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and Wireless Review

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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.

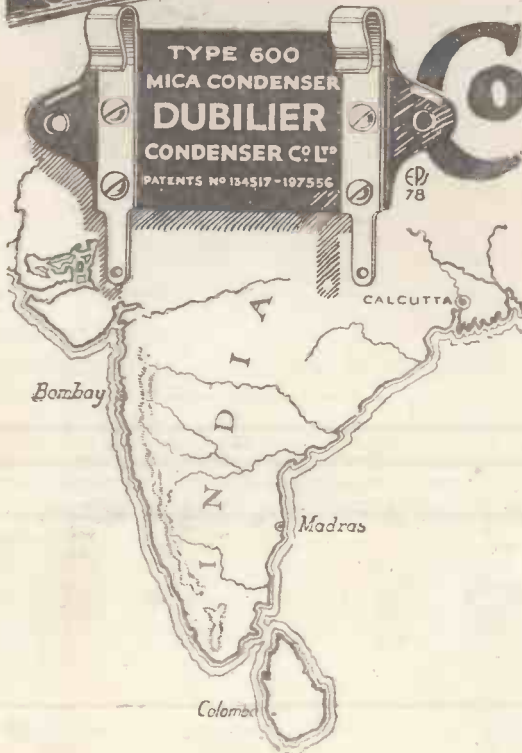
More About Oscillating Crystals.
Electric Television.

Loud Speaker Reception.
"Getting Beyond."

The Amateur's Portable Set.
A DX Crystal Circuit.

Technical Notes.

The "P.W." Time Table.



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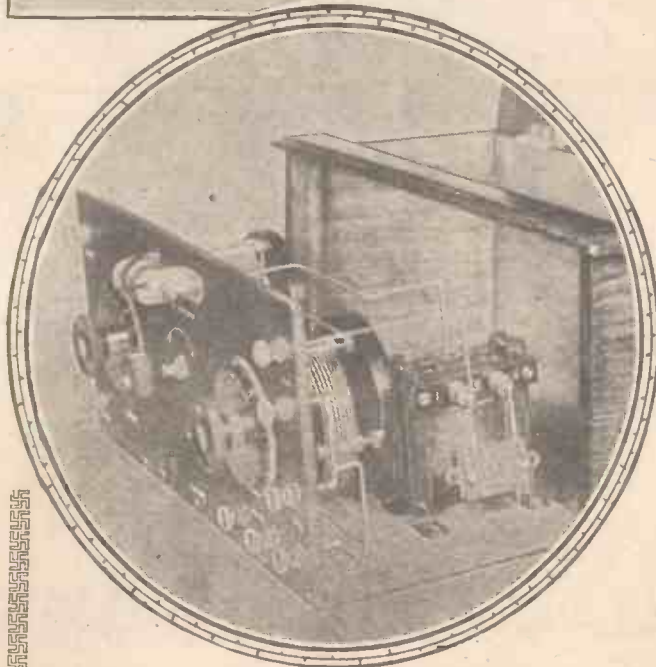
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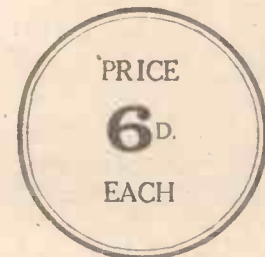
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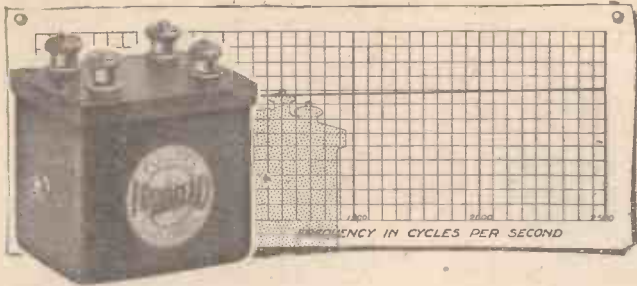
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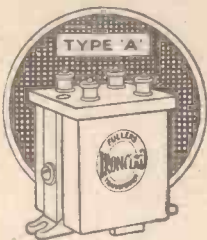
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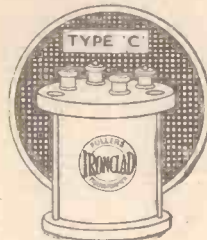
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Glance at the characteristic curve of the Type "B" Ironclad Transformer—note the flatness throughout practically the whole range of audible harmonics. This shows why its amplification is so extraordinarily natural.

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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 Montpellier (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, Montpellier, 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 admired 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 Stuttgart 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 KDK 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 "DX" 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 going 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.

FIRE 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 5XX feel jealous. They certainly succeeded in astonishing a Vienna listener who was searching round on Det. and 2LF; 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 Bridgewater. 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!

"Mesopot 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 Berkhamstead, 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.



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

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.

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

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.

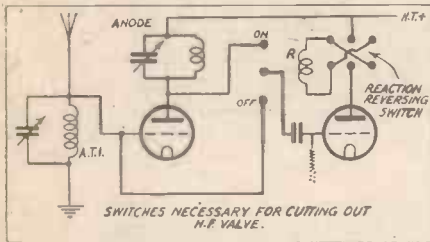
Need for Grid Bias.

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



SWITCHES NECESSARY FOR CUTTING OUT H.F. VALVE.

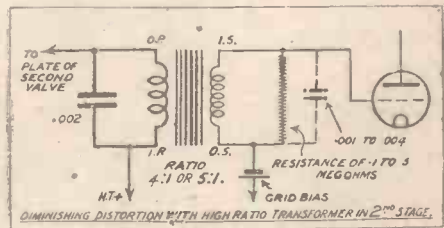
with a further look at the loud speaker fully explained the reasons for the peculiar mixture of asthmatical wheezing and hoarse, guttural sounds that I had been told was the "London station," and with which I had been greeted as soon as I entered the house. The set, by the way, was situated at about 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



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 $1\frac{1}{2}$, 3, $4\frac{1}{2}$ 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.

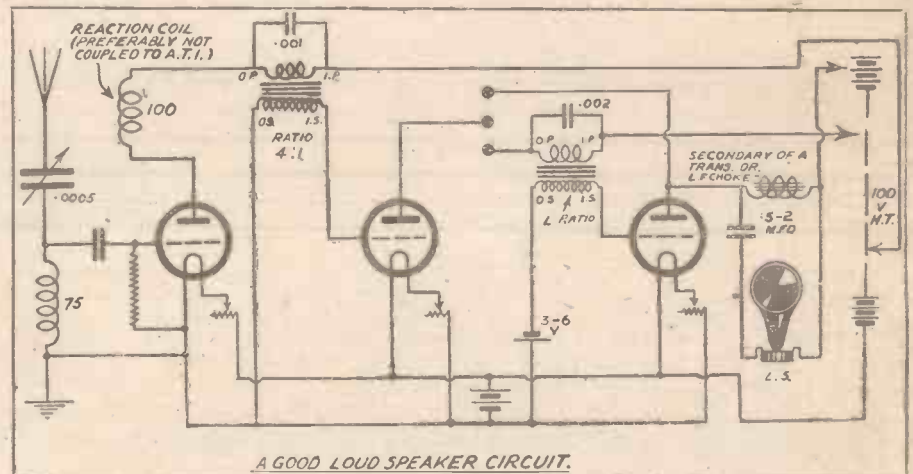
In the former case all valves, in whatever set they are to be used, should be chosen for the purpose they are to fulfil. For instance, it is sheer waste of money to buy a valve designed for H.F. or detector work and to expect it to give good service in the second stage of an L.F. amplifier.

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



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

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

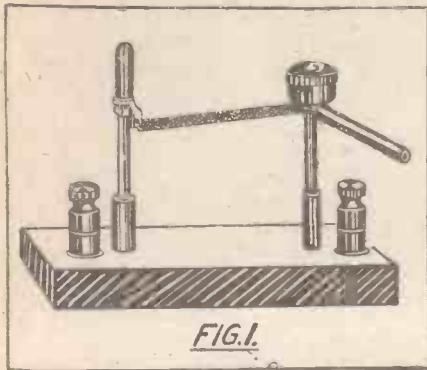


FIG. 1.

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

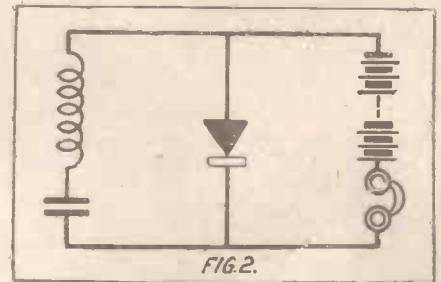


FIG. 2.

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 $\frac{3}{4}$ 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.)

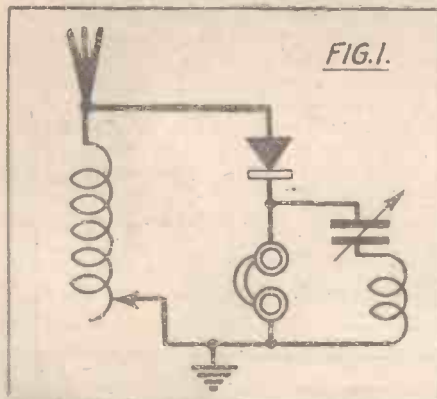


An operator at the Nash Point Station adjusting the wave-length of the C.W. sets by means of a wave-meter.

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

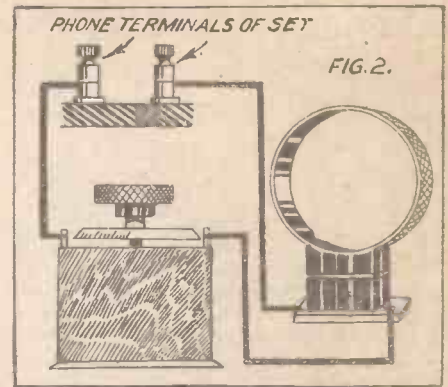
Bournemouth and Glasgow was fairly regular, but the other two stations could only be received when conditions were especially favourable. In order to test whether this reception was due to the circuit used, the writer had a switch connected so that the 'phone coil could be short-circuited. Transmissions 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.



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.)



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.

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.

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

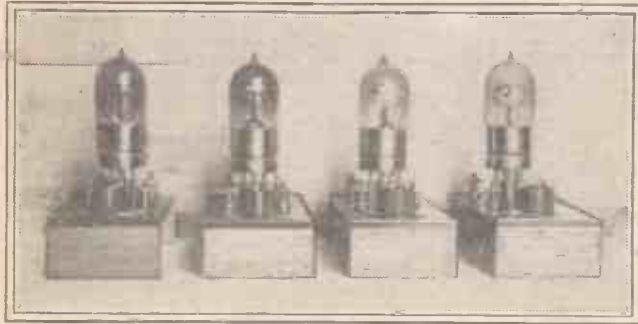


Fig. 1.

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.

that his scope for experimenting is increased at every step towards the multi-valve stage.

Construction of Valve Panels.

Fig. 1 shows a set of experimental valve panels which should now be made up. The ebonite panels are $\frac{1}{4}$ in. in thickness and $7\frac{1}{2}$ 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.

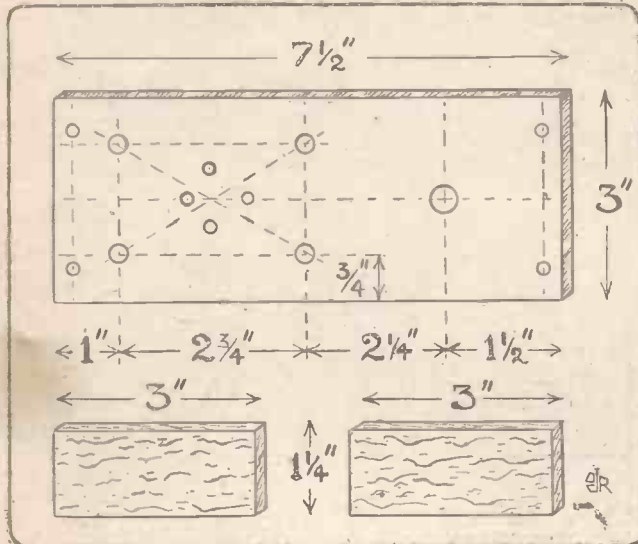


Fig. 2.

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

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)



Fig. 3.

grid and plate, and the two lower terminals (left to right) L.T. negative and positive.

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.

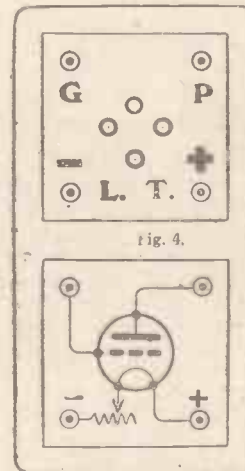


Fig. 4.

Two strips of wood, each 3 in. long by $1\frac{1}{4}$ 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

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.)

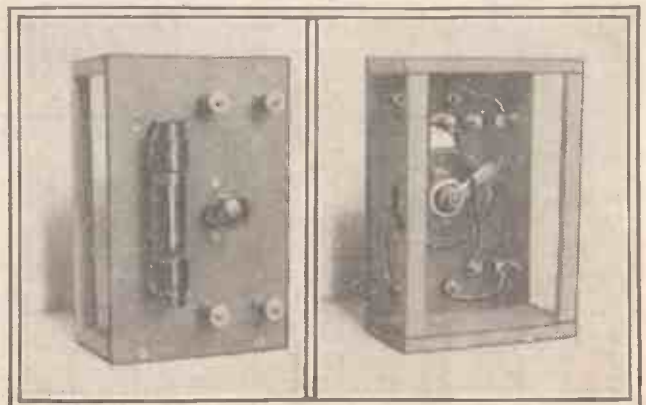


Fig. 5.

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

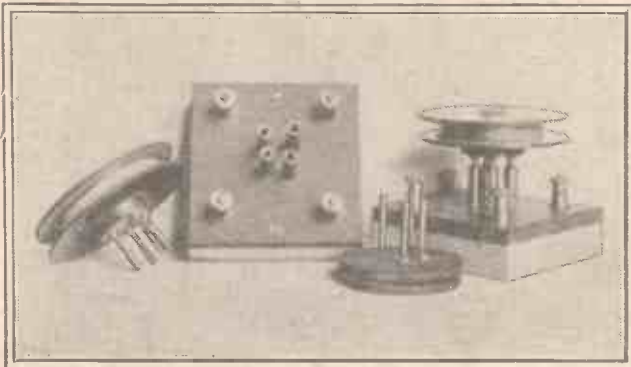


Fig. 6.

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 1 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.

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 X 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 of the aerial it is often necessary to load the variable condenser (or, in effect, the coil) with a fixed condenser of .003 mfd. capacity, as shown. A .002 mfd. fixed condenser is connected across the telephones.

Useful Reflex Circuit.

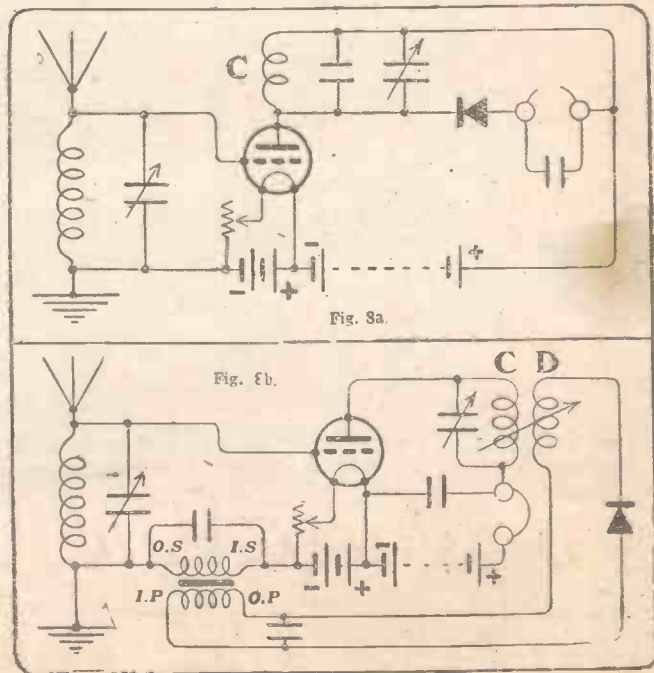
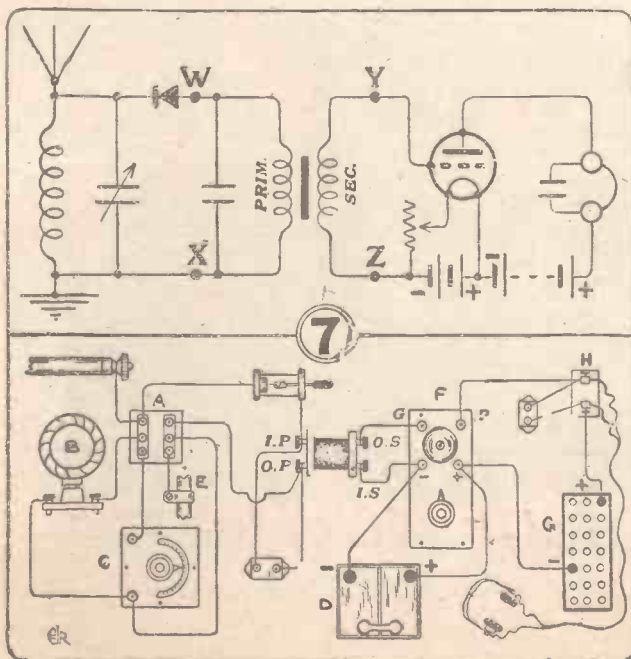
In the lower diagram (Fig. 8b) the valve is made to function as a high and low frequency amplifier simultaneously. This is a simple single valve "reflex" circuit which might also be tried. The coils C and D are mounted in the two-coil holder, their best values being found by trial. Alternatively an H.F. 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 coating.

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).

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



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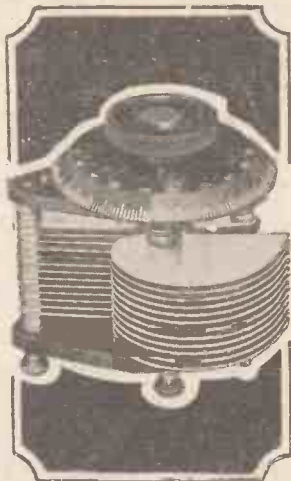
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| .00075 | 9/- | .0002 | 5/6 |
| .0005 | 8/- | .0001 | 5/3 |
| .0003 | 6/9 | Vernier | 4/6 |

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THE DEAD BROUGHT TO LIFE For 6/6

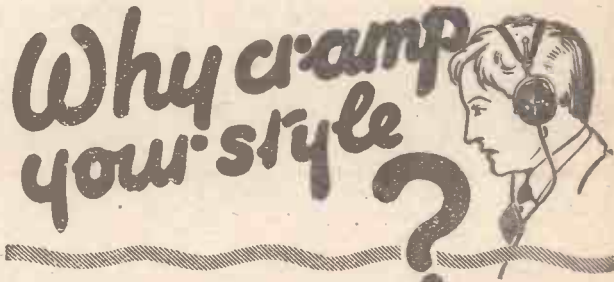
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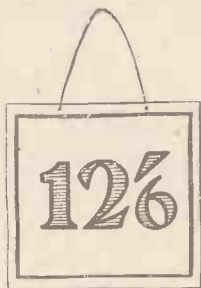
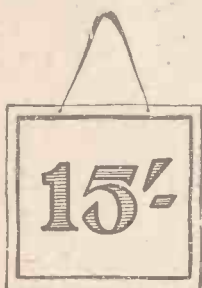
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- Complete with instructions.
- PRICE 2/-

EXPERIMENTS with wireless circuits depend upon the ease with which wiring can be interchanged. Wires wrapped round ordinary terminals cause loss of power. Soldered connections weaken with constant breaking down, but Newey Snap Terminals ensure vibrationless contact and can be connected up or broken down with the finger and thumb of one hand. As many headphones as your set has power to fill can be connected up on their original setting with Newey Snap Terminals.

ASK YOUR DEALER TO SUPPLY.





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

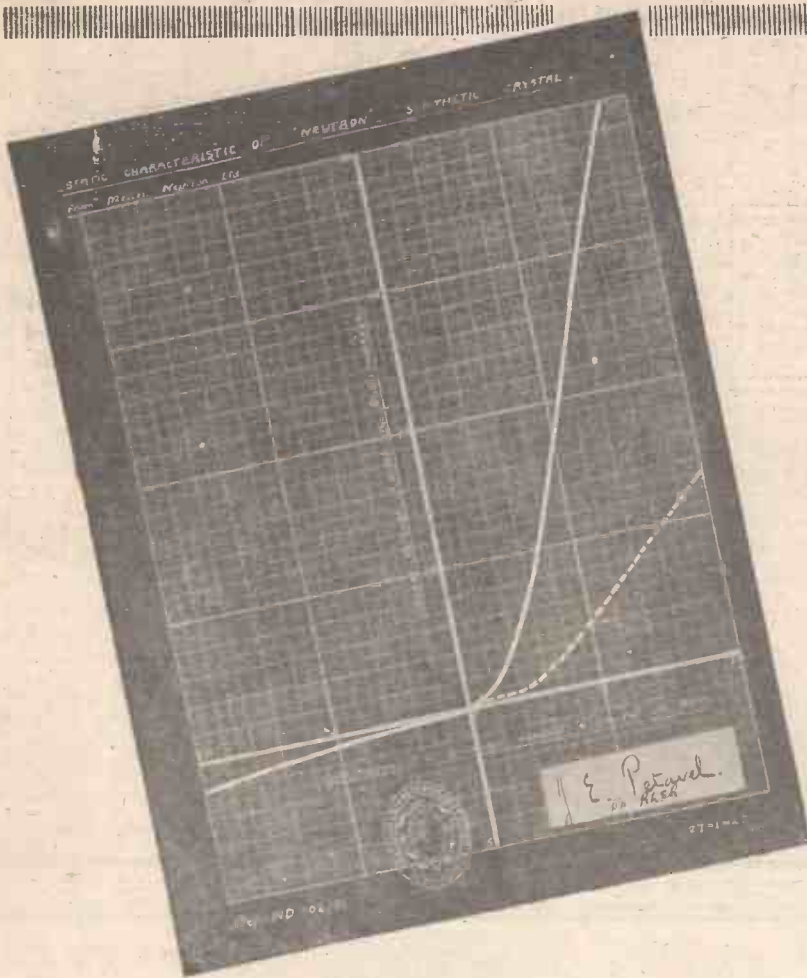
In the last 4 months it has more than trebled its sales.

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



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.

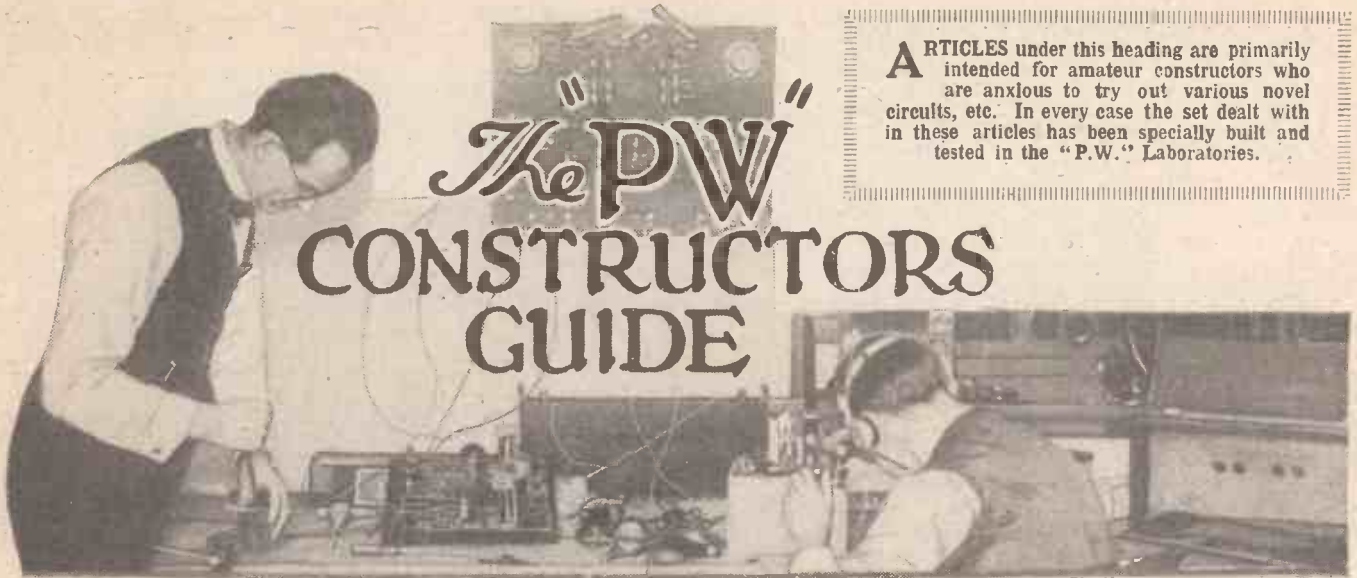
Stocked by the Best Radio Dealers. Packed in tin, with silver cats-whisker. Insist on Neutron, in the Black and Yellow Tin. If unable to obtain, send 1/6 with dealer's name, and this wonderful crystal will be mailed by return.

1/6



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



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 P.W." CONSTRUCTORS GUIDE

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

THE "SUPER-SELECTIVE" RECEIVER.

Specially Built and Described by
G. V. DOWDING, Grad.I.E.E.
(Technical Editor "P.W.")

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

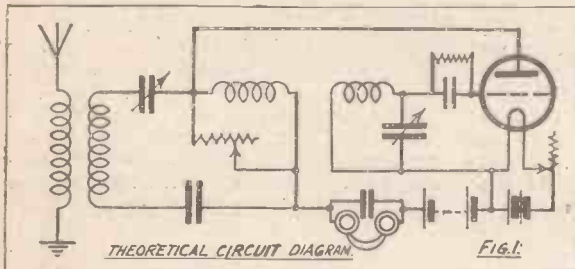
really can be entirely cut out, even if it is only a mile or so away, and

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



amateur must not endeavour to obtain this during broadcasting hours, as the circuit is a very bad "oscillator."

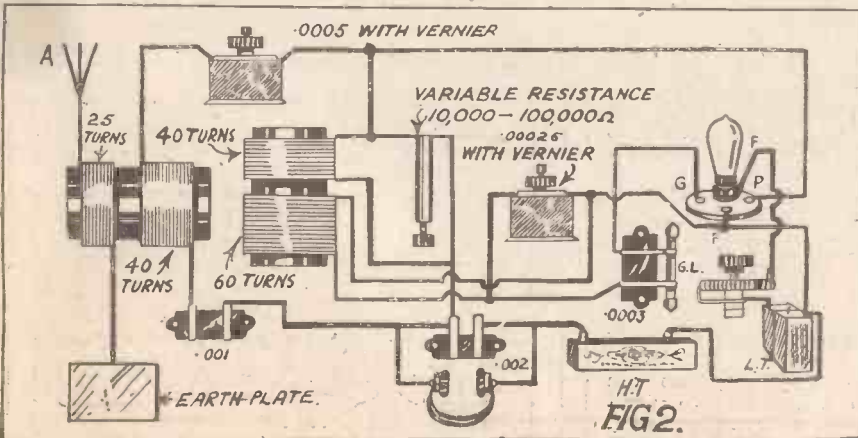


A front view of panel of the Super-Selective Receiver. An L.F. amplifier can be added, but tends to cause great instability unless separate batteries are used.

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.

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.

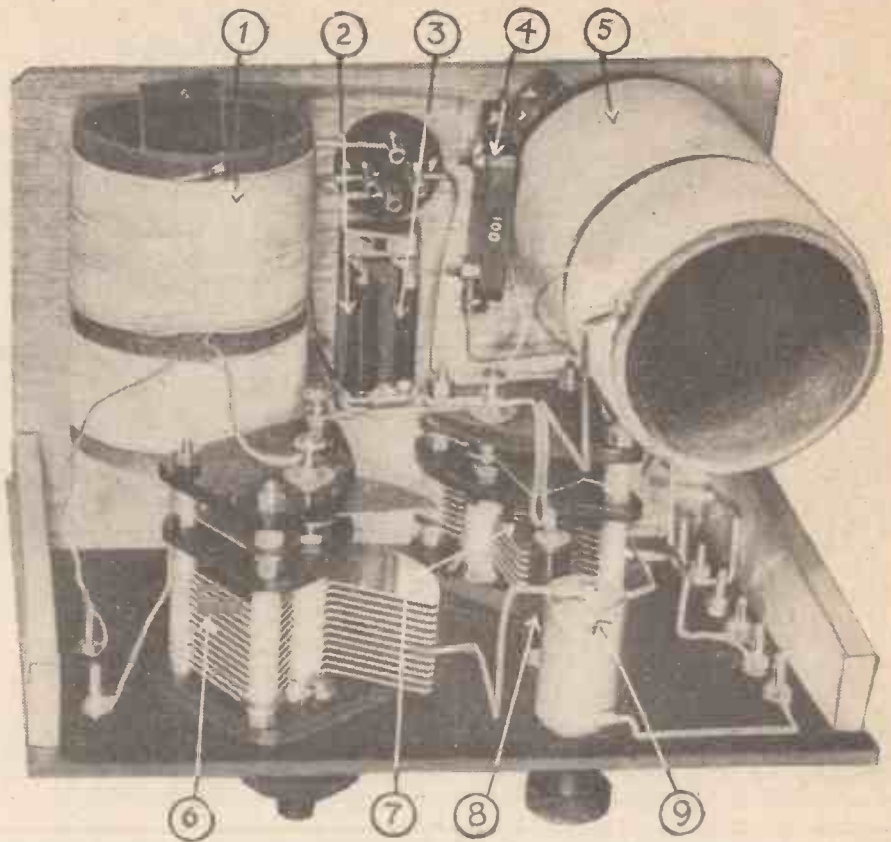
This component has, however, been rendered suitable for the purpose by having five of its pellets removed. It was found to be quite a simple matter to do this. The metal base was unscrewed, five of the little black discs and their accompanying metal separators extracted, and a small piece of brass rod 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 $\frac{1}{4}$ -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.

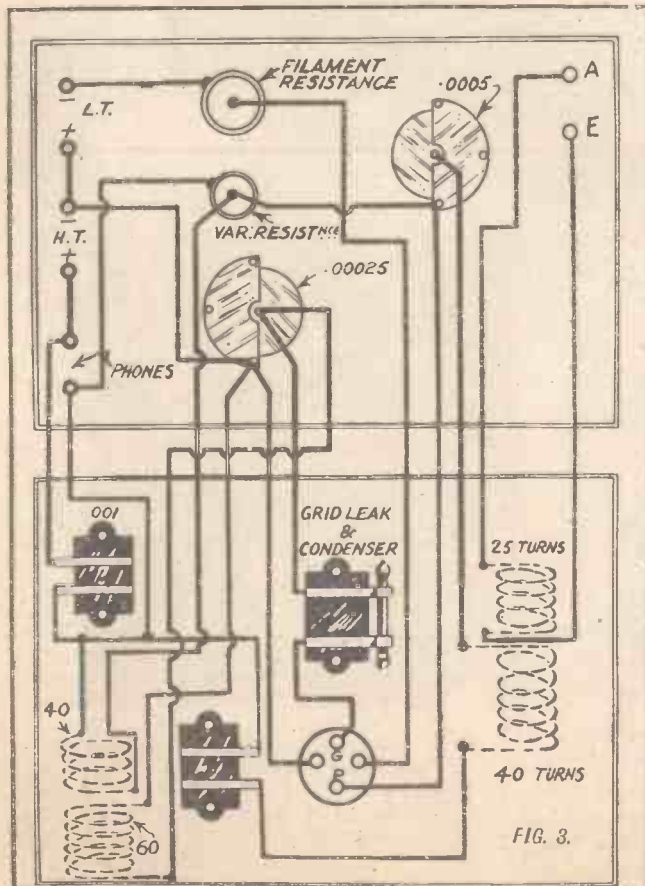


FIG. 3.

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 ade-

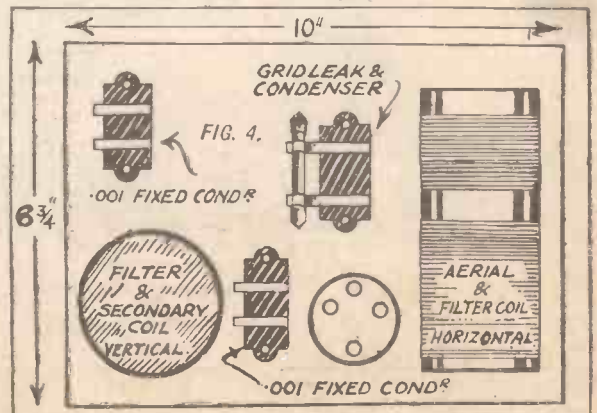
quate spacing and yet permit the set to be confined within a case of reasonably compact dimensions.

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.)



ensure ade-

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.

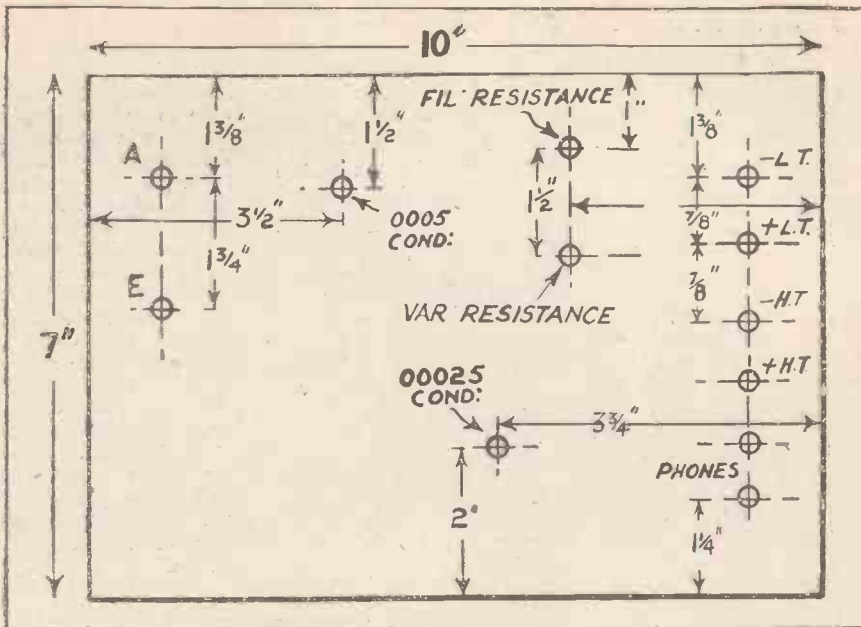
Referring to the diagrams, Fig. 1 shows the theoretical circuit which is given in Fig. 2 in pictorial form as well in order to make the coil and other connections perfectly clear.

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-selective" 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.

Technical Notes

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

What is Hysteresis?

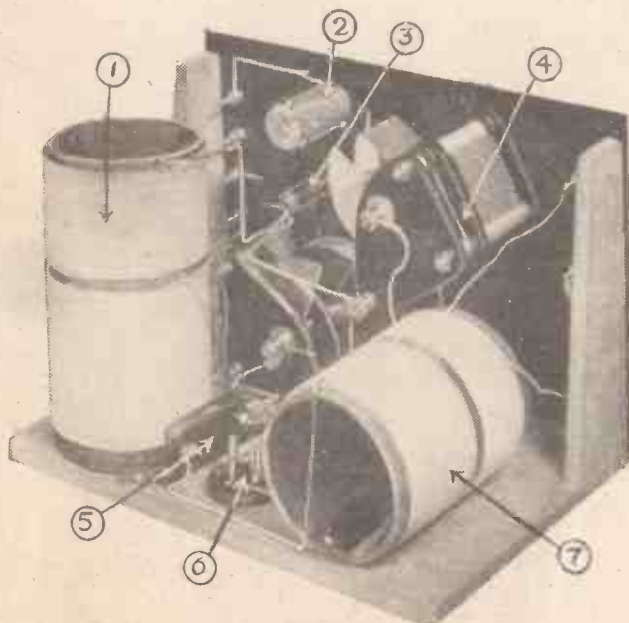
I HAD a letter the other day from a reader wanting to know what was meant by magnetic hysteresis. Well, a full account of hysteresis and the effects which it produces, would take the whole of this journal several times over. But briefly the answer is this. When a piece of iron is placed in a magnetic 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

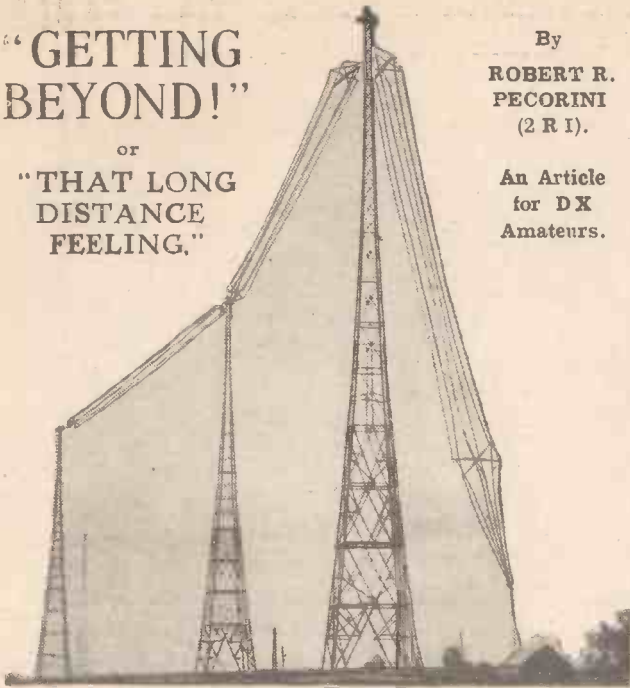
(Continued on page 35.)



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 alter coils.

"GETTING BEYOND!"

or
"THAT LONG DISTANCE FEELING."



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 begs 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.

By

ROBERT R. PECORINI
(2 R I).

An Article
for DX
Amateurs.

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.

Strength of signals weak,
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,—Oído aqui vuestras señales telefónicas a a.m. tiempo medio de Greenwich p.m.
en Alto frecuencia, detector, baja frecuencia.

debil,
Intensidad mediana,
fuerte.

Desvanecimiento nada,
mucho.

De Usted atento y S.S.,
(Signed).....



Reduction in Price of B.T.H. Headphones

Radiola Receivers.

OWING to the reduction in the price of B.T.H. Headphones, all Radiola Receivers supplied complete with Headphones are also reduced in price.

WE have pleasure in announcing that, owing to increased sales and improved manufacturing facilities, the price of B.T.H. Headphones has been reduced to 20/-

Many constructional improvements have been introduced into the latest pattern, making it by far the most comfortable, sensitive and convenient instrument of its kind on the market.

- Weight (with cords) only 9½ ozs.*
- No hair-catching projections.*
- No "scissors" movement of headbands.*
- Can be adjusted by a single movement without the manipulation of screws.*
- No screws employed in construction.*
- Permanent magnets that are really permanent.*

"A cute aid to Acute hearing"



Old Price - - - £1 · 5 · 0
NEW PRICE - - - £1 · 0 · 0
 (per pair, 4000 ohms)

Advertisement of The British Thomson-Houston Co., Ltd.

"BELLING-LEE"

Indicating Terminals

Patent No. 5807/24

Heads cannot screw off.

Grips a spade lag or flex.

Standard 4 B.A. Stem.

Brass, 3½d. each.
Nickel, 4½d. each.

Tops engraved in White on Black 16 Indications.

Hole to Grip a phone tag or solid wire.

Serrated bottom prevents working loose.

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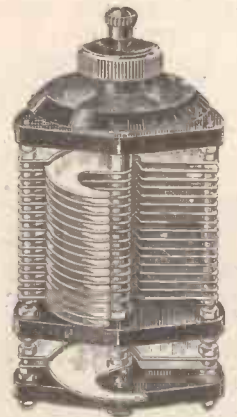
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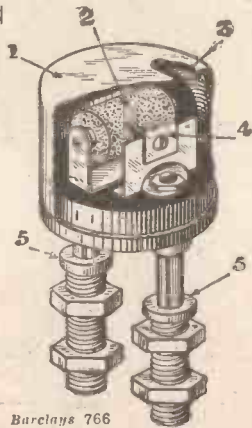
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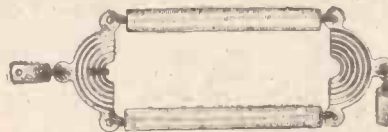
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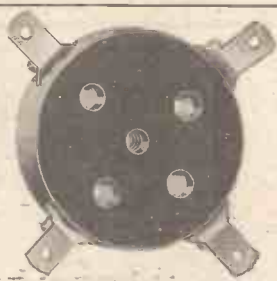
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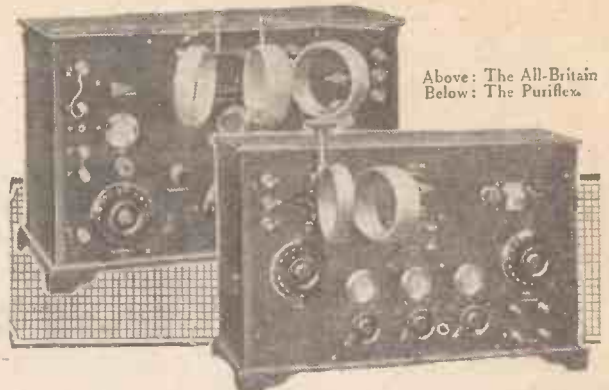
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| All Concert de luxe | 3 | 15 6 | 4 15 6 | 0 17 0 |
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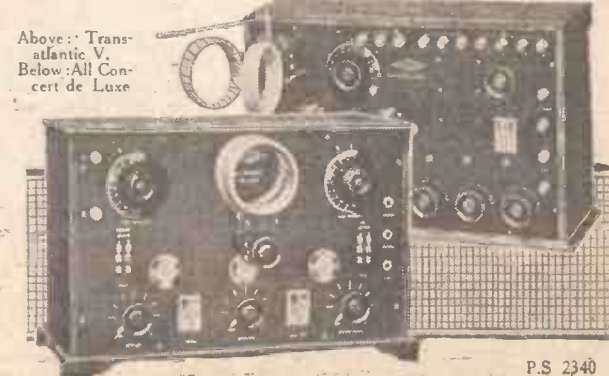
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Above: Transatlantic V.
Below: All Concert de Luxe

P.S. 2340

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,

| | | | | | |
|----|----|----|----|----|----|
| 23 | 15 | | | | |
| 14 | 13 | 23 | | | |
| 16 | 20 | | | | |
| 30 | 24 | 11 | | | |
| 25 | 19 | 27 | 28 | | |
| 37 | 18 | | | | |
| 17 | 36 | | | | |
| 33 | 32 | 31 | 21 | 26 | 12 |

FIG. 3 B.

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.

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.

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

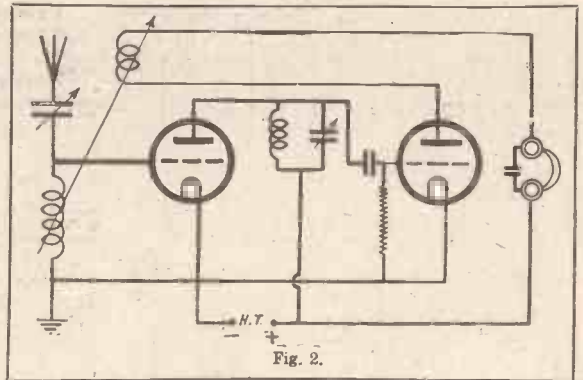


Fig. 2.

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

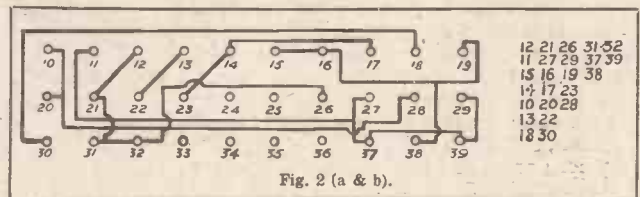


Fig. 2 (a & b).

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.

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.)

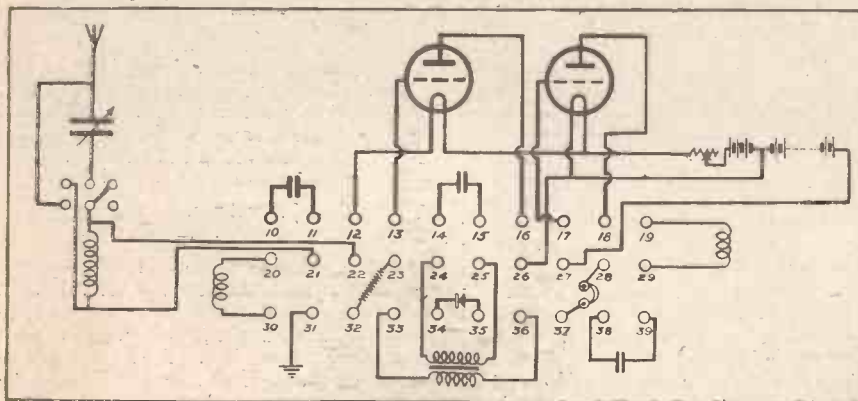


Fig. 1. Diagram of connections for 2 valve multipanel. Note, however, that the condenser, 38-39, should be variable and not fixed, as shown.

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) is the best for the reception of distant stations, the results being admir-

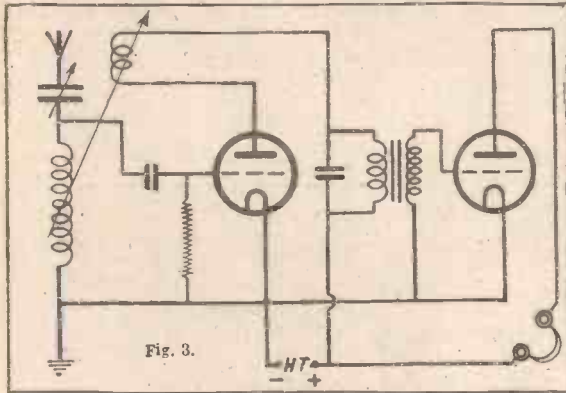


Fig. 3.

ably 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.

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

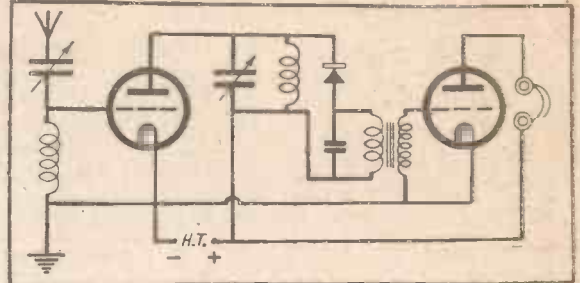


Fig. 4.

manufacture of Multidyne sets] is well in hand. These parts, I understand, will be sold at reasonable prices that will be inclusive of royalties.

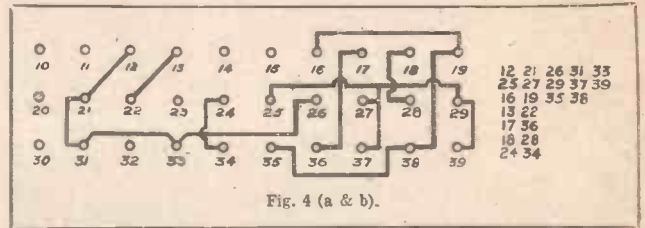


Fig. 4 (a & b).

UNIDYNE VALVE HOLDER CONNECTIONS.

IN constructing Unidyne sets with the "valve tray" mounted on a base-board, 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.

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.



Fig. 2.

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

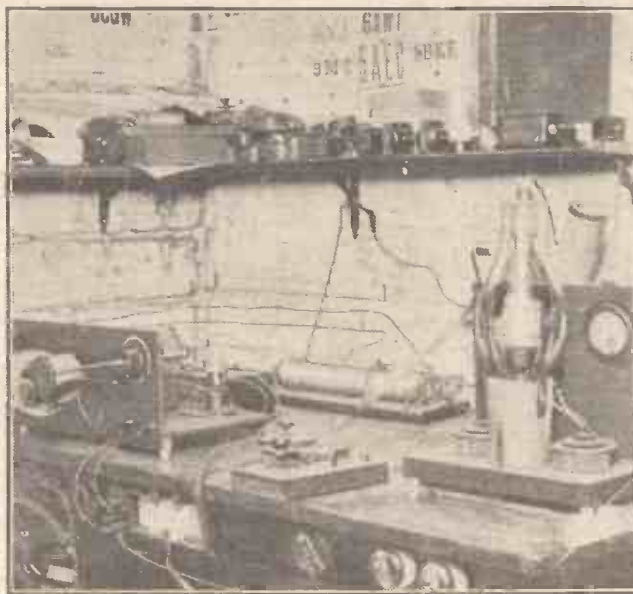
blame the P.M.G. for wishing to strengthen his powers in the matter of wireless licences.

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.



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

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.

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

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.

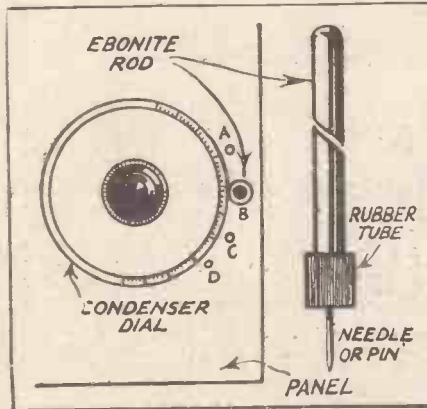
Constructional Notes

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,

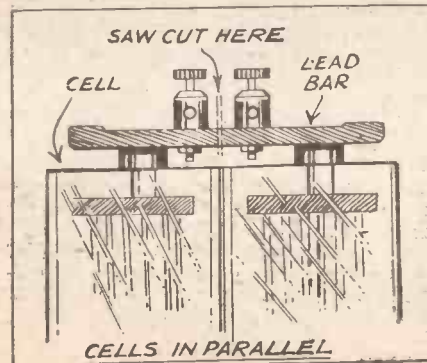


nearer or farther away, according to the thickness of the rod used, as shown at A, B, C, D.

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.

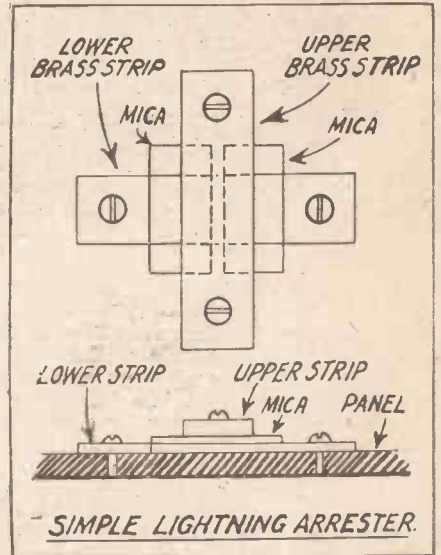
'Phone-Hook Switch.

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 $\frac{1}{2}$ to $\frac{3}{4}$ 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.

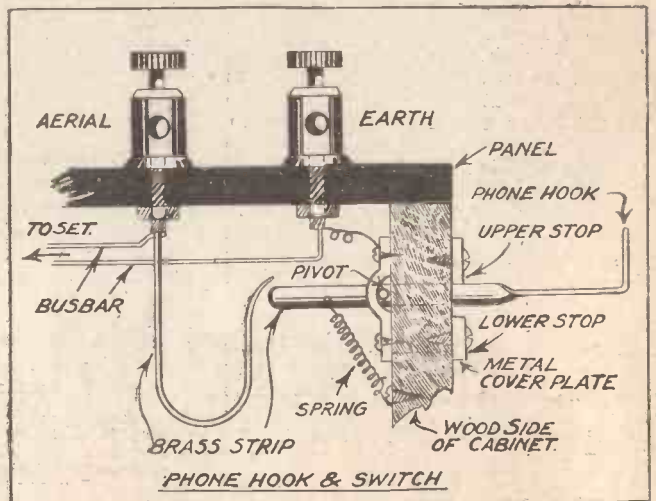
Another small hole in the arm enables a



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 base-board. 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.





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.



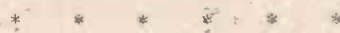
ECONOMY

-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.

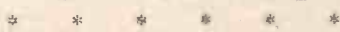
The cost for this may be anything up to 2/-. Eight shillings for a month's broadcasting—practically £5 per year. Not much when compared with the pleasure you obtain, but still quite an appreciable item in the family exchequer.



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.

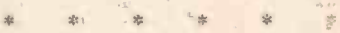
In other words, you get 5 weeks' broadcasting for nothing every time you get your accumulator charged if you are using Wuncells. And they will save their cost in a couple of months or so.



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.

Cossor Wuncell Valves

THE ONLY DULL-EMITTER VALVES SOLD IN SEALED BOXES



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—VOLUTEONE.

Mull & Fellows

YEATES, LTD.,

20, Store Street, Tottenham Court Road, London, W.C.1

Well equipped demonstration and sales offices of Fellows Wireless Products. Wholesale and Retail.

FELLOWS WIRELESS

The Volutone Loud Speaker gives really large volume without sacrificing the quality of reproduction. The diaphragm is adjustable.

PRICE: £4 : 10 : 0



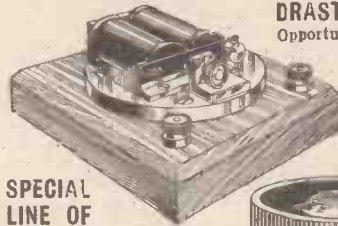
WIRELESS ON EASY TERMS

GAMAGES have now extended their easy payment system to Wireless, and you may now secure on payment of first deposit Wireless Sets and Apparatus from £5 upwards, balance being payable in monthly instalments. Write for details to Wireless Dept.

GAMAGES GREAT Wireless SALE

DRASTIC REDUCTIONS!

Opportunity to secure at lowest prices of the Year! Order by Post if unable to call—money back if not satisfied!



SPECIAL LINE OF PRACTICE BUZZERS

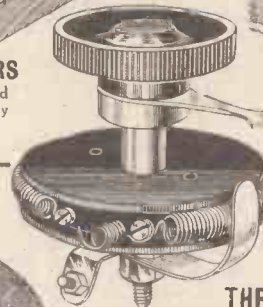
Well made and finished throughout of high quality materials. Usual Price 7/6.

Sale Price 6' Post 4d. Send for yours right away to secure at this price!



3-COIL HOLDERS

Beautifully finished throughout. Suitable for Honeycomb and Burnsept Coils. Simple in construction and most practical in use. Usual price 10/6. Sale Price 9'6 Post 6d.



THE GAMAGE VELVET FILAMENT RESISTANCE

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.



150 FT.

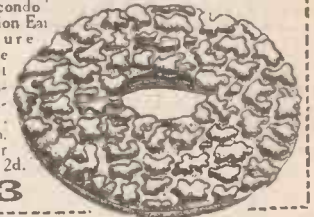
5'7

SALE OFFER OF AERIAL WIRE

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.

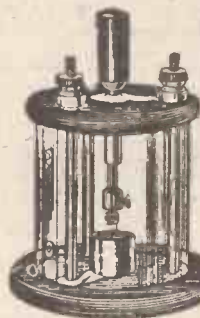
PNEUMATIC EAR PADS

The 'Macondo' Air Cushion Ear Pads ensure absolute comfort when using headphones. Try them. Price per pair. Post 2d.



1/3

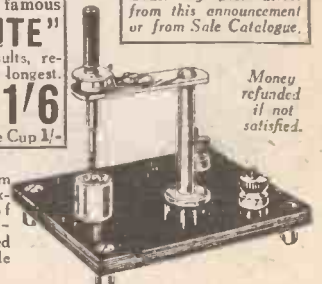
FAMOUS CRYSTAL DETECTORS



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/-

Order by post direct from this announcement or from Sale Catalogue.



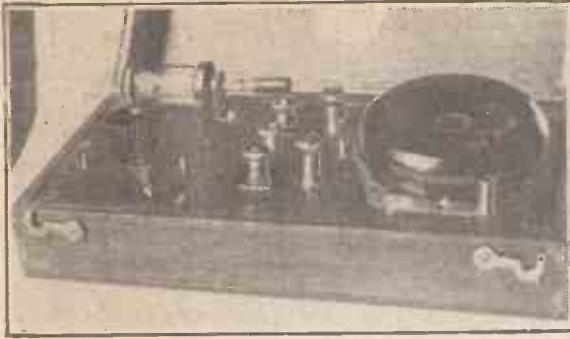
Money refunded if not satisfied.

DUSTPROOF DETECTOR

Supplied complete with a piece of famous "Permanite" Crystal. The dustproof cover protects the crystal. Usual price 3/9. Sale Price 3'3 Post 6d.

CRYSTAL DETECTOR

Well made and finished, Lacquered Brass, mounted on ebonite, ball joint and cat's whisker. Fitted with our famous "Permanite" Crystal. Usual price 2/6. Post 6d Sale Price 2'2



The receiver ready for use.

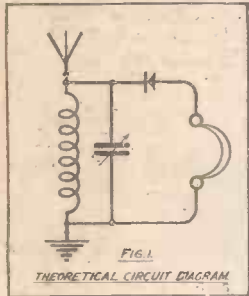
THE AMATEUR'S PORTABLE CRYSTAL SET.

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 1/4 in. by 3 3/8 in., and 2 3/8 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 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.

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 1/4 in. by 4 3/8 in., and 3/8 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



The ribbon aerial is wound on an ebonite disc.



Close up view of the panel.

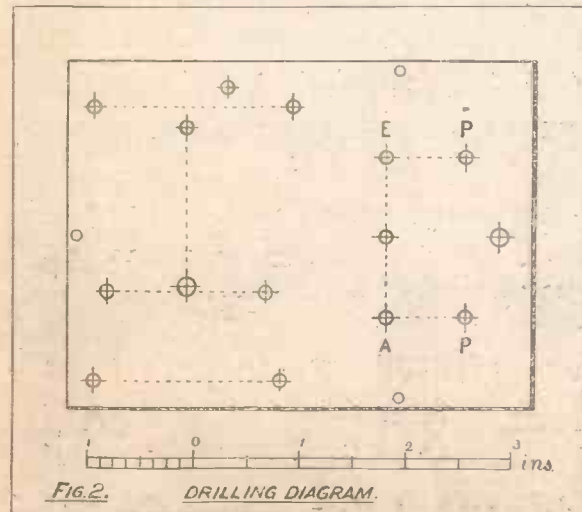
and is shown in dotted lines to avoid confusion.

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 1/16 in. beyond the fixed vanes.

The Variable Condenser.

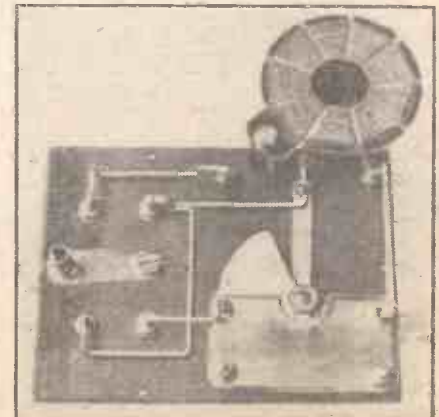
These vanes are fixed to the panel by two screws and nuts, N, and separated from the panel by small pieces of ebonite tube, L, 1/4 in. long, but nuts can be used instead as shown in the enlarged diagram, which gives the details of fixing the condenser to the panel. The free corners of the fixed vanes 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.)



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 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 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,



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

permanent small capacity in parallel with the inductance which is consequently wound with only 50 turns of wire.

The details of the aerial are shown in Fig. 4. It consists of an ebonite disc $1\frac{1}{8}$ in. diameter and $\frac{1}{4}$ in. thick, fixed at one end of a 2 B. A. rod, H. A brass strip $\frac{1}{2}$ in. wide,

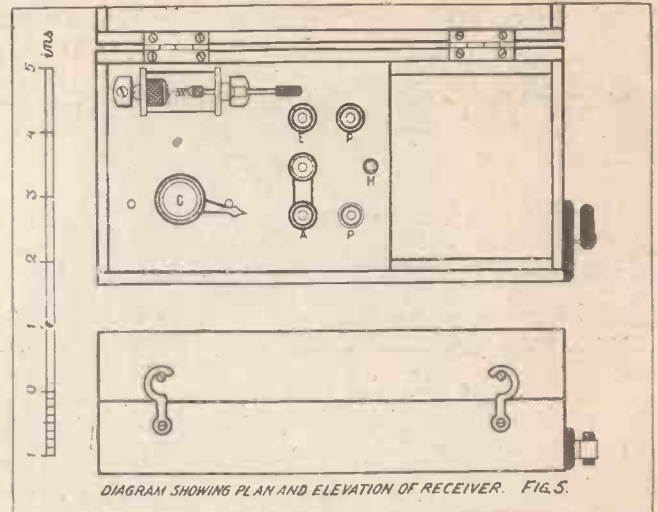


DIAGRAM SHOWING PLAN AND ELEVATION OF RECEIVER. FIG. 5.

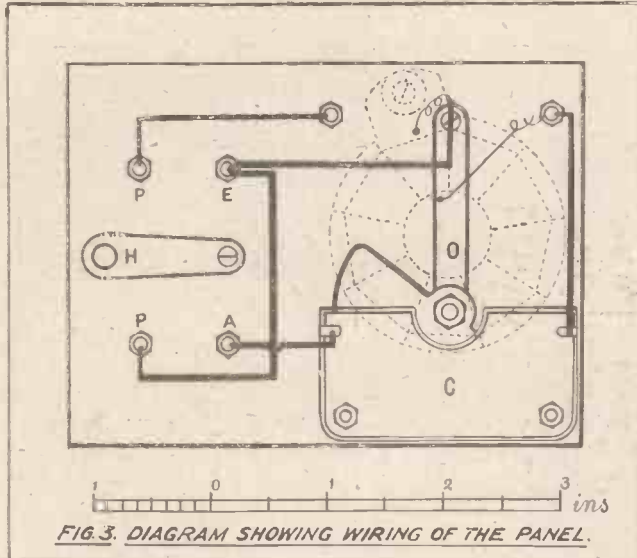
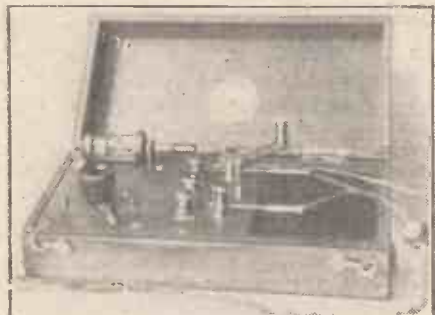


FIG. 3. DIAGRAM SHOWING WIRING OF THE PANEL.

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



The set connected with 'phones.

vanes. This is essential as the moving vane will not go in between the mica sheets if completely taken out. This means a

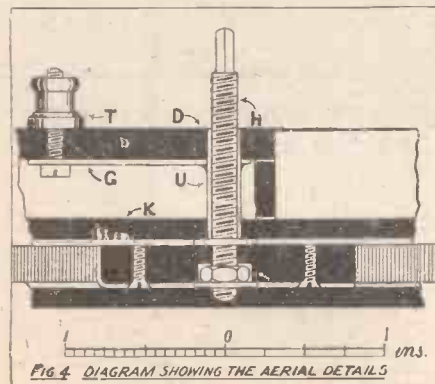


FIG. 4. DIAGRAM SHOWING THE AERIAL DETAILS.

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.

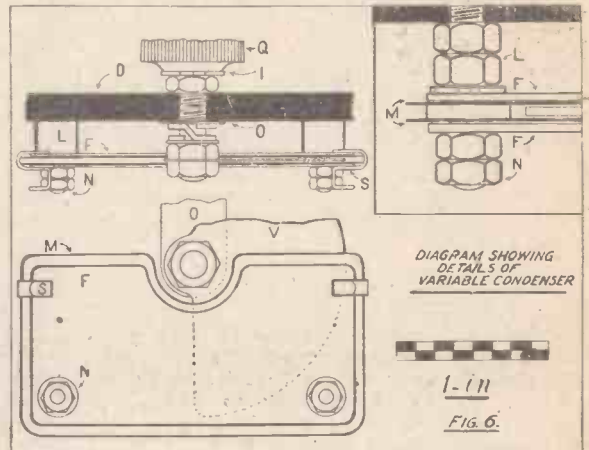


DIAGRAM SHOWING DETAILS OF VARIABLE CONDENSER.

1-11
FIG. 6.

In order to make the cabinet compact it was necessary to use an ebonite sheet, $\frac{1}{4}$ 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.)

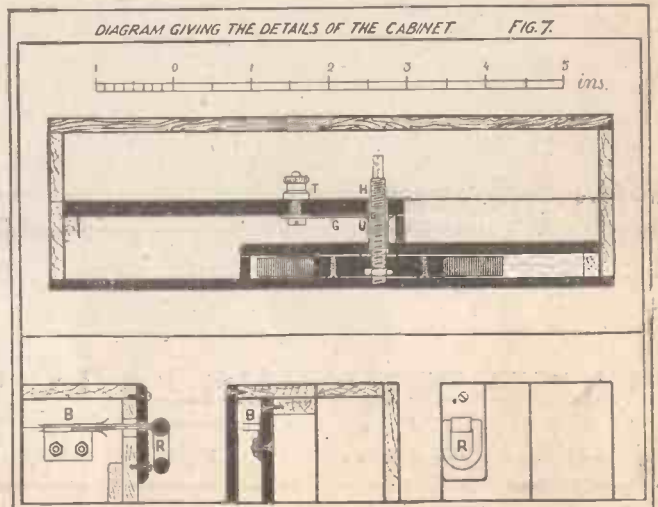


DIAGRAM GIVING THE DETAILS OF THE CABINET. FIG. 7.

The "GÖLTONE" CONSTRUCTIONAL

RECEIVING SETS BRITISH MADE.

These Sets are dispatched with ready drilled Ebonite Panel, Assembled Condensers, wound Transformers, etc., enabling the set to be easily and quickly constructed. The Circuits employed have been thoroughly tested and can be recommended for use in any part of the U.K. Blue Print diagram and full instructions supplied.

- 1 VALVE SET, £2 9 0
Marconi Royalties, 12/6 extra.
- 2 VALVE SET, £5 5 6
Marconi Royalties, 25/- extra.
- 3 VALVE SET, £6 17 0
Marconi Royalties, 37/6 extra.
- 4 VALVE SET, £9 2 0
Marconi Royalties, 50/- extra.
- 5 VALVE SET, £12 19 0
Marconi Royalties, 62/6 extra.

See Catalogue No. R/111 for full details.

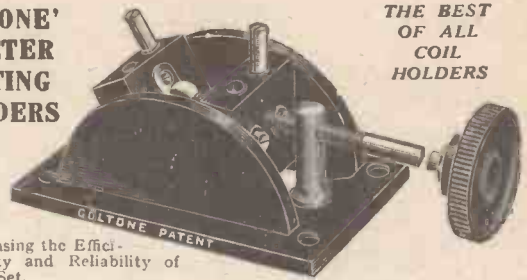


The 'GÖLTONE' MICROMETER REGULATING COIL HOLDERS

Patent No. 4037/24.

High grade finish. Enables the finest possible tuning, considerably increasing the Efficiency, Selectivity and Reliability of the Receiving Set.

Two Coil Type, 7/6 Three Coil Type, 10/6
See Catalogue for other types.



THE BEST OF ALL COIL HOLDERS

"SAMPSON" ACCUMULATOR CARRIER

BRITISH MADE.

Patent No. 214037/23.

Light, strong and exceedingly useful. The inconvenience of handling weighty, cumbersome accumulators is entirely obviated. Suitable for any size accumulator. Folds flat to fit the pocket. 2/6 each.
WARNING:—Rigorous action will be taken against infringements of this Patent.



Fully illustrated 32 pp. Radio Catalogue showing a complete range of Crystal and Valve sets and Component Parts of every description, post free on request. Enclose Business Card for Trade Terms.

These lines are stocked by the leading Radio Stores. Write direct if unobtainable.

Ward & Goldstone's
PENDLETON MANCHESTER LTD.

Address all communications to HEAD OFFICE & WORKS: PENDLETON, MANCHESTER. Stocks also held at GLASGOW DEPOT, 95, PITT ST.

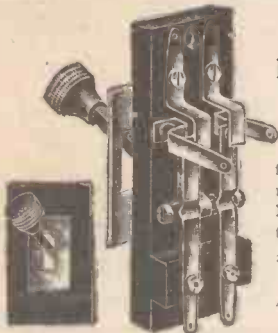
"GÖLTONE" NO-CAPACITY SWITCH

Fitted with screwed front plate for panel mounting. Easily fitted. Neat appearance, and takes little space.

- 2-Way Double-Pole, 3/6
- 4-Way Double-Pole, 5/6



W. & G. PANEL SWITCH
Size 1 1/2 x 1 ins. Perfectly reliable. Neat design. Price 1/6 each. Refuse substitutes.



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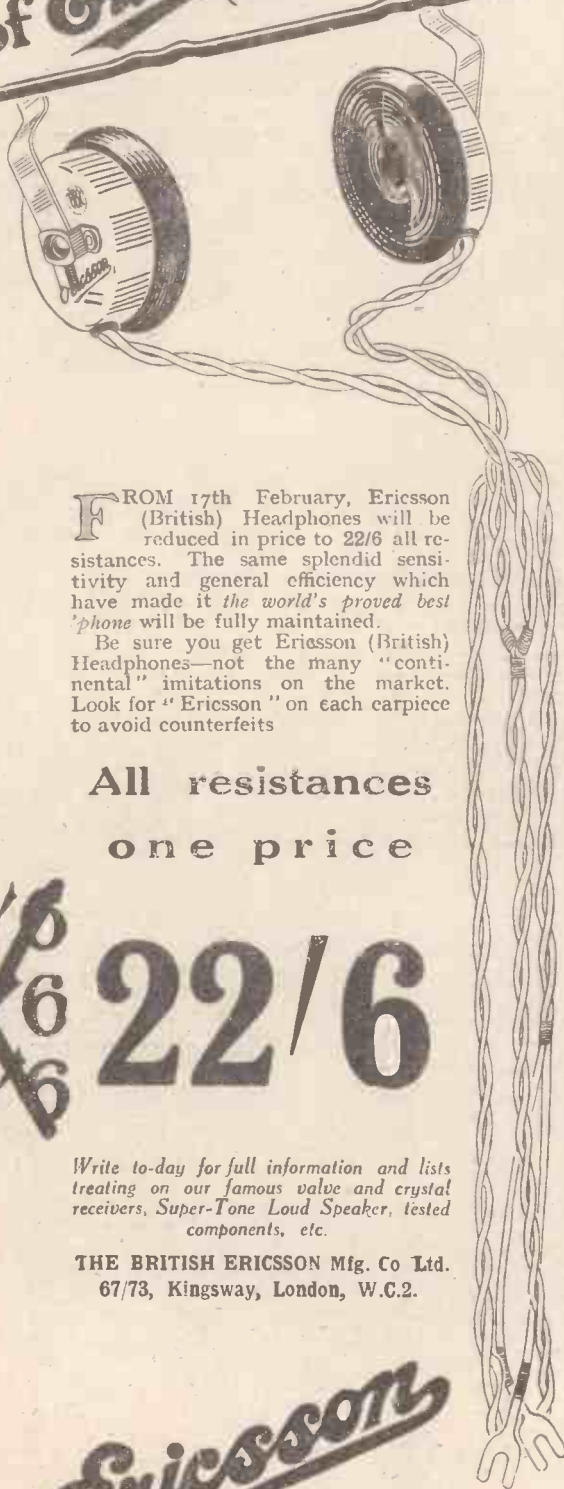
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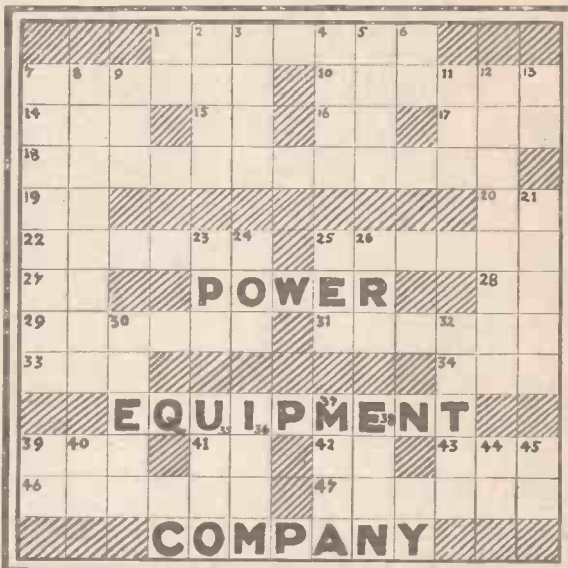
Can you do this one?



One free "Powquip" Transformer (Shrouded Model) will be given for each of the first twelve correct solutions opened on the morning of the 12th March, 1925.



Send your solution, with your name and address written clearly at the foot of this page, to the address below.



Down.

1. A "pub" without you
2. Food for horses
3. The wett
4. Employer
5. Entry
6. Father
7. Troubled
8. Annoy
9. Meadow
11. Spoil
12. Small firearm
13. Road (abbreviated)
21. Curiously
23. Found in the Zoo
24. Neither
25. Favourite
26. Period of time
30. The choicest
32. Locations
35. To
36. Separate detail
37. Easily split mineral
38. English town
39. 3/4th
40. Consonant
44. Preposition
45. "Its" beheaded

Across.

1. The best Transformer for the best set
7. Town in Spain
10. Impresses
14. Found in the earth
15. Preposition
16. Behead behold
17. Small island in a river
18. Our speciality
19. Signal of attraction
20. Towards
22. Pertaining to Mount Etna
25. Interval of time
27. Egyptian Sun God
28. Ancient beheaded
29. Engraver
31. Hanging ornament
33. Colour reversed
34. Sympathy beheaded
39. Vegetable
41. 3rds of a ton
42. Impersonal pronoun
43. Feed
46. Lodger
47. Sea borders

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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

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



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

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.

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

as cinematography which gives the beholder the impression of seeing "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 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 pro-

mises 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 1/2 in. high, while the lid has a height of 1 1/8 in., thus making the total height of the receiver 2 3/8 in., which is 7 1/2 in. long and 3 1/2 in. broad. The wood used for the cabinet was three-ply mahogany 3/8 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



The finished set closed up.

letting it sink in the water, while the other end is attached to the earth terminal of the receiver.

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 complaints 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



Mr. Samuel Kutcher.

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

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



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

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."

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.

"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.

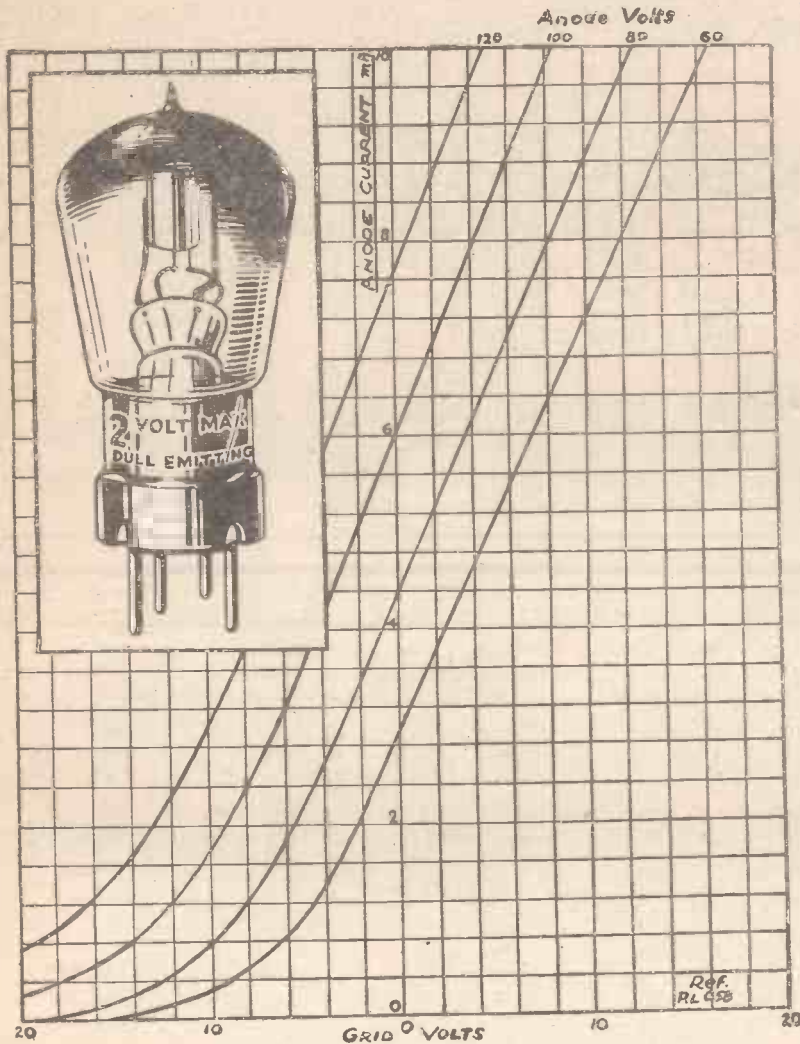
On Tuesday, Miss Vivvien Chatterton. On Wednesday, The Philharmonic String Quartet, and Miss Wynne Ajello, Leonard Lovesey, and Joseph Farrington.

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



Miss Phyllis Emanuel.

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.

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 - Vernier fittings are not necessary.
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Use the "RAVOX" and be
MORE THAN SATISFIED



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And so it should be with the man who builds a Wireless Set. He, too, builds for the future.

He does not want to find, when his Set is finished, that a leaky ebonite panel prevents good results being obtained. He does not want to labour in vain, so he looks to his foundation—the ebonite panel.

All ebonite, unfortunately for the wireless enthusiast, is not of one recognised quality. Some is good—some is bad. Some is suitable for wireless use—some is not. How are you to tell? The only safe way is to use a guaranteed brand such as Red Triangle Panels—every one of which is positively guaranteed to be leakproof, impervious to moisture, and finished with a smooth surface which does not require sand-papering before use. But Red Triangle Ebonite—for all its advantages—is not costly. Indeed, it often costs less than the ebonite of doubtful ancestry which you may be able to buy locally.

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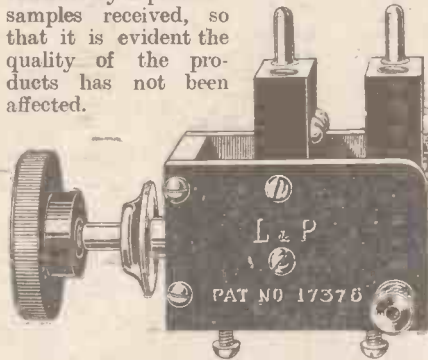


APPARATUS TESTED

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.

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.

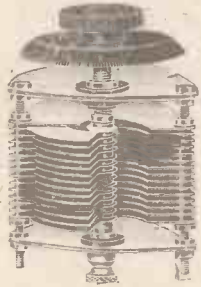
Messrs. The London and Provincial Radio Co., Ltd., recently sent us an "L and P" universal coil holder. It is a component particularly designed for baseboard mounting "American fashion," the moving coil falling backwards from the panel instead of sideways. The movement, which is particularly positive 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.)

We are informed that the firm of Cook and Co., of 76, Estcourt Road, S.E.25, has

—components that make successful sets



The **WOODHALL** Square-Law Condenser. Vanes of entirely new design, to permit CENTRAL fixing. Occupies minimum space on panel. Gives square-law variation in both directions: One-hole fixing; 22-gauge vanes; aluminium end-plates; minimum H.F. losses. Prices with knob and dial:

0003 9/- 0005 10/6 001 12/6

The **WOODHALL** Vernier Rheostat (Pat. No. 213,030). Combined plunger and rotary movement. Push-pull movement for coarse setting; rotary for vernier. Wonderfully smooth movement; best ebonite former; one-hole fixing.



6 ohms 2/6

10 or 12 ohms 3/- 30 ohms 3/6



No. 1 L.F. Transformer.

Wound with 42 gauge wire simultaneously with fine SILK. Even on 200 or 300 volts pressure gives no trace of distortion and its amplification factor is decidedly above the average of other good-class transformers. Specially recommended for circuits of the "reflex" type

23/6

WOODHALL
Guaranteed Components

Sole Distributors:

Pressland Electric Supplies, Ltd., HAMPTON-ON-THAMES.

'Phone: Molesey 22.

America on one valve, with Reactone Coils



Set of 5 3/-

A. G. E., Maidenhead, writes: "Using Reactone Coils and One Valve only, WGY and WBZ came in quite loud on the 'Phones. With three valves, using Reactone coil for H.F. Anode tuning, volume was so great on the loud speaker that it could be heard all over the house. I have tried many makes of coils, but have never been able to get satisfactory long-distance reception before, neither have I had such sharp tuning."

It is in the reception of the distant stations that the higher efficiency of Reactone Tension-Wound Inductances is most apparent.

It is then that the sharp tuning of Reactone Coils counts—and the unique construction that gives, without shellac or wax, a highly efficient rigid and uniform inductance.

Supplied in sets of 5 (Nos. 25, 35, 50, 75, and 100), and each set is boxed. Be sure to see the name "Reactone."

3/-

No. 150 (Chelmsford) - Price 1/9
No. 200 " " 2/3

Reactone
TENSION WOUND
Inductance Coils

Ask your Wireless Dealer: In case of difficulty send P.O. (adding 3d. for postage) with your Dealer's name and address to The Manufacturers:

LEWIS HARFORTH & CO.,
88-90, Chancery Lane, London, W.C.2.
Phone: Holborn 2213.

Wholesale from V. Zeilin & Sons,
114, Theobald's Rd., London, W.C.1.
Agents wanted in all Broadcasting Centres.





The Discovery of 1925

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/-

Contractors to the
Admiralty and
all Government
Departments.

Radio Instruments Ltd
12 Hyde Street, Oxford Street

Telephone: REGENT 6214 (3 lines) W.C.I. 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 effi-

ciency 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.



**TWO
PRIME
FOOLS—**

FIRST, the man who buys trash—he is the greater, for he gets no return for his outlay. SECOND, the man who assures himself that the higher the price the better the quality.

THE WISE BUYER gets tip-top quality at the right price, thus if he is a valve buyer, he asks for the

C & S DULL EMITTER
2 V. 0.2 A.
WHICH RECEIVED
NEW ZEALAND
ON A SINGLE VALVE
PRICE **12/-** EACH

CRAIK AND SMITH,
ALLEN STREET : : LONDON, E.C.1

Phone: Clerkenwell 7346. Showcards now available.

PLIOTRON S.S. '07 VALVE

TESTIMONY by "Popular Wireless."

(Extracts from Feb. 14th, 1925, page 1438.)

"It also appears to be fairly strong mechanically, which is a distinct asset to a valve of such low filament consumption.
"The price, 12/6 is distinctly reasonable for a product of this nature, and considering the good and consistent results we have found it will give, it should command a very ready sale."

Maximum consumption, '07; fil. volts, 3.0; anode, 40-80. Concert tested and sent with maker's instructions for use on

24 HOURS' APPROVAL.

SPECIAL VALVES FOR P.W. UNIDYNE CIRCUITS

Philips 4-Electrode D.E. 1.8 volts, 16 amp. (see P.W. Nov. 22, p. 714) .. 25/-
Philips 4-Electrode Bright Emitter (see Corres. cols. P.W., Dec. 13, p. 954) .. 12/6
Thorpe K4 Bright Emitter (5 pin holder free if requested) .. 17/6

Above Valves are concert tested, post free 24 hours' approval. Insurance against all postal damage. Valves must be returned within 24 hours of receipt. 9d. per 12, 6 Valve; 1/- per 17/6 or 25/- Valve.

ANELOY PRODUCTS (Dept. P. 25),
Eton Works, Upland Road, London, S.E.22.

READ ABOUT THE LATEST

Watmel IMPROVEMENT

The latest addition to the many distinctive features which characterise every Watmel Variable Grid Leak and Anode Resistance and make them suitable for any circuit, is the new contact. By means of an ingenious bronze spring (shown in the enlarged illustration) any slackness, between the bush and adjusting screw, is automatically rectified and perfect electrical contact maintained at all times. Other features worthy of special mention are:—Continuously variable, silent in operation, dust and damp-proof, and constant in any temperature.

GRID LEAK, .5 to 5 megohms, 2/6

ANODE RESISTANCE, 50,000 to 100,000 ohms, 3/6.

SPECIAL VARIABLE RESISTANCE for Super-Selective Circuit, 10,000 ohms, 3/6.

Send P.C. for Descriptive Folder

WATMEL WIRELESS Co. Ltd.,

332A, Goswell Road, London, E.C.1.

Tel.: 7990 Clerkenwell



From
your dealer



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 "gramophones." 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 1d. 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 Lead 1/6

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. Tunestaltite

COIL STANDS 2-Way—
 Vernier 4/6, 5/- 5/6
 Geared 5/11 Polar 4/6
 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 6/8
 Shinton V. 9/-

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 2/0
 Coil Plugs, Wedge, p. 2/-
 Edison Bell 2 for 2/6
 Plugs with Fibre 1/6

DETECTORS (Enclosed)
 Micrometer 2/6
 Nickel, Large 2/6
 Brass 2/-
 Burndept 4/6
 Mic. Met. 6/8

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
 McMichael's 2-meg. Leak and Clips 2/6
 100,000-ohm Res. 2/6

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

GOSWELL QUALITY
 Valve Legs, Set 4 1/3
 Valve Holder 1/9
 2-way Cam Vernier 12/6
 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 300/800 10/-
 1100/3000 10/-
 Energo. 250/700 3/11
 " 450/1200 4/3
 " 900/2000 4/6
 Raymond B.C.C. 2/9
 " 5 X X 2/9

ICRANIC—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

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 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 18/6

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 SPDT 1/8
 Panel DPDT 1/4
 Ebonite DPDT 2/6
 Ebonite SPDT 1/8
 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/-
 K.L. 25/-
 Ormond 14/-
 J.A.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
 Brunet 1/9
 Solid Rod Standard 1/3
 Goswell 1/8

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.
 Ratio 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.

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

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

THORPE K 4 5 pin valve
 For Undyne 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.

Brands Matched Tons.
 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) "AUDIO 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
 Octopus, Tested at 350 v.D.C.
 .01 2/3 T.C.C.
 .25 3/- 2 mid. 5/-
 1 mid. 3/8 1 mid. 3/1
 2 mid. 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

AGGUMULATORS FOR CALLERS ONLY at present.

Rheostat Bretwood with Dial, Valve-holder. extra value, 2/- 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.
 6x6. 1/8 10x 8. 3/6
 7x5. 1/8 12x 9. 5/-
 8x6. 2/6 12x12. 5/9
 9x6. 2/9 14x10. 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
 100 100 3/-
 SET OF 5 (25, 35, 50, 75, 100) 10/- Post 3d.

RIGHT-OPPOSITE
DALY'S
 GALLERY DOOR

K. RAYMOND

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

No responsibility accepted on post orders unless cheques and postal orders are crossed and made payable to the firm. Moneys sent must be registered

HOURS OF BUSINESS:
 DAILY - 9 to 7.45
 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. Ebonite Ends.

| | | |
|--------------------|---|-------|
| .0005 ebonite ends | - | 18/11 |
| .0003 | " | 12/6 |
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The Editor will be pleased to consider articles and photographs dealing with all subjects appertaining to wireless work. The Editor cannot accept responsibility for manuscripts and photos. Every care will be taken to return MSS. not accepted for publication. A stamped and addressed envelope must be sent with every article. All contributions to be addressed to The Editor, POPULAR WIRELESS AND WIRELESS REVIEW, The Fleetway House, Farringdon Street, London, E.C.4. All inquiries concerning advertising rates, etc., to be addressed to the Sole Agents, Messrs. John H. Lile, Ltd., 4, Ludgate Circus, London, E.C.4.

Technical queries 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 bought 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. tapplings 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 ft. 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

(Continued on page 50.)

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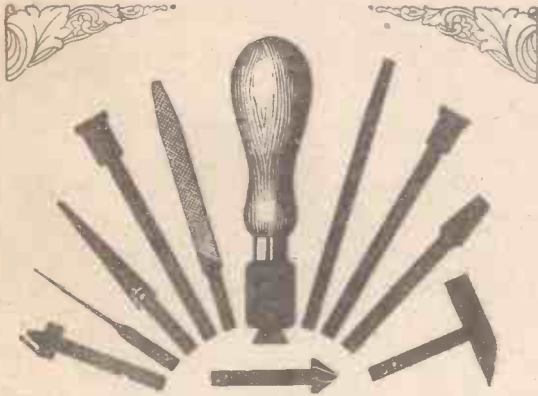
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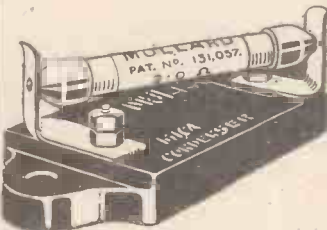
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RADIOTORIAL QUESTIONS & ANSWERS.

(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 fl. rheostats, and the other side of these two to one fl. 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 fl. leg of this valve is then connected to the fl. 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

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.

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 resistance coupled amplifier. The last valve, of course, is now transformer

(Continued on page 51.)

P.W. UNIDYNE FURTHER AMAZING RESULTS

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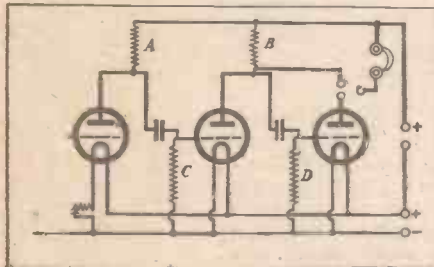
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RADIOTORIAL QUESTIONS & ANSWERS.

(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.)

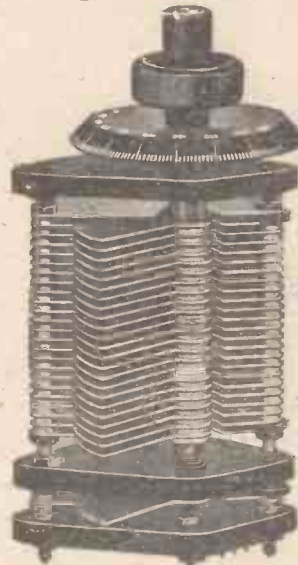
On switching in the 15-volt battery, a current of 4 to 10 milliamperes may pass through the contact. Sometimes oscillations will commence at once, and be heard in the telephone like the note of a very distant steam syren, or the whistle that announces 2LO is about to broadcast. Sometimes these can be 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 arc 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.)

DEVICON

SQUARE LAW CONDENSERS



Devicon Square Law Variable Condensers, complete with knob and dial.

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.00075 mf. 8/9
.0005 .mf. 8/3
.0003 .mf. 7/9
.0002 .mf. 7/3
.00005 mf. 6/3

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.0005 mf. 12/6
.0003 mf. 11/6
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C.A.V. & Fullers, soiled, but guaranteed 12 months. Sent on approval against cash.

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| 2v-40a ... 9/6 | 4v-80a ... 27/6 | 6v-60a ... 32/6 |
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EBONITE BUSHES

For mounting on Wood Panel. Perfect insulation.

Price 1/- for 12 (post free). Easily fixed by drilling a 1/8" hole.

DAREX RADIO Co.,

STANDARD WORKS, Waldram Rd., Forest Hill, London, S.E.23. Trade Supplied.

NAVY PATTERN STEEL MASTS

Catalogue "B" on request.

HAMILTON MAY (late Lieut. R.N.V.R.), Weybridge, Surrey. Tel. 784.

VOLUME & RANGE

Guaranteed, by adding our Type 3 Unit to your crystal (or valve) set. Loudspeaker perfectly operated within 8 miles of broadcasting, without valves, batteries, etc. Costs but few shillings to make and nothing in upkeep. Measures 5" x 6" x 5". Complete instructional blue-prints of Unit, diagrams of the American Circuit, etc. 2/6, including special series link and brass brackets. Dozens of testimonials.

DEBENHAM & CO.,

6, Loampit Vale, London, S.E.13.

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 1 1/2 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. LUKY-DAVIES.

75, High Street, Mountain Ash, Glam.

(Continued on page 53.)

THE SKINDERVIKEN HOME CONSTRUCTOR'S HOUSE 'PHONE

SET 1 (for home use).

- 1 Aseptic Microphone Case.
- 1 Skinderviken Button (brass).
- 1 5-ohm 'Phone.
- 2 Terminal Blocks.
- Extra Diaphragms and Carbon.
- 15 Yards Length of Wire.
- 6 Special Screws.

SET 2 (for longer distances).

- Transformer allows ordinary 'phones to be used.
- 1 Aseptic Microphone Case.
 - 1 Skinderviken Button.
 - 1 Transformer.
 - 2 Terminal Blocks.
 - Extra Diaphragms and Carbon.
 - 15 Yards Length of Wire.
 - 6 Special Screws.

Only 25/- per set.

Full instructions with each set.

Send your order with cash to-day and install your own 'phone.

New edition of "Marvels of the Microphone" now ready, post free 6/d. (P.O. not stamps).

MIKRO, Ltd., 32, Craven St., Charing Cross, London, W.C.2.

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.: WGY, Schenectady, N.Y., 330 m.; WBZ, Springfield, Mass., 337 m.; KDKA, E. Pittsburg, Pa., 326 m.; WJAX, Cleveland, Ohio; WFI and WIP, Philadelphia, 395 and 509 m. respectively; WMAFS, Dartmouth, Mass., 360 m.; WEA 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, WGY, WBZ and WJAX coming in on the loud speaker, and with an extra stage of L.F. WBZ could be heard upstairs, and all the others, except WIP, were comfortably audible. In addition to these I have had WTAM, Cleveland, Ohio, 395 m.; WOR, Newark, N.J., 405 m.; CKAC, Montreal, Can., 425 m.; and another station, presumably on the west coast, of which I could only get the letters KW. 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 WGY 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 2ZY or 6BM.

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. DER'S). Speech from 5IT and 5NG, 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.

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.)

"I have tried several well-known receivers but the new A.J.S. 4-valve Set in my opinion beats anything on the market. Last night I picked up all the B.B.C. Stations and 3 American Stations at good loud-speaker strength without the slightest trouble."

—London user's letter.



"The HALL MARK OF RADIO PERFECTION"

SOME EXAMPLES OF THE A.J.S. RANGE

A.J.S. PEDESTAL CABINET RECEIVER

Designed and constructed by experienced Cabinet-makers to contain the A.J.S. 4-valve Receiver. Represents the highest standard yet achieved in the design of Wireless Receiving Sets. Each cabinet is a complete unit containing 4-valve Receiver, H.T. and L.T. Batteries, special A.J.S. Loud Speaker to match the cabinet and all accessories. In Mahogany or Oak 50 gns.

A.J.S. 'DESK TYPE' 4-VALVE RECEIVER

Noted for Selectivity, Power and Clearness. Extremely flexible, it functions on wave-lengths from 150 to 20,000 metres, giving most successful results on indoor aerials.

Prices (including all Royalties)—4-valve Set, complete with 4-valves, Brandes Phones, Batteries, Aerial Wire, Insulators, and Lead-in Tube £27 : 5 : 0
Panel only, £20 : 5 : 0.

A. J. STEVENS & Co. (1914) Ltd, WIRELESS BRANCH, WOLVERHAMPTON.

Telephone : 1550. Wireless Call Sign : 5 R I.
Telegrams : "Reception, Wolverhampton."

London Offices, Show and Demonstration Rooms, 122-124, Charing Cross Road, W.C.2.

Representatives for India, Burma, and Ceylon: W. & A. Bates (India), Ltd., Calcutta, Bombay, Rangoon, and Madras.

Representatives for Australasia: R. V. Bristol, Pty., Ltd., Melbourne and Sydney, Australia, and Wellington, N.Z.

Representatives for Europe: G. A. Strasser, 12, Navigation Street, Birmingham.



The special A.J.S. Volt Meter let into the face of every A.J.S. panel is just one of several exclusive A.J.S. features that a personal inspection of our Wireless Instruments will reveal. Ask your Dealer to show you the full A.J.S. range, including the "Unit System" Cabinet, the 2 and 3-valve Standard "Desk Type" Receivers, the "Unitop" 4-valve Cabinet and the A.J.S. Loud Speakers. There are also A.J.S. Component parts. Illustrated Catalogue sent on request.

ACCUMULATOR SERVICE

Most valve set users know the troubles of Wireless accumulators and would appreciate the comfort and economy of a service by which a fully charged accumulator of suitable size for a full week's use was delivered to the door regularly every week.

Such is the A.M.C. Hire Service.

We supply and deliver to your door weekly a fully charged, specially constructed "Rotax" wireless accumulator of suitable size for your set, from 1/6 weekly inclusive (by quarterly subscription) within 10 miles of Charing Cross.

Our service consists entirely of "Rotax" accumulators of a most efficient type, and we guarantee punctual and regular deliveries.

An interesting folder, showing the capacity of accumulator required for a full week's use on sets using 1 to 5 valves, post free on request.

We regret that we were recently unable to meet the great demand for our service, but are now in a position to accept an unlimited number of subscriptions for our new "Rotax" accumulators.

ACCUMULATOR MAINTENANCE CO.,
267, High Street, Camden Town, N.W.1

Phone: Hampstead 2698.

HEADPHONE REPAIRS

Rewound, re-magnetised and readjusted. Lowest prices quoted on receipt of telephones. Delivery three days.—**THE WABLEY MAGNET CO., London, S.E.18.** Phone 888-9 Woolwich. Est. 26 years.

EBONITE PANELS

GUARANTEED BEST QUALITY.

Money returned if not satisfied. Dull Matt Finish.

- 6 x 6 in. 1/2; 1 in. 1/11. Post free
- 8 x 6 in. 1/6; 1 in. 2/6.
- 10 x 8 in. 2/8; 1 in. 4/2.
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Any other sizes 3/4 in. thick, 3d. per sq. in.

1 in. thick, 4d. " " "

Cash with order to

P. FRASER & CO., 79, PICCADILLY, MANCHESTER.

LUID RADIO '06 VALVES

3-Volt Excellent H.F. Detector, L.F. 50-100v. Plate. Each guaranteed, 12/6. Accumulator Carriers, 2/6. Valves, Telephones, and Sets repaired.—**W. G. BAMES, 15, Red Lion Street, London, W.C.1.** Phone, Chancery 8220.

Fit a 'Malone' to your 'phone
and you get results rivaling a **50/- LOUD SPEAKER**

SOUND BRITISH FOR 7/6 POST
MAKE COMPLETE, ONLY 1/-
strongly packed. Fitted in a second. Send P.O. 8/3 at once and listen in comfort.

Send Stamp for free descriptive Leaflet P.
Write direct to Works:—
MALONE & CO., LEIGH-ON-SEA, ESSEX.

100% EFFICIENCY
This is your aim. The W.L.B. One Valve Receiver is the most highly efficient receiver you can buy. Receives majority of B.B.C. Stations, several Continental, including Madrid, and at twelve miles from London will work a loud speaker. £2 17 6 plus 12 6 Marconi Royalty. Finest workmanship. Send for particulars.

W. L. BROWNE, A.M.I.E.E.,
Longfield Avenue, Hackbridge, Surrey.

CABINETS for Wireless CONSTRUCTORS

PICKETT'S
NICELY POLISHED
CABINETS
from 1/6 each
They're good value

Send for constructors list free
PICKETT'S CABINET WORKS
BEXLEYHEATH, S.E.

Labels: DESA TOP, CONDENSER, LIDDED

Send for Constructor's List (P.W.) FREE,

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.

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, G 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 I. J.
32, Gascony Av., West Hampstead, London, N.W.6.

THE "TWO-FOUR" VALVE SET.

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. GRASSWELL.

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.



Remember the Skylark!

MANY who have heard the Brown H.2 Loud Speaker are amazed that such a small instrument can give such a volume of pure and undistorted sound.

To those, we would say, Remember the Skylark! One of the smallest of our songsters—yet his tuneful melody can always be heard from afar. Volume in a Loud Speaker is dependent upon correct design and not upon mere size. When you select the Brown H.2 you obtain the fruition of many years of experimental work devoted entirely to the science of sound reproduction. In fact, the very first Loud Speaker ever built for wireless was a Brown.

Prices

- H.2 12 inches high.
- 120 ohms £2 : 5 : 0
- 2000 ohms £2 : 8 : 0
- 4000 ohms £2 : 10 : 0

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67 HIGH ST., SOUTHAMPTON

Brown

Wireless Apparatus

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 milliamperere 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)

(Continued on page 56.)



No. 9 of a Series.

The Living Artiste

LOTS of people think that good suits cost too much—that a good car costs too much—that fine furniture costs too much. Yet there are people who buy all these things and who know that they get very good value for their money.

They are just the kind of people who believe that in the building of a Wireless Set it is well worth while using only Eureka Transformers. They are not necessarily well-to-do—they don't do it to impress their friends. They do it because they cannot resist the appeal of quality.

Into the manufacture of Eureka Transformers goes much care and forethought. In fact, it would not be too much to say that each Transformer receives the individual attention that is usually accorded only to expensive scientific instruments. An incessant demand—not only from all parts of this country, but also from the Continent and from the Colonies—has certainly necessitated their manufacture on a mass production basis, but no test is too stringent and no safeguard too great to ensure the original Eureka quality being fully maintained.

As a direct result, we have yet to hear of a dissatisfied Eureka user—while the wonderful flow of correspondence from wireless enthusiasts is a spontaneous tribute to Eureka excellence, and its ability to "re-create the living Artiste."

Portable Utilities Co., Ltd.,

Fisher Street, London, W.C.1

Concert
Grand 30/-

Eureka 22/6
No. 2.

(For Second Stage)

Supreme **EUREKA** for Tone

TECHNICAL NOTES.

(Continued from page 55.)

TO WIRELESS TRADERS, ELECTRICIANS, DEALERS AND OTHERS.

31, Camden St., Camden Town, N.W. (Close to Camden Town Tube Station.)

VERYARD & YATES, F.A.I., will sell by auction, on Thursday, March 5th, large quantities EX-GOVT. WIRELESS, ELECTRICAL, TELEPHONE & GENERAL SURPLUS STORES—4,000 Pairs Sullivan Headphones (4,000 ohms), 10,000 L.F. Choko Coils (500 & 1,000 ohms), 500 Coils New V.I.R. Lighting Cable, 100 3-Valve Amplifiers, 40 New 1/2 & 1 kw. Transformers, 20 cwt. O & 1 B.A. Brass Terminals, 85 New 2-Valve Mark IV Receiving Sets, 2,000 Single Phones, 1,500 Microphones, 1,000 2 mid. Condensers, 300 Spark Coils, 250 Marconi Variable Condensers, 12 cwt. Sheet & Rod Ebonite, 40 Large New Distribution Boards, 5,000 Fulley's Leclanche Cells, 100 Jar Condensers, 250 Transmitting Sets, 4 Electric Motors (1 & 1 hp., 220 volt), 400 New & S.H. Accumulators, 40 Ships' Liquid Compasses, 10 Marconi Ships' Wireless Sets, 30 Radiation Meters, 5,500 Ebonite Earcaps, 2,500 Terminal Blocks, 200 Road Meters, 100 Kilo-watt Meters, 60 Galvanometers, 5,000 Wound 1,000-ohm Telephone Bobbins, 500 Gross Brass Screws, 250 Wireless Cabinets, 2,000 Variotettes, Portable Telephones, Switches, Cable Resistances, Insulators, Barographs, Telescopes, Crystal & Valve Sets, and Wireless Equipment and Spares of all kinds; also 60 Mechanical Calculators, 1,500 Sheets Roofing Glass, 250 Cycle Foot Pumps, Kettle Drums, Tools, New Hinges, 300 Pairs Rubber Trolley Wheels, Acetylene Flares, Scrap Metal & Ebonite, etc., etc.

Catalogues from the Auctioneers, 365, Norwood Road, London, S.E.27. (Phone: 346 Streatham.)

Paris and other Stations

Clearly heard on Loud Speaker near London using the "MIRACLE" MASTER 2-Valve Set. £3 12-6, plus Royalties 1/3, and 4 Valves. Trade supplied. Send Stamp for particulars. World's Wireless Stores, Wallington.



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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 1/2 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 Sodian 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.

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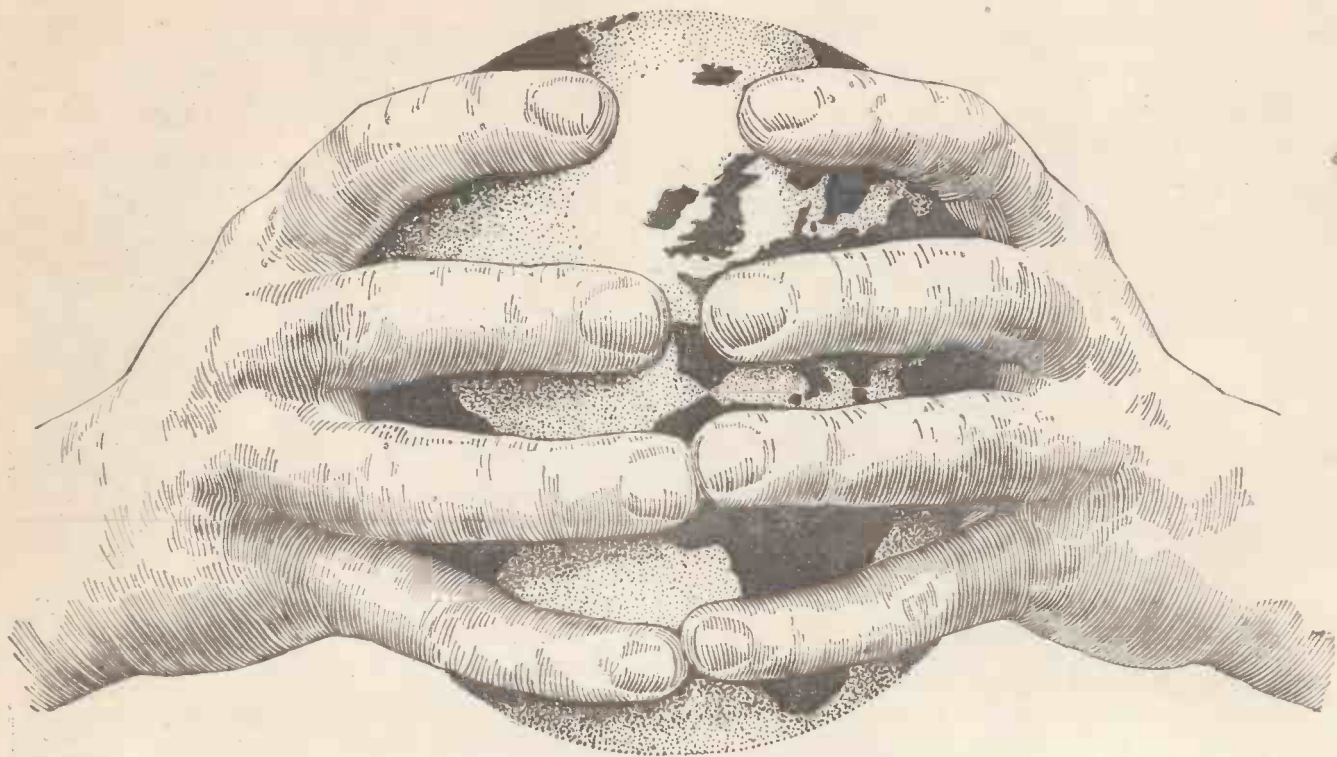
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WE are introducing an additional range of "LISSENAGON" coils. To distinguish the series from the well-known and standard "LISSENAGON" coils, we are calling this new series of coils "LISSENAGON X" coils. The first number to be put on the market, and now ready, is a No. 60 coil.

This "LISSENAGON X" coil has two tapings. The tapings are nearer that end of the winding which is connected to the socket, "A" tapping being nearer to the end than "B" tapping. In all circuits where one of the tapings on this coil is used, connections should be tried to both terminals separately to see which tapping gives the best results.

SELECTIVITY.

Great selectivity is a noticeable feature of this new "LISSENAGON X" coil. There is now a use for a tapped plug-in coil which will provide the user with the means of alternative connections called for to keep pace with the development in radio circuits.

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Aperiodic Aerial Tuning.

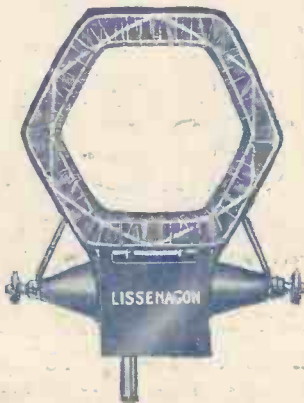
You can adopt this method of tuning with your existing receiver by simply taking your aerial off its present terminal and connecting it to either of the two terminals on the "LISSENAGON X" coil. Best results are usually obtained when the tapping point on the coil is nearest the earth terminal.

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This new "LISSENAGON X" coil is the only coil which can be used in "Neutral-Grid" circuits similar to that described by Mr Cowper. The H.F. amplification obtained with this new "LISSENAGON X" coil is remarkably stable, because the coil is so designed that on one or other of the tapping points a neutral point is provided which balances out the unwanted capacities.

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It will be noticed that in all circuits in which this new coil is used, reaction control is exceptionally smooth, and is very much finer than usually obtained.



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