of the American Relay League), Dec., 1924.

Spans the World

How wonderful to listen to a fellow creature talking on the other side of the globe! More wonderful to be able to reply to him.
With Mullard Valves the first **two-way connection between England and U.S.A., Australia, Argentine and New Zealand** was established, and these valves that can pick up and give you this wonderful power of communication are just the **standard Mullard Receiving Valves,** obtainable from all dealers. They will give perfect reception from *your* local Broadcasting or Relay Station. Why **shouldn't they?**

Mullard
THE · MASTER · VALVE

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R/R