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THE 1926 TWO-VALVE UNIDYNE SET.

Popular Wireless

Every Thursday PRICE 3d.

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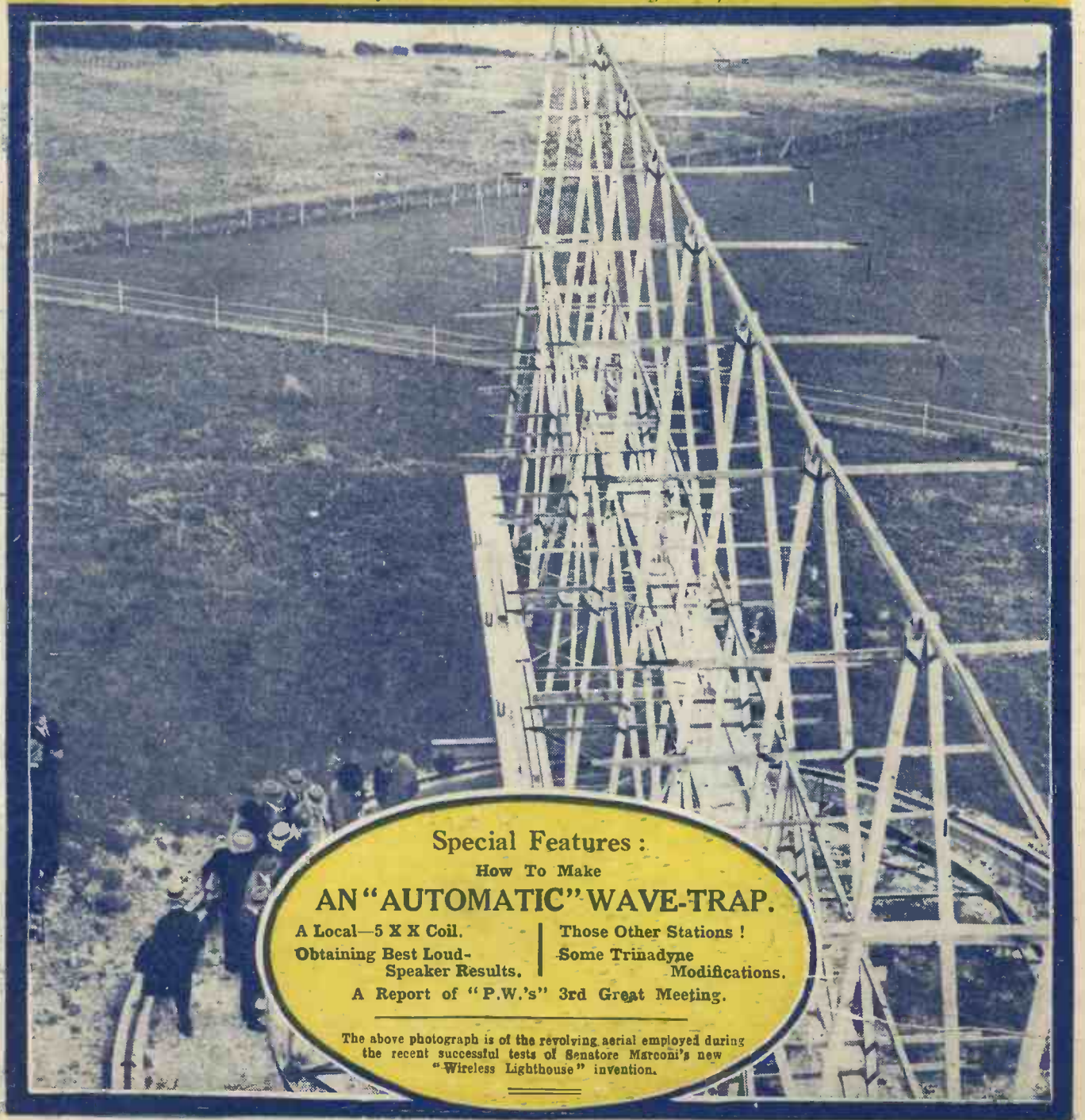
and Wireless Review

Scientific Adviser : SIR OLIVER LODGE, F.R.S., D.Sc.



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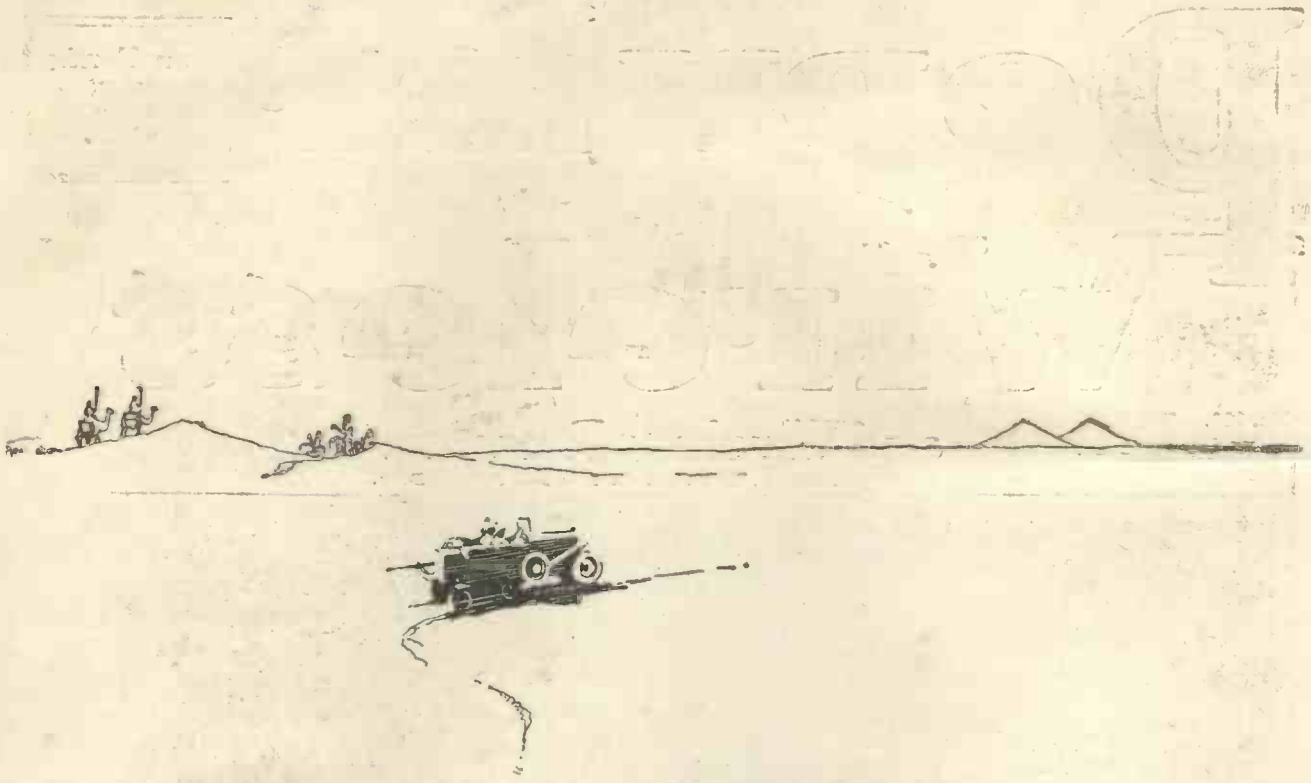
A Local—5 X X Coil. Obtaining Best Loud-Speaker Results.

Those Other Stations ! Some Trinadyne Modifications.

A Report of "P.W.'s" 3rd Great Meeting.

The above photograph is of the revolving aerial employed during the recent successful tests of Senatore Marconi's new "Wireless Lighthouse" invention.



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—the Wuncell Dull Emitter has the longest life of any valve because it operates at by far the lowest temperature.

MANY a man trying out his first Wuncell has serious doubts as to whether his Valve is really switched on. In broad daylight it is literally impossible to discover, by a superficial glance, whether the current is on or off. And at night time the glow is only just discernible.

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Popular Wireless

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RADIO NOTES AND NEWS.

A Final Farewe'l—The First Prosecution—A "Freeze-Out"—The Most Popular Station, 5 G B—Radio's Great Day—"P.W." Radio Sounds Competition.

Hilversum Concerts.

IN future, every Thursday night the Hilversum station (H D O) is arranging to broadcast a concert by the world-famous orchestra of the "Concertgebouw" at Amsterdam.

Listeners who pick up these concerts are invited to report upon the transmissions to the promoters, Messrs. Philips, Ltd., Eindhoven, Holland.

A Final Farewell.

ACCORDING to the "Daily News," a touching story was told of the late Mr. Easthope Martin, whose recent sudden death has deprived listeners of a broadcast favourite. After Mr. Martin had concluded his last broadcast performance with the words "Good-night, everybody," listeners were astonished to hear someone say a moment or two later, "Good-night, guv'nor," and most of us thought that the remark reached the microphone by accident. It now transpires that it was a farewell message from Mr. Martin himself, addressed to his old schoolmaster and lifelong friend, Mr. G. Jackson, of Stourport, in the hope that he would be listening. Fortunately, this was the case, and "the "guv'nor" heard his pupil's fine performance, and also the broadcast final farewell.

The First Prosecution.

THE first prosecution under the new Wireless Act was recently heard at the London South-Western Police Court, when Henry Hazlewood, of 34, Ursula Street, Battersea, was summoned by the Postmaster-General and charged with unlawfully working and installing a wireless apparatus without a licence. Evidence was given that Post Office officials visited the house, and that Hazlewood admitted that he had been listening-in on a crystal set, although he had no licence. It was stated that he added: "I suppose I am like a good many more; I didn't want to lay out the money."

Bound Over.

MR. H. S. PEARCE, assistant solicitor to the Post Office, stated that Hazlewood was a poor man who could not afford to pay a heavy fine. Under the Wireless Act he was liable to a penalty not exceeding £10, but the Postmaster-General was more desirous of giving a practical warning to other "pirates" than of punishing Hazlewood. The magistrate, Mr. Ratcliffe Cousins, said it might be better to treat such cases as ones for summary jurisdiction, and he bound Hazlewood over in £25 for six months.

A "Freeze Out."

DID you notice how the 2 L O announcer dropped two and a half minutes in one sentence recently? Explaining an accidental "freeze out" in the programme, he said: "As we have only *three* minutes to go before the time signal, we regret that we cannot give the Bacchanale first; the time signal will be going in *half* a minute." Said all in one breath, it left one with the impression that time flies on the radio!

Percy Pitt's Selection.

I HEAR that that beautiful song, "Red Rose," from "Monsieur Beaucaire," is one of the five complete musical gems selected for Part 3 of "Music Masterpieces," which will be on sale next week. Parts 1 and 2 can still be obtained, price 1s. 3d. each, and the work will be completed in about thirty parts, published fortnightly, and edited by Mr. Percy Pitt of the B.B.C.

The Most Popular Station.

THE most popular foreign station at the moment appears to be Radio Toulouse, which, by the way, has raised its wave-length from 273 to 432 metres. The French station is soon to have a rival, I hear, for a full-power transmitter is being constructed at Amsterdam, the programmes from which should cover the south of England at a strength equal to, or greater than, those from the Mediterranean station. Holland will be one of the best-heard countries then, for in addition to the forthcoming Amsterdam programmes, those from Hilversum will be transmitted upon treble power.

New Call Signs.

I AM asked to announce the following call signs, which have been allotted recently: 2 N R, 10 watts, 115-130 metres and 150-200 metres. Radio Society, Acton County School, Acton, London, W.3; and 5 J O (replacing 2 A R Y), 10 watts, 150-200 metres and 440 metres, Mr. L. W. Jones, 50, King Street, Cambridge. Transmissions from the latter will be due on the air in a day or two, and reports will be welcomed and acknowledged.

Broadcasting in Spain.

AMBITIOUS schemes are afoot for future broadcasting in Spain. There are already several powerful stations there, but within the next two years it is proposed to increase the number up to a total of twenty-one. Seven of these will be working upon the comparatively high power of 4 to 8 kilowatts, which would enable them to be heard in this country quite easily, judging by the success with which Spanish broadcasting is already received here. Whatever will Geneva say to this further invasion of Europe's ether?

5 G B.

THE new B.B.C. experimental station at Chelmsford (5 G B) has been treating listeners to some fine free programmes recently. The strength of the signals is certainly an eye-opener, and excellent crystal reception is possible over a wide area. On valve sets in the eastern London suburbs the programmes have been coming in as powerfully as 2 L O's, and most of the reports I have received praise the quality of the transmissions as well as the strength. A feature of the reports which strikes me is the large number of people who listen outside regular hours, and the appreciation which is shown of the temporarily extended hours of service.

(*Continued on page 560.*)

NOTES AND NEWS.

(*Continued from page 559.*)

The "P.W." Meeting.

THE third "P.W." meeting, held at the Central Hall, Westminster, on October 23rd, was a tremendous success, and I am sure that nobody who was present will forget one incident of that great gathering. I refer to that moment when Senatore Marconi—presenting to Sir Oliver Lodge a casket on behalf of "P.W." as a token of the great esteem and affection which he commands—paid a personal, generous, and glowing tribute to the work of the greatest living British pioneer of radio.

An Historic Moment.

SUCH a spontaneous public tribute—falling so gracefully from the lips of Senatore Marconi himself—was affecting to the onlookers as well as to the recipient. The generous warmth of feeling expressed made the scene a memorable one, as the two great men shook hands amidst a tumult of clapping.

In the years to come onlookers will proudly recall that incident, for it was a glimpse into the great hearts of the men who have made radio history.

Radio's "Great Day."

SIR OLIVER LODGE, taken completely by surprise, was for the moment almost at a loss for words; but in the delightful speech which followed he happily expressed the general feeling when he turned to Senatore Marconi and said: "It was a great day for the human race when you got that letter 'S' across the Atlantic. Your achievement marked the beginning of a new era, when mankind shall no longer be separated and divided by the geographical boundaries between the nations, but all shall unite in the great brotherhood of mankind."

5 X X in Belgium.

"EVERY evening I switch on the Daventry station to hear its beautiful concerts, because all our stations here on the continent are not half as good as 5 X X," writes a Belgian reader, who lives near Thumaide (Hainaut).

Here, in England, it is fashionable to grumble sometimes at the Daventry programmes, but there is no other station in Europe which has such a large or appreciative audience as 5 X X.

This reader goes on to ask "Who is 5 X W?" Particulars of this station would be gratefully received by M. C. J. Noil, Chateau de Rameignies, par Thumaide, Belgium.

Radio Association News.

THE recent Radio Sounds Competition has called attention to the necessity for greater research in the wireless reproduction of various sounds, and, realising this, the Radio Association has recently added to the council Professor Lloyd James, the well-known lecturer in phonetics at the London University. It is interesting to note that at the receiving end, the odds against the recognition of certain sibilants are reckoned to be as high as 100 to 1.

The R.A. Dinner.

TALKING of the Radio Association reminds me that their forthcoming dinner speeches at the Hotel Cecil will be broadcast upon November 10th. The Duke of Sutherland will preside, and promises of support have been received from Lord Cecil, Senatore Marconi, Viscount Wolmer (Asst. Postmaster-General), J. C. Reith, Esq., and other prominent members of the B.B.C. By the way, the Radio Association's address has just been altered from Southampton Row to 24, Queen Victoria Street, E.C.4.

Mr. Goyder Again.

I HAD a cheery line from Mr. C. W. Goyder (who works the famous Mill Hill School set), the other day, and he tells me he has bagged another record by working with an amateur in California.

SHORT WAVES.

"The Government has appointed a Special Committee to review the whole position of broadcasting both here and abroad and to make recommendations for the future. Whatever happens to the form of broadcasting after 1926, it should remain as a public service under unified control."—Mr. J. C.W. Reith, Managing-Director B.B.C.

* * *

"When discontent assails the cook,
You can't afford to pique her;
So fix inside the scullery nook
An up-to-date loud speaker.
So long as she can listen-in
She'll stay with you through thick and thin.

"With spoon or ladle in her hand,
She stirs the broth and salts it
To music by the Savoy Band—
And frequently she'll waltz it.
No more you'll hear her threats to go
If she can stay with 2 L O.
"Cosmos" in the "News of the World."

* * *

"Whether it be for local listening or for reaching out, more valves than are commonly used are necessary if simplicity, good performance, reliability, and ease of adjustment are required."—Capt. Eckersley, writing in "Lloyd's Sunday News."

* * *

"It is said that radio is still in its infancy. Which probably accounts for its bad behaviour when you have company."—"American Legion Weekly."

This is the first time that Britain has worked the sixth district of America (the Pacific Coast), for it is far more difficult to get a short wave signal to California than to New Zealand, for some obscure reason.

Short-Wave Developments.

Like Mr. Marcuse, Mr. Goyder has been experimenting with telephony, and has worked New Zealand, Australia and America with it. This winter will see some startling developments in this fascinating field of radio science, and both Sir Oliver Lodge and Senatore Marconi admitted at the "P.W." Meeting that they were "watching points" with great interest. "P.W." readers have an absolutely unique opportunity of keeping au fait with the situation, for those week-by-week articles from 2 O D and 2 N M are the very last word upon the latest aspects of the subject.

Technical Queries.

THERE has been a very big rush on the Technical Queries Department recently, and in their own interests readers are reminded that time is saved if the rules are observed. Every effort is made to get the replies off quickly, but failure to number the questions will delay not only your own query, but all those following it. And many a letter misses the post because that stamped addressed envelope is omitted.

The Lady Announcer.

HAVE you heard the lady announcer at San Sebastien (E A J 8)? The station works through till late at night upon about 340 metres, and has been coming over with great gusto during the last few weeks. One Manchester reader tells me that he gets splendid loud-speaker reception from E A J 8 upon Det. and 2 L.F., but he complains that Manchester has been heterodyned for several weeks by a station he believes to be Oslo. Can any northern reader confirm this, or say who is the delinquent?

"P.W." Radio Sounds Competition.

AT the time of writing it has not been possible to announce the results of the "'P.W.' Radio Sounds" Competition, owing to the very great number of entries received. The names of the prizewinners will be announced very shortly, and they will be published exclusively in POPULAR WIRELESS. The Editor tells me that in addition to the names of the successful entrants a short article will appear, showing how successfully—or unsuccessfully—the various sounds were identified by listeners.

Reception in Cornwall.

AS a result of my recent paragraph, in which I quoted a reader's opinion that "reception in Cornwall is absolutely a wash-out," I have had some interesting letters of contradiction from Cornwall. One reader says, "Even with the plainest and simplest crystal set I was able to get fairly audible reception from 5 X X. With a 4-valve set the reception—power, clarity and tonality—is very little, if at all, inferior to reception heard by me on notably good sets in London and around."

Low-Wave Loud-Speaker Work.

THIS letter continues: "As regards low waves I admit that one has to contend with much Morse, but in spite of this I have had loud-speaker reception from all the main B.B.C. stations, several relays, and of the Continental, German, French, Italian, and several unknowns at excellent L.S. strength."

Which just shows that it *can* be done, even in Cornwall, if your aerial is good—and your luck is in!

A Complimentary Card.

YOU know those cheery little "Q.S.L." cards that transmitters send one another when reporting reception? Well, the other day an Australian reader hit upon the happy idea of filling in one reporting the reception of his weekly copy of this journal! It was filled in carefully, with CALL SIGN—"P.W."; RECEIVED HERE—"Regularly"; and all the other details applicable. In the space devoted to STRENGTH OF YOUR SIGNALS—my far-away friend had filled in the single word "Knockout"—which constitutes one of the neatest and farthest-travelled compliments I have seen for a long time!

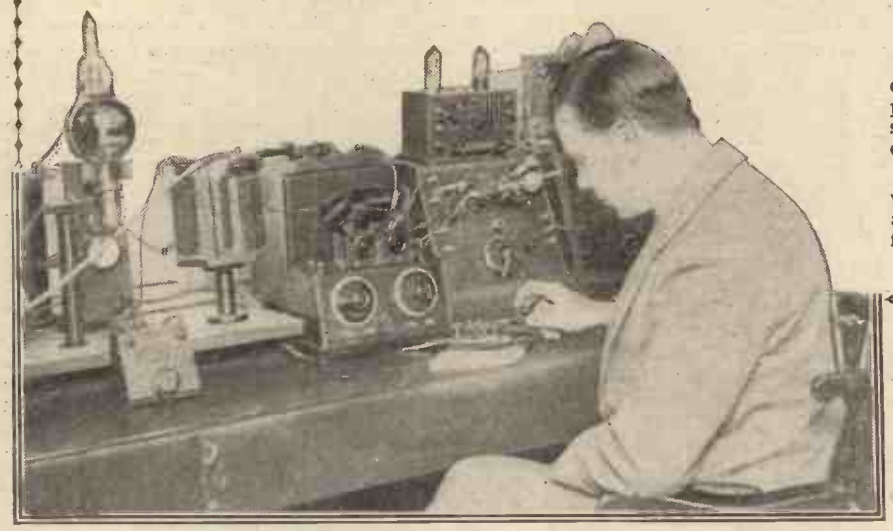
ARIEL.

2 O D CALLING.

MY SHORT-WAVE RECEIVER.

INTRODUCTORY DETAILS.

By E. J. SIMMONDS, M.I.R.E., F.R.S.A.



In this article Mr. Simmonds describes his new short-wave set as a preliminary to an article which will shortly appear giving full constructional details for the benefit of other amateurs.

Like Mr. Marcuse, Mr. Simmonds only writes articles in "Popular Wireless," and this arrangement will remain in force until further notice.—The Editor.

IN my last article I discussed the various points to be considered when the construction of a short-wave receiver was being designed, and I also gave a diagram of the set in use at my station. Since then, however, I have been carrying out extensive experiments on the reception side of short-wave work, and have just completed a two-valve receiver which for efficiency, ease of operation and wide range will be found a great advance on past designs.

I am giving here a few of the details necessary for the construction of a similar receiver, as a preliminary to a full description in my next chat, which will include extracts from a log of stations received on the set, photographs and calibration curves of the tuning coils.

The main idea in designing this set was to enable the writer to have a receiver capable of going down to 10 metres and possibly 5 metres and yet to have a maximum wave-length of over 50 metres. To do this, existing circuits had to be carefully considered with a view to reducing all capacity losses to the minimum.

Elimination of Capacity Losses.

It is well known, of course, that all circuits have high and low potential points, and that if the high potential points come anywhere in the vicinity of an "earthed" body, such as the operator's hand, variation of tuning and perhaps total loss of signals will result. This capacity leakage is not unnoticed in broadcast receivers, though here it does not assume such large proportions, as the frequencies dealt with are comparatively so low. But take the case of 40 metres or less, where the frequency is increased to over 7 millions per second, and then it is seen that small values of capacity or high potential-low potential leakage will cause large frequency changes with great loss of signal strength.

In the design of the set under consideration the high potential points, such as the grid and plate ends of the coils, are kept well away from points at earth potential (in fact, the whole of the H.F. side of the set is kept away from any earthed objects), the connections to variable condensers where necessary, as in the case of the grid coil being made to the fixed vanes. These are denoted in the diagram by a straight line, the moving vanes being shown as a curved line with an arrow head.

In the condensers used—G.E.C. slow-motion type—true low-loss design has been employed, the moving vanes are earthed to the frame of the condenser, and the fixed vanes are insulated from the frame. This method gives absolute immunity from hand capacity effects and enables easy and accurate tuning to be carried out.

The H.F. Choke.

In the circuit diagram of this receiver, it will be observed that the usual arrangement of connecting the H.F. choke to the anode of the detector valve has been abandoned. Instead, the anode lead goes direct to the high potential end of coil, and both the H.F. choke and feed-back condenser are placed in that part of the circuit which is at earth potential. This is an important change, and has a great bearing on the successful operation of the set below 10 metres.

Constructional Details.

The use of ebonite has so often caused noisy and inefficient reception in my experience that I decided to keep it out of the set altogether on the high-frequency side, and with the exception of the Dubilier grid condenser no ebonite is used in H.F. circuits. Even the valve (which is a D.E.Q.) is mounted by its filament contacts only, the grid and plate connections being made by floating clips to the two side contacts on the valve.

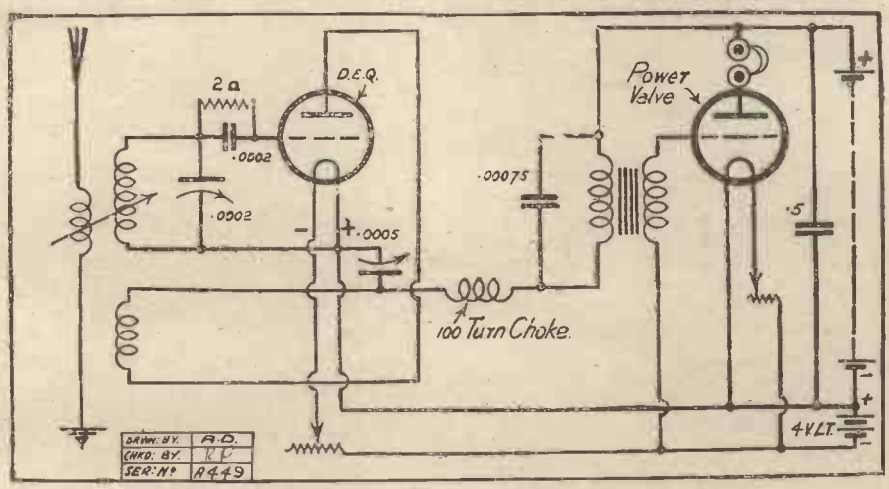


Diagram of the short-wave circuit discussed in the accompanying article.

(For the benefit of readers unfamiliar with the D.E.Q. I must mention that it is of the V. 24 low-capacity type and does not have four pins like the ordinary valve, its electrodes being taken out at the two sides and the ends.)

A flat "bread-board" is used for mounting, the variable condensers being mounted at the front edge and the coil holder, valve and choke a little farther back. The coil holder consists of three lengths of glass

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MY SHORT-WAVE RECEIVER

(*Continued from page* 561.)

tubing mounted horizontally and so arranged that coils of 2½ in. diameter slide on easily but without being too slack.

The choke is also wound on a glass tube 1 in. diameter and consists of 100 turns of 32 D.S.C. wire spaced with thread, the thread being removed afterwards, making the turns air spaced. This point is very important, as self-capacity in the choke would be sufficient to prevent the circuit from oscillating. The feed-back condenser is also an important feature and should be of the low-loss variety with vernier movement. The G.E.C. condenser is again quite suitable, but this condenser should have a maximum capacity of ·0005 mfd.

The low-frequency side of the set is quite straightforward and need not be discussed here, full details concerning the construction of the set being given in my next article.

The main points about the receiver are those I have mentioned, namely, the coil holder, and the choke and variable condensers. The grid condenser and its parallel 2-megohm grid leak are supported in air on short wiring, while the coils are of the cylindrical type wound with 18 gauge tinned copper wire, the turns being spaced by means of small glass beads. These coils do not "plug in," but are merely hung on the three glass tubes, connections being made to their ends by small lengths of flex provided with those small press clips used by some firms for window dressing.

In considering the design of coils for these frequencies it should be borne in mind that the losses in the modern variable air condenser of good design have been reduced to a very small value, and any further improvement must be looked for in the design of the coils. This is a difficult problem as there are so many conflicting factors, but much can be done by suitable air spacing, and removing all solid dielectrics from the field of the coil.

The lay-out is well spaced but not unduly so, and the net result is a receiver remarkably easy to control and without the slightest hand capacity effects. Reaction is smooth and the valve slides in and out of oscillation very gently, retaining a clear background.

Components Well Spaced.

As I have the set at present the coils have been wound for two stages of wavelength, though there is no reason why lower or higher frequencies should not be reached with coils of more or less turns. With only a one-turn grid coil the set oscillates quite satisfactorily over a large range, so that it seems feasible for 5-metre reception to be attained if need be.

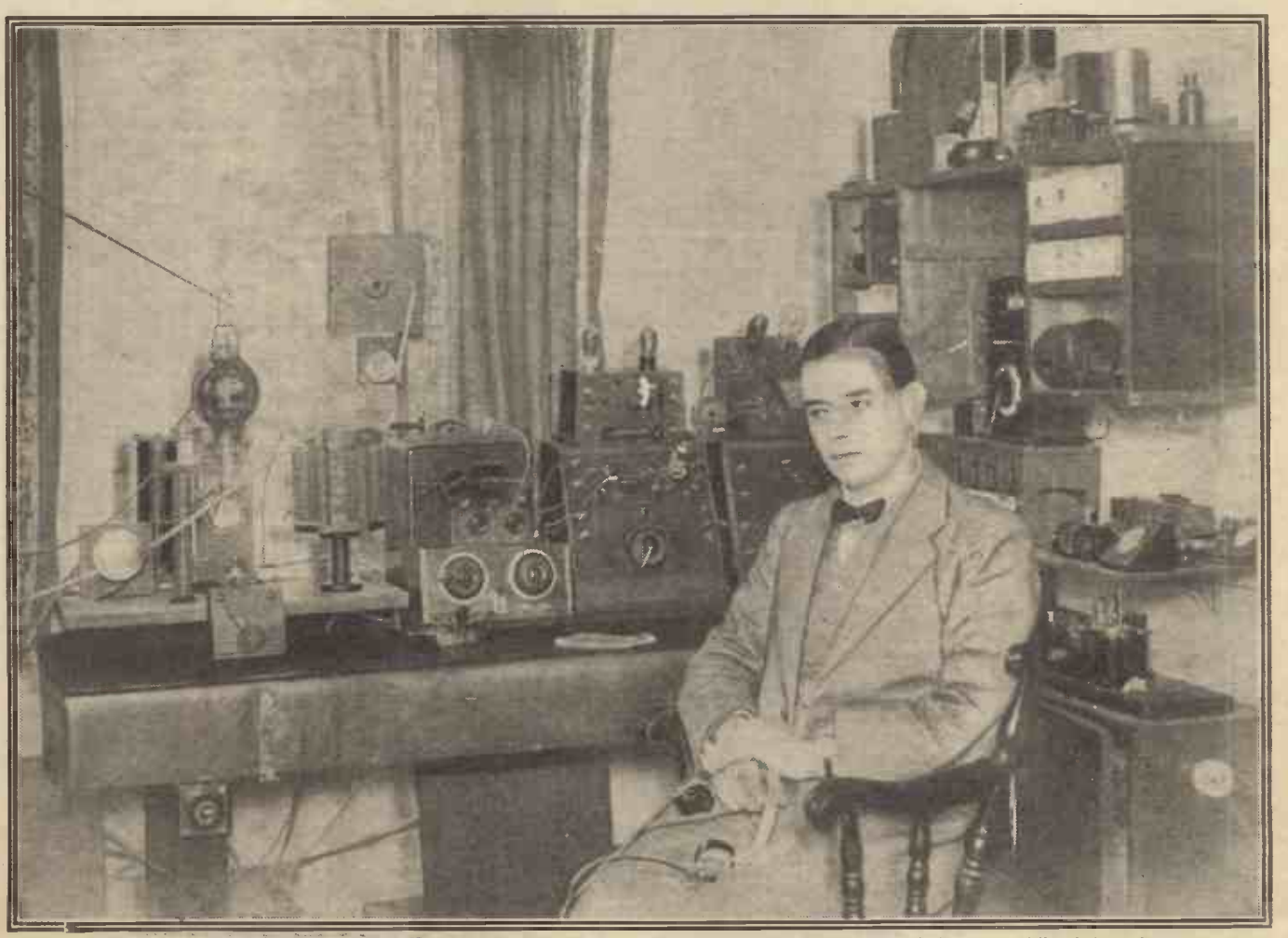
For general use, however, a 5-turn grid coil and 6-turn reaction will give best results, covering wave-lengths of from 13 to 40 metres, while a 12-turn grid and 9-turn reaction enable stations working between 25 and 70 metres to be received. A 3-turn grid coil will carry the wave-length down to 8 metres.

In the actual operation of the receiver a four-volt L.T. battery is used and about 60 volts H.T. on the plates of both valves. The impedance of the D.E.Q. valve is high (approx. 100,000 ohms) and is designed to operate with a fairly high anode voltage. While this type of valve is designed to rectify on the "lower bend" principle, a grid leak and condenser gives greater sensitivity on the high frequencies.

The grid leak and condenser are of the usual construction, though it is doubtful if full efficiency is obtained at the very high frequencies they are called upon to handle. The question of grid condenser design using air as dielectric is being considered, and further details will be given in the future, because it is realised that in order to obtain the maximum efficiency all the links in the chain must be redesigned.

The grid leak must be carefully chosen, and any variation in its value will make the circuit noisy, and the reception of weak signals becomes an impossibility. Great attention should be directed to this important point.

In my next article I shall deal fully with all the details of this interesting receiver.



Mr. E. T. Simmonds in his operating room at G 2 O D, Gerrard's Cross. The old short-wave receiver shown in the centre of the photograph has now given place to the new one, the construction of which is to be described in next week's issue.

One of the new Brown Loud-Speakers.

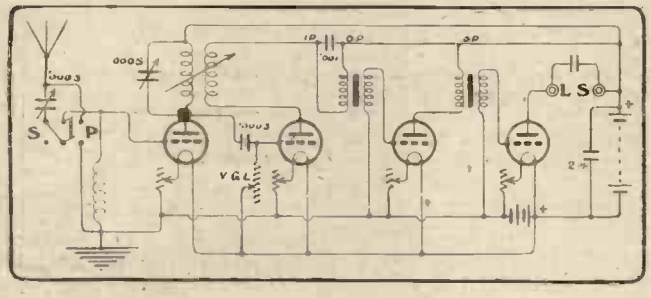
OBTAINING BEST LOUD-SPEAKER RESULTS.

By

OSWALD J. RANKIN.

"Every loud-speaker enthusiast should make a serious effort to combine quality and quantity."

IT is a great mistake to imagine that the best loud-speaker results can be obtained by simply piling up the signal strength in the low-frequency amplifying circuits of a receiver so as to obtain the loudest possible signals. It is true that volume is absolutely necessary to operate a loud speaker, but at the same time, one should not overlook the fact that if such essential factors as note quality and that very desirable effect known as "the background of silence" is ignored, or even partially neglected, then even the most perfect loud speaker ever produced will not function satisfactorily. Every loud-speaker enthusiast should make a serious effort to combine quality with quantity, and it is hoped that the following hints will be helpful to those who, having arrived at the quantity stage, desire to effect those simple yet all-important improvements which make for perfect results.



Various Coupling Methods.

Theoretically, resistance-coupled L.F. amplification gives best results on the quality side, but inferior results as far as actual amplification or note strength is concerned. It is an excellent plan to combine the usual transformer coupling with a resistance coupling by using, in a two-stage note magnifier, a transformer in the first stage and a resistance in the last stage. Similarly one might employ a stage of transformer-coupled and two stages of resistance-coupled L.F. amplification, or the three stages could be arranged as follows: First stage, transformer, second stage L.F. choke coil, and third stage non-inductive resistance. However, for efficient amplification there is nothing to equal the transformer method, and if properly handled two transformer-coupled L.F. valves will not distort speech and music in any way.

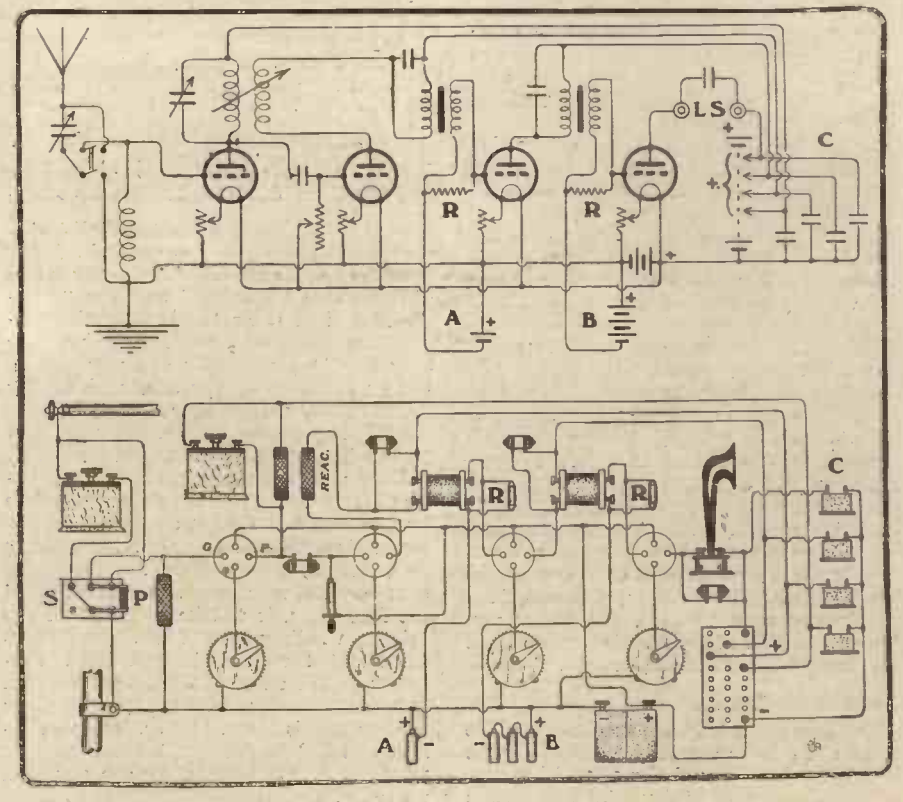
One of the most important things to remember is that loud-speaker reception should be confined to the nearest broadcasting station. For really good results not more than four valves should be used, and it will be found that a good straight circuit employing one stage of H.F. amplification, valve or crystal detector, and two stages of transformer-coupled L.F. amplification will generally give the best results provided one is capable of effecting the various little modifications outlined below, which constitute essential improvements.

Two Years Ago.

The standard four-valve loud-speaker circuit shown in Fig. 1 needs but a brief description, since the majority of POPULAR WIRELESS readers are well acquainted with same. This is perhaps the most usual four-valver for loud-speaker work, the first valve functioning as an H.F. amplifier, the second as the rectifier, and the third and fourth as L.F. amplifiers or note magnifiers. The aerial tuning condenser is usually placed in parallel with the aerial coil, but it is a much better plan to include a simple D.P.D.T. switch, so that it may be placed either in series or parallel with the coil as shown. The well-known tuned anode coupling is employed in the H.F. circuit, and a reaction coil is connected in series with the plate of the detector valve and I.P. of the first L.F. transformer, and coupled to the anode coil in the usual way. The upper end of the anode coil, the two O.P. transformer leads, and one of the loud-speaker terminals are all connected to a common lead which joins the H.T. positive wander-plug.

Less than two years ago such an arrangement was considered ideal, and amateurs possessing a receiver embodying this circuit were able to "work" a loud speaker and so amuse their friends. To-day, however, it is the exception rather than the rule to find a mere trace of enthusiasm where a loud speaker is rasping out a mixture of mush and music from a "receiver" such as this.

(*Continued on page* 564.)



Technical Notes

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

THERE are many cases when the amateur is in doubt whether an extra stage of H.F. amplification or an extra stage of L.F. would serve his purpose best. What is he to do? Of course, you know that, in general, extra H.F. amplification gives you distance and extra L.F. amplication gives you loudness. But the matter is not by any means quite so simple. If the H.F. amplification is used, it undoubtedly increases strength of signals, especially in cases where the original strength was not sufficient properly to actuate the detector. You can easily prove this by decreasing the efficiency of your aerial (for example, if an indoor aerial, by touching it with the finger), when strength of signals will fall off very noticeably.

It is common to assume that each stage of H.F. amplification increases the strength of signals three times, but it is very doubtful whether this is actually so in practice. As a matter of fact, simple reaction applied to the aerial will do more towards the strengthening of signals than one stage or sometimes even than two stages, of H.F. amplification. Unfortunately, however, there are two well-known drawbacks to H.F. amplification.

Variable Grid Condensers.

As regards L.F. amplification, one stage is usually sufficient for all ordinary purposes, and two stages should be sufficient for any purpose, particularly with a power valve in the second stage. Three stages are apt to introduce too much distortion, and, moreover, the amplification obtained seldom seems to justify the third stage.

By the way, when using a power valve in the second stage (or any other stage, for that matter) of L.F. amplification, be careful to ascertain that you have the best value of grid bias, as this makes an important difference to the results obtained. In some cases you will find that a grid bias of very much more than the customary 3 or 4½ volts is desirable.

The grid condenser is almost invariably a fixed one; this is because the value of this condenser is usually not critical, but there is no reason why a variable condenser should not be used, and in some circuits it may be found a distinct advantage to use a variable grid condenser instead of a fixed one. At any rate, it may be useful to include a variable one in the first instance, and find out by that means the best value, afterwards substituting a fixed condenser of the best value. Alternatively, different fixed condensers may be used, but unless you have a number of such condensers on hand that may be an expensive process.

Unnecessary Complications.

Talking about variable condensers, there seems now to be a great tendency to make all sorts of fancy varieties of variable condensers, many of the special movements having, in my opinion, little or nothing to recommend them except perhaps novelty of design or ingenuity of movement. Personally, I never can see that anything is superior to a condenser in which all the vanes move together, but in which a vernier is provided or the movement of the rotor is by a vernier control. After all, what you want is to vary the capacity by very small amounts, and provided you can do that, it seems more or less immaterial how you do it.

In other words, the simplest mechanism which enables you to secure micrometer movement over any part of the scale is all that is required, and there is little justification for all kinds of complicated or merely ingenious mechanical movements.

Resistance Losses.

When dealing with the subject of the energy losses in a circuit it should be remembered that the ordinary ohmic resistance is not the only cause of resistance loss, nor, in fact, the principal one in most cases: that is to say, the loss measured according to the ohmic resistance of the circuit to direct current.

(*Continued on page* 604.)

The diver being equipped with a microphone during some recent undersea broadcasting experiments carried out near Heligoland.

OBTAINING BEST LOUD-SPEAKER RESULTS.

(*Continued from page* 563.)

People are no longer content with distorted speech and music; the novelty of this has passed, and now the order of the day is *tone purity*—more "speaker" and less "loudness," and in order to obtain such desirable effects one must naturally pay a little attention to his receiver and rely a little less on the loud speaker itself which, after all, is merely a device for reproducing the amplified signals fed into it, and *not* a filter for passing only the undistorted signals.

Briefly, Fig. 2 represents the Fig. 1 circuit adapted to present day needs. Here we have the same direct circuit with a few essential modifications on the low-frequency side; modifications which mean all the difference between success and failure. In the first place, it will be noticed that the primary windings of both L.F. transformers are shunted with ·001 mfd. fixed condensers. The effect of shunting the second transformer may not be apparent but it is best to put it there. The ·5 megohm resistances (R) which shunt the secondary windings of the transformer are almost a necessity.

On no account should the grid bias batteries A and B be omitted. These are connected in series with the O.S. transformer leads, the first (A) being a single cell (1½ volts), and the second (B) having a value of about 4½ volts. Connect the O.S. transformer leads to the negative sides of the batteries, and join the positive sides to the common L.T. negative line.

Separate H.T. Valves.

By this time it should be fully realised, that in order to obtain the very best results from a multi-valve receiver the high-frequency, detector, and low-frequency valves should be provided with separate H.T. positive connections so that the plate voltages supplied to the valves—which will vary according to the various functions of the valves—may be adjusted quite independently. Such an arrangement is clearly outlined in Fig. 2.

It is a mistake to imagine that a single reservoir condenser of 2 mfd. capacity is sufficient for the H.T battery when more than one positive connection is provided. A separate condenser should be used for each tapping, as shown at C in Fig. 2, for a single condenser can only be made to shunt one active section of the battery, and if this is connected across the largest section as indicated in Fig. 3 it will have no effect whatever on the sections marked 1 and 2.

"RADIO SOUNDS" AND ST. DUNSTAN'S.

How Blinded Soldiers Listened-in.

By LESLIE G. MAINLAND
(*The well-known "Daily Mail" writer.*)

"YOUR best chance to do well in the POPULAR WIRELESS Radio Sounds Competition is to keep your eyes shut."

This casual remark by a famous wireless engineer irresistibly led our thoughts to some whose eyes have been closed by Fate—and the Great War.

"Yes," he agreed, "the men at St. Dunstan's should have a real good chance of winning prizes—better than most. And who will grudge it them?"

An inquiry at the great training centre for blinded soldiers showed that the POPULAR WIRELESS contest had already been most keenly debated among the ex-soldiers, who are wireless enthusiasts almost to a man. The trouble lay in the fact that the great lounge was served by a big loud speaker, and this was not an ideal arrangement for quiet and concentrated listening.

Those men who had their own private sets and headphones were obviously better off than those who would have to listen in company, yet all wanted to "start fair."

Then came a stroke of inspiration and some wonderfully smart work. Captain Ian Fraser, Chairman of St. Dunstan's, got into touch with Messrs. Burndept, who generously offered to install a special receiving set and fifty pairs of headphones.

It was after lunch on Friday—the night of the competition—when Messrs. Burndept's experts brought their gear to St. Dunstan's. They were at once surrounded with a crowd of sightless wireless enthusiasts, begging to be allowed to "see it"—that is, to follow the leads, touch the terminals and finger the dials and controls. With exquisitely delicate touch they "saw" as much as time allowed.

"A Whizz Bang?"

The set—an Etherphone V, Mark IV, with a frame aerial—was placed at one end of the lounge while six leads were carried away to half a dozen tables and connected with distributing boards with terminals arranged in parallel, so that ten sets of headphones could be used at each table. This apparatus, too, was eagerly examined by the questing fingers of the sightless men.

Half an hour before the Radio Sounds Contest was due to start, wives, sweethearts and daughters began to drift into the lounge. They had promised to come and help by writing down the guesses of their menfolk.

Boy Scouts, volunteer Sisters and Nurses, together with one or two orderlies also acted as competition secretaries, so when zero hour (7.50) arrived, there were about a hundred people in the great room, St. Dunstan's having mustered a guessing team nearly 50 strong for a collective assault on the prizes.

"You must remember that these are all newly-blind men," whispered an official. "They are suffering the deferred penalty of blindness as the result of eight and ten-year-old wounds, and have only just come to us for training following recent loss of sight. Our original fellows are now self-reliant, self-supporting men who have won back their independence in the world. *These* to-night are only beginners, so they will find the Radio Sounds Competition nearly as difficult as an ordinary 'sighted' person."

As one overheard the whispered solutions hazarded by the men, one saw that the competition was going to be, as one puzzled man remarked, "a teaser." For some of them the war and warlike sounds must become almost an obsession. One heard one or two guesses such as "A whizz-bang," "Machine-gun fire," "Laying table at the Y.M.C.A."

Unofficial Secretaries.

Others were not making such heavy weather of it. One man breathed his solutions to a small daughter with bright bow, another confided his to a uniformed Sister. An earnest couple of "pals" kept their respective wives busy with pencil and paper. Yet another had a tiny Scout with a gift for original spelling. The fair copy on the coupon, however, would see that put right.

Then a sightless Canadian drifted in rather belatedly. He was one of the lucky ones with a pension on a more lavish scale than the over-taxed Mother Country can afford. As soon as he grasped the idea of the new game his comrades had found, he bemoaned his bad fortune at being out of it.

He was a real sportsman, however, for he whispered to an official that he would put up a special ten-shilling prize for the boys, to go to the sender of the most successful attempt from St. Dunstan's.

Some Knotty Points.

Then there was a grand filling up of forms, with all those worrying, all-important, final choices to be made.

That queer sound could not really have been "a man walking on ice," though it sounded precious like it to one competitor. Was that other noise caused by the tearing of calico or linen? All these knotty points had to be decided.

"If *I* had heard the tearing," said a wife, "I could have told you in a second." Still, under the rules laid down by the St. Dunstan's men themselves, no one was to have any outside help, in order that none should have an unfair advantage. This rule was kept throughout the evening in a most sporting way.

Then came a final grand clearance—of papers, of wireless gear, of chairs and tables, and of Boy Scouts (who had to go home to report for bed). The next item on the St. Dunstan's programme that night was a dance, and I left after a glimpse of bright and cheery sights and sounds. Sightless ex-soldiers being steered through a brisk two step by Sisters or by their wives or by wives-to-be, and they swung round the splendidly-proportioned room without a trace of the terrible handicap which St. Dunstan's is teaching them to forget.

But we—we for whom they gave up light for darkness—we must not forget.

These people are listening to "radio sounds" broadcast from the bottom of the ocean by a diver. We are unable to publish a photograph of the actual "sound apparatus" used by the B.B.C. as they wish to keep its nature a secret.

BROADCAST NOTES.

By O. H. M.

A Broadcast Festival—Ambitious Programme Plans—Scrapping the Transmitting System—The Calthrop Cabaret—Criticism and the B.B.C.—No Decline in Broadcasting—The Journalistic Mind.

I WAS able last week to give exclusive information of the intention of the B.B.C. to develop special programmes during the second week in November. These plans have gone forward, and now the Broadcast Festival has taken form. During the week beginning Sunday, November 8th, which will include the third birthday of the B.B.C., there will appear in the programmes the greatest aggregation of entertainers and stars, theatrical and musical, which have ever been gathered together for one purpose. Names already mentioned as possible are Sir Harry Lauder, Hefetz, George Robey, Paderewski, and Pachmann.

From what I have heard of it, this week will more than live up to the expectations of those who are planning it as a great broadcast festival. I hope, therefore, that the programme builders at Savoy Hill are legislating against any anti-climax afterwards. It might cause great dissatisfaction if, after a special week, the programmes slid back into what might appear to be, in comparison, something like mediocrity.

Ambitious Programme Plans.

But I have enough confidence in the Savoy Hill people to believe that they would not embark upon a venture of this kind unless they were sure of being able to maintain a consistently high standard throughout the winter. Naturally, the pace cannot be as fast as in the first week, but there should be no very marked falling off.

These ambitious plans of programme development would seem to indicate that the policy outlined by Lord Gainsford in his last annual survey, is being closely followed.

Lord Gainsford emphasized that henceforth programmes and technical development would absorb the increasing proportion of revenue, in view of the fact that organisation was practically stabilised.

I imagine, therefore, that a good deal more money is now being released for programme purposes, especially as the P.M.G. is losing no time in enforcing his powers under the Short Wireless Act. There is one danger, however, and that is that in enthusiasm about programme development, the B.B.C. will lose sight of the essential importance of finding the funds for the forthcoming technical transformation of the British Broadcasting System.

Scrapping the Transmitting System.

The policy of scrapping the present system of 20 transmitters, 19 of which are of low-power, and substituting for them about 8 high-power transmitters, seems inevitable. This process will mean a capital outlay of the order of half a million sterling.

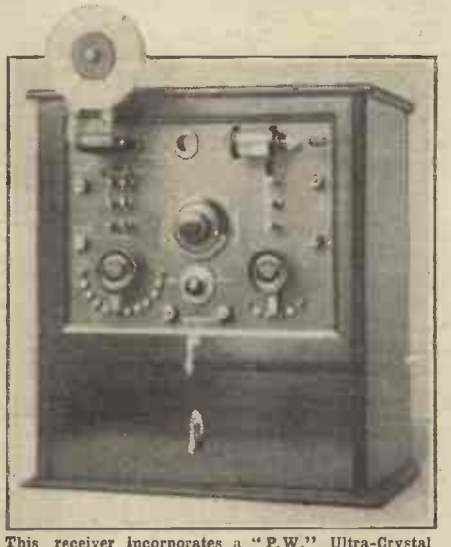
The work should be put in hand early in the new year, in order that the public may have the benefit of the new system by the beginning of 1927. While even the most stringent economy in programmes would not realise even one-fifth of the capital sum required for this rebuilding scheme, it would appear desirable that there should be saved at least enough money to carry interest charges and to start a sinking fund.

A Financial Query.

While we are on the subject of finance, I think that both Parliament and listeners generally will require a much more satisfactory account of the disposition of the 2s. 6d. which the Post Office retains from the licence money.

* * *

One of the effects of the Radio Sounds Competition organised by POPULAR WIRELESS was to bring to the B.B.C. an



This receiver incorporates a "P.W." Ultra-Crystal circuit and a Unidyne L.F. amplifier. It was constructed by Mr. T. Mullen, 65, Viceroy Street, Seaham Harbour.

enormous volume of correspondence. There would appear to be wide general interest in the solution of such problems. Incidentally, this provides another proof of the drawing power of the microphone.

* * *

The Calthrop Cabaret will soon be a subject of general discussion among listeners. Since Donald Calthrop joined the staff of the B.B.C. he has been busy on many things, but particularly in laying plans for his new broadcast cabaret, which will contain modifications of some of the most successful features of "Yoicks," as well as certain original novelties which Mr. Calthrop thinks will be particularly successful for the wireless medium.

* * *

Sir Oswald Stoll has now launched his big criticism of the B.B.C. I notice that he is following the ingenious line of suggesting that the B.B.C. was created in a manner contrary to the British constitution. This criticism really represents the last effort of the diehards of the entertainment industry who are against the B.B.C.

Criticism and the B.B.C.

The proposition which they will urge upon the Government Broadcasting Committee is that the B.B.C. should disappear in favour of a number of competitive concerns organised in the ordinary commercial way. They will also urge that the licensing system be abandoned, and that broadcasting be paid for in the same way as it is in America.

There is a great deal that is superficially plausible in this line of argument. It is true, for instance, that the suspicion of a monopoly is anathema to the British mind. It is true also that a proposal which would appear to be capable of providing broadcast programmes without cost to the listeners would be generally acceptable.

But there is a very real snag in all this, and one which I have no doubt will be adequately represented to the Broadcasting Committee. The snag is that in point of fact the Americans, who are being held up to us by the enemies of the B.B.C. as possessing an ideal system, are at this moment making the most strenuous endeavours to imitate the British system of broadcasting organisation. Whatever may be the theoretical objections to the British system, the basic fact remains that it delivers the goods more efficiently and more consistently than any other system in the world.

* * *

It is a good sign that our Broadcasters are looking ahead a little farther than has been the custom in the past. I hear that plans are already under weigh for a Christmas festival week, which, after the experience of the Birthday festival week, should be even better.

There would appear to be rather an unusual number of pessimists just now who declare that wireless generally is on the decline, and that it will pass away just as the roller skating craze.

No Decline in Broadcasting.

It is quite true that the novelty stage has been left behind, and that people are thoroughly fed up with the chatter about the wonders of wireless and its possibilities. But, I believe it is equally true that the broadcast programmes have become part of the settled life of the community, and have become really an indispensable instrument of our civilisation. With programmes steadily improving, and all the great artistes and entertainers being brought to the studios, with the steady development of the technique of radio drama, radio music, and the spoken essay, I can see no possibility of a decline of broadcasting.

* * *

Now that more of the journalistic mind is in evidence at Savoy Hill, I shall look forward to prolonged interest stunts. Thus, I see no reason why there should not be a series of innocuous mysteries with prizes attached. I think the listening public would love to be given an opportunity to solve detective problems or even murder mysteries. Nor do I see any artistic or ethical objection if these problems were handled skilfully.

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Readers who would like to call at the Institute are heartily invited to do so. The Consultant will be very pleased to have a talk with them on any matter affecting their personal efficiency, and no fee will be charged for his advice.

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An 'Automatic' Wave Trap

The first published description of a new invention by

G. V. DOWDING, Grad.I.E.E.
(*Technical Editor.*)

STRICTLY speaking, the instrument described in this article is not a "wave-trap" at all; it is really a "tuning sharpener and filter." Nevertheless it gives results in respect of eliminating unwanted stations as good as the best of wave-traps without introducing an extra control.

Primarily it is intended for use with valve receivers employing reaction on to the aerial such as ordinary one-valve detector sets, dét., L.F., det. 2, L.F., or reflex sets. With an ordinary three-valve set (det., 2 L.F.) the Petit Parisien station has been brought in on a loud speaker one mile from the London station at a time when the two stations were "clashing" at their worst. Further, instead of loss of signal strength being caused by the use of the device an actual gain is more often than not registered.

Four terminals only figure on the panel; not a single adjustment has to be made.

That it reduces the resistance of the aerial tuning circuit of the receiver to which it is attached to an extraordinary degree, is proved by the fact that an ordinary Unidyne set can be made to oscillate with a 35-turn reaction coil, instead of the 100, which is almost invariably required. Reducing the tuning circuit's resistance must necessarily improve reception so that on these grounds alone the use of the "automatic" is justified.

The "automatic," which I am going to describe more or less in detail in this article, proves *too efficient* in the case of receivers employing stages of H.F. amplification, and tuning becomes so sharp that not only is it impossible to tune a station in without micrometer verniers, but side-bands become clipped, and this, of course, destroys quality.

In the case of the type of receiver previously mentioned (including Unidynes) the instrument will hold its own and excel anything I have ever tested, and my experience of eliminating devices is extensive. Anyway, the constructor will soon be able to discover its merits for himself, for it does not take long to build.

I will briefly run through the theory of the "automatic." In the first place, as is well known, an "aperiodic aerial" introduces an excellent measure of selectivity when it is coupled by means of a small coil with the tuning circuit of a receiver. The aperiodic or untuned aerial system is shown diagrammatically in Fig. 1.

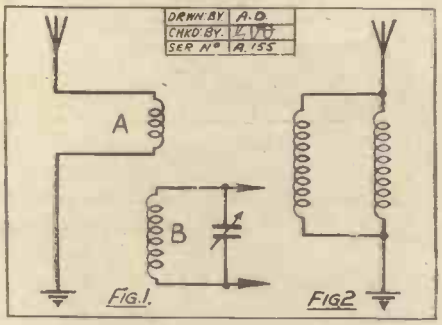
It will be seen that the aerial and earth are connected to a coil A, which is coupled inductively to a coil B. The latter coil is tuned by means of a variable condenser, but coil A remains untuned irrespective of the wave-lengths of desired stations. Coil B and its tuning condenser represents the tuning system of the receiver.

Aperiodic aerial coupling is the primary factor of the "automatic," but not the only one to which it owes its success. Additionally it introduces paralleled inductances, and in this manner brings about a reduction of tuning coil resistance. The effect of reducing grid circuit resistance has already been explained.

A Very Simple Device.

Fig. 2 shows diagrammatically two inductances in parallel. Now the resultant inductance will be less than the inductance of the smaller of the two coils so arranged. Therefore, even if one coil will, in the ordinary way, tune in 5 X X, if it is placed in parallel with a coil that will not tune to a greater wave-length than 2 L O, then the combination most certainly will not tune up above the latter station. This point is important, as it has a distinct bearing on the use of the "automatic."

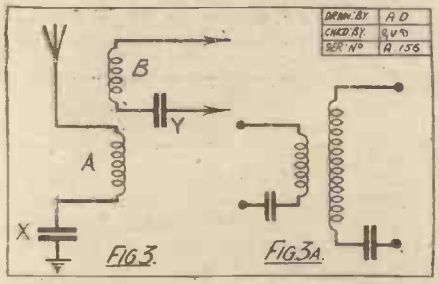
With the model to be described a wave-length range up to about 600 metres is



possible. It must be remembered that whatever the size of coil used in the receiver the wave-length range is limited by the "automatic" to a certain definite maximum.

Two fixed condensers figure in the instrument as well as two coils, and these, the former, are employed for two distinct purposes. That one in the aerial circuit (X, Fig. 3) reduces aerial capacity, and the other (Y, Fig. 3) of larger capacity is introduced to absorb L.F. interference.

Fig. 3a is a theoretical circuit of the device, and Fig. 4 and 4a show it coupled



to a simple one-valve and reaction circuit which has in the one instance series aerial tuning (Fig. 4a), and, in the other, parallel condenser aerial tuning (Fig. 4).

As will be seen by the photographs, the construction of the "automatic" is simplicity itself. On a 3-in. diameter former, 5½ in. long, are wound two coils, 20-gauge D.C.C. wire being used in each case. One

(*Continued on page 570.*)

AN AUTOMATIC WAVE-TRAP.

(*Continued from page 569.*)

coil consists of 75 turns, and is separated from the other one of 25 turns by a space of ¼ in.

The panel measures 6 in. by 6 in. and a case of 6 in. by 6 in. internal dimensions is required, the panel being supported by two fillets.

The coils are mounted on the panel direct by means of two small nuts and bolts, one at each end, Peto-Scott fixed condensers of the plug-in type are employed, as these enable rapid changes of capacities to be made, although this is not an essential requirement it is an advantage, as will be explained later.

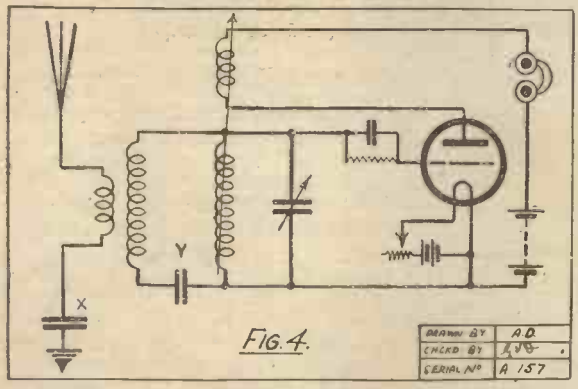


FIG. 4.

Reaction Becomes Easier.

Fig. 5 gives wiring details, and with the aid of this and the photographs, no difficulties should be experienced in connecting up. The method of marking the four terminals is very clearly shown in the photographs. The two terminals marked "tuner" should be connected to the aerial and earth terminals of the receiver to which the instrument is to be attached, aerial and earth leads being taken directly to the terminals so marked on the "automatic."

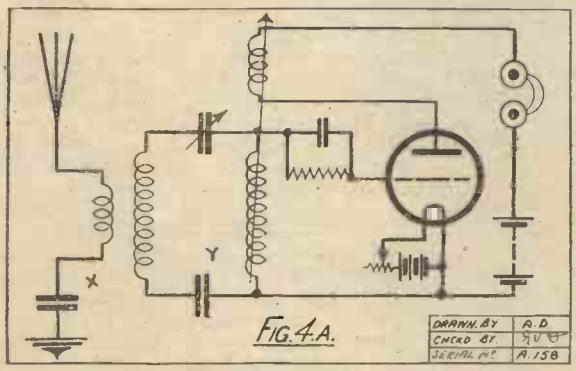


FIG. 4.A.

When using this "wave-trap," readers should not be misled by its apparent docility and simplicity, it is quite a "fierce" little component. Reaction will become so much easier that when plug-in coils are used a smaller reaction coil will invariably be essential.

A reversal of the connections between the "automatic" and the receiver will sometimes be necessary, but not in many cases. Receiving sets vary so much that absolutely standard methods of using such a device are difficult to devise.

To obtain optimum results the values of the two fixed condensers should be experimented with. It is not imperative that this should be done, but, at the same time, it is advisable, inasmuch as the existing capacity in different aerial and earth systems, and in different receivers, is apt to vary to a considerable extent, and these factors should of course be taken into consideration.

In some cases it may prove advisable to connect the earth and tuner "E" terminals together externally by means of a short length of wire. This reduces the instrument's selectivity slightly, and when it is not used very close to the jamming station or stations this is an advantage, for it naturally facilitates tuning.

Within two miles from 2 L O that station can be cut completely out on a "vernier," or within slightly less than one degree of movement of an ordinary condenser dial, using the "automatic" and a "non-selective" set such as a "det. 2 L.F." with reaction. Moreover distant stations can be tuned in without loss of strength, and this is, of course, a very great advantage.

Later on I will describe the construction of a "no-dial" designed to cover all wave-lengths up to 3,000 or 20 metres, but in view of the fact that the real 'broadcast belt' is between 300 and 600 metres the instrument dealt with in this article should satisfy the requirements of the majority of listeners.

Just a few more words respecting the employment of this "automatic wave-trap" may prove useful. When it is used with a set employing parallel condenser tuning, a larger aerial coil will generally be required in the receiver. Where a 35 or 50 turn coil has been in use a 75 may be necessary. When series aerial tuning is used, the same law applies but at a slightly less degree, and a 100 turn coil may be required.

No fixed rule can be made as the above values are liable to vary in individual sets, but almost invariably it does not matter much what the size of the aerial coil in the receiver is as long as it is *larger* than the one generally in use. The reaction coil must always be smaller or the reaction coupling considerably reduced.

When it is desired to use the wave-trap with a receiver not employing reaction with

(*Continued on page 571.*)

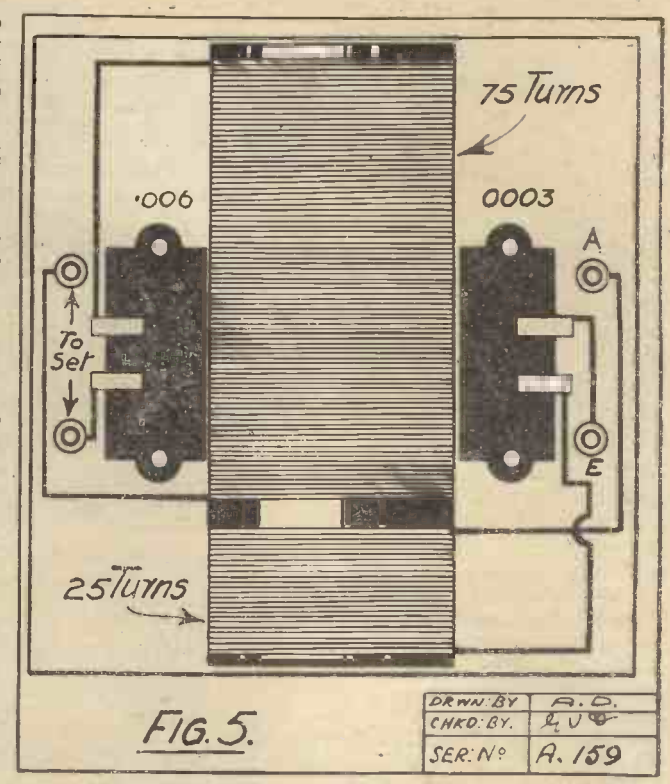
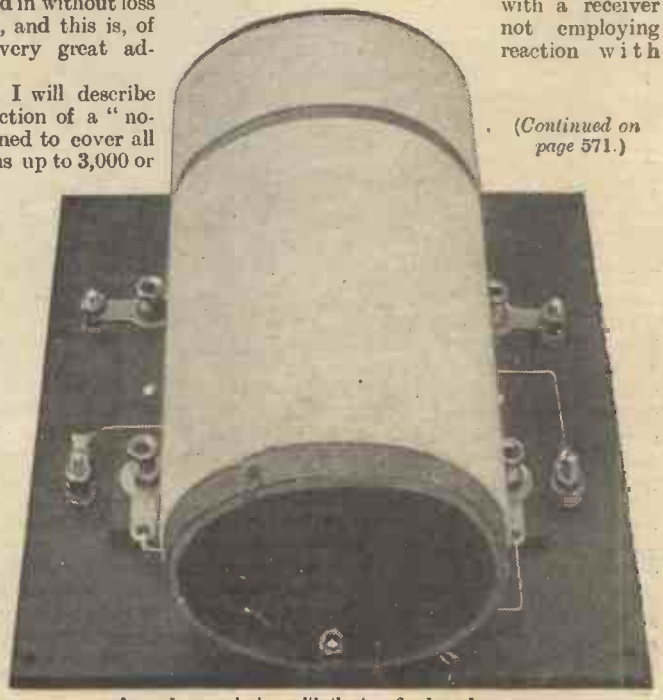


FIG. 5.



An under-panel view with the two fixed condensers removed.

AN AUTOMATIC WAVE-TRAP.

(*Continued from page 570.*)

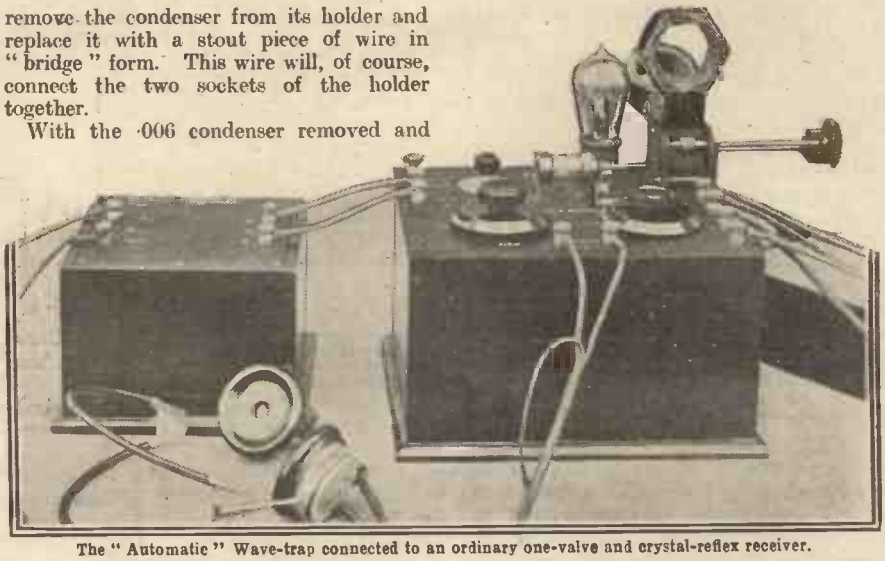
the aerial, it will be found advantageous to remove the aerial coil.

Should one of the various types of tuning units consisting of a tapped solenoid coil be in use, then it should be disconnected by slipping a tiny piece of paper beneath its switch arm. Should the switching arrangement be enclosed and not easily accessible, then it will be necessary to disconnect the unit at one of its terminals.

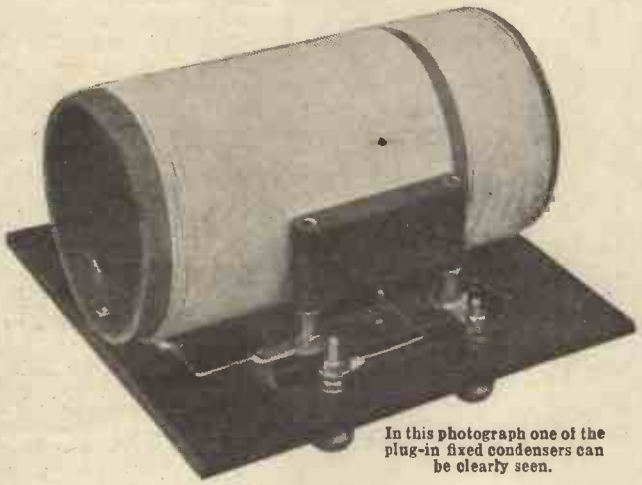
"Shorting" the ·006 Condenser

Under the above conditions, that is, when the coil in the wave-trap is operating as the aerial tuning coil, it becomes advantageous to "short" the ·006 fixed condenser. This is easily accomplished if the Peto-Scott plug-in type is in use. All that it is necessary to do in this case, is to remove the condenser from its holder and replace it with a stout piece of wire in "bridge" form. This wire will, of course, connect the two sockets of the holder together.

With the ·006 condenser removed and the sockets of its holder connected together, and with the 75-turn coil of the wave-trap acting as the grid circuit tuning coil, the "automatic" wave-trap becomes merely an adaptation of "aperiodic aerial tuning."



The "Automatic" Wave-trap connected to an ordinary one-valve and crystal-reflex receiver.



In this photograph one of the plug-in fixed condensers can be clearly seen.

Although the instrument loses most of its originality in these circumstances, it becomes no less efficient. The "untuned aerial" principle is applied in the best possible manner. Solenoid coils wound with stout wire represent the best possible method of coil winding.

On the Higher Wave-lengths.

Should the constructor desire to experiment with the device on the higher wave-lengths, say for the 5 X X, he can with little trouble do so. He will find that, generally speaking, it is unnecessary to "load" the aerial circuit. The "closed circuit" coil (75 turns) can be loaded by removing the ·006 condenser and replacing it by a 200-turn basket or other type of coil. The coil in the receiver itself will necessarily also require to be replaced for one of a larger value, or "loaded" in the usual way.

In conclusion, I would like to reassure those readers who may have come to the conclusion that the instrument is "tricky" in application, that in the case of the use of the straightforward types of sets mentioned at the beginning of this article employed in the indicated usual straightforward manner, the "automatic" wave-trap is quite as simple as its title would suggest.

It has been tested very thoroughly under these conditions, and has invariably given satisfactory results.

RADIO-INDUCTIVE INTERFERENCE.

ALL current-carrying conductors are surrounded by an electro-magnetic field, and when the current changes the field changes too, and will induce a voltage in any nearby aerial. There is also an electro-static field surrounding the wire and changes in this field will induce a voltage in an aerial near it. Normally the field round power lines does not reach farther than a few yards, but a sudden alteration of current or voltage—a surge, as it is called—will affect aerials at a considerable distance. Induced voltages in aerials result, of course, in telephone noises.

An aerial should be erected as far as possible from power lines, and if it is not practicable to get very far away, it should be run as nearly as possible at right angles to the direction of the power lines.

In order to assist sufferers in tracking the sources of telephone noises we give the following notes:

1. Battery chargers of the vibrator type cause a regular series of clicks in the telephones.

2. The sparking of motor commutators causes interference. The noise will rise in pitch as the machine speeds up.

3. A faulty insulator on a power transmission line may cause an electrical surge which travels along the line for many miles, causing interference to radio sets within 100 yards of the line.

4. A power line sparking to an insulated conductor, such as a guy wire or non-earthed conduit, will interfere with radio sets. If the fault is caused by a line swinging on to a guy wire it is usually noticed to be intermittent in windy weather.

5. A faulty bushing on a power transformer may cause interference by sparking on to the frame of the transformer.

"Internal" Noises.

To investigate interferences the first thing to be done is to make sure the trouble does not originate in the set itself. Disconnect aerial and earth. If the broadcast music stops, but the noise continues as strongly as ever, it is probable that the set is faulty. Look for bad connections, faulty batteries or defective valves.

Sometimes interference is caused by the house lighting circuit, and may be due to a lamp being loose in its socket, or to a loose heater plug. If, however, the noise is continuous, throw out the main switch of the lighting circuit, listening in at the same time. If the noise stops when the switch is opened the moral is obvious.

Tracing the Source.

If you are sure that the interference "comes in on the ether" the first step to locating its source is to compare notes with other listeners in the district. A little careful direction-finding work by a local wireless club will probably soon "spot" the intruder. The owner of any defective electrical plant will no doubt be grateful for information concerning the fault, and the proper application of choke coils or condensers will generally remove the trouble or render it tolerable to listeners.

When searching for trouble-makers recollect that flashing signs, internal combustion engine ignition systems, rotary converters and electric ozonators such as are used for purifying air in large buildings and for bleaching purposes in flour mills, can each cause interference in radio receivers.

THOSE OTHER STATIONS!

By K. D. ROGERS.

(Assistant Technical Editor.)

A Commentary on Broadcasting Reception Conditions.

AS the longer evenings draw on many a neglected wireless set is being taken out of storage and carefully dusted and examined prior to being pressed into service once again. Other receivers are being reconstructed and enlarged, while many a listener is wondering whether he ought to add a valve or two to his set so that he can pick up other stations besides the local and 5 X X.

Supposing he does add that valve or even two, what will he find during his trips through the ether in quest of radio adventure? I do not wish to appear cynical or to throw cold water upon the aspirations of prospective DX enthusiasts, but the answer to the question is mainly contained in one word—mush.

Noisy Background.

The thrill of searching round and picking up one station after another has to be experienced to be believed, but those who are lucky enough to be able to tune in distant transmissions on a loud speaker will be surprised at the poor quality of their reproduction. DX telephony reception is fairly good when telephones are used, with a three-valve set, say (preferably 2 H.F. and Det.), for the extraneous noises that—I was going to say creep—rush in are not magnified to any great extent by 2 H.F. valves, and the speech and music from Oslo, Madrid, or perhaps Aberdeen are reasonably clear and enjoyable—on the headphones. But let the listener add the necessary 2 L.F. to bring the reception up to loud-speaker strength.

What happens? All those extraneous noises suddenly grow in volume and completely spoil the music and speech that were moderately enjoyable before. Sometimes really clear reception of a distant transmission can be obtained, and it is always interesting to try to "get someone else," but as an enjoyment nothing ever comes up to the "local," however poor the programme appears to be.

In order to gather experience of the present condition of the ether, I have spent some time in searching for broadcast programmes hoping that they would be audible and fairly enjoyable on the loud speaker. I had not done much of this for some time, and the result was a revelation of the advancement of broadcasting. Where I had (last winter) been able to pick up one or two stations there were now four or five—or so it seemed—for, apart from Great Britain's twenty-one stations, Europe has sixty or so, nearly all going strong.

The wave-band from 200-500 metres is indeed crowded, and it says a great deal for the organisation at Geneva that the interference between the various stations is not worse than it is.

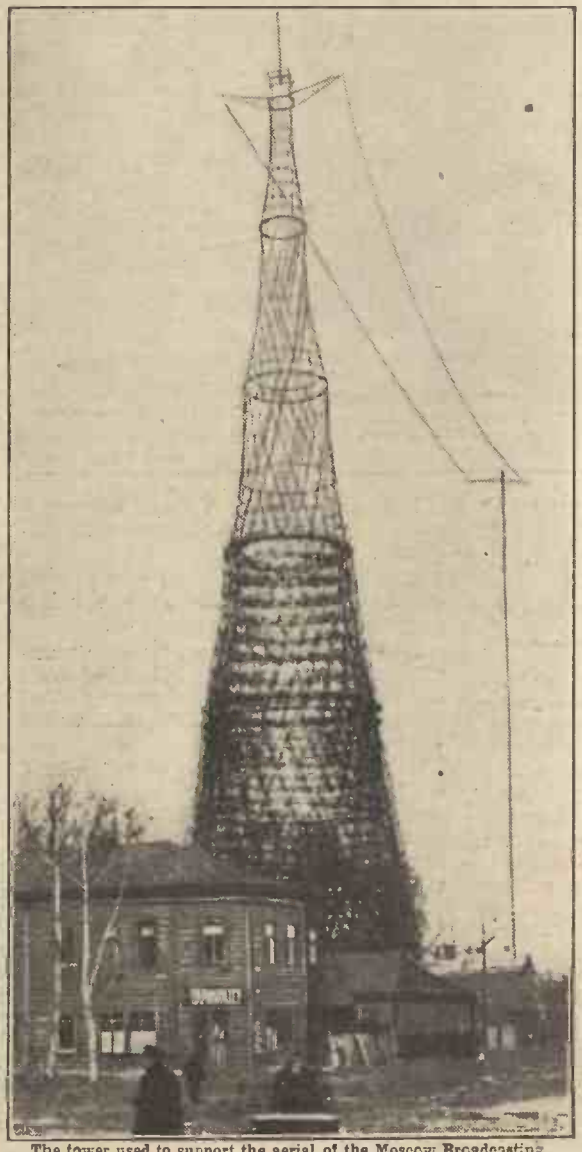
Typical Reception Results.

I used a 2 H.F., Det., and 2 L.F. (resistance coupled) receiver, and the results were very disappointing, the test being carried out twelve miles N.W. of 2 L O's aerial. (Relay stations were not counted among those expected to give good loud-speaker results, though sometimes Dundee and Nottingham came in exceedingly well.)

2 L O was, of course, deafening—I usually use a crystal and 2 L.F. for loud speaker work for this station. Birmingham came in next best (excepting 5 X X), and was moderately good on the loud speaker, jammed by spark occasionally. When I use the word good, I refer to the *quality*, not the quantity of noise—most stations can be brought in more or less loudly, but very few clearly.

Bournemouth and Brussels both had clear moments, and so did Oslo, but those were the only ones which I would dare to ask friends to listen to. These were jammed intermittently by spark stations, but this interference can sometimes be explained away as unavoidable, and, after all, there were fairly clear intervals every now and then.

The rest of the stations were hopelessly jammed, some almost out of existence, mainly by mutual heterodyning or else by the local P.O. station at Northolt. This station is typical of many dotted round the Continent, which play havoc with any broadcast reception that is attempted of stations over distances of more than fifty miles.



The tower used to support the aerial of the Moscow Broadcasting Station.

Arc Interference.

Northolt, for instance, is often audible—and well audible, too—over a wave-band of 340-500 metres at my home, and, of course, the mush from his aerial adds to the excitement to tuning by heterodyning with more mush from other arc stations, the whole making up a glorious background that can only be described as like the spluttering of frying bacon with an accompaniment of rushing water.

The long and short of this means that DX (or long distance) reception is possible—yes, even easy—in many cases, but its results are never pure, for the ether is crowded with transmissions from flatly tuned stations, or transmitters that have been badly designed.

Readers will probably ask why I do not use a more selective tuner and cut out more of the "mush." This *does* have that effect, I admit, but it also cuts off the side-bands of the modulated telephony carrier waves, and the result is distorted music and speech from nearly every station whose broadcasting one desires to pick up.

A frame aerial assists matters somewhat, but even then the noisy background reappears to a large extent as soon as the signals are amplified for loud-speaker work. That is the whole crux of the matter, for DX work is quite good fun if telephones are used and the loud speaker is left out of the question; bring in the latter, and the music and speech become mere distorted noises, and any attempt of enjoyment a farce.

Side Band Distortion.

I do not want to decry the transmissions of the various stations, for it is not these which are at fault; they are all good—in the case of the B.B.C. stations probably equally as good as the local station to those within reasonable range. It is when you have to push reaction, and H.F. and L.F. amplification are brought in, that the trouble commences and distortion is so apparent. Reaction at once begins to chop off part of the modulated wave, tuned H.F. amplification chops off some more, and so it goes on through each stage until the L.F. part of the set is reached. Here the distortion is amplified, not infrequently with added distortion, and the final result is very far

(Continued on page 577.)

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The Climax Metal-Cooled Rheostats and Potentiometers are metal wound on metal cooling cores. They employ no carbon, no ebonite, no rubber. Except for the bakelite knob and terminal bar they are 100 per cent metal. The Climax Anti-microphonic Valve Sockets have anti-microphonic metal contact springs housed in metal sockets. They employ no rubber. Except for the insulating sleeves they are 100 per cent metal.

THE CLIMAX METAL-COOLED RHEOSTAT (Prov. Pat. No. 220,124/23) is wire-wound on a solid metal rod, and insulated by high temperature vitreous enamel, capable of standing over 2,000 volts. The cooling thus obtained far exceeds that of any other method, and keeps the resistance cool even on excessive overload. This method of construction is a Climax Patent. No other can be "just as good." Being to all intents solid, the resistance element gives a perfectly smooth adjustment. It cannot be damaged by mechanical ill-treatment or prolonged heating. The resistance value can be cut down practically to zero while a clear, sharp break is obtained at the off-position. Every point in the adjustment is definite and steady.

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Cruciform Design. Multiple Ratio. The workmanship and materials used are of the highest possible quality. The cores and windings are enclosed in a die cast aluminium case, giving complete mechanical protection and a handsome finish.
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The Climax de Luxe Transformer is *constructed on a new method.* The laminations of the iron core are at right angles to the usual direction. This construction enables a *much shorter iron path* to be employed, which means that a larger flux can be set up for a given magnetising current. It also cuts down the total weight of iron used and therefore reduces the possibility of loss by leakage and by hysteresis.

The primary and secondary coils are subdivided to reduce capacity effects and advantage is taken of this subdivision to bring out both primary and secondary circuits to two sets of terminals each. There are thus eight terminals altogether. The Climax de Luxe L.F. Transformer is therefore a multiple ratio transformer and can be connected to suit many different circuits and valves in a way not possible in the ordinary design.

The Climax Popular Model L.F. Transformer is a highly efficient transformer for general L.F. Amplification

CLIMAX POPULAR L.F. TRANSFORMER.
This transformer is specially designed to give uniform amplification over the widest possible range of frequencies. Reproduction of speech and music is therefore exceptionally good and pure. Robust in construction being completely enclosed in a metal case. Substantial and conveniently arranged terminals are provided. PRICE 17/6

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USEFUL NOTES ON DRY CELLS.

FROM A CORRESPONDENT.

THE dry cell is still holding its own in connection with wireless sets, and will, in all probability, continue to do so, especially for H.T. batteries, for some time to come. They have their troubles, however, and the following notes may prove useful to readers who have experienced some of them.

Everyone knows that the common Leclanché wet cell, such as is used for electric bells, is made up of a carbon rod or plate, enclosed in a porous pot which is filled up with manganese dioxide and lumps of carbon; and a zinc rod, immersed in a solution of ammonium chloride. Practically every dry cell on the market is of the Leclanché type, though instead of the liquid electrolyte a paste is employed. The carbon element is connected to the positive terminal, and the zinc element, which generally takes the form of the container, is connected to the negative terminal.

Part of the aerial system of the Munster station.

The strange truth about a "dry" cell is that to function well it must be wet. When the paste dries the E.M.F., i.e., the voltage, is reduced, and the resistance of the cell increases.

The chemical actions which occur when a dry cell is in use are as follow: The chlorine component of the ammonium chloride combines with the zinc to form zinc chloride; ammonia gas is released, together with hydrogen. The hydrogen forms bubbles which collect on the carbon plate and which, if not dealt with, reduce the efficiency of the cell by increasing its resistance and setting up a back E.M.F., a process known as polarisation. A depolarising mixture is used, manganese dioxide (black oxide) and lumps of carbon. The latter increases the conductivity of the cell, and the former is "reduced" by the nascent hydrogen to brown oxide of manganese, water being formed as a result. *This water helps to keep the paste moist.*

"Aged" Cells.

For the benefit of those who have acquaintance with chemical notation the equations of these actions are given:

1. $Zn + 2\ NH_4\ Cl = Zn\ Cl_2 + 2\ NH_3 + H_2$
2. $2\ MNO_2 + H_2 = Mn_2\ O_3 + H_2\ O.$

The ammonia gas (NH_3) dissolves in the water.

The voltage of a dry cell is about 1·5, though when in circuit this drops to one volt. When buying dry cells you should see each one tested with a voltmeter, *not with a lamp.* If a cell is "aged" it will almost always reveal the fact by exhibiting a swelled appearance; the walls of the cell bulge and local swellings appear in the pitch with which the cell is covered. Reject such cells. It is the practice, sometimes, to provide little ventholes for the escape of gases, but as the gases are liable to carry off the water which is needed to keep the paste moist this method is of doubtful value on balance.

Effect of Temperature.

In using dry cells it should be recollected that a moderate discharge is beneficial because the resultant chemical action produces water to replace that which is lost by the paste through "ageing"; thus, "ageing" is to a certain extent retarded by use.

The temperature to which a cell is exposed is a factor which assists in determining its age. If the service demanded of the cell is heavy, warmth is not greatly deleterious; but if, as in the normal case where a cell is in use in an H.T. battery, the required service is light, the temperature should be low, in order to prevent as far as possible the evaporation of water from the paste. In brief, do not keep your H.T. battery, or any other dry cells you are using, near any source of heat, or exposed to the sun.

THOSE OTHER STATIONS!

(*Continued from page 572.*)

from the original. If you do not want to cut off those side-bands your receiver is necessarily so unselective that much of the jamming in the neighbourhood and for miles round comes in, and too often completely wipes out the desired transmission.

It has been put forward that the neutrodyne and the super-heterodyne is to solve the problem of distortionless and interference-less DX reception. I am afraid it has a long way to go yet. The former certainly cuts out the interference, but it chops up modulation as well, and as soon as you begin to amplify, the degree of distortion due to the loss of the side-bands is surprising.

Our present system of telephony transmission necessarily gives rise to a flat wave, owing to the large range of frequencies that the modulation has to cover. Thus, the ideal wave for clear and undisturbed reception—one with a very pronounced peak—cannot be used, and instead, a very much flattened wave is emitted. I am speaking of the modulated carrier wave, the carrier itself can, of course, be sharply tuned; it is only when the modulations are imposed upon it that the flatness is apparent.

It will be seen, therefore, that the problem of obtaining selectivity without destroying the quality of the telephony is a difficult one to solve, one that would appear to be impossible of solution while flat transmissions are the order of the day.

In the case of the super-heterodyne, it is possible to have selectivity without so much side-band distortion, but as a rule this benefit is counterbalanced by the amplified oscillator hiss due to the valve employed for heterodyning the received signals. This receiver is a recent development, and may be improved a great deal yet, so that at the moment I am not in a position to say whether it will ever give the solution to the problem that besets all those desirous of receiving long-distance transmissions.

Local Station Best.

The above remarks apply, of course, to the wave-lengths between 200 and 500 metres. Above this there is less congestion and results are better, and below 200 metres there are other problems that come into the picture, such as high-speed fading and night distortion, but these need not concern us at the moment.

Suffice it to conclude by remarking that, as has already been pointed out by Captain Eckersley, the only really enjoyable broadcasting is that supplied by the local station and perhaps 5 X X. Long-range reception is interesting, instructive, and fascinating, but as a form of musical entertainment the programmes from any station on the wave-band between 200 and 500 metres more than fifty miles away are practically valueless. Exceptions there are, but those who have done even a little ether searching will agree that, apart from the romantic side, there is nothing in it.

FOREIGN RADIO NEWS.

FROM OUR OWN CORRESPONDENT.

French Amateurs' DX Results.

LILLE amateurs have, during the past week, achieved some remarkable results in both transmission and reception.

The private station, 8 W K, which belongs to the Lille Radio Amateurs' Club, working on a 40-metre wave-length, with 13 watts, got into very clear and sustained communication with the amateur station P K 4 S A, in Porto Rico.

With the same wave-length, but only 10 watts, the same station succeeded in getting into telephonic communication with the amateur stations S 2 M N, in Finland, and L A 4 X in Stavanger, Norway.

Denmark Re-arranges Stations.

The new Copenhagen station is now ready, and will open this week, thus, it is hoped, inaugurating a new era in Danish radio work.

The wave-length will be 308 metres, and programmes will be broadcast on Fridays, Saturdays and Sundays. The Ryvang station will become an independent broadcasting station, and will work on a wave-length of 1,150 metres on Tuesdays, Wednesdays and Thursdays.

The relay stations at Odensee and Hjorring will relay the programmes of Copenhagen and of Ryvang.

New Stations for Holland.

Dutch radio amateurs are apparently not satisfied with the service they are getting from Hilversum, and a limited company, the Radio Omroep, has been formed to construct and work a new station at Amsterdam. It is understood that this will be of 500 watts.

Germany's Twenty Stations.

In a public speech the German Minister of Posts and Telegraphs stated that, comparatively speaking, it might now be said that the German radio house was almost in order. By the end of the year, he said, there would be 20 fully equipped German broadcasting stations in operation. The leading theatrical and opera performances in Berlin, Munich, and Frankfort will be transmitted daily to the relay stations, by means of a special network of direct telephonic lines.

Broadcasting Epidemic Warnings.

Last week, the medical authorities in Toulouse and district reported to the mayor of the city the outbreak of a slight epidemic of smallpox. The mayor, who is a keen radio amateur, proceeded to the Radio-Toulouse station and broadcast a warning to the entire district.

The result of this was entirely satisfactory and much greater promptness than usual was displayed by the local authorities in dealing with the situation.

Radio-Toulouse Programme Extension.

The Radio-Toulouse station announces an extension of its broadcasting arrangements.

On Thursdays at 5.30 p.m. it will give a special programme for children, and on Saturdays at 5.30 p.m. there will be a weekly pianoforte recital.

Powerful Station for Geneva.

The new observatory which is being erected at great expense on the top of Mont Saleve, near Geneva, will be equipped with a powerful broadcasting station which, it is claimed, will enable this observatory to transmit daily meteorological bulletins to the farthest ends of the earth.

Paris's Radio Defence Communications.

The funeral of a Communist workman, Sabatier, who was killed by a shot from a factory fired by order of the director, gave rise to grave fears in Government circles here that the crowd might attempt to wreak vengeance on the factory in question, and most elaborate precautions were taken by the police and military.

A feature of these preparations was that, for the first time, radio was used as the connecting link between the various detachments of the Government forces and the directing chief, M. Chiappe.

From Puteaux, an industrial suburb of Paris, right into the heart of the capital, successive lines of defence had been established composed of strong detachments of police, Republican Guards, and cavalry. In every central group was an official with a portable wireless set in constant touch with the Ministry of the Interior.

As it happened, the crowd of about 100,000 demonstrators dispersed quietly and did not try conclusions with the police, so that this use of radio to put down political risings was not thoroughly tested, but so far as its services were required, it is understood to have worked very well.

Rome Station Moves to Naples.

The Rome station of the Union Radiofonics Italiasa is shortly to be moved from its present site to a new one near Naples.

The opportunity will be taken to increase the power of this station, which will also operate on a different wave-length to be announced later.

A Radio College.

A college which will broadcast all its lectures and instructions by wireless has been inaugurated in Vienna.

(*Continued on page* 608.)

THE THIRD "P.W." MEETING.

Senatore Marconi's Tribute to Sir Oliver Lodge.

ENTHUSIASTIC SCENES AT THE CENTRAL HALL.

Below we print a brief account of the great wireless meeting held at the Central Hall on October 23rd, at which Senatore Marconi, on behalf of "Popular Wireless," presented a silver casket to Sir Oliver Lodge as a memento of admiration, affection and esteem. We also publish in full Senatore Marconi's speech.

THE 3rd great wireless meeting, organised by POPULAR WIRELESS, was held at the Central Hall, Westminster, on October 23rd. The Editor of POPULAR WIRELESS was in the chair and the speakers were Sir Oliver Lodge, Senatore Marconi, Viscount Wolmer, M.P., Mr. J. C. W. Reith, Lieut.-Commander Kenworthy, M.P., Major Raymond Phillips, Captain Eckersley, and Mr. Gerald Marcuse.

An enthusiastic audience crowded the hall, and when, in the course of the evening, the chairman announced that Senatore Marconi would present a silver casket to Sir Oliver Lodge, on behalf of the editor and staff of POPULAR WIRELESS, a tumult of clapping broke out.

Sir Oliver Lodge.

The chairman explained that POPULAR WIRELESS had for a long time desired to present Sir Oliver with some memento of his association with this journal and, thanks to the very kind co-operation of Senatore Marconi, it was possible at the meeting to offer a public tribute to the genius of Sir Oliver Lodge. Before calling upon Senatore Marconi to present the casket to Sir Oliver Lodge, the chairman read messages of goodwill and affection for Sir Oliver, from several distinguished people, including the Duke of Sutherland, Sir J. J. Thomson, O.M., Sir William Mitchell Thomson (the Postmaster-General), Dr. J. A. Fleming, Dr. Eccles, Dr. Roberts, and others. At the conclusion of his speech, Senatore Marconi, paying a warm and generous tribute to the genius and pioneering work of Sir Oliver Lodge, presented on behalf of this journal the silver casket illustrated on this page.

Sir Oliver's Speech.

The presentation came as a complete surprise to Sir Oliver and he was obviously deeply touched by Senatore Marconi's words and by the kindly thoughts of those who had sent messages of good friendship.

Rising to accept the casket from Senatore Marconi and to reply, Sir Oliver was greeted with an enthusiastic thunder of applause and it was some minutes before he could commence to speak. At last silence was obtained.

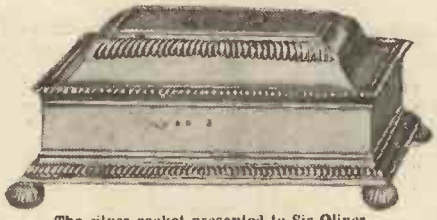
Sir Oliver Lodge said:

"I feel quite overwhelmed by this surprise which has been put upon me absolutely unexpectedly. If I had known before I should have asked my wife to come as she is in London with me (I expect I shall get it when I go home!), but she said she has already too much of the wireless and can always hear Captain Eckersley in that way!

"I am extremely grateful for the honour which Senatore Marconi has done me and for his kindly act in coming and sparing this evening from his busy life to give me this casket.

"I cordially thank Mr. Norman Edwards (the Chairman) and the staff and all connected with POPULAR WIRELESS for the kindly thought which initiated this idea. I rather wish I had known, but, however, these things come quite unexpectedly and we are grateful—as I am always grateful—for friendly feeling and sympathy from any part of the world. I have a very large correspondence, and the longer I live the more friendly I find people. What one has done does not matter much, but still one has lived one's life to the attainment of truth. But the efforts of all will be recognised in time.

"I cordially thank all those who have been associated with this token, if I may say so, of affection."



The silver casket presented to Sir Oliver Lodge by Senatore Marconi.

Sir Oliver said it was a great day when Senatore Marconi got the letter "S" across the Atlantic, and although Senatore Marconi thought he did not believe him, he did, though he hoped he was not mistaken, as it was, of course, a great achievement. This feat had been repeated and made very sure since then. It was out of that beginning that Senatore Marconi made the discovery that the long waves travelled best by night, and this point had opened up a great deal of investigation, etc.

Focus at the Antipodes.

During the course of his speech Sir Oliver mentioned the fact that no one thought in those early days how radio waves could curl round the earth. About a year ago he thought he knew, but Mr. Marcuse had brought out a new theory which he did not understand; now it was found that the waves would go round, and it was thought that there might be a concentration or focus at the Antipodes.

Sir Oliver pointed out that experiments showed that there was such an effect, but such effects always had to be brought to the test, and that there we found the most novel and surprising difference between theory and practice. As far back as 1865, when Sir Oliver was a boy at school, these waves were predicted by that brilliant scientist, Clerk Maxwell.

New Tuning Invention.

Speaking of the ether, Sir Oliver Lodge said that it contained a great range of short wave-lengths if we knew how to use it.

On the subject of tuning Sir Oliver said that he wanted to abolish reaction. If the aerial had no tuning, he pointed out, you could not make it "howl," and he hoped to achieve this state of affairs by means of what he called his N. circuit. A further improvement in this circuit (into which he could not go) had been introduced by a Mr. Melinsky, who was present in the audience, and Sir Oliver hoped that there would be co-operation, because Mr. Melinsky had a very similar system of tuning.

We hope to publish, in an early issue, full details about this new N. circuit, which Sir Oliver mentioned in public for the first time at the "P.W." Meeting, and therefore we will refrain from quoting further from his speech, which had to do with a theoretical explanation of his new invention.

SENATORE MARCONI'S SPEECH.

New Short-Wave Experiments.

"IT gives me very great pleasure to be present at this meeting, especially as I have the honour of presenting to Sir Oliver Lodge, on behalf of POPULAR WIRELESS, this token of admiration and esteem.

"Sir Oliver Lodge is, as we all know, one of our greatest physicists and thinkers, but it is particularly in regard to his pioneering work in wireless, which should never be forgotten, that we all welcome him here amongst us to-night.

Senatore Marconi.

"In the very early days, after the experimental confirmation of the correctness of Clerk Maxwell's theory as to the existence of electric waves and their propagation through space, it was given to only very few persons to possess a clear insight with regard to what was considered

(*Continued on page* 582.)

THE THIRD "P.W." MEETING.

(*Continued from page* 581.)

to be one of the most important hidden mysteries of nature, and Sir Oliver Lodge possessed this insight to a far greater degree than perhaps any of his contemporaries.

"The results of our understanding something of this subject is now fortunately manifest to all when we look round at the wonderful progress that has been achieved by radio, which has already become an aid—or, rather, a necessity—to all civilised communities throughout the world.

Mr. J. C. W. Reith, Managing Director of the B.B.C., who spoke at the "P.W." Meeting.

"We look back over a comparatively short period of time and proudly reckon up all the benefits that wireless has conferred upon mankind. Telegraphy, telephony, broadcasting (that most popular of all present-day wireless manifestations), safety of sea and air navigation—these are all but steps in the ever-ascending ladder of wireless applications.

"But although our knowledge has progressed, and although we now know a great deal about producing, radiating, and receiving these waves, we know very little; and I might say we now realise that we know a good deal less than we thought we knew some time ago in regard to the laws governing the propagation of electric waves through space across big distances.

"Little over two years ago we all believed that to cover world-wide distances it was necessary to employ large amounts of power and long waves.

"We thought that short waves could only be utilised for communication over considerable distances at night, but that these night ranges were freaky and altogether too unreliable to allow the carrying out of commercial work.

"Now all this has been changed, and it looks very much as if short waves, and short waves alone, were destined to carry the bulk of long-distance telegraphic and telephonic communications throughout the world.

Recent Tests.

"We found that these waves will carry messages at all times of the day and night to such distant parts as Australia, and I might recall the successful tests by amateurs in exchanging two-way communication with New Zealand.

"In regard to New Zealand, Australia, and other places near the Antipodes, I should, however, point out that when using broadcasting, or non-directive methods we have never so far been certain as to which way the waves travelled round the earth, there being always, when working to the Antipodes, a practically dark way round one side of the earth when the other side is exposed to daylight.

"During the last few days further tests have been carried out between Chelmsford and Buenos Aires (in the Argentine), over a distance of nearly six thousand miles, by Captain Round and other engineers of the Research Department of the Marconi Company.

"In regard to the Argentine, the great circle track of transmission not being very far away from a north-south direction, there is no other track of comparatively the same order of distance over which the waves could travel in darkness at the same time as when the short, direct track is exposed to daylight.

Low Power Employed.

"By using a fifteen-metre wave and a power of only one-fifth of one kilowatt, which is an amount of energy comparable to that which has been used by amateurs in their tests, it has been found not only possible, but easy to communicate with the Argentine during the hours of daylight at possible speeds of thirty words per minute, whilst nothing could be received at Buenos Aires when darkness extended over the area separating the two stations. It was further noticed that the signals were strongest and at their best when the sun was at its highest over the great circle track separating the two stations.

"So much for the idea that short waves will only travel big distances at night, and it should therefore be no longer necessary for wireless enthusiasts to continue losing their sleep by staying up into the small hours of the morning in order to communicate with their friends in very far distant countries.

"I now have the pleasure of presenting to Sir Oliver Lodge, on behalf of POPULAR WIRELESS, this casket, with the sincerest expression of our regard, esteem, and good wishes."

THE IMPORTANCE OF THE AERIAL.

From a Correspondent.

OWING to the facility with which a feeble incoming signal can be amplified by means of H.F. or L.F. valve amplifiers, there is sometimes a tendency for the amateur to regard his aerial as of minor importance; he gets into the way of thinking that, however inefficient the aerial may be, if he is using a valve set he can always "make it up" with valve amplification later on. This idea is largely erroneous, and in any case the attitude is to be discouraged.

The less you rely upon artificial amplification the better. That is one of the reasons why simple crystal reception, with headphones, is supreme from the point of view of purity of reception. Here you have no batteries, no loud speaker, and nothing to help you except the pure incoming energy from the aerial. You realise the importance of your aerial when using a crystal set; why, then, depreciate the importance of the aerial when using a valve set?

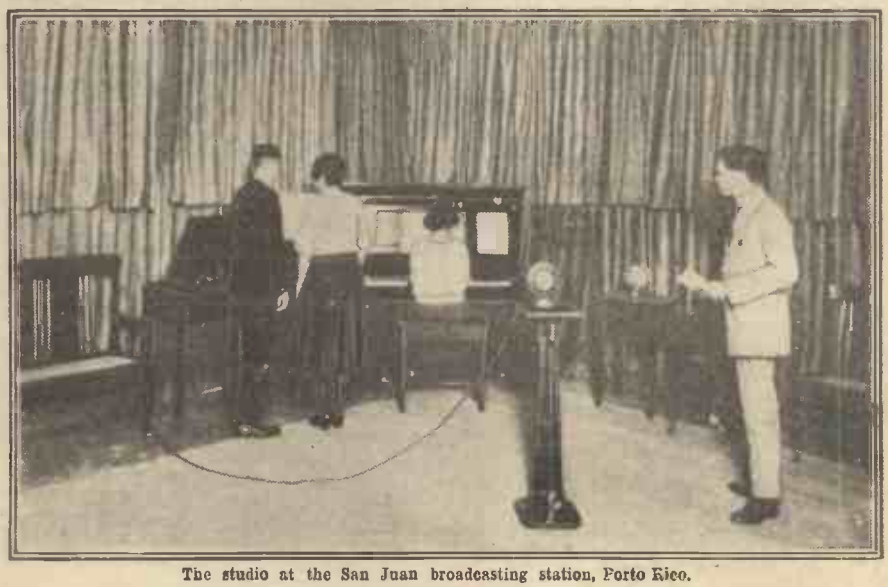
In the first place, if you want distance, you generally need to employ one or more stages of H.F. amplification before the detector will operate efficiently. Then, if you want loud signals, especially to operate a loud speaker, you require one or more stages of L.F. amplification, or "note magnification," as it is sometimes called.

Very Desirable Factor.

If you can possibly do without the H.F. amplification it is very desirable to do so, as by this means you will avoid one of the sources of distortion. And the simplest way to avoid the need for H.F. amplification is to use a really efficient aerial.

It is usually supposed that the L.F. amplifier increases the strength of signals, and that the strength of signals depends, if not entirely, at any rate principally, upon the amount of L.F. amplification. But don't forget that, although the original energy which you are amplifying is extremely small, it has a definite magnitude, and that when multiplied up, as it is by L.F. amplification, the final result depends upon the magnitude of the quantity you started with. So a good initial signal or incoming strength is very desirable from any point of view, and here again it is best obtained by means of a good aerial.

The indoor aerial has much to recommend it from the point of view of convenience but from any other point of view it is not to be compared with a good outdoor aerial, which should be used wherever possible.



The studio at the San Juan broadcasting station, Porto Rico.

The 1926 Unidyne 2 Valver

The Set Designed, Described and Constructed by G. V. DOWDING, Grad.I.E.E., and K. D. ROGERS.

This two-valve set makes use of the latest Unidyne method and should give every satisfaction, providing the instructions in this article are faithfully carried out.

UNDOUBTEDLY the most popular of all the Unidyne circuits published during the last year or so has been the one requiring two valves, used as a detector and L.F. amplifier respectively. But since the first publication of that circuit further developments have taken place, and last week we published details of the first of a series of re-designed receivers, a one-valve Unidyne which had important modifications of the reaction and inner grid circuits.

This week we have decided to give readers the opportunity of incorporating the new detector design in the popular two-valve set, making it an exceptionally useful and easily handled receiver whose potentialities for long-range reception are probably unequalled by any other receiver having the same number of valves. It is a fact that for DX work the Unidyne easily beats receivers using H.T. batteries, because the latter are apt to give rise to a noisy background which often ruins reception of weak telephony.

A switch is provided in the actual set under consideration so that either one valve or two may be used, a utility switch being employed in order to avoid capacity losses that might take place between the various contacts of the switch.

Low-Capacity Transformer.

This switch takes the 'phones out of the plate circuit of the first valve and places them in that of the second valve, at the same time interposing the primary of the L.F. transformer between the plate of the detector valve and the reaction coil.

This is an unusual place to have the L.F. transformer, but for the operation of the special circuit used it has several advantages over the more conventional position—between the reaction coil and the filament of the valve.

There is one point that should be mentioned here regarding the L.F. transformer, and that is that this component, being placed at the high potential end of the anode circuit (with regard to earth, of course), should have a low self-capacity, or leakage between the transformer primary and secondary due to this capacity will take place, and it will be difficult to make the set oscillate satisfactorily.

Action of the Detector.

The action of the detector circuit was described in last week's issue of POPULAR WIRELESS, when the construction of a one-valve Unidyne was dealt with, but for the benefit of those readers unacquainted with the Unidyne principle, we will run briefly through the theory of operation of both the detector and L.F. stages of the set.

LIST OF COMPONENTS.

	£	s.	d.
1 Panel, 13 in. x 6¼ in. x ¼ in. (Peto-Scott) and			
1 Case and baseboard to fit ..	1	6	0
1 ·0005 mfd. variable condenser and vernier (Peto-Scott) ..	0	10	6
1 ·0003 mfd. variable condenser and vernier (Peto-Scott) ..	0	9	6
1 "Utility" three 2-way switch	0	4	6
2 Filament rheostats (Precision)	0	6	0
1 Grid leak and condenser (Dubilier)	0	5	0
1 Variable anode resistance (Bretwood)	0	2	9
2 ·001 fixed condensers (Lissen)	0	5	0
1 L.F. transformer (R.I.) ..	1	5	0
1 Coil unit (Peto-Scott)	0	4	6
1 Coil socket unit (Peto-Scott)	0	2	6
10 Valve sockets	0	0	10
7 W.O. terminals	0	0	10½
Wire, transfers, etc.	0	3	0
1 H.F. choke (Peto-Scott) ..	0	10	0

In the detector circuit the filament of the valve is supplied with energy in the usual way, so that electrons are emitted. These would tend to cluster round the filament if the inner grid—made positive by connection to the L.T. battery—did not attract them and speed them up, as it were, so that they shoot through it and on towards the plate. This latter is also at a positive potential, so that the speed of the electrons is maintained, and they reach the plate in the same manner as they do in the case of an ordinary valve using H.T. The main grid acts as a regulator in the usual manner, controlling the electron flow in accordance with the energy supplied to it by the incoming signals.

In the new detector circuit first published in last week's issue of POPULAR WIRELESS the inner grid is utilised to assist in providing reaction, and this is controlled by means of a variable H.F. choke in series between the inner grid and the reaction coil. By this means extremely smooth control is obtained, and variation of reaction can be carried out without change of wavelength—a feature that still further enhances the properties of the set as a DX receiver.

The Inner Grid.

On the L.F. side the inner grid is taken direct to L.T., and fulfills the same purpose as it does in the detector circuit—of course, with the exception of reaction.

We should like to reiterate the advice regarding the L.F. transformer, for this is a very important component, and it is essential that one of reliable construction be used. Furthermore, it is equally, if not more, necessary that the transformer have a low self-capacity, otherwise signal strength will be greatly impaired. We have found the R.I transformer very suitable in this respect.

A photograph of the complete receiver showing the two main controls and the switch for cutting out the L.F. valve.

There is one other point that should be noted about the L.F. side of the set, and that is the fixed condenser and leak in series with the O.S. side of the transformer and L.T. negative. This condenser is necessary if the amplifier is to act up to its name, for if the secondary of the transformer is connected direct to the filament battery, the valve merely passes the signals delivered to it from the detector stage, and does not amplify them at all.

It would appear in this latter case that as the two grids are connected together via the filament battery, there is a fairly steep potential slope between the two grids, for the inner grid is at full positive potential and the control grid is at nearly

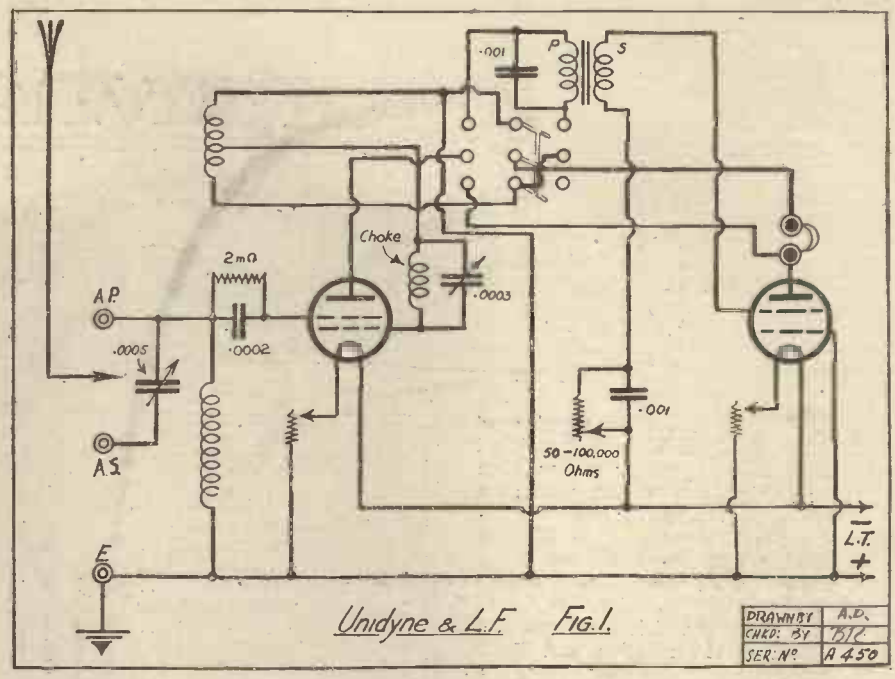
(Continued on page 584.)

1926 UNIDYNE TWO-VALVER.

(*Continued from page 583.*)

the full negative. This result has the effect of largely nullifying the effect of the inner grid, upsetting the balance of the circuit, and raising the internal resistance of the valve.

The express purpose of the inner grid is to overcome the space charge of the valve, and this action is important and necessary for the successful operation of the valve. A condenser is therefore inserted into the main grid circuit to break the circuit, and thus reduce the negative charge on the grid. The value of the condenser is not critical, but the one used in the set and recommended as standard has a value of ·001 mfd. Close control over the grid of the amplifier is then obtained by means of a variable leak placed across the condenser. In the actual set described this was an anode resistance of 50,000 to 100,000 ohms.



Constructional Details.

Coming to the actual construction of the receiver the parts mentioned in the list of components will be needed and it is recommended that the makes specified be used in all such components as variable condensers, switch, rheostats, transformers, etc., otherwise the constructor will probably be faced with unexpected difficulties as to the spacing of the components. The set is not unduly crowded but no space has been wasted, and a glance at the photographs will show that careful adhesion to the details of the lay-out is essential.

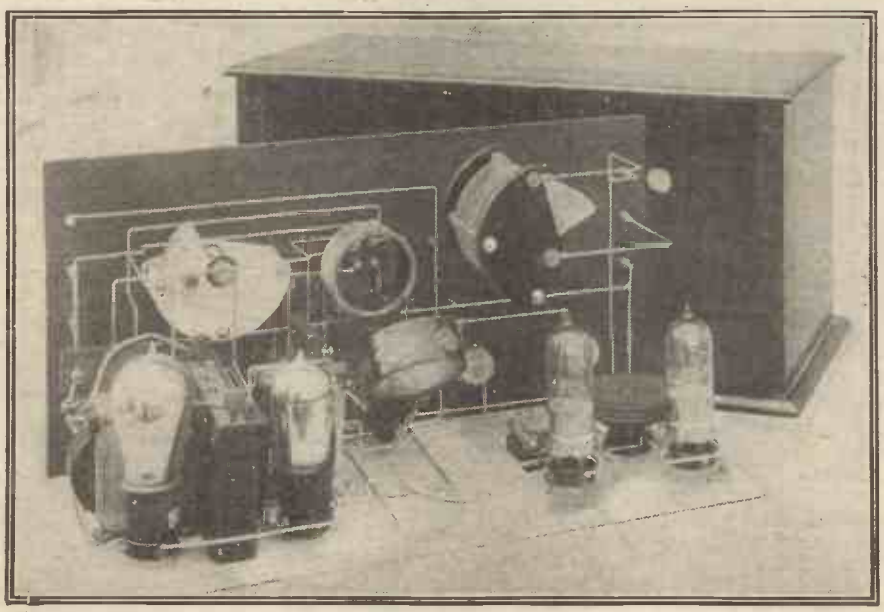
The well-known three-terminal series-parallel arrangement has been employed so that the switch for changing the position of the aerial tuning condenser from series to parallel, or vice versa, and the consequent inter-connection capacity losses is unnecessary. The method of using the three terminals is simple. The bottom one is taken to earth, and the other two are for the aerial connections. When "series" is required the lead-in is connected to the centre terminal and the top one left unconnected. For "parallel" the aerial goes to the top one and the centre one is connected to the earth terminal.

The Valve Platform.

The construction of the set is quite plain sailing with the exception of two points which require careful consideration. The first of these is the valve shelf. This is used to keep the valve sockets above the baseboard and consists of a strip of ebonite 5 in. long and 1½ in. wide (¼ in. thick), mounted at each end on a piece of ⅛ in. ebonite or wood about ½ in. wide and 1½ in. long. Two wood screws at either end secure the platform to the baseboard when all is ready for mounting. The photographs of the interior of the set will make the foregoing clear.

The strips are then drilled to take the ten valve sockets (five for each valve), these being located according to the template on page 588. These sockets should be reversed in position when the second valve holder is being considered so that the filament sockets face each other, the connecting up being rendered very much easier if this detail is carried out. In the set whose photographs are reproduced with this article the pairs of valve filament sockets were 1½ in. apart (centre to centre).

Small soldering tags are fitted between the sockets and the ebonite platform before the nuts under the platform are tightened up. If short valve sockets are employed the necessity for sawing off the legs flush with the fixing nuts under the platform will not arise; but if the standard sockets are employed this will have to be done before the platform is mounted. Connections to the valve sockets are made to the soldering tags *after* the shelf has been fixed in position, so that the connecting up of the valve holders is not at all a difficult matter.

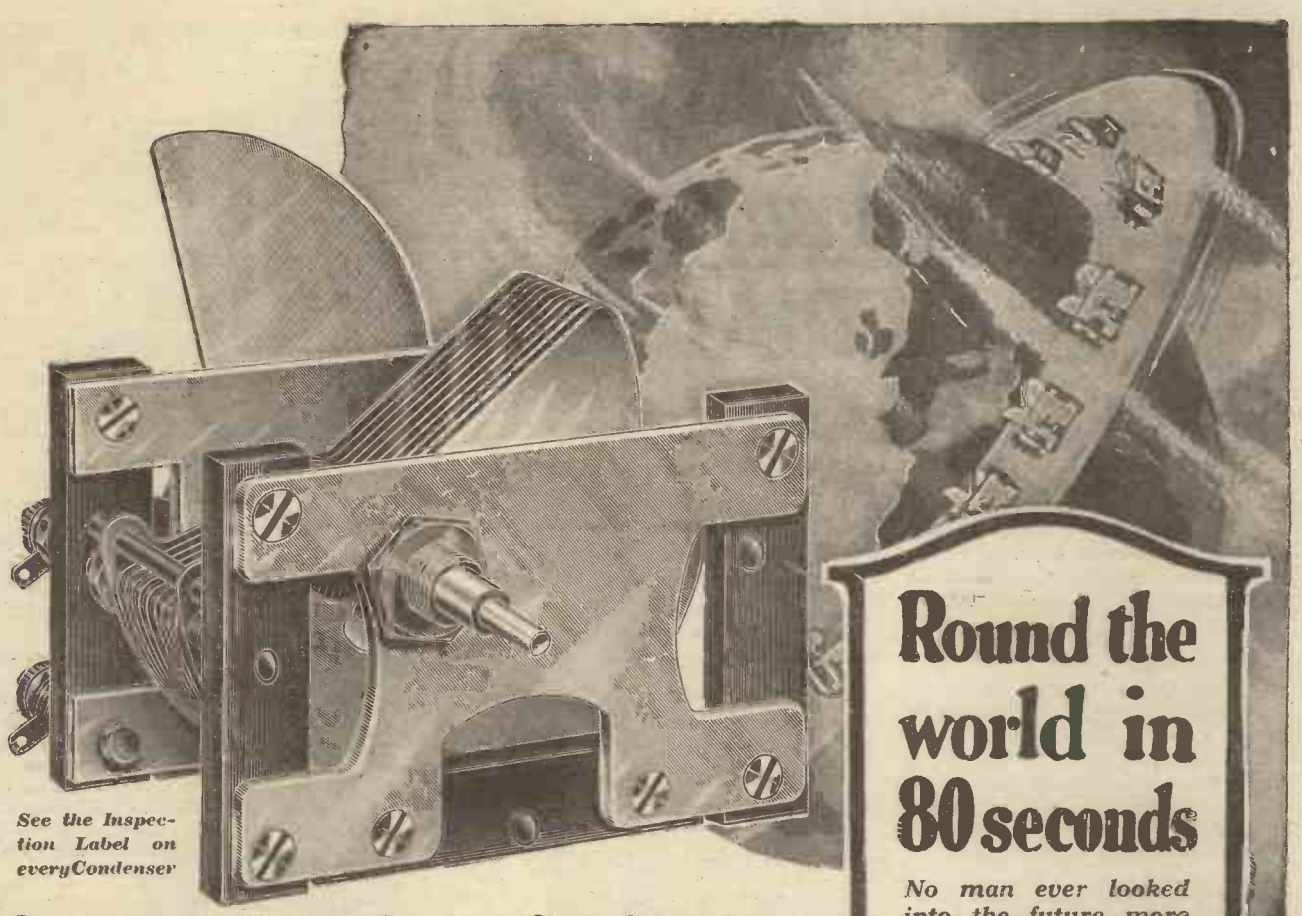


This photograph gives a clear idea of the wiring of the receiver, and should be used in conjunction with the diagram on page 587, when the components are being connected up.

Winding the Choke.

The other point to be considered is the H.F. choke placed between the L.F. transformer and the valve platform. This consists of 500 turns of S.S.C. wire (about two ounces of this should suffice) wound on a bobbin of ¾ in. outside diameter and 2 in. internal length (cheek to cheek). The wire is wound on in sections. That is to say, the wire is wound round at one end of the bobbin for about 40—50 turns and then a further 50 turns are wound on about ¼ in. away, followed by 50 or 60 more turns ¼ in. farther along the former. Four sections of winding can be wound on the first "layer," and then a piece of waxed paper is wrapped round the former and then a further layer of four sections is wound on. This is followed by more waxed paper until about 500 turns have been wound on the bobbin. Finally a layer of waxed paper and a covering of Empire cloth completes the construction of the choke.

(*Continued on page 587.*)



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Supplied in the following sizes:

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

Complete with Knob and Dial.

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Other components in the Efesca Series of One-Hole Fixing Tapped Coils are the H.F. Transformer and Anode Tuner (illustrated here), Aerial Tuner and the H.F. Reactance Coil.

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H. V. S., of Darlington (*full name and address on request*), lives at the bottom of a steep bank surrounded by high buildings, one of which towers 60' above the top of his drum aerial, which is 30' high. His expert friends told him he was an optimist indeed to expect any results worthy of the name. But the aerial was a 'Mars.' On a two-valve Unidyne set, Detector and Low Frequency, he gets Breslau, Leipzic, Frankfort-on-Main any night he chooses, and, under reasonable conditions, W B Z, from Springfield, U.S.A. Expect at least 50% better results from the 'Mars' Aerial than you will get from 7/22's. Generally the margin of superiority is higher. Expert or beginner, it pays to pay 9/6 and get a 'Mars,' for 'Mars' Super efficiency will save you its cost over and over again by reducing the necessity for amplification.

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The 'Mars' Aerial consists of 84 strands of fine wire spun together. Easy to fix—exceptionally strong, durable, and does not corrode easily; hence its popularity in seaside towns and for ships' aerials.

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The spacing of the Low-Loss Coil is a positive joy to the expert. Nowhere in the Coil will he find a parallel. The eccentric method of winding bears a definite relationship to the loss of harmonics and the superior reproduction of tone provided by this method is rather wonderful. Again the 'Mars' Low-Loss Coils provide greater selectivity and give greater signal strength. The 'Mars' Coils represent a definite advance in Coil construction. Their superiority is tangible; even a tyro can detect it instantly.

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No.	Price	·0005 Condenser
35	4/9	280 to 440 metres
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75	5/3	600 „ 1,000 „
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150	7/1	1,110 to 2,050 metres
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the wonderful new insulating material

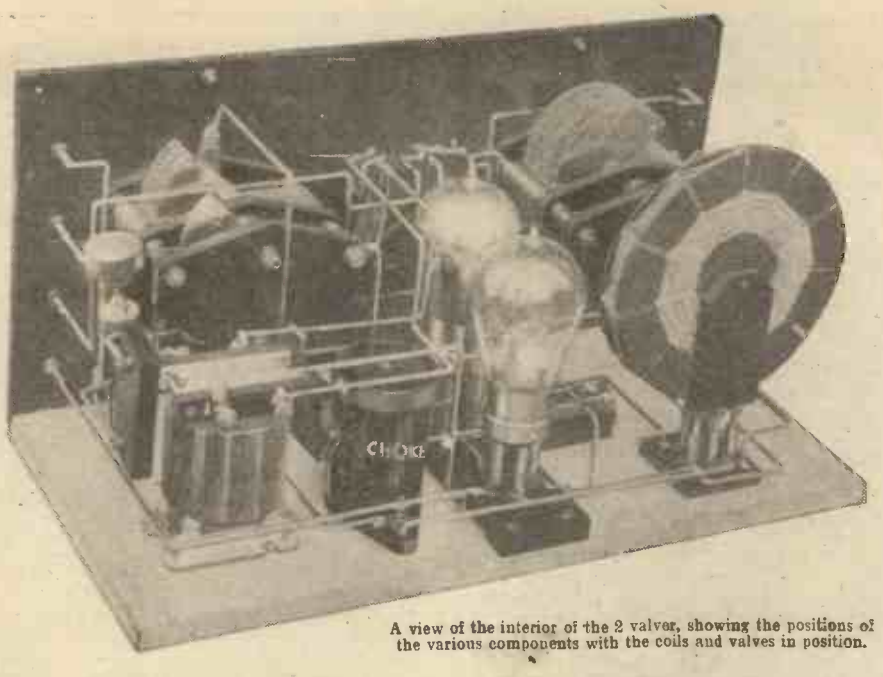
TROLITE commends itself to all amateurs because of its cheapness and the beautiful finish it gives to Wireless Sets by its lasting Polish. TROLITE has no surface leakage, is unaffected by exposure and does not warp or discolour. Ask your Dealer to show you standard parts from TROLITE or write for full particulars to

F. A. HUGHES & CO., LIMITED, 204-6, Gt. Portland Street, LONDON, W.1

1926 UNIDYNE TWO VALVER

(*Continued from page 584.*)

The coils and coil unit can be purchased complete and we advise constructors to do this in order to avoid any mistakes that might otherwise creep in and prevent good results being obtained. The coil holder consists of a piece of ebonite with five sockets. Three in one row for the reaction coil and two in the other for the aerial coil. We understand that the coils as manufactured are permanently coupled together so that no mistakes about coupling can be made and it is impossible to place the unit the wrong way round in the holder. In the photographs separate coils are shown but the double coil unit has many points to recommend it and renders this important part of the receiver absolutely "fool-proof."



A view of the interior of the 2 valver, showing the positions of the various components with the coils and valves in position.

Wiring Up the Set.

The actual connections of the set can be followed from the diagram Fig. 2 below, and the wiring of the receiver should be carried out extremely carefully in order that poor connections or "dry" joints may be avoided. Square section tinned copper wire is advised as it not only makes the set much neater in appearance but is easy to handle and an efficient conductor.

As in the one-valve Unidyne described last week the variable grid resistance and condenser used in the earlier circuits has been eliminated and a fixed grid leak and condenser takes their place.

Wire rheostats are used throughout, as it is felt that the compression type, unless of exceptionally good construction, will give rise to noisy reception due to small fluctuations in the filament current caused by the heating up of the carbon granules. The rheostats should have a maximum resistance of 30—35 ohms, as they will then give the fine filament control necessary for best results.

When the wiring has been completed it should be carefully checked from the list of point-to-point connections given and the set should be cleaned up, all traces of flux and loose beads of solder being removed. As regards the flux it is best to remove this after making each joint, while the wires are still hot.

The test of the receiver should be carried out with the switch in the "one-valve" position and the ordinary broadcast wave-length coils in the coil-holder. The aerial should be in the series position for all stations below the

(*Continued on page 588.*)

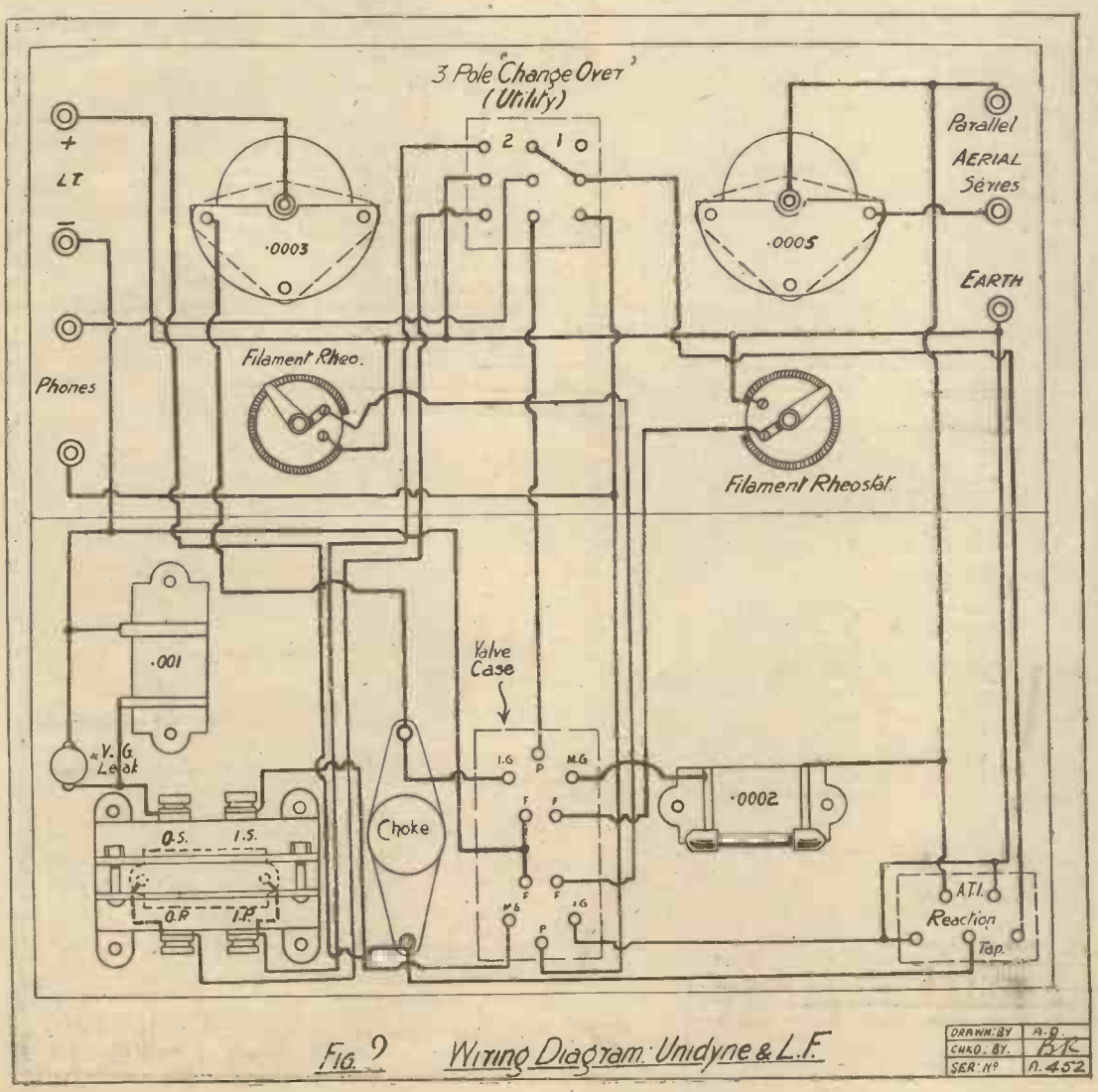


Fig. 2 Wiring Diagram: Unidyne & L.F.

DRAWN: BY	A.D.
CHKD. BY.	B.K.
SER: No	A. 452

1926 UNIDYNE TWO-VALVER.

(Continued from page 587.)

POINT-TO-POINT CONNECTIONS.
(Looking at back of Set).

Aerial parallel terminal to one side of ·0005 variable condenser, one side of A.T.I., and one side of grid leak and condenser. The other side of this goes to main grid of 1st valve (inner valve holder).

Aerial series terminal to the other side of ·0005 condenser. Earth terminal to other side of A.T.I., also to L.T. plus.

L.T. plus to one side of each rheostat, also to L.H. side of reaction coil sockets, and to inner grid of second valve. The other rheostat connections are taken to the corresponding sockets of each valve holder.

The remaining filament sockets are joined together and to L.T. minus, which also goes to one side of variable resistance and the ·001 fixed condenser (switch contacts are numbered from the rear of the set 1, 2 and 3).

Plate of 1st valve to middle (1) contact of switch; (2) contact to top 'phone terminal centre; (3) contact to right hand; (2) contact also to right-hand socket of reaction coil. Right hand (1) contact of switch to plate of second valve and to lower phone terminal (right-hand No. (3) contact no connection).

Left hand No. (1) contact of switch to OP, left hand (2) contact to L.T. plus, left hand (3) contact of switch to IP. IS to main grid of second valve. OS to the other side of variable resistance and ·001 condenser. Left-hand reaction coil socket is connected to earth lead.

Centre reaction socket is connected to the choke which is shunted by the ·0003 variable. Other side of choke goes to inner grid of first valve. A ·001 fixed condenser is connected across IP and OP.

wave-length of, say, Belfast, unless an exceptionally small aerial is being used.

The special U.C.5 valves now on the market will be found to be quite efficient, and can be recommended for use with this receiver, a 6-volt L.T. battery being provided to supply the filament current.

Reaction Control.

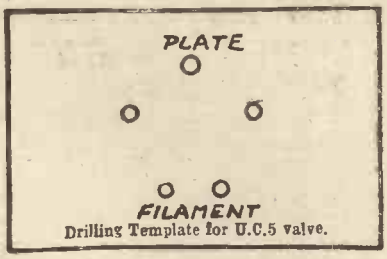
Reaction is obtained by rotating the right-hand (·0003 mfd.) variable condenser spindle towards the *minimum* position, and is stopped by increasing the capacity of this condenser. Very fine control can therefore be obtained, and the set has the added advantage that only two "knobs" have to be operated.

When the tuning-in of a station has been mastered on the one valve, the second should be switched in and the filament rheostat of the second valve turned on. Amplification should be apparent at once, and then this should be increased by variation of the grid leak behind the transformer. This should be altered until maximum signal strength is obtained, after the best results have been reached by varying the two condensers.

DX Reception.

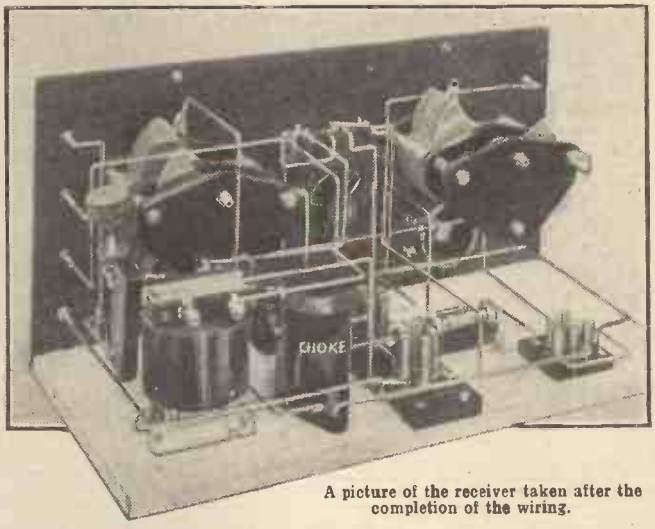
The successful reception of distant stations will only come after a little practice with the receiver has been obtained, but those who make the set will, we feel, be agreeably surprised at the ease with which such transmissions can be picked up.

As regards 5 X X and Radio-Paris, these



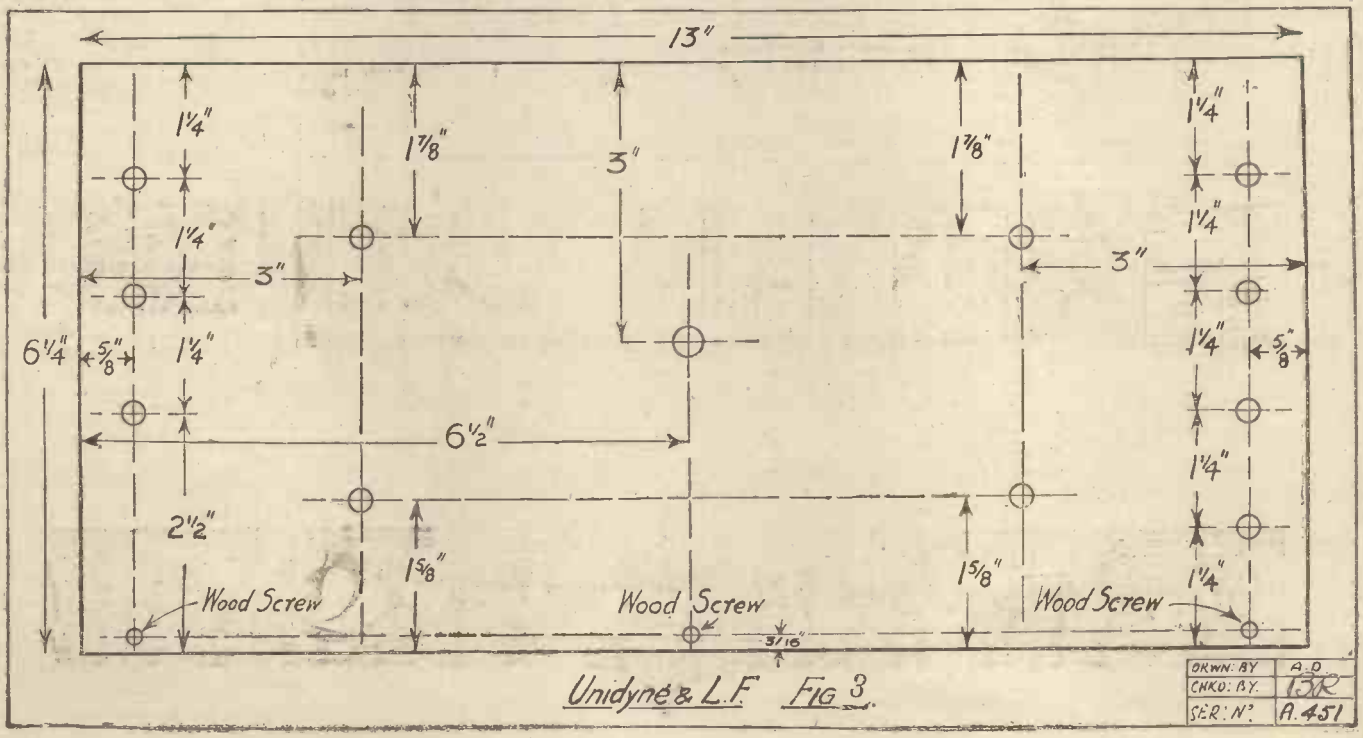
Drilling Template for U.C.5 valve.

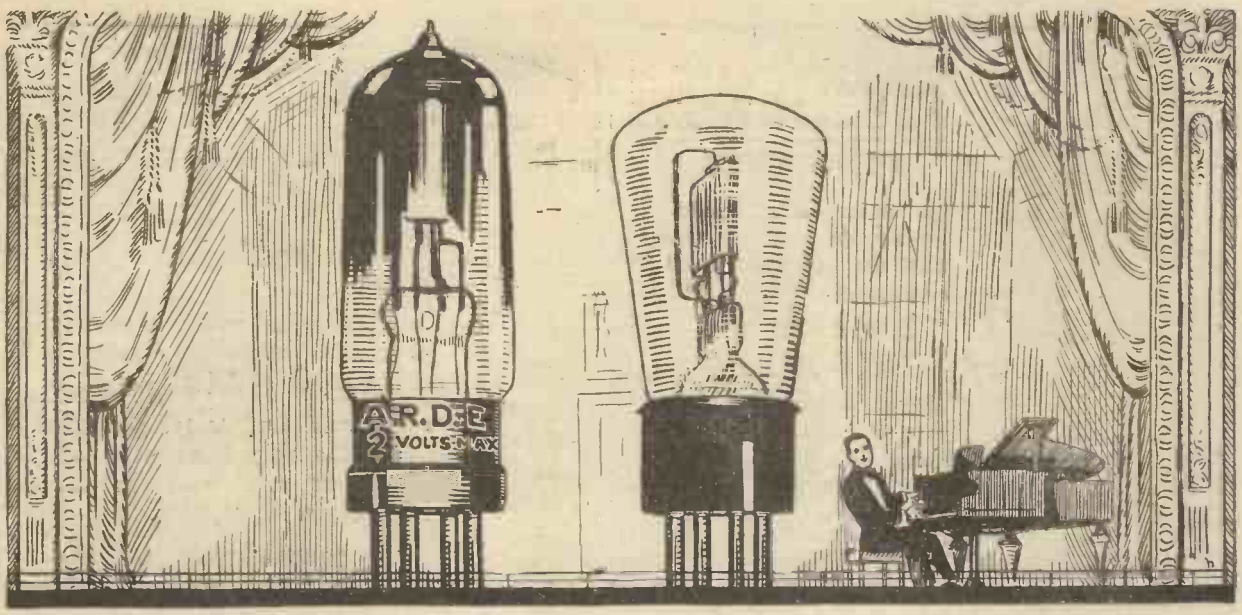
stations need the larger coil unit, and when this is in use the "parallel" position of the aerial condenser should be employed.



A picture of the receiver taken after the completion of the wiring.

The template reproduced on this page gives the correct drilling centre for the mounting of valve sockets for the U.C.5 valve. It will be seen that the filament sockets are placed close together while the two grids are on the extreme left and right of the template. In wiring up the valve sockets the greatest care must be taken to make sure that the correct grid connections are made.





Ideal Entertainment by the Ediswan Troupe

P.V.6: "Hallo! Fancy meeting you! I *am* surprised!"

A.R.D.E.: "*I'm* more surprised at your surprise. You should know better by now. We Ediswans always find each other in the end."

P.V.6: "That's true, my dear: but we seem to have found each other remarkably quickly in this case. Mr. Owner has only had this set a fortnight, and already you're here and the other Miss A.R.D.E. has gone!"

A.R.D.E.: "Good for you—and for him! Couldn't you get on with the lady?"

P.V.6: "I did my best. But she was very trying. However, I'm always chivalrous—it's in the family. We seem to do more for other valves than for ourselves."

A.R.D.E.: "They need it. We, we always work well together."

P.V.6: "Of course, my dear. But then, we know each other so well, and are so sure of each others' abilities that—well, it *isn't* work. It's pleasure!"

A.R.D.E.: "That's true . . . but now, I hear FL—the Eiffel Tower. Let's get *Mr. Owner* some pleasure . . . Ready?"

P.V.6: "Ever—till the end of my life——"

A.R.D.E.: "Which is, naturally, a long way off!"

Remember that for a 2-volt A.R.D.E. Valve its best and only "mate" is the P.V. 6. The 2-volt Power Valve.

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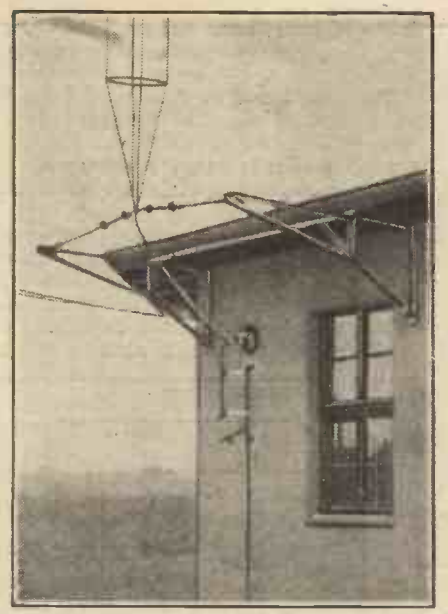


The lead-in at the Berlin Radio-Aeroplane Harbour.

MORE ABOUT A POPULAR P.W. CIRCUIT

SOME TRINADYNE MODIFICATIONS.

AN EASILY CONTROLLED REFLEX RECEIVER

By J. ENGLISH.

THE original Trinadyne circuit, reproduced in Fig. 1, was the outcome of experiments undertaken to discover a simple method of obtaining reaction effects from an L.F. valve amplifying the output of a simple crystal receiver, thus reducing the heavy damping of the aerial circuit due chiefly to the resistance load of the crystal detector.

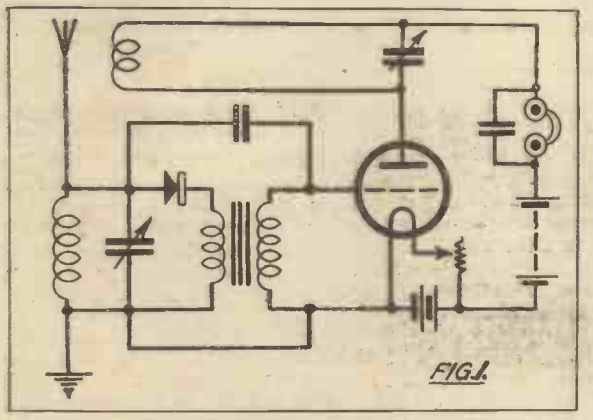


FIG. 1.

A considerable degree of success has been achieved in this direction with this circuit, which in operation gives strong signals from nearby stations, while as regards selectivity and range of reception, it is equal to if not better than an ordinary reflex receiver, but without the disadvantages of the latter.

With a view to removing certain sources of loss not so apparent in practice as in theory, further experiments were made with circuits employing *series* instead of parallel introduction of the audio-frequency impulses into the grid circuit, a possible circuit being Fig. 2.

"Damping" Avoided.

At first glance this circuit may seem to differ widely from No. 1, but, in reality, there is little difference between them from the point of view of function. The main alteration is the position of the transformer secondary, which is introduced between filament negative and earth, shunted by a small fixed condenser to by-pass H.F. currents. With the transformer in this position we avoid one source of damping of the grid circuit, and at the same time we can dispense with the grid condenser, thereby obtaining more perfect amplification.

Ample Reaction.

Results obtained with this circuit were quite good, and ample reaction was obtained with an untuned anode coil. A noticeable feature was the marked purity of reproduction.

Now while it is possible by judicious use of reaction to counteract the damping caused by the detector (a very well-known practice) a better way should be to make this damping small in the first place. This can be realised to a large extent by connecting the detector across a portion only of the aerial coil, and the most satisfactory point seems to be midway between aerial and earth tappings. Again, damping due to the aerial system itself can be reduced by tapping the aerial lower down the coil, whence we arrive at circuit No. 3. It is obvious that a very convenient form of inductance for this circuit is the well-known "Ultrynic" coil, the method of making connections to which will be apparent from Fig 3.

Several Variations Possible.

The method of introducing the transformer secondary used in circuit No. 2 gives good results, though sometimes apt to cause instability, while further stages of L.F. amplification cannot be added without setting up howling, due to L.F. potentials being set up across the transformer secondary. If the secondary is placed in series with the earth, after the well-known method introduced some time ago by a famous English radio engineer, the stability is increased and amplification can be added.

Several variations of this circuit are possible, and it is worth while trying various tappings for aerial, crystal and grid leads. Values that I have found satisfactory, working with a fairly large aerial, are set forth above, the number of turns being counted for each tap from the bottom end of the coil, which is wound with 22 D.C.C. on a three-inch former. The tapping points are indicated in the diagram of circuit No. 3.

	1	2	3	4
G	40 turns	50 turns	55 turns	40 turns
A	35 ,,	30 ,,	35 ,,	20 ,,
C	20 ,,	20 ,,	15 ,,	15 ,,
Wave-length range	300–450	300–500	325–500	250–400

Suitable values for the reaction coil, wound on a 3½ inch former, are, 90 turns to cover 300 to 600 metres, and 60 turns to cover 200 to 400 metres.

The fixed condenser across the transformer

(*Continued on page 592.*)

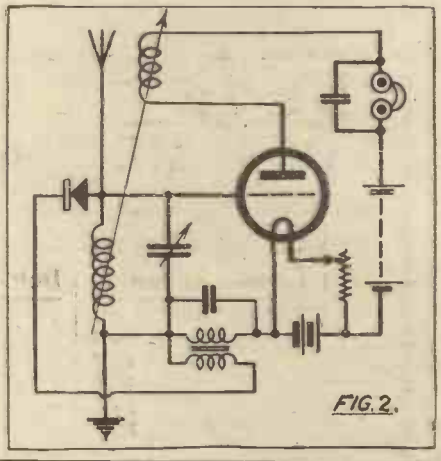


FIG. 2.

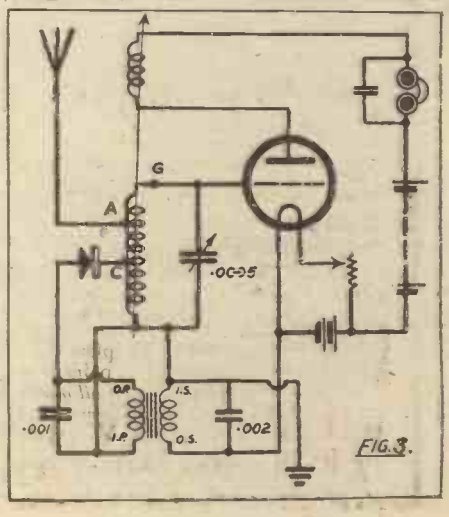


FIG. 3.

HOW TO MAKE "A LOCAL-5 X X" COIL.

By G. H. LAMBERT.

MANY listeners do not take advantage of the alternate programmes sometimes broadcast from Daventry, because of the slight trouble involved in changing coils.

It is thought, therefore, that a brief description of a combined plug-in coil which is used by the writer, may prove of interest to constructors. The change over from a local station to 5 X X is made by simply opening a switch fixed to the coil mount.

Figure 1 shows the completed coil. It will be observed that it consists of a basket coil, or any low loss coil, with a tapping at 40 or 50 turns, according to whether the wave-

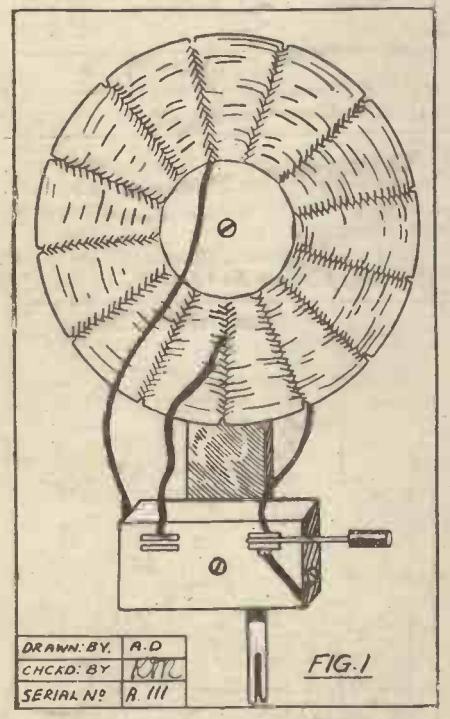


FIG. 1

length of the local station is below or above 400 metres.

A spider coil former, about 5 in. in diameter, is obtained or cut out of cardboard, then shellacked and baked. The former should be one having 13 slots. 170 turns are wound on by going alternately in and over three slots at a time, remembering to leave a tapping at 40 or 50 turns.

Mounting the Switch.

The coil mount is then prepared. An ordinary flat coil plug is used, preferably one with a large amount of ebonite above the socket and plug contained in it. Near the top edge two small holes, A and B, Fig. 2, are drilled for a miniature S.P.S.T. switch, and a larger hole is bored at C, which is later used to secure the coil. The switch is now mounted.

The coil is attached to the plug mount by means of a strip of ebonite about ¾ in. wide, using screws to pass through the hole C, Fig. 2, and through the centre of the coil former.

The beginning of the coil goes to the connecting screw X, a short length of wire is next soldered to the tapping at the stated number of turns, its other end going to one side, A, of the switch, and the other lead of the coil is joined to B, and to the other connecting screw Y of the plug.

A Further Refinement.

When the switch is opened the whole number of turns is in circuit, and when closed the outer portion is short circuited.

A further refinement is to add or take wire from the outer portion so that the condenser readings for the local station and 5 X X are identical. For example, suppose the local station gives best results at 20° on the condenser dial, and Daventry at 35° with the switch open, then by means of trial and error the correct number of turns can be added to equalise the condenser readings.

The principle of this coil may obviously be applied to reaction and tuned anode coils, remembering in the latter case that a larger number of turns is necessary, say 65 for the inside, and an additional 160 for the outside portions.

Readers who construct this will be pleased with the facility with which they can change over from one station to the other. A favourite item can be heard, and on its completion the other station can be listened to again, by simply opening or closing a switch.

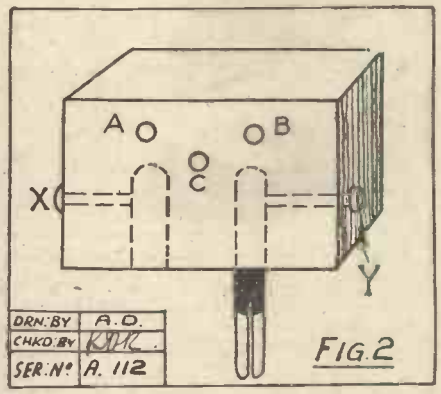


FIG. 2

SOME TRINADYNE MODIFICATIONS.

(Continued from page 591.)

secondary can be anything from ·002 to ·0005 mfd. capacity, decreasing the value simultaneously lowers slightly the wavelength. The values given above were obtained with a ·002 mfd. condenser. The connections to the transformer are important and should be varied until best results are obtained.

We now come to a further modification circuit No. 4, in which capacity instead of magnetic reaction coupling is used, the Reinartz method of regenerative control having been adapted with satisfactory results. The transformer may be in series with the earth in this case also, if desired.

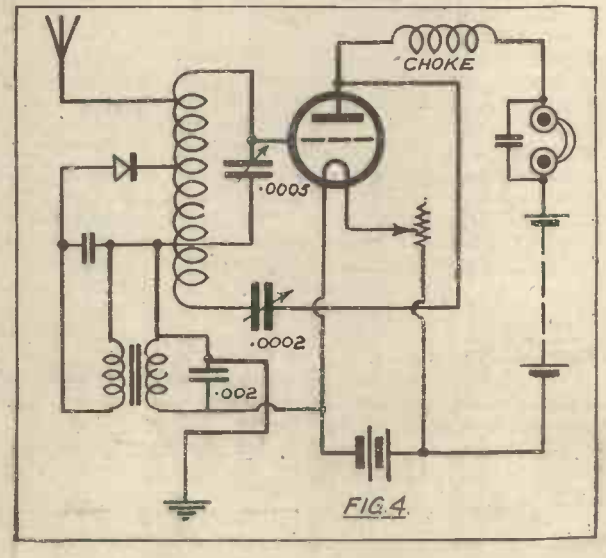


FIG. 4.

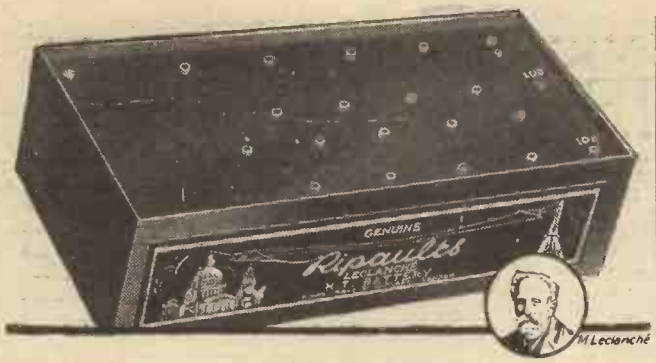
Here reaction is controlled by the small variable condenser C2, and with the correct number of turns in series, wound on the earth end of the coil, a smooth and easily adjustable form of reaction is obtained. The number of turns for each tapping is the same as given above for No. 3, while 15 turns should be added for the reaction winding, which with a ·0002 mfd. condenser in series, will cover the same wave-length bands. Below 300 metres it is more convenient to use 20 turns for the reaction winding.

Friends who have tried out Nos. 3 and 4 report that they have had very good results with them, remarking especially on the clarity of signals given by No. 3.

Excellent Selectivity.

I also have found that this circuit gives the best results, being very simple in operation, and in a few minutes good readable signals have been logged from a dozen different stations from 2 L O to 5 I T. As regards selectivity, Münster (410) which comes in very well, is received without any interference from Newcastle (400), or 2 L O the local station, but Manchester (374) cannot be received without interference from 2 L O.

While good DX results can be obtained with these circuits, they are more suitable for the reception of the local station, as the purity of reproduction obtained is so good. Compared with an ordinary detector valve with reaction, No. 3 gives almost double the signal strength with distinctly better quality and in sufficient volume to be heard quite well on the loud speaker.



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20 volts	4/6
36 volts	7/6
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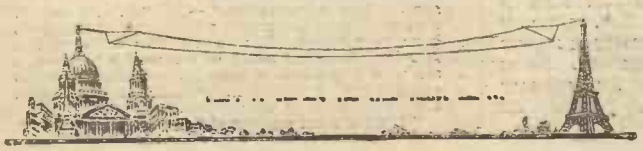

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A.J.S. PATENT VARIABLE LOW-LOSS CONDENSERS

Extremely low minimum capacity. Special shape vanes giving greater movement from 0-30 degrees. Large and rigid bearings, ebonite end-pieces and special friction washer. No rubbing contacts. Vernier adjustment.

·0002 mfd. .. 10/6	·0005 mfd. .. 12/6
·0003 mfd. .. 11/6	·001 mfd. .. 17/6

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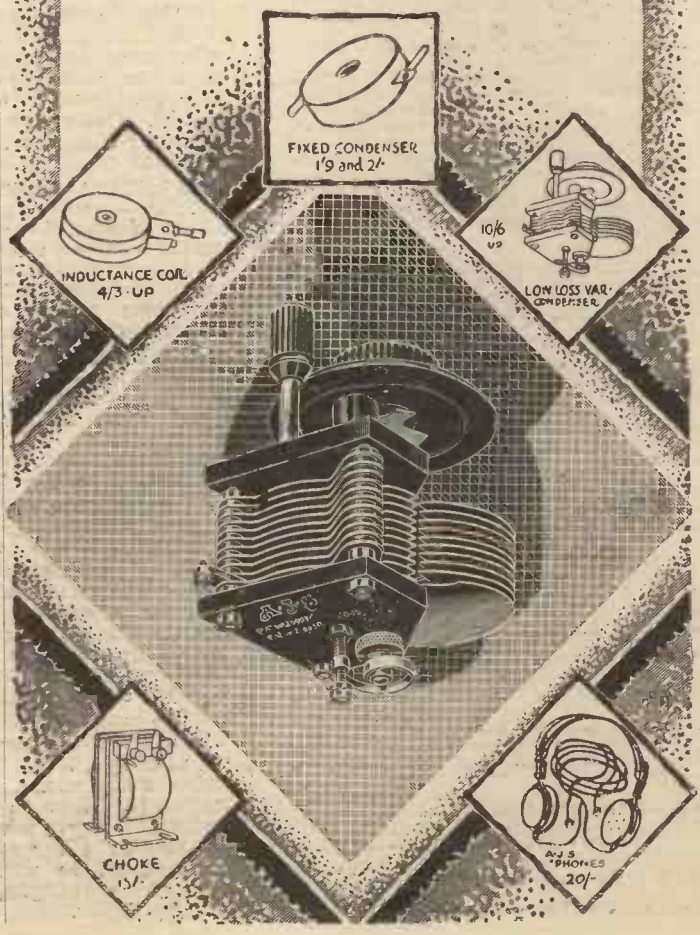
GLASGOW: 240-250, GREAT WESTERN ROAD.



MORE UNIDYNE OPINIONS

WHAT OUR READERS SAY

May I write a few words on the capabilities of the Unidyne. I have tried out the 1-v-0. and 0-v-1, and I must say that I have found them to beat anything with H.T.

D. J. JENKINS.,
School House, Gellinudd, Pontardawe, Swansea.

* * *

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.

HUGH OVENDEN.
Holmfield, Whitestake, Preston.

* * *

I must add my thanks to the many sent to the inventors of the Unidyne, which has far exceeded my most sanguine expectations.

JOHN STEWART.
4, Grange Place, Perth Street,
Blairgowrie, Perthshire.

* * *

Having been a Unidyne enthusiast from the very beginning, I wish to add my thanks to Messrs. Dowding and Rogers, and hoping for more circuits to come.

M. A. CONWAY.
58, Swann Street,
Great Portwood Street, Stockport.

* * *

If anyone about me should doubt these claims as to the capabilities of a Unidyne, I shall only be too pleased to set their minds at rest by giving a demonstration. It is equal if not better than a set using H.T., possessing all H.T. advantages without its disadvantages.

ARTHUR R. MURDEN.
287, Heath End Road, Nuneaton, Warwickshire.

* * *

I have obtained on the Unidyne results which, as all admit when they have heard them, are but seldom equalled on a similar set with H.T. The purity and selectivity of the set are outstanding.

C. H. GRIFFITHS.
5, Brentry Road, Fishponds, Bristol.

* * *

I should just like to say a few words in support of the Unidyne principle.

I have a one-valve set constructed from "Best Way" series, and am very well satisfied with same. I get 2 Z Y at good 'phone strength on two sets headphones, also 2 L O very slightly less strength, and Bournemouth equal to 2 L O. I have also had Leeds, Bradford, Liverpool and Newcastle at good 'phone strength, any of these when 2 Z Y, the local station, is transmitting.

I think this is not so bad for a one-valve set with indoor aerial and waterpipe earth.

H. LOWIS.
Burnley.

* * *

I picked up following stations: 2 L O, 5 I T, 6 B M, 2 Z, 5 W A, 5 N O, and two French stations, Petit Parisien and Toulouse, at approximately 3.45 a.m. I picked up W G Y on 379½ metres.

P. J. INGRAM.
The Terrace, New Northcourt, Abingdon, Berks.

* * *

I feel I must thank the technical staff, also Messrs. Dowding and Rogers, for such fine circuits.

THOS. MULLEN.
65, Viceroy Street, Seaham Harbour.

P.S.—My next set will either be a three or four-valve Unidyne.

* * *

. . . . the above results speak highly of the wonderful detecting powers of the H.T.-less circuit. Please convey my most sincere thanks to the inventors.

W. H. HARRIS.
26, Cornbury Road, Rotherhithe, S.E.16.

* * *

Where I am situated, Glasgow, 25 miles away, can be heard with the 'phones on the table, and all the other main stations at readable strength.

ARCHIBALD E. RAFFERTY.
Caldwellside, Lanark.

* * *

Just another letter in praise of your one-valve Unidyne set. Everything is going splendidly. I have heard all the B.B.C. main stations except Belfast. I have also logged Hanover, Münster, Bremen, Brussels, Hamburg, and Voxhaus (Berlin), and dozens of others which I could not recognize.

J. RICHARDSON.
6, Richard Street, South Shields.

* * *

I feel it is only due to Messrs. Dowding and Rogers and to your valuable paper that I should tender my thanks for the two-valve Unidyne set, det., and 1 L.F.

Can tune-in Liverpool, Newcastle, Glasgow, Aberdeen, Belfast, Chelmsford, Berlin, Hamburg, Radiola, while 2 Z Y is working. When they close down all other stations come in on good 'phone (2 sets of Brandes) strength. Relay stations, Stoke, Leeds and Hull, I have also tuned in.

H. VAN DIEMAN, A.M.I.E.E.
8, Grange Road, Near Bentcliffe,
Pendleton, Salford.

* * *

You said you would not care to put the range of a single-valve Unidyne much above 40 to 100 miles. Well, from my experience of this excellent circuit, I say well up to 600 miles.

JOSEPH PEEBLES.
Bellahouston, Military Hospital,
Cardonald, Glasgow, Scotland.

UNIDYNE TROUBLES.

FIVE IMPORTANT RULES.

(1) To ensure successful Construction.—Use first-class components throughout and adhere strictly to the details given, particularly in respect of values. A 10 to 1 ratio L.F. transformer is useless in the Det. L.F. circuit.

Pay attention to the spacing of components and wiring. Be as careful in respect of insulation as you would be if 100 volts H.T. was to be used.

Ensure that all contacts and connections are perfectly clean and see that where such are soldered all traces of flux are removed.

(2) When a One-Valve Unidyne Fails to Work, Possible Causes.—Unsuitable coils. Reaction coil connections reversed. Valve pins making inefficient contact with their sockets. Grid connections reversed. Faulty grid condenser. Faulty contact or connection in wiring. Error in wiring.

(3) Inefficient Amplification on the L.F. Side.—Possible Causes. Unsuitable L.F. transformer, L.F. grid resistance of unsuitable value (instead of pencil lines an ordinary variable grid leak can be used.) The POSITION of the L.F. transformer requires reversing. More L.T. required. See also (2).

(4) Failure to Obtain Efficient H.F. Amplification.—Possible Causes. "Crowding" of components. Parallel and badly spaced wiring. H.F. transformer not as per specification. H.F. transformer in too close proximity to tuning coils or L.F. transformer. See also (2) and (3).

(5) General Notes on the Operation of Unidyne Receivers.—Careful tuning is essential. Make primary adjustments of A.T.C. with minimum reaction. When reaction is being increased use the vernier condenser adjustment simultaneously. Run the filaments as low as possible—never increase their brightness above actual requirements. Use the detector filament control lightly for tuning purposes.

When tuning has been carried out on one valve only, it will be necessary to slightly retune when the L.F. stage is brought in. When an H.F. stage is brought in it may be necessary to reverse the reaction coil connections. Series A.T.C. should be used for ordinary broadcast wave-lengths, parallel for 5 X X and higher.

Have constructed the one-valve Unidyne and found it far better and more efficient than I dared imagine.

The strength and quality are beyond criticism, and much superior to the ordinary detector with H.T. and reaction, and much smoother and quieter in its functioning, whilst the selectivity and flexibility of control are the last word.

With one valve only it is like a real good crystal set, with the advantage that you can turn to any station.

I offer my sincere thanks and congratulations to Messrs. Dowding and Rogers for the Unidyne Circuit and assure you it is my best set, and I wish for nothing better.

ALFRED FRANCE.
33, Church Street, Rotherham.

* * *

I received K D K A . . . . All British stations come in well . . . . .

When 2 L O is working I receive many Continental stations with no interference.

G. T. HAMILTON.
19, Bardolph Road, Holloway, N.7.

* * *

As I think half the fun in wireless is in being able to get other than local stations, if one should feel inclined, I am more than glad that I have made the Unidyne.

ERNEST DONALD DURRANT.
Eversleigh, Ipswich Road,
Woodbridge Suffolk.

* * *

I must congratulate Messrs. Rogers and Dowding on their wonderful circuit, the Unidyne. I have been working a one-valve set about nine months with fine results. It is not a difficult matter to receive any British station on it.

D. HEATON.
"Dunkirk," Oxenhope, near Keighley, Yorks.

* * *

I should imagine the one outstanding merit of the Unidyne, apart from the abolition of H.T., is its selectivity. Newcastle, Madrid, Bournemouth, Manchester, London and Cardiff on a wave-band from 350 to 400 can be tuned in distinctly one after the other by little more than altering the coupling of the reaction coil.

M. PIPPET.
"Craigmore," Highclere Road,
Bassett, Southhampton.

A Few Expert and Press Opinions.

"This is certainly an epoch-making discovery in wireless. The results are astounding. When I first heard of the invention I was rather dubious of its possibilities, but now I am absolutely convinced that the two inventors have accomplished what appeared to be the impossible."—Mr. C. H. Mummery, of the Ever-Ready Company.

* * *

"Any attempt to focus attention upon the disadvantages of the large H.T. battery is of value."—"Wireless Weekly," May 14th, 1924.

* * *

"Broadcatching, without the bugbear of high-tension batteries, is now a reality, constituting the most important discovery since the advent of wireless."—"Daily News."

* * *

"An important invention that will appeal to everyone interested in wireless was shown at work yesterday by two young radio engineers, Mr. G. V. Dowding and Mr. K. D. Rogers, at Radlett, Hertfordshire, about 18 miles from the centre of London. Wireless reception was carried out by them with a single-valve set without the use of a high-tension battery and on an entirely new circuit."

"The elimination of the high-tension battery and the mysterious noises, fizzling, and disturbances, which are so familiar to those who listen in with valves, is the essence of the invention. One single accumulator supplies the whole of the power used in the reception, so that the valve receiver becomes as simple to handle as a crystal set.

"The clarity of tone and absence of distortion when listening-in with the new arrangement was very marked."—"Daily Mail."

* * *

"It cures sound distortion in loud speakers and largely eliminates atmospherics."—"Daily Herald."

* * *

"Last night's demonstration (one given some time ago to press representatives.—Ed. "P.W.") showed that several of the greatest problems for amateurs have been solved. It proved that a valve set can now be handled as easily as a crystal set. Results achieved were equal to those from ordinary receivers employing an expensive high-tension battery, and in some respects they were better.

"Loud speaker reproduction was certainly clearer, and 'atmospherics' were greatly reduced."—"Daily Express."

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The "IGRANIC-FRESHMAN" is a *fixed* Condenser in the truest sense of the word. Because of the special form of construction, dust or moisture cannot enter, and therefore, its capacity, which is guaranteed to be accurate within the unusually small limit of 5 per cent. remains absolutely unalterable over long periods of use. For the same reason IGRANIC-FRESHMAN FIXED CONDENSERS may be relied upon to give consistently excellent performance under all climatic conditions.

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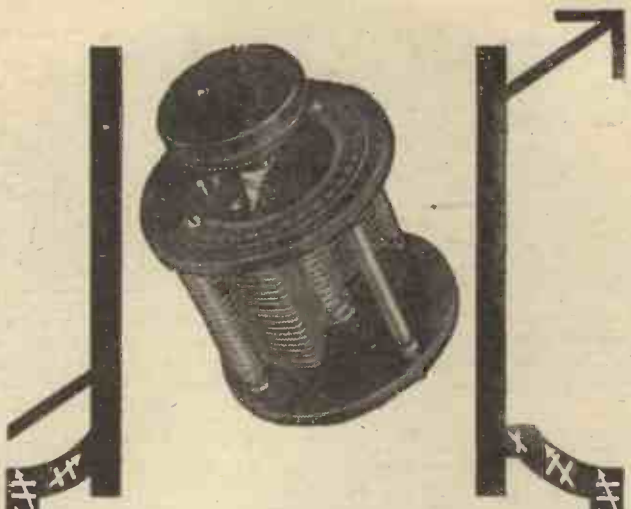

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Prices as follows:

Cat. No. 0/1010	·0005 mfd.	**10/6**
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Cat. No. 0/1060	·0003 mfd.	**11/-**
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Write to-day for fully illustrated list giving practical wiring hints and showing how to get the best from your set. Lists also sent fully describing our super sensitive 'phones, crystal and valve receivers, components, Supertone Loud-speakers, etc.

The British L.M. Ericsson Mfg. Co., Ltd., 67-73, Kingsway, London, W.C.2.

Ericsson
TESTED CONDENSERS

Traders and manufacturers are invited to submit wireless sets and component parts to the "P.W." Technical Dept. for test. All tests are carried out with strict impartiality in the "P.W." Test Room under the supervision of the Technical Editor, and the general reader is asked to note that this weekly article is also intended to provide a reliable and unbiased guide as to what to buy and what to avoid.—EDITOR.

OF all the various makes and types of dull-emitter power valves on the market, the new Ediswan P.V.6 D.E., in our opinion, represents one of the nearest approaches to the ideal. Taking ·5 amps. at 1·8 to 2 volts, it has the useful impedance of 10,000 ohms with an amplification factor of 6·0.

The shape of the anode and grid has been changed from the former cylindrical to the oval box type, and the filament is now of "V" pattern.

The bulb also is now "pipless," and Messrs. The Edison Swan Electric Co., Ltd., inform us that this construction and the moulded ebonite base, which is another feature of the new P.V.6 D.E., is in future to be adopted as standard in all their power valves.

Where the new P.V.6 D.E. differs from the old model in characteristics is in respect of impedance, which is reduced by 2,500 ohms; in filament amps., which are increased by ·1; and emission, which is now 0·6 milliamps. per volt instead of 0·45 milliamps. per volt.

In view of these it is not surprising that we discovered that two P.V.6 D.E.'s in a two-valve circuit (det., L.F.), using 72 volts H.T. and 3 volts grid bias on the L.F. (det. cumulative grid rectification) gave astonishingly good results, although, of course, the valves were, according to their category, misapplied. We do like the P.V.6 D.E. in the first D.F. stage, however; it is far superior to most "L.F." valves. In a second L.F. stage with 2 volts grid bias and 100–120 volts H.T., it gave exceptional results. Immense volume with perfect tone was possible, and we realised how far valve design has progressed within the last year or so, when we glanced at the small 2-volt accumulator that was used.

Ediswan P.V.6 D.E.'s at 18s. 6d. each are excellent value for money.

* * *

From Messrs. O. Ruhl (1922) Ltd., 85, City Road, London, E.C., we have received a pair of "Audion" telephone receivers for test. They are fitted with a patent adjustable elastic band additionally to a steel headband, and this allows them to fit on the head firmly, but very comfortably. The headpiece is quite light, although its overall size exceeds that of most other types. They are quite sensitive, and their tone is good. Guaranteed for twelve months, they are quite reasonable propositions at 17s. 6d. per pair.

* * *

From Messrs. J. R. Jennens, Ltd., Jennens Row, Birmingham, we recently received a J.R. "Lo-Los" L.F. transformer for test. It is of the shrouded type; is, in fact, steel shrouded, and retails at 20s. It is stated to be made

The J.R. "Lo-Los" L.F. Transformer.

(*Continued on page* 598.)

APPARATUS TESTED.

(*Continued from page 596.*)

entirely of British materials with the exception of non-magnetic Swedish iron which is used for the core. It is a substantial component, and bears evidence of thoughtful design and careful craftsmanship.

One standard ratio only is available, but it is claimed that this is suitable for all purposes. Certainly on test it functioned very well in all ordinary positions, and energy transference was carried out efficiently and with inappreciable frequency distortion over the middle ranges.

* * *

One of the neatest little loud speakers we have seen is the "Be-Co," a product of Messrs. British Electrical Sales Organisation, Dept. L.S., 623, Australia House, Strand, W.C.2. It is of the hornless type and is only some 6 in. in height and 5 in. in diameter. In appearance it is quite ornamental and much more an "objet d'art" than the horn type of loud speaker of a year ago. As a matter of fact, placed on the top of a receiver or on the table it looks almost too small and too "pretty" to act as an efficient reproducer of sound.

However, on test it gave results in excess of expectations. It proved to be very sensitive and delivered a volume equal to a much larger instrument. Tone was good, and the adjustment at the back smooth and efficient. The "Be-co" is retailed at 52s. 6d. in nickel plate and at 55s. in oxidised silver on copper. We advise readers to examine one of these little instruments and, if possible, hear one in operation before making their next loud speaker purchase; their time will not be wasted.

* * *

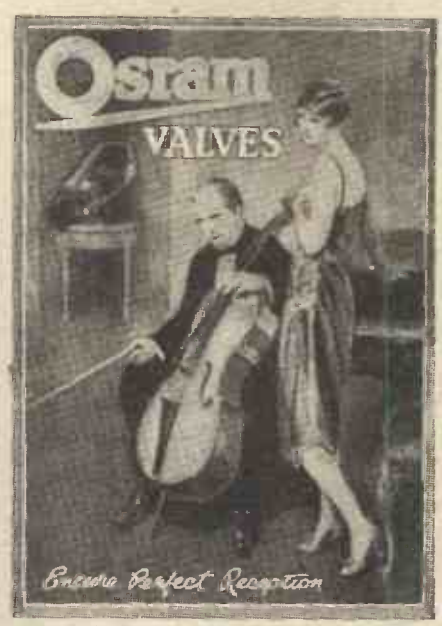
A novel form of valve socket which will be of interest to experimenters, is shortly to be placed on the market by Messrs. Wates Bros., Ltd., 12–14, Great Queen Street, London, W.C.2. Known as the "Trucon," it is quite unconventional in design, and relies for its panel fixing not on nuts, but on the forcing back underneath of two triangular pieces of metal. No thread or screws of any kind are employed and the socket is all in one piece.

The "Trucon" is certainly "anti-capacity" in character, and will no doubt appeal to those amateurs who incline to the unorthodox.

* * *

"Vernier" adjustments are extremely useful devices, but there is no lack of variety of types available on the market, the supply, in fact, must be very adequately coping with the demand. However, yet a further device of this nature has been brought to our notice. It is known as the Linaker cut gear adjustment and can be applied to existing variable condensers, variometers, etc.

It consists of a large gear wheel which is provided with a threaded central hole for fixing to the spindle of the component with which it is to be used, and a small spindle panel fitting with a small gear wheel which engages with the larger gear wheel. Thus a high ratio adjustment is available. The device is very accurately produced, and when carefully mounted operates excellently. It is a production of Messrs. R. H. Linaker & Co., 19, Cannon Street, Manchester.



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The new improved Unidyne 1-Valve

HERE'S an entirely new one-valve Set which is more sensitive even than the first Unidyne Set introduced twelve months ago. A Set which is cheap to build, economical to run and safe to use. Check up the list of parts you can buy for £2. And then remember, above all, that because it uses no high-tension battery you cannot possibly have a mishap and burn out your valve. For quality of reproduction the new Unidyne stands supreme. And for extraordinary value for money this kit of Components cannot be equalled.

Complete Unidyne Kits of Components

Includes the following: One Square Law Variable Condenser, ·0005 mfds., and one ditto, ·0003 mfds. Each with vernier and spiral contact. One 30-ohm Rheostat; one 2-megohm Grid Leak; one ·0003 Fixed Condenser; one Unidyne Efficiency Choke; 10 nickel-plated Valve Sockets; 7 Mark III plated Terminals; one plated Shorting-bar. All components tested by us and fully guaranteed. **41/-**

Extra if required:

"Red Triangle" Ebonite Panel, 10 x 8 x 3/16th, drilled and tapped 5/-
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Coil Unit for B.B.C. wave-lengths (comprising aerial and reaction coils mounted on duplex plug-in base) 4/6
Interchangeable Daventry Coils, similar to above 5/6

NOTE.—When all parts are purchased together with panel a Marconi Royalty of 12/6 must be remitted with order.

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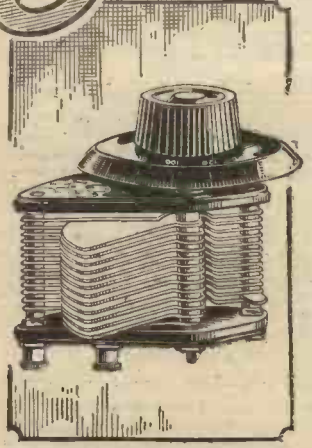

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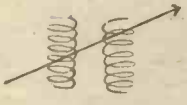
SAVE  **TIME MONEY LABOUR**

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RADIOTORIAL

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

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

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 wireless 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.*

TECHNICAL QUERIES

Letters should be addressed to:
Technical Query Dept.,
"Popular Wireless,"
The Fleetway House,
Farringdon Street,
London, E.C.4.

They should be written on one side of the paper only, and MUST be accompanied by a stamped addressed envelope.

Queries should be asked in the form of the numbered questions: (1), (2), (3), etc., but may be accompanied by a short letter giving any necessary additional particulars as briefly as possible.

For every question asked a fee of 6d. should be enclosed. A copy of the numbered questions should be kept, so that the replies may be given under the numbers. (It is not possible to reproduce the question in the answer.)

IMPORTANT.—If a wiring diagram, panel lay-out or list of point-to-point wiring is required, an additional fee of 1/- must be enclosed.

Wiring diagrams of commercial apparatus, such as sets of any particular manufacture, etc., cannot be supplied. (Such particulars can only be obtained from the makers.)

Readers may submit their own diagrams, etc., for correction or for criticism. The fee is 1/- per diagram, and these should be large, and as clear as possible.

No questions can be answered by 'phone.

Remittances should be in the form of Postal Orders.

NOTE: Unidyne queries will be answered free until further notice.

Questions and Answers

REFLEX FOR LOUD-SPEAKER RESULTS.

C. B. (Liverpool).—Can I take it that the one-valve reflex set described in "P.W." No. 175 (October 3rd, 1925), will work a loud speaker from the local station 6 L V, which is situated two miles away from my home?

Providing you have an outdoor aerial and the set is working efficiently, we cannot see any reason why you should not work a small loud speaker efficiently from the local station.

AM I OSCILLATING?

J. S. (London).—Being a beginner as regards valve sets, I should be pleased if you can give me any information with regard to reaction and oscillation. My set, I am informed, has a reaction coil fitted, and I do not wish to

(*Continued on page* 602.)

RADIOTORIAL QUESTIONS AND ANSWERS.

(*Continued from page* 600.)

cause any interference to my neighbours' sets. How can I tell when I am oscillating? And, if so, how is it cured?

We cannot do better than to quote the following paragraphs taken from a circular letter addressed to listeners in Canada by the radio branch of the Department of Marine and Fisheries of the Canadian Government, and published in "The Times" of recent date:

The principle of regeneration, as used in radio receiving sets, is that part of the output of the detector valve feeds back into its own input, and thus greatly increases the volume of the signal. The electric waves reaching the receiving set from the transmitting station travel down the aerial wire, through the primary coil in the set, and so to earth down the earth wire. The weak electric current resulting from this influences the valve in such a way as to set it functioning.

The resulting output from the plate circuit of this valve is fed back in such a manner as to set up a "field," or influence, in the part of the circuit connected to the input (the grid) of the valve. This field induces in the input circuit a current of electricity of the same frequency as that of the received electric waves. The energy, therefore, which comes down the antenna wire is automatically strengthened by an impulse from the output of the detector valve. Unless controlled, this action will continue until the saturation point or climax is reached, the valve being then said to be in a state of oscillation. When a receiving set is in oscillation, it causes howling and squealing, both in itself and in neighbouring receiving sets. Regeneration should therefore never be allowed to proceed to this point, as it then constitutes a public nuisance.

When a radio receiving set in a state of oscillation is being tuned to a broadcast station, it produces the following effects:

(1) It causes whistles in radio receiving sets of all types which are tuned to the same station. This interference may be heard up to a distance of several miles.

(2) It distorts the quality of the music.

(3) It uses more "B" battery power, and therefore the life of the "B" battery is reduced.

(4) It tends to reduce the life of the detector valve. (The equivalent of the "B" battery is the H.T.).

When a radio receiving set in a state of oscillation is exactly tuned to a broadcast station, it is said to be in the state of "zero beat." This distorts the broadcast reception, and also interferes with neighbouring receiving sets which are tuned to the same station. In a word, regeneration carried to oscillation causes great annoyance to neighbours, poor reception and expense to the owner of the set, and has no advantages whatever.

The interfering whistle which is heard in a receiving set may originate in the set itself, or it may be interference caused by a neighbour. In order to determine this point, the following test may be made:

Leave the regeneration control (reaction handle) in a fixed position, slowly rotate the tuning dial, and note particularly the change in sound of the whistle. If the whistle rises and lowers in pitch sympathetically with the movement of your tuning dial, it indicates that your receiving set is in a state of oscillation, and probably causing interference to other sets. On the other hand, if the whistle does not change in pitch corresponding to each movement of your tuning dial, but simply varies in volume, the whistle is not caused by your receiving set, but is interference produced by some other oscillating receiving set in the neighbourhood.

"P.W." TWO-VALVER.

S. A. J. (Briorley Hill, Worcestershire).—In the Det. and L.F. set described in "P.W.," No. 178 (Oct. 24th), there is a discrepancy between the list of components and the wiring diagram on page 488. The latter shows the fixed condenser across the 'phone terminals as ·003, and the fixed condenser across the primary as ·002: but in the list of components two ·001 fixed condensers are specified. Which are the best values for the "Two-Valver's" fixed condensers?

In the actual set shown in the photographs the 'phone condenser was a ·003, and the primary condenser had a capacity of ·002 mfd. When testing-out these were removed and two ·001 condensers were used instead, to see if results were affected. The difference was found to be too slight to be noticeable, and though no doubt there is sometimes an advantage to be gained by experimenting with the value of these fixed condensers, generally speaking it is immaterial whether the ·001, ·002 or ·003 are used.

COILS FOR 5 X X.

L. P. R. (Croydon).—I have a 3-valve set (H.F., Det. and L.F.) which has 3 coils fitted. These, I understand, are the aerial, anode and reaction coils. The reaction is coupled to the anode coil.

What coils are suitable for the reception of 5 X X?

The coils necessary to receive 5 X X on the above set are as follows:

Anode 250 turns.
Reaction 75 to 150 turns.
Aerial coil 200 (if parallel aerial condenser is used).
Aerial coil 250 to 300 (if series aerial tuning is employed).

TUNING-IN DISTANT STATION.

"Novice" (Bedfordshire).—I have purchased a 2-valve set, which, I am told, consists of an H.F. and a detector valve.

Having no friends interested in wireless in the immediate neighbourhood I cannot obtain any information as regards tuning the set, which appears to be working O.K., but on which I cannot receive distant stations, although I receive whistles (which I take to be their carrier waves).

Can you inform me how I can receive distant stations?

I know my aerial and earth are all right as I have had a crystal set working from 5 X X on them.

You are evidently receiving the carrier waves but do not know how to resolve them.

On a set of your description there are usually two variable condensers, a 2-way coil holder, an isolated coil holder, and two filament rheostats.

Assuming you know the correct coils to plug-in and that everything is connected up correctly, you proceed as follows: First turn on the filament rheostats. If the valves take 4 volts and a 4-volt accumulator is used they should be tuned right on, so that all resistance is out of circuit. Should you, however, be using a 6-volt accumulator, the rheostats must only be turned on about two-thirds of the way round, otherwise the filaments of the valves will be overrun.

Having adjusted the filaments, the reaction coil should then be moved towards the coil to which it is coupled.

Usually the reaction coil is coupled to the aerial coil, but on some sets it is coupled to the anode coil.

The important thing to remember, however, is that whatever coils are coupled together, they should never be so close together that the set howls, as this causes interference to nearby sets.

A good method of adjusting the reaction coil is to bring it gradually nearer the anode or aerial coil and while doing so keep on tapping the aerial terminal with a wetted finger.

While a series of clicks will be heard even when the reaction coil is at 90 degrees with the anode or aerial coil, these will be suddenly intensified on bringing the reaction coil closer.

In practice, it will be found satisfactory if the set starts oscillating silently when the reaction coil is brought up to within approximately 45 degrees of the coil it is coupled to, although if it oscillates (heard by the intensified click) when the reaction coil is farther away, a smaller reaction coil should be used, and the same process repeated.

Having got the set almost oscillating, the reaction coil is left in this position. The two variable condenser dials are then rotated *simultaneously*, both starting at about the same number of degrees.

It is always a good plan to start at 90 degrees on each dial, as then you can tune down so many metres, and also (by rotating the condenser toward 180 degrees) tune up an equivalent number.

If the set gets away from the oscillation-point when the condensers are set at 140 degrees or more then the reaction coil can be brought slightly closer to the other coil.

When the carrier wave of the transmitting station is heard the condensers are rotated until it is at its maximum volume, and the reaction coupling is loosened as far as possible.

Should, however, speech or music be distorted, the reaction should be "loosened" further by moving it away from the other coil. Signal strength will then decrease slightly, but it will be found that the distortion has disappeared.

It is always advisable to incorporate vernier adjustments on the variable condensers, as without their use weak signals are sometimes passed by, while they give a certain amount of selectivity and often rid distant stations of interference.

CONDENSER CAPACITIES.

G. D. D. (Golder's Green, London, N.W.11).—Can I use a ·0005 variable condenser instead of a ·0003 mfd. in the "Experimental Crystal Set" which was described in "P.W." No. 176, (Oct. 10th)?

Yes. The ·0005 will do quite well in place of the smaller condenser, though of course the tuning is slightly more efficient when the capacity of the variable condenser is that stated in the article.

TECHNICAL NOTES

(Continued from page 564.)

In the first place it is very desirable to reduce the resistance losses in the circuit to as small a value as possible, because low resistance makes for sharper tuning and consequently greater selectivity, and greater resistance means less sensitivity and broader tuning, or "flatter" tuning, as it is sometimes called.

If you could draw the curve showing the relation between the response or signal strength and the wave-length, you would find that in a circuit in which the resistance was low the curve would show a sharp peak at one particular wave-length (this depending, of course, upon the tuning of the circuit), whilst where the resistance was comparatively high the curve would merely show a hump or rise in the region of the resonance frequency or wave-length, but no sharp peak.

If there is a sharp peak in the curve it is easy to see that a small change of wave-length in that region will mean a considerable change in the strength of received signals, that is to say, there is good selectivity. If the curve carries a broad hump instead of a sharp peak, it means that a considerable change of wave-length is necessary before any great change occurs in the response; that is, the selectivity is poor.

The resistance of the wires depends upon their surface more than upon their cross-sectional area, for the H.F. currents travel principally upon the skin, as is well known. For this reason, H.F. coils are now being made, both in this country and abroad, of stranded wire, similar to that which has been used for aerials, and chosen for the same reason.

Explaining "Aperiodic."

Many amateurs appear to be puzzled as to the meaning of an "aperiodic" receiver or circuit. Strictly speaking, the word "aperiodic" means "without natural period of vibration," but no vibratory system can be truly aperiodic, if it is capable of vibrating at all. The natural period of vibration of any vibratory system depends upon the mass of the moving part (or some quantity which corresponds to mass in a mechanical system, such as inductance in an electrical circuit), and the restoring force called into play when the system suffers the unit amount of disturbance. Consequently, no such system can be absolutely equal in its response to all imposed frequencies.

Nevertheless, by suitable arrangements practical aperiodicity may be secured, and one of the simplest methods is to arrange the system so that its natural frequency of vibration is either far above, or far below, the range in which it is required to operate "aperiodically." For example, suppose a certain system were required to respond more or less uniformly to vibrations imposed upon it and varying in frequency between, say, 400 and 800 per second. If the natural frequency of the system were arranged to be in the region of, say, 15,000 per second, or alternatively, in the region of say 10 per second, it is clear that it would respond more or less indifferently to 400 or 800 vibrations per second imposed upon it.

(Continued on page 605.)

TECHNICAL NOTES.

(*Continued from page 604.*)

This idea is applied to the aerial in a well-known way. The tuned aerial may consist of an inductance coil, fixed or variable, with condenser in series, the latter being adjustable. The secondary circuit is inductively coupled to the antenna and includes inductance, which may or may not be adjustable, together with variable condenser.

In the "aperiodic" or semi-tuned aerial. the natural tuning may be arranged, as mentioned above, to be above or below the working range (usually above), and the tuning is thus broad so far as the aerial circuit is concerned. The secondary circuit, inductively coupled to the aerial, includes inductance and variable capacity, and thus is tunable, or "semi-tunable."

The use of the aperiodic primary has the advantage of simplifying the control. Thus, the two controls in the first case are reduced to one control in the second.

"P.W.'s" "Radio Sounds."

It is early at the moment of writing to form any opinion as to the information which will result from the recent "radio sounds" experiment organised by this Journal and the B.B.C., but I can say already that many very surprising results are likely to come to light. For one thing, it seems generally to be admitted that the headphone scores decidedly over the loud speaker when it comes to identifying sounds which are in any way unfamiliar, that is to say, unfamiliar on the radio.

In this connection, I notice that experiments are proceeding on a large scale in the United States upon the acoustic properties of rooms and buildings. This is a subject which, until recent years, has been much neglected, although it was one which has intrigued certain physicists from time to time. Its slow progress has been due partly to the great difficulty of the problem, and partly to the inconvenience of making full-scale experiments; and any experiments on a reduced scale are, unfortunately, of very little use.

Effect of Echoes.

The B.B.C. have, of course, made quite a number of experiments for their own particular requirements, and it is as a result of these that the studios are now heavily curtained and carpeted, giving a depressingly "dead" effect to the voice when conversing in the studio, but giving, as is found by experience, the proper effect in transmission over the microphone.

According to experiments made some months ago, it was found that if echoes were allowed to broadcast they produced a "clangy" effect which was distasteful, as well as rendering the reproduction difficult to interpret. It might have been thought, since in the ordinary way we always hear sounds with an accompaniment of echo, that the presence of the echoes would have made for greater naturalness; but the fact that it does not do so, just goes to illustrate the curious difficulties and complexities of acoustic research.

You will often notice the effect of the echo when a concert is being broadcast direct from a concert hall instead of from the studio.

Correspondence

Letters from readers discussing interesting and topical wireless events or recording unusual experiences are always welcomed, but it must be clearly understood that the publication of such does in no way indicate that we associate ourselves with the views expressed by our correspondents, and we cannot accept any responsibility for information given.—Editor.

"THE UNIDYNE."

The Editor, POPULAR WIRELESS.

Dear Sir,—I noticed the remarks in your issue of October 3rd, referring to the report I sent to the B.B.C. on the Geneva Tests.

There may be, I expect, quite a number of wireless enthusiasts who probably look upon that achievement as rather in the nature of the Tall Order type, in fact I have heard of suggestive views passed.

The fact that the term applied to some as "H.T. wallahs" need not disturb them. Whilst I do not object to it, I did not apply it. It would be a dull world without savour.

In attempting to educate with an alternate subject one must expect criticism from the opposition, everyone has his own views and his choice, but if we keep to facts which we are prepared to substantiate we shall then only get the best out of it, and no one needs to get jealous, because in this case it is simply a matter of efficiency as applied through science and invention.

When I gathered my report I just did my bit to assist the B.B.C., who were going to considerable expense and inconvenience in an endeavour to give us still better conditions.

As far as my receiver is concerned, well, it is natural for all to possess the best, but what I say is, "It suits me right well, and it will do just what I claim."

Anyone interested can obtain the same results, and, perhaps, it may assist if I state how I came to pay attention to the "Unidyne."

I read and studied from the first issue, the claims, etc. of the inventors, and following it up I realised that no one can blow their own trumpet and get the favourable opinions of such eminent scientists, as already mentioned in the press, without cause.

I did not expect the Circuit to get backed up from certain outside quarters, so I followed the reports of the various experimenters, and from the numerous correspondents who did not find enough to supplement the claims of the "P.W." Staff, surely the claims of the independent writers were such to declare every satisfaction.

I followed out the "P.W." Circuit, selected good and reliable tested components, took notice of values quoted, carefully drawing the whole construction out on paper first, and applied a method of tuning which is speedy, sure, easy to operate, and *vernier safe control*; this, however, was rather more trouble to apply, but well worth it, and the results justify themselves.

A good rule is, if one is constructing a single-valve set, to make it large enough to allow for the addition of another valve without alteration to the whole structure, thus saving expense and time, besides one has a tendency of increasing to two at least.

The "P.W." Staff and the inventors have every cause to stand by their "Unidyne," the receiver on which I have received on two valves, DX messages which a *three-valve set with H.T.* failed to identify, at one and the same time.

Constructors please note that this Circuit is well worth your serious consideration, and any addition or improvement, apart from being interesting, should prove of great value.

Yours sincerely,
29, Neville Street, T. B. MAYER.
Earlestown, Lancs.

FEWER BUT HIGHER POWER STATIONS.

The Editor, POPULAR WIRELESS.

Dear Sir,—Re the suggestion for fewer stations with increased power. This would no doubt settle the wave-length question, but what about the crystal set owner? Would the increase in power, say, of 5 I T, compensate for the closing of 5 N G (I gather it is proposed to shut down relay stations) to the Nottingham crystal owner, who pays 10s. per year, the same as the owner of the six-valve super-het.

Could no alternative be arrived at? I would suggest that all relay stations transmitting the programme from 2 L O (and the majority do) change on to 2 L O's wave-length and still keep to the power already allotted to them. If this could be done, Nottingham may object to not having their local night, but if 5 N G closed down and had to rely on 5 I T they would still have the same grievance, and the lesser of the evils I think would be to keep the local station going and be sure of a programme without having to buy a more expensive set. Would this suggestion, if carried out, have the effect of increasing 2 L O's power? I mean would the transmission from 2 L O be equal to its own power of 1,500 watts plus the power of ten relay stations at 200 watts each—3,500 watts, and so cause jamming to other stations on wave-lengths round about 2 L O's? If so, I suggest the wave-length be changed a few metres either way to eliminate this. I would like to add that I am in the fortunate position of owning a multi-valve set and can take a tour round the stations.

(*Continued on page* 607.)

but there are thousands who, owing to financial difficulties, do not possess this privilege and rely solely upon the local station for the evening's entertainment, and they pay the same licence fee as I do, and have therefore the same right as myself of listening to the B.B.C. concerts, even though it be on a crystal set.

Trusting this suggestion may be of some help to those in charge, and hoping that POPULAR WIRELESS, of which I am an old reader, will continue to be as popular as it is to-day.

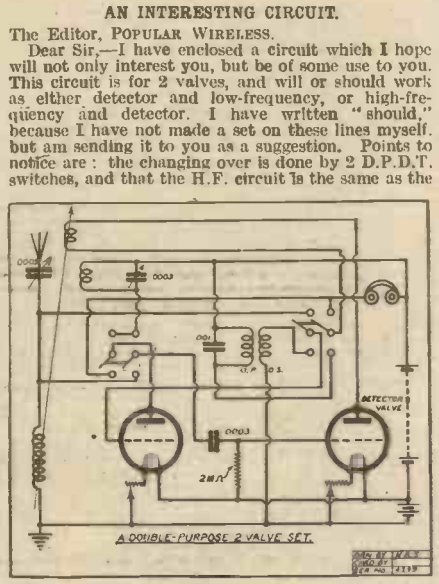
I am, sir,
Yours faithfully,
FRANK BUXTON.

Wanlep Road, Syston,
Near Leicester.

AN INTERESTING CIRCUIT.

The Editor, POPULAR WIRELESS.

Dear Sir,—I have enclosed a circuit which I hope will not only interest you, but be of some use to you. This circuit is for 2 valves, and will or should work as either detector and low-frequency, or high-frequency and detector. I have written "should," because I have not made a set on these lines myself, but am sending it to you as a suggestion. Points to notice are: the changing over is done by 2 D.P.D.T. switches, and that the H.F. circuit is the same as the



"P.W." Continental set in many respects. Also that the same valve will do the detecting in both circuits. A set like this should be popular with all as the two circuits are very much used. I have enclosed a small photo of myself with some sets I have made. The two-valve set is the same as your "Continental" set, except that I have placed the coils on the ontside of the panel.

Yours faithfully,
HECTOR COLE.

4, Pearson Street,
Workington, Cumberland.

1-VALVE REFLEX RESULTS.

The Editor, POPULAR WIRELESS.

Dear Sir,—As regular readers of your paper, we have noticed the number of "records" claimed for 1-valve sets.

We have had a 1-valve reflex set in operation for about two years now.

During this period we have logged 122 stations (all telephony). These are comprised as follows:

Amateur Transmitters	52
All B.B.C. Stations (main and relay) ..	21
Aerodromes (900 metres)	8
Foreign stations	41

The latter are briefly tabulated as under:

Germany	.. 15	Norway	..	1
France	 1	Switzerland	..	1
Holland	 2	Italy	.. ..	1
Belgium	 1	Spain	.. ..	5
America	7	viz., W G Y, W B Z, K D K A, W O R, W P G, W F I, and W S M.		
Canada	1	viz. C N R A.		

Recently during the Geneva Tests we were successful in tuning in 54 stations on the last night, and sent a carefully compiled report to the B.B.C.

On ordinary broadcast evenings about 40 stations can be brought in.

We should very much like your readers' comments on this and shall be pleased to show our set in operation to any person who may be interested if they will first write to address below.

Yours truly,
C. R. PONTING.
R. G. B. PONTING.

11, Woolcott Street,
Redland, Bristol.

THE "P.W." CRYSTAL SET.

The Editor, POPULAR WIRELESS.

Dear Sir,—I thought you would like to learn that I have had wonderful results from your "P.W." Crystal Set described in No. 173. Newcastle on loud speaker heard all over the room, and with a wave-trap cutting out Newcastle I obtained Daventry on the 'phones loud enough to make out all the talks, and music heard very well. I used No. 22 D.C.C. instead of No. 20.

Yours truly,
HY. C. T. IRELAND.

32, Wingrove Road, Newcastle-on-Tyne.

FOREIGN RADIO NEWS.

(*Continued from page 578.*)

The daily courses will start at 10 p.m. and will last approximately two hours. Instruction will be broadcast at first in the following subjects: French, English, Esperanto, Solfeggio. Lectures will be delivered by qualified authorities on philosophical, historical and business-training subjects.

The wave-length used will be 400 metres.

Esthonia Fixes Wave-length.

It is now announced that, after various trials, the wave-length of the new Reval station, the only one in Esthonia, which was opened recently, has been definitely fixed at 350 metres.

Radio in Mexico.

The Mexican Legation in Paris announces that radio is now being used in Mexico to further the education of the Indians throughout the country. Receiving stations have been installed in the most populous Indian centres, and instruction, varied by Indian musical and entertainment items, is being broadcast in no less than seventeen different native dialects. The venture is being organised by Dr. Pueg Casarauno, himself an Indian, who is a director of the Mexican Department of Public Instruction.

Karlsberg Station Opens.

The new radio station at Karlsberg, Sweden, is now in operation, with a wave-length of 1,350 metres and 25 kilowatts power.

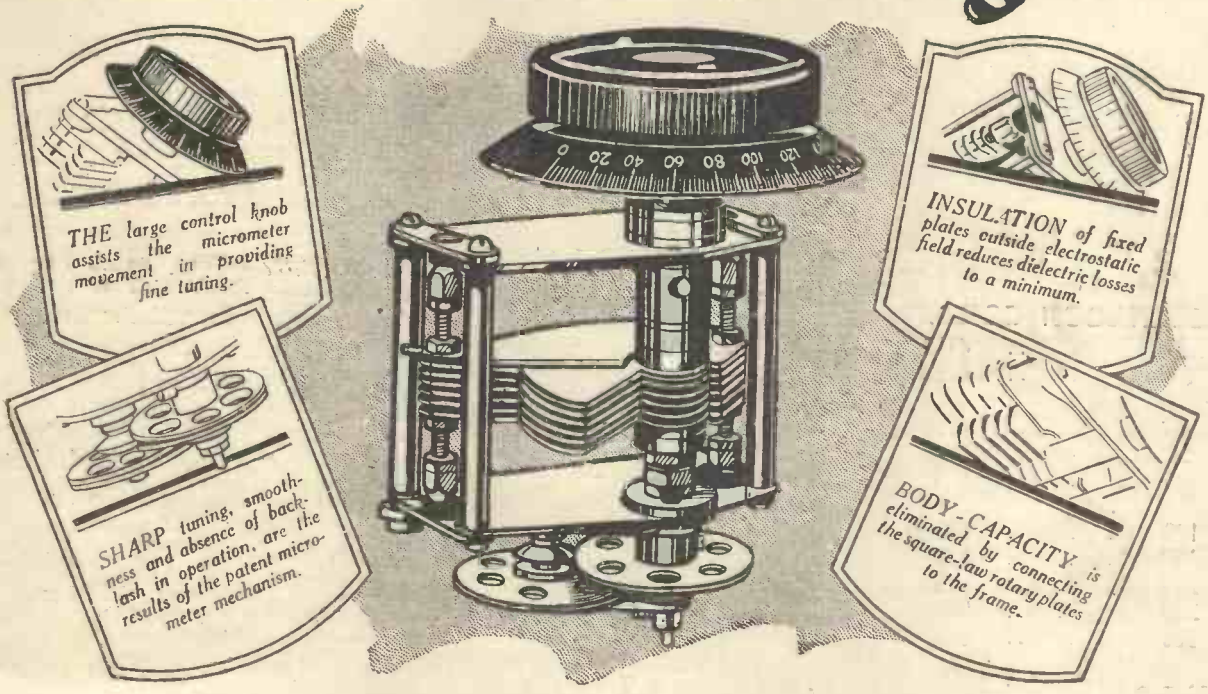
New Czech Station.

The new station at Brunn, Czecho-Slovakia, is now nearing completion, and it is hoped to have it ready by Christmas. Its power will be 12 kilowatts, but the wave-length has not yet been determined.

HALF HOURS WITH GREAT AUTHORS.

A FORTNIGHTLY part work entitled THE WORLD'S GREAT BOOKS IN OUTLINE begins publication this week. It aims at reproducing, in condensed form, the greatest books of all times and countries. Part I alone contains 18 masterpieces, each skilfully shortened so that it may be read as a complete work in half an hour. This new work will make known to hundreds of thousands of readers books which have hitherto been but names, and which few would have the time to read, or, very often the means to purchase. At very moderate cost it will open the gates to a vast treasury of literature—books which should be known—books, the subjects of which at least should be familiar to everyone aspiring to be "well-read." Each part will cost 1/- only, and will be fully illustrated. The completed work will contain over 700 books. The works selected for inclusion range from grave to gay, including great romances, great poetry and novels, and works by recent and living authors, many specially written in shortened form by the authors themselves. No lover of good reading should miss Part I, which is now on sale everywhere.

A New Standard in Condenser Design



By now the GECOPHONE Low-Loss Slow-Motion Variable Condenser has become firmly established in public favour as the most perfect condenser yet built. The improvements it effects in tuning have been proved by thousands of experimenters in their own sets, praised by notable expert users, corroborated by the public and radio press.

***Your* set deserves a GECOPHONE Condenser. You owe it to yourself to discover the surprising ease of tuning that this new condenser gives and the increased possibilities of reception that it opens up.**

Inspect at your dealer's to-day!

PRICES:

·0002 mfd.	.. 22/-
·00025 mfd.	.. 23/-
·0003 mfd.	.. 24/-
·0005 mfd.	.. 27/6
·001 mfd.	.. 32/6

GECOPHONE components are described in Booklet B.C. 3759.

GECOPHONE

LOW LOSS-SLOW MOTION VARIABLE CONDENSER

EARL HAIG'S APPEAL

WEAR A FLANDERS POPPY

NOVEMBER 11TH

Sold by all GECOPHONE Service Depots, Wireless Dealers and Stores.

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

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R/R

POPULAR WIRELESS AND WIRELESS REVIEW, November 14th, 1925. REGISTERED AT THE G.P.O. AS A NEWSPAPER.

HOW TO MAKE A LONG RANGE TWO-VALVER.

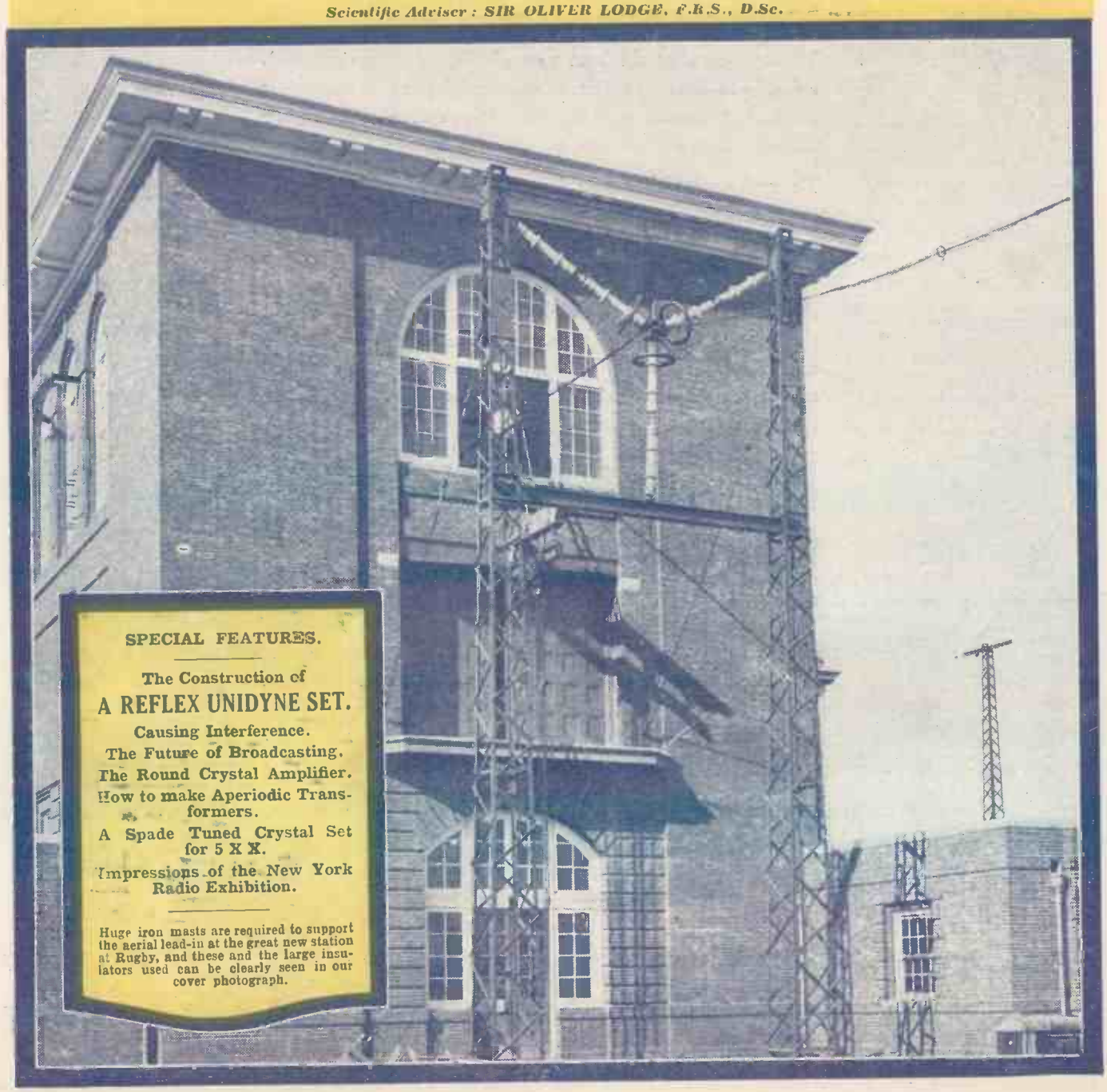
Popular Wireless

Every Thursday
PRICE
3d.

No. 181. Vol. VIII.
November 14th, 1925.

and Wireless Review

Scientific Adviser: SIR OLIVER LODGE, F.R.S., D.Sc.



SPECIAL FEATURES.

The Construction of
A REFLEX UNIDYNE SET.

Causing Interference.

The Future of Broadcasting.

The Round Crystal Amplifier.

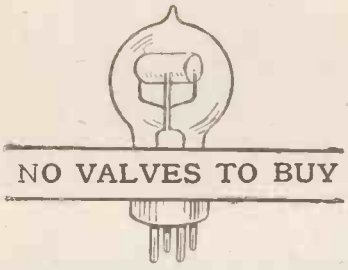
How to make Aperiodic Transformers.

A Spade Tuned Crystal Set for 5 X X.

Impressions of the New York Radio Exhibition.

Huge iron masts are required to support the aerial lead-in at the great new station at Rugby, and these and the large insulators used can be clearly seen in our cover photograph.

Brown

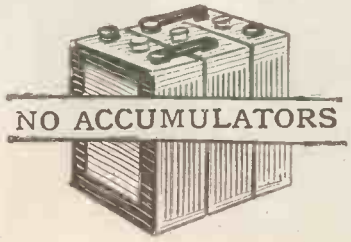


NO VALVES TO BUY

Dull Emitter Valves cost 14/- each. It takes a 2-valve Set to operate an ordinary Loud Speaker. Valves need renewal when burnt out. The Crystavox uses no valves—it works straight from your Crystal Set.

NO H.T. BATTERIES

A high tension battery will cost about 15/-. It will last about six to nine months according to the size of your Set and the amount of current it requires. The Crystavox uses no valves and therefore requires no high tension battery.



NO ACCUMULATORS

A good Accumulator will cost about 15/- and will require charging at periodical intervals — a constant expense. If you use a simple Crystal Set and a Crystavox you'll save the constant expense of Accumulator charging.

The only Loud Speaker which works direct from a Crystal Set

WITHIN 50 to 75 miles from Daventry thousands of Crystal users are now finding that they can get Loud Speaker results direct from their Sets by means of the wonderful Crystavox. Here is a super-sensitive Loud Speaker, which for purity of tone and economy of upkeep, is absolutely unrivalled. In fact, it requires no valves or accumulators—just attach it to your Crystal Set in place of the headphones and you will obtain a volume of sound sufficient to fill the entire room. No technical skill is required. Think what this means to you. Just tune in at any time and you can obtain perfect Loud Speaker reproduction—not a whisper but real volume. Any member of the family can use it—its simple mechanism is proof against mishandling.

Try this Test:
Owing to the wide variation of local conditions it is not possible to guarantee that every Crystal set will work a Crystavox. The test is this: Tune in to greatest strength and hold the headphones 12 inches from the ear. If the signals can still be heard your Set is sufficiently powerful to operate a Crystavox.

For those fortunate enough to live within easy reach of a Broadcasting Station, the use of a Crystavox with a Crystal Set is by far the cheapest, most reliable and most economical method of enjoying Wireless.

£6

Special Offer to London Readers.

During Broadcasting hours our Mortimer Street Showrooms are now demonstrating the Crystavox. If you cannot call and would prefer a demonstration at your own home, send the attached coupon direct to our Head Office at North Acton, W.3. No charge is made for any private demonstration within 5 miles from Marble Arch.

S. G. Brown, Ltd., N. Acton, London, W.3

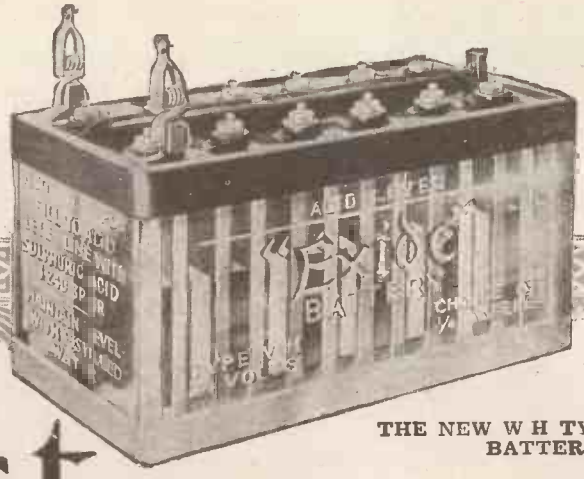
Retail Showrooms: 19, Mortimer Street, W.1.
15, Moorfields, Liverpool. 67, High Street, Southampton.
Depots (Wholesale only): 18, Bushy Park, Bristol. Cross House, Westgate Road, Newcastle.

My Crystal Set gives loud signals when used with a standard outdoor aerial. Please arrange a Crystavox demonstration at my home, without charge at a time convenient for me.

Name.....

Address.....

Gilbert Ad. 3896



THE NEW W H TYPE H.T. BATTERY.

For the Best Wireless Reception

Exide

The Long-Life Battery

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

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

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

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

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

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

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

1 Valve		OR		2 Valves		3 Valves	
1 DTG (2 Volts) 56 hrs.	5/-	1 DFG (2 Volts) 125 hrs.	10/-	1 HZ 2 (2 Volts) 75 hrs.	17/6	1 HZ 2 (2 Volts) 43 hrs.	17/6

·06 amp. Dull Emitter (Marconi-Osram "D.E.3," B.T.H. "B.5," Ediswan "A.R.'03," Mullard "D.'06"):

1 Valve		2 Valves		OR		3 Valves		OR	
2 DTG (4 Volts) 290 hrs.	10/-	2 DTG (4 Volts) 106 hrs.	10/-	2 DFG (4 volts) 320 hrs.	20/-	2 DTG (4 Volts) 60 hrs.	10/-	2 DFG (4 Volts) 190 hrs.	20/-

W H High-Tension Battery, supplied in 24-volt units, sealed in moulded glass container.

OBTAINABLE EVERYWHERE.

BIRMINGHAM: 58, Dale End. *Central, 7629/30.*

BRISTOL: 22, Victoria Street. *'Phone: 6460.*

THE Chloride ELECTRICAL STORAGE COMPANY LIMITED.

CLIFTON JUNCTION, Near Manchester.
LONDON: 219-229, Shaftesbury Avenue, W.C.2.
Telephone: Regent 8070.

MANCHESTER: 1, Bridge Street. *City, 2075/6.*

GLASGOW: 40-44, Tureen Street. *'Phone: 985 Bridgeton.*

Heat
—the biggest thief in your Receiving Set

THERE'S a thief in your Receiving Set! The moment you close the filament switch he starts his deadly work. His name is Heat. Sometimes he works quickly and sometimes he works slowly. But all the time he is planning the destruction of your valves and stealing valuable hours of usefulness from their lives. For years science has been waging a stiff fight against his nefarious practices, and for years little or no impression could be made upon him. But at last there came a valve with a filament which made use of new principles—a valve which at one stroke definitely got to grips with this crippling influence —the Wuncell Dull Emitter.

Let's investigate further. The old bright emitter possessed a tungsten filament which required a very high temperature—as much as 2000°—in order to create the necessary stream of electrons. Such a temperature—coupled with the constant expansion and contraction of the filament—rapidly caused brittleness and disintegration. In other words, the intense heat—while necessary for the prolific production of electrons—robs the filament of many hours of usefulness. But if the temperature is reduced—then the electron stream is impoverished, too.

So other means had to be sought. Instead of tungsten, the Wuncell uses a filament which is built up layer upon layer under a secret process known only to Cossor. This external covering emits a copious supply of electrons at an extraordinarily low temperature. In fact, at 800° the Wuncell produces more electrons than a bright emitter valve does at 2000°. The Wuncell goes a long way towards banishing heat from the valve altogether—at all events 800° is no more than a dull red glow practically invisible in daylight. When you choose the Wuncell for your set, therefore, you get a valve which has the longest life of any because it is the only valve which so effectively reduces the ruinous influence of heat.

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

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

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

Cossor

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

Gilbert Ad. 3889

Popular Wireless

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RADIO NOTES AND NEWS.

Saturday Evening "Stars"—Unidyne in South Africa—Radio Revels—Amateurs Encircle the World—5 X X Hold-up—Big Ben in Burma

South African Amateur Activities.

A SOUTH AFRICAN amateur, living at Johannesburg, Mr. S. C. Pleass (A 4 M) has been getting clear reception from the MacMillan Arctic Expedition. He reports that reception in Jo'burg was perfect when the "Bowdoin," MacMillan's flagship, was in the Arctic Circle at a point beyond North Greenland. Apparently neither the coral strand nor Greenland's icy mountains can damp the efforts of real radio enthusiasts.

Saturday Evening "Stars."

ON and after November 21st, the B.B.C. has arranged for Saturday evening concerts to be given by famous stage stars. Each week, after the ordinary programme has finished, one or more of the famous entertainers of the theatres will wind up the week for the B.B.C. with a more or less spontaneous programme for listeners. The arrangement will not in any way interfere with the theatre-going public's pleasure, for the studio fun will not begin until after "lights-out" at the theatres.

Solace for the Blind.

"WIRELESS has been, in recent years, taken up by the men of St. Dunstan's with the greatest enthusiasm, as is only natural when one considers that it is, perhaps, the only pastime which puts the sighted and non-sighted on an absolute equality," says the St. Dunstan's report for the year 1925. One sightless constructor actually carried away the Silver Medal for home-made sets at the Hull Wireless Exhibition—a wonderful tribute to the spirit which animates St. Dunstaners! This splendid work, which has now been carried on for ten years, is at the moment hampered for lack of funds—but—the Treasurer's address is "St. Dunstan's Headquarters, Inner Circle, Regent's Park, N.W.1."

The Unidyne in South Africa.

SO great has been the success of the single-valve Unidyne in South Africa that "Radio," the popular South African wireless journal, has been supplying blue-prints of the circuit to its readers. The October number contains a long constructional article, written by Mr. F. C. Retief, of Bulwater, who is still tuning-in Cape Town, Durban, and Johannesburg on one valve, at distances of 235, 550, and 560 miles respectively!

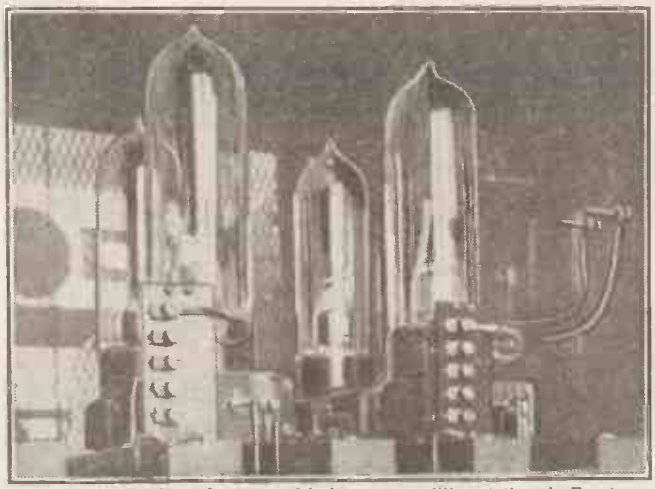
NEXT WEEK.

How to Make

"The Cheapest Crystal Set,"

and the Construction of

"A Household Three-Valve."



Typical transmitting valves as used in large transmitting stations in France.

Radio Revels.

THE programmes of the B.B.C. this week are claimed to be the very best entertainments that have been put on the air in any part of the world. Next Saturday is the third birthday of the Broadcasting Company, and every effort has been made to celebrate the event by the finest week's broadcasting that it is possible to produce. In order that the star turns should be evenly distributed amongst listeners, it has been decided that every station shall receive and relay the London evening programmes from November 8th to November 14th.

Exceptionally Good Fare.

SOME exceptionally good fare from the theatres has been arranged for, including a selection from "The Co-optimists" to-morrow night, followed in all probability by excerpts from "Mercenary Mary" on November 27th. To-morrow night George Robey is due to make the microphone laugh, and on Saturday the B.B.C. Staff Birthday Concert will enable listeners to hear the old favourites who "pushed the boat out" for the B.B.C. three years ago.

Amateurs Encircle the World.

TWO good instances of round-the-world-radio were reported recently in the "Daily Telegraph." The first message started from Columbus, Ohio, on a 20-metre wave-length, and was picked up at Stocksfield-on-Tyne, England, by Mr. H. S. Nichols. He passed it on to 2 O D (who writes exclusively for "P.W." but reads everything in the ether), and 2 O D handed it across to one of his pals in Sydney. From Australia the message was sent direct to Wittier, California, and was forwarded to the A.R.R.L. headquarters, its destination.

Good Work by Mr. Marcuse.

THREE days later the second message was sent in the opposite direction. Starting from the U.S.A., it was picked up in New Zealand by Mr. I. O. O'Meara, who by an excellent effort placed it straight into a pair of 'phones belonging to 8 Q Q, a French amateur. 8 Q Q sent it on to Mr. Marcuse, of Caterham, and in between the articles he finds time to write for "P.W." Mr. Marcuse shot it over to Pittsfield, Mass. From there it was forwarded on its last lap to its final destination—again the A.R.R.L. headquarters.

A Mouse "Holds Up" 5 X X.

DAVENTRY broke down for 12 minutes recently, the reason being that a baby mouse—weighing only about a quarte

(*Continued on page* 614)

NOTES AND NEWS.

(*Continued from page* 613.)

of an ounce—walked across one of the condensers and electrocuted itself! Casualties of this kind are very regrettable, and I think that the least the B.B.C. can do is to put up a notice, saying:

"Hickory Dickory D.,
The mice at Daventry,
Mustn't walk on these vanes,
Or they'll get for their pains,
Ten thousand volts H.T."

New Address for 5 G F.

COMMENCING forthwith, the address of 5 G F is altered from 14, Johnston Terrace, Cricklewood, N.W., to Mr. H. Stopher, The Holt, Hare Hatch, Twyford, Berks. Lists of call signs should be amended accordingly.

Amateur Re-Broadcast.

STRIKING success has attended the re-broadcasting of the Daventry programmes upon the short waves, to which I referred a fortnight ago. The well-known Essex amateur-experimenter, Mr. F. A. Mayer, of Wickford, was recently talking in Morse to the R.A.F. station at Mosul (Iraq), and finding communication good upon 45 metres, he decided to try and re-transmit the 5 X X concert to Mesopotamia. Although quite unable to pick up Daventry direct upon 1,600 metres and high power, the Mosul station was able to enjoy the concert when transmitted upon low waves and low output, thus demonstrating very clearly the superiority of the short-wave's carrying power.

The Broadcasting Committee.

THE Committee which was appointed by the Government last summer to advise as to the future of broadcasting in this country, is now ready for work upon the great mass of facts and figures which they must investigate. The first meeting is due to take place on November 19th (a week from to-day), under the chairmanship of the Rt. Hon. the Earl of Crawford and Balcarres.

Trouble in Spain.

I HEAR that despite the ambitious programmes for the future development of broadcasting in Spain, all is not well with radio in that country. The trouble appears to be that although the amps. are going into the aerials of the various broadcasting stations, and the programmes are going out on to the air, the pesetas are not coming in fast enough to pay for them!

Human nature seems to be pretty much the same the world over, doesn't it?

Wrexham Wireless Exhibition.

IN conjunction with the Wrexham and District Wireless Society, the "Wrexham Leader" has arranged a wireless exhibition, to be held on November 27th and 28th. Attractive prizes are being offered, and the proceeds will go to the Wireless Society, to help erect an experimental transmitting station. This seems to be a pretty good scheme, which might be tried in other districts where hope is high but funds are low.

Going Strong.

ACCORDING to the latest figures issued by the Post Office, the number of licences issued to listeners at the end of September amounted to 1,464,500. The recent prosecutions of "pirates" by the Post Office have caused a good many hesitating people to call at the nearest P.O. with ten shillings and a sigh, and by now the number of licensed listeners is doubtless past the one and a half million mark.

The licences issued at the end of September last year amounted to 998,607, so despite the howls in the middle of the night, the radio-baby is making very satisfactory progress!

SHORT WAVES.

"Wireless has strengthened the link of Empire, and brought the Old Country very near to us all."—A "P.W." reader (writing from Burma) whose long-distance exploits are referred to on this page.

* * *

"How is it really probable that a loud speaker, having a diaphragm little bigger than a five-shilling piece, can push enough air about to give you the same effect as a great, husky man hitting a drum of parchment three feet in diameter and moving that parchment through, perhaps, an inch at the initial bang?"—Capt. P. P. Eckersley, writing in "Lloyds' Sunday News."

* * *

"A writer points out that wireless enthusiasts have difficulty in getting a good earth. There's no doubt that something seems to have spoilt this one."—"Passing Show."

Oxford Calling.

THE B.B.C. has built a new studio in Magdalen Street, Oxford, which will be used for broadcasting university events to listeners all over the country. It is to be opened on November 26th, and there is much rejoicing amongst people who like narrow trousers that Television is not an accomplished fact.

"Curfew shall not ring——"

AFTER the successful broadcasting of the famous peal of bells at Crowland Abbey, which took place a few weeks ago, it was disclosed that a deliberate attempt had been made to prevent this transmission from reaching listeners. Just before the broadcast was due to commence, the three wires joining Crowland to Peterborough were cut, apparently with a pair of pliers. The wires were cut near one of the poles on a lonely part of the road, and were completely severed and twisted apart. Fortunately these particular wires were not used by the P.O. to connect Crowland to listeners, but evidently the cutter assumed that they would be, and the matter is now in the hands of the police.

New Station at Dublin.

IT is announced by the Irish Free State Department of Posts and Telegraphs that the new broadcasting station in Dublin will work upon a wave-length of 390 metres. And if it is not in working order by Christmas, shure, there's goin' to be trouble, begorrah!

The 1926 Unidyne Two-Valver.

A GOOD many readers rubbed their eyes over the photograph on page 584 of last week's "P.W." It purported to give a clear idea of the wiring of the two-valve set, but, owing to a printing-works error, it showed a totally different receiver, complete with 4 valves. The correct photograph will be found on page 662 of this number of "P.W."

Denouncing the Announcers.

ANNOUNCERS are having a warm time in America just now, for there is a crusade against them, in which they are denounced as a "lot of skirt-crazy dullards." One writer in "Popular Radio" sums up the situation in the following words:

"How anybody with anything but a warped sense of æsthetic values can relish and even revel in the literary flapdoodle so freely peddled by the average sleek-haired, radio-station ballyhooer, is far more than our research department has been able to fathom."

Read over that last sentence again, and you will see why it is that Americans have acquired the habit of assuring one another, "Bo, you said a mouthful!"

Big Ben in Burma.

DAVENTRY seems to be pushing out the programmes pretty well of late, for I have just received news that this station has been heard in Burma. My informant writes from Mergui District, Burma, and says:

"On August 29th I heard the concert from 5 X X, and Big Ben striking midnight. Our clocks were corrected accordingly—the distance being about 7,000 miles."

It must have been rather exciting to correct a Burmese clock by Big Ben, but there was more in store in the ether, for this "P.W." reader goes on to say:

Sun Never Sets on Radio.

"ON another occasion, after Daventry was heard closing down, I heard the Australian Farmers' Association station at Sydney waking up. Broadcast from Calcutta and Rangoon comes in well. Durban and Perth have also been heard, but not well yet." The set used was a 3-valve Burndept, and judging by these results, there is nothing much the matter with it.

ARIEL.

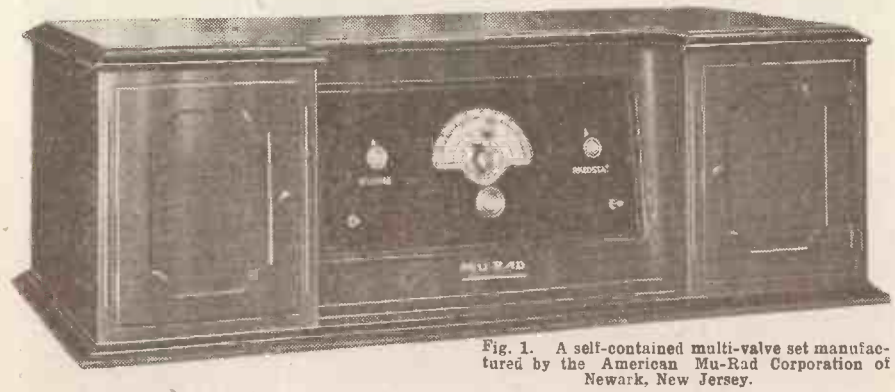


Fig. 1. A self-contained multi-valve set manufactured by the American Mu-Rad Corporation of Newark, New Jersey.

IMPRESSIONS OF THE NEW YORK RADIO EXHIBITION.

By L. W. CORBETT.

(Our Resident Correspondent in New York.)

THE New York Radio Exhibition opened its doors to the public on exactly the same day as did the London one at the Albert Hall. I should say that the Fourth Annual Radio Exhibition opened its doors on this date, as there were two New York exhibitions this year, both equally large, and both were opened within a couple of days of each other. Many concerns had stands at each exhibition, and both attracted large crowds.

The above-named one was held at the Grand Central Palace, which, as its name

Fig. 3. The Furnell 360° Taper Coil Condenser.

implies, is conveniently located in a central position, while the second was held in the Kingsbridge Armoury, which is about as far from "Times Square" as is the Albert Hall from Ludgate Circus. The fact that the "Underground," which, to be exact, is elevated at this particular point, was within a dozen yards of the door of the Kingsbridge Armoury, probably accounts for the fact that the World's Radio Fair, as this second exhibition was termed, was more popular than it might have been, and was very well attended. Remember, it's a "nickel" all the way on the New York "Subway."

Super-hets Out of Favour.

The writer decided that before writing this article it would be interesting to wait for the copies of POPULAR WIRELESS, in which a review of the British exhibition would be contained, thus to be in a position to compare the two American ones with the London one. Hence the delay, for which I do not hasten to apologise as some would, for by adopting this plan one very interesting point is noticed right away. It is to the effect that while many of the British manufacturers are showing super-heterodyne receivers for the first time, a very large percentage of American manufacturers have discontinued to manufacture receivers employing this circuit, the reason being that people are beginning to realise that DX is not everything nowadays, and are giving quality a chance.

It is generally admitted that there is nothing quite so sensitive as the super-heterodyne, but at the same time it is agreed that it is not feasible to combine super-sensitivity for DX stations with super-quality for local stations. Also it is being realised that however selective a receiver may be, it is now almost impossible to get through the locals in a large city, so why try at the expense of quality? In spite of the fact that most manufacturers will agree with this statement, the sets mostly on view at the exhibition had two stages of H.F. amplification (a super-heterodyne usually has at least three) in a straight five or six "tube" circuit. In the latter case three stages of resistance-coupled L.F. plification were included. By the way, this latter form of amplification is becoming exceedingly popular on this (the American) side of the Atlantic, The main point of interest, then, is that quality is being given more attention, and that the straight circuit is coming back into its own again.

"Fool-proof" Receivers.

Now let us take some of the exhibits individually. First comes rather an extraordinary development in the form of a "No-Dial" receiver. It is shown in the second photograph, but in spite of the fact that a single hand may be seen supposedly operating it, one would be inclined, especially the motorist, to grasp the cover in both hands and turn it to the left or right as one would the steering wheel of a car. The two levers are for L.T. control and fine adjustment. However funny this receiver may appear to the more advanced amateur, it must be admitted that it is simplicity itself, and an ideal receiver for the beginner; and very good results may be obtained with it, too. It has five valves.

Simplicity of control seems to be the keynote of many of the receivers recently shown at both of the exhibitions. For example, that shown in Fig. 4 is a five-valve dry-battery receiver entirely self-contained, and controlled by the lever which may be perceived at the centre of the scale above

Fig. 2. A "No-dial" Receiver, which contains 5 valves, and is tuned by rotating the lid.

the cone-type loud speaker, which sticks through the front of the cabinet like a clock dial. The two knobs, to left and right, at the bottom, are for fine adjustment. This receiver is a product of the Thompson Manufacturing Company of New York, and sells for the equivalent of about fifty pounds complete.

There are many other receivers employing only a single control for tuning, too many to enumerate here even if it were possible to list them at all. It is quite probable that

(*Continued on page* 616.)

Fig. 4. A neat five-valve set which is entirely self-contained and is controlled by the small lever above the cone loud speaker.

IMPRESSIONS OF THE NEW YORK RADIO EXHIBITION.

(Continued from page 615.)

there will be a demand for these simple-to-operate receivers, as there must be many people yet who are afraid that they will not be able to operate a receiver with too many controls, however carefully couched are the instructions. To these a single control receiver would not appear so indomitable.

New Loud Speakers.

Developments along the loud-speaker line have not altered a great deal, for it was not so very long ago that the cone type first became popular, and one can hardly expect anything new yet. It is likely that the cone will retain its popularity for some time in fact, as many people say it is far better than any horn type of loud speaker.

A very neat and attractive form of loud speaker is in the form of a lamp, which, by the way, I hear is shortly to be placed on the British market. It is being manufactured by the Payne Company of Wall Street out here, and is known as the "Oracle" loud speaker. Imagine the consternation of "Bridget," as she brings in the coffee, when she hears the new electric lamp speaking. Another beautiful loud speaker is being manufactured by the Bosch Magneto Corporation of America. It is conoid in form, but a wooden cone is used instead of a paper one, thus assuring extreme mellowness of tone. The Romanesque design makes this instrument especially pleasing to the eye.

Condenser Design.

In Fig. 1 is illustrated one of the most beautiful receivers of its kind at the exhibitions, a "Mu-Rad" product. It has several valves, and, as will be seen, the conventional dials for tuning have been eliminated, their place being taken on the panel face by three knobs. An indicator makes tuning a simple operation.

Many novelties in condenser design were seen at the exhibitions, from the miniature vernier condensers, which are an exact replica of their larger brothers, to the finest of straight line frequency models. These latter have been designed to give an equal reading without bunching at the lower end all around the dial in kilocycles, just as the square law condensers give an equal reading in metres.

It is possible that the term "wavelength in metres" will soon become obsolete in American radio circles (it will elsewhere, too), and all figures expressed in kilocycles. The editors of "Radio Broadcast" magazine, for example, have made it their policy to give all figures in kilocycles, with their equivalent in metres in parentheses, the latter for the benefit of those die-hards who will stick to metres. This practice is being very strictly adhered to.

A Novel Condenser.

These straight line frequency condensers are weird to behold. That is, their plates are, for manufacturers have cut them to all sorts of shapes to obtain the desired results. An interesting condenser development, a modified form of the straight line frequency type, is that depicted in Fig. 3. This is known as the Furnell Taper Coil Condenser, and has a 360-degree movement. It is formed of only two plates, each being coiled in a form not unlike that of the spring of an unwound clock. This condenser is extremely rugged, more so than the usual type, is exceptionally sweet in action, and, in the opinion of the writer, is quite a step forward in condenser design.

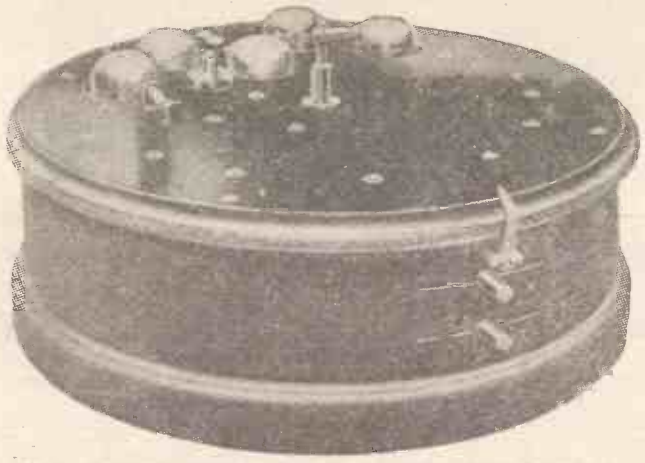


Fig. 5.—This photograph shows the "works" of the "No-dial" 5-valve set. The tuning dial has been removed.

It would be impossible to go into details about the many novelties which every manufacturer naturally claims for his displays at each and every exhibition, but I have attempted in these few lines to give a little "dope" on the more interesting of the exhibits. There were, of course, more just as interesting, but many being similar to exhibits at the Albert Hall, I have not attempted to describe them all.

TWO RADIO NOTES.

FROM A CORRESPONDENT.

THE newest development in the valve is a type which operates directly from the electric light socket. A step-down transformer is used to reduce the line voltage from, say, 200 volts to about 4 or 6 volts for the heater.

The valve is different from the conventional type of valve in that it has a filament proper, that is, an "electron emitter," and also a "heater," which serves the purpose of heating and maintaining the filament proper. The heater is kept hot by the passage of the low-tension alternating current, just in the same way as the filament of an ordinary valve is heated by the passage of the current from the low-tension battery. But owing to the fact that alternating current is used, if the heater were used directly as the "electron emitter," a loud humming noise would be heard in the loud speaker or 'phones.

This is overcome by disconnecting the heater entirely from the electrodes of the valve, and the filament proper is heated only by radiation from the heater, which is placed in close proximity to it inside the valve. In some cases, the filament consists of a metal tube, coated on the outside with the "dull-emitter" materials, and the heater is a thin wire which passes axially within this tube.

A valve of this kind is being successfully marketed in the United States, and it is expected soon to make its appearance on the English market.

* * *

OWING to various atmospheric and other influences, some of which are at present little understood, the transmission from a station suffers attenuation or "fading," that is, it becomes weaker in different localities, or on different occasions in the same locality. The phenomenon of fading is not so troublesome in England as in some other parts of the world, but nevertheless it does occur here, under certain conditions, and is often quite troublesome enough.

In the United States, where the fading problem is a serious one, experiments are constantly in progress with a view to finding means of overcoming it.

The United States Bureau of Standards has lately discovered that the effects of fading may be overcome partially by increasing the power of the transmission, and this does not seem to be attended by any serious increase in the interference between stations. But unfortunately, the decrease in fading is not proportional to the increase in the power of the transmitting station, and so considerable increases in power have to be undertaken to make even a small decrease in the effect of fading.

It is probable that before very long co-operative tests and experiments will be made upon "fading" by stations all over the world, as it is only by such co-operative efforts that information of real value can be obtained.

THE DX UNIDYNE.

Owing to further developments, which appear to our Technical Staff to be very promising and which may lead to important results, we have held over the article on "The 1926 DX Unidyne Receiver," announced for publication in this issue. An interesting article describing the construction of "An Improved Reflex Unidyne" has been inserted in its place.

2 N M CALLING.

MORE ABOUT SHORT-WAVE WORK.

By GERALD MARCUSE.

Mr. Marcuse again contributes an exclusive article to our columns on the fascinating subject of short waves. His next notes will appear in a fortnight's time.

FOLLOWING my previous articles in POPULAR WIRELESS, I think it will now be of interest to readers to have some details of the inner working of my station. I have already dealt briefly with the technical arrangements and "gadgets" used (see "P.W." No. 177, Oct. 17th), so for the benefit of new readers I need only explain that the station is situated at Caterham, Surrey, and the call sign is G 2 N M.

Most of the people who come to Caterham to see me ask the same two questions: "Do you ever sleep?" and "Why do you work so enthusiastically?"

Peculiar Effects.

The first of these questions is easily answered—in the affirmative! It is quite true that in the early days, when we were working upon 100 metres, I did not get very much sleep; but the further reduction in wave-length that has now taken place enables us to *get distance in daylight.*

As a matter of fact, for some reason not yet fully explained, the best time for communication with the Antipodes is during actual bright sunlight at both ends.

The other question I am asked, "Why do you work so enthusiastically?" is best answered by pointing out some of the fascinations of my wireless hobby. For instance, one of the main points which is now interesting all short-wave experimenters is the unexpected fading effect which is noticeable with long-distance transmissions.

We believe that we have secured a considerable amount of evidence showing that short-wave signals—by which I mean all waves below 100 metres—show far less fading at great distances than at near-by points. It is very noticeable, especially upon wave-lengths below 40 metres, that at certain times of the day (such as when the sun is rising) stations in, say, Australia and New Zealand, are much louder here at Caterham than the local London stations, which can hardly be heard; but as the sun gets higher and higher, the signals from London amateurs get stronger and stronger, whilst those from stations over 1,000 miles away fade away completely.

High-speed Fading.

We have noticed, too, that the telephony signals from all near-by short-wave stations show a phenomenon that we call "high-speed fading." This condition simply kills the speech modulation at points within a few hundred miles, although farther off the speech is reported as good and clear. This queer effect is fascinating all short-wave workers, and extensive experiments in this direction have been carried out by the U.S. Navy Department. I believe that recently this high-speed fading has been photographed with non-oscillating receivers, and though aggravated or modified by wave-length shift, it is not primarily due to that cause.

In many parts of the world, high-speed fading can play havoc with high-frequency telephony signals, and we have noticed this to a marked degree on some nights with K D K A, working upon 63 metres. It is even more pronounced on certain nights when receiving W G Y upon a wave-length of 43 metres. It is noteworthy that a station can show a high-speed fading even when working with a master-oscillator circuit, and using absolutely pure D.C. Sometimes, in such circumstances, even a very rough C.W. note has been reported at points not far distant from the transmitting station.

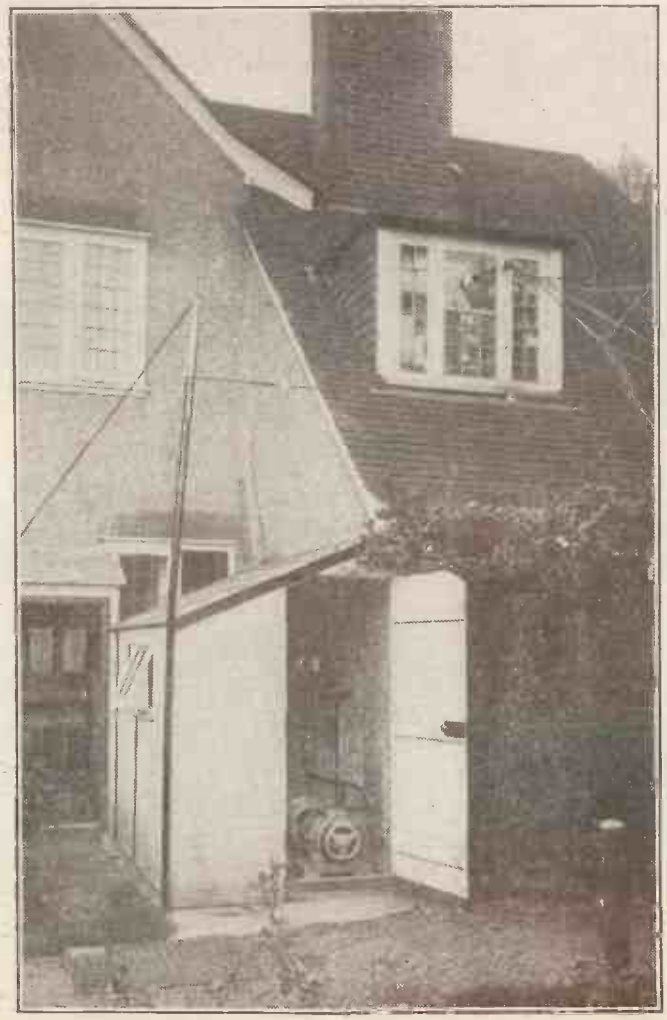
Another very curious short-wave effect which needs investigation is the fact that there seems to be a great concentration of the ether energy near the Antipodes. During the recent cruise of the U.S.S. "Seattle" around the Antipodes, it was found by the wireless operator that he could put his signals into South Africa much easier than into Washington, at times which corresponded with the South African early morning or early evening.

This effect was very noticeable all the time that the vessel was in the vicinity of Honolulu; but as soon as she cruised away from Honolulu, the signals were lost to South Africa, just as though the vessel were moving out of focus.

At the same time, quite suddenly, Great Britain came "into focus." We had been on the watch for the "Seattle" for several months, and all the time we had hardly heard her signals. Then suddenly, when the vessel got to within about 600 miles east of Sydney, her signals began to fairly "roar in" at Caterham!

Recent Tests.

I was specially interested in these signals from the U.S.S. "Seattle," for the operator on board the vessel was an old friend of mine, Mr. Frank Schnell. He was specially chosen from the ranks of the American amateurs for the job of carrying out these short-wave tests for the American navy, and he was granted the temporary rank of lieutenant whilst so engaged. During the war, Schnell was the chief wireless operator upon the great American liner "George Washington," and he was in charge of the wireless equipment when the vessel brought President Wilson to Europe.



A photograph of the back of Mr. Marcuse's house, showing the generators and the lead-in arrangement.

In passing, I ought to mention that there is a very close co-operation between the Government Departments of America and the amateur radio organisations. They frequently assist one another in carrying out experiments and tests, and I cannot help hoping strongly that the same conditions will soon exist in this country. I think it is beginning, as I know that several tests have already been carried out between British amateurs at various R.A.F. stations abroad, and regular schedules are being run with Iraq, India, and Egypt.

Continuing my experiments with the

(*Continued on page* 618.)

THE FUTURE OF BROADCASTING.

SUPER POWER OR SHORT WAVES?

By SEXTON O'CONNOR.

In view of Senatore Marconi's speech at the "P.W." Meeting at the Central Hall, this article will be read with considerable interest by all who speculate as to the future of broadcasting.

THE most pressing problem before those responsible for European broadcasting at the present moment is to find some remedy for the increasing overlap and interference between existing stations, and at the same time endeavour to make provision for additional stations now in course of erection on the Continent.

The solution to this problem will necessarily involve some drastic change in the present system. On the one hand, it has been suggested that many of the low-powered and relay stations should be abolished, and that their place should be taken by a smaller number of high-powered or super-broadcast centres. This would certainly reduce the number of different wave-lengths in use, and so diminish overlap.

Another proposal is to shift the existing broadcast wave-lengths of from 200-600 metres down to the neighbourhood of 50-150 metres. The frequency gap between 50 and 150 metres is four million cycles, whilst that between 200 and 600 metres is only one million. Therefore, by moving down the scale to this extent, four times the existing number of broadcast stations could be accommodated, and each would have the same "elbow-room" in the ether as at present. Such a change would, however, entail some modifications in the ordinary type of receiver to enable it to deal effectively with short-wave signals of this order.

Four Points of View.

In this connection the speeches made at the recent POPULAR WIRELESS meeting in the Central Hall disclose a significant divergence of opinion amongst such eminent authorities as Senatore Marconi, Sir Oliver Lodge, and Captain Eckersley as to the precise lines along which possible future developments may take place.

Captain Eckersley, who addressed himself directly to this point, maintained that the only practical and feasible remedy for mutual interference, as things stood at present, was to cut down the number of stations in operation, and to cover the same broadcast area by a relatively small number of super-power stations. In his opinion, the whole of the Continent could be adequately covered by erecting the same number of super-stations as that now maintained by the B.B.C. to serve this country alone.

Although Senatore Marconi's speech did not deal directly with the issue of the super-power station, he undoubtedly gave it as his opinion that the future progress of wireless lies in the further development of the shorter wave-lengths. The result of his latest investigations has convinced the Senatore that not only telegraphic, but also telephonic communication can be reliably maintained over both long or short distances on a wave-length of 15 metres, using a power input of less than half a kilowatt. The inference is that the use of long wave-lengths and high power must in the near future give way to the more efficient and less expensive short-wave technique.

On page 563 of our last issue we published a photograph of a German loud speaker erroneously stated as of Messrs. Brown's manufacture. Readers will agree with us that the genuine Brown instrument shown above is far more pleasing in design.

Although Mr. Marcuse, in the course of his speech, had expressed the opinion that short-wave signalling could only be utilised over long distances—owing to its habit of "skipping" some thousands of miles via the Heaviside layer—Senatore Marconi maintained that this peculiarity could be controlled, and that short-distance signalling was quite as feasible as long-distance upon a 15-metre wave.

More Selective Receivers.

Sir Oliver Lodge opened up a third possible remedy for interference trouble in the course of some illuminating references to his new N-circuit. In effect, Sir Oliver proposes to solve the question of overlap by making receiving sets enormously more selective than they are at present.

Without using reaction, and by depending entirely upon a method of impulsive tuning derived from an aperiodic aerial, Sir Oliver hopes with his new circuit to be able, not only to select and cut out programmes differing from each other by only one metre in wave-length, but also to greatly increase the purity of ordinary broadcast reproduction.

MORE ABOUT SHORT-WAVE WORK.

(*Continued from page* 617.)

"Seattle" (call-sign N R R L), my friend Schnell and I kept regular schedules to see how long we could maintain communication. We found that although he could receive my telephony nearly the whole of the time from when he was 600 miles east of Sydney, as soon as ever he arrived at Samoa I "lost" him, although he could still receive from me.

Curiously enough, the U.S.S. Navy experienced their greatest trouble in maintaining communication with Schnell whilst the Seattle was cruising between New Zealand and Samoa. This coincided with my own observations, so I inferred that he was far enough away to make signals weak, but not far enough to reap any benefit from concentration or focus.

Distortion from K D K A.

From my own experience, I have often proved that it is much easier for my telephony to reach stations at a great distance with good modulation, crystal clearness, and even strength of signals, than to reach intermediate distances; except perhaps at daylight, when the intermediate-distance stations may get better results. A good instance is the well-known case of K D K A, which in spite of its nearness cannot put an intelligible programme into Washington, except during daylight.

The modulation is absolutely ruined at night by high-speed fading, but yet at a distance of 6,000 or 7,000 miles the reception is reported as being absolutely perfect. (In England we are hardly far enough away from K D K A to get the best results.)

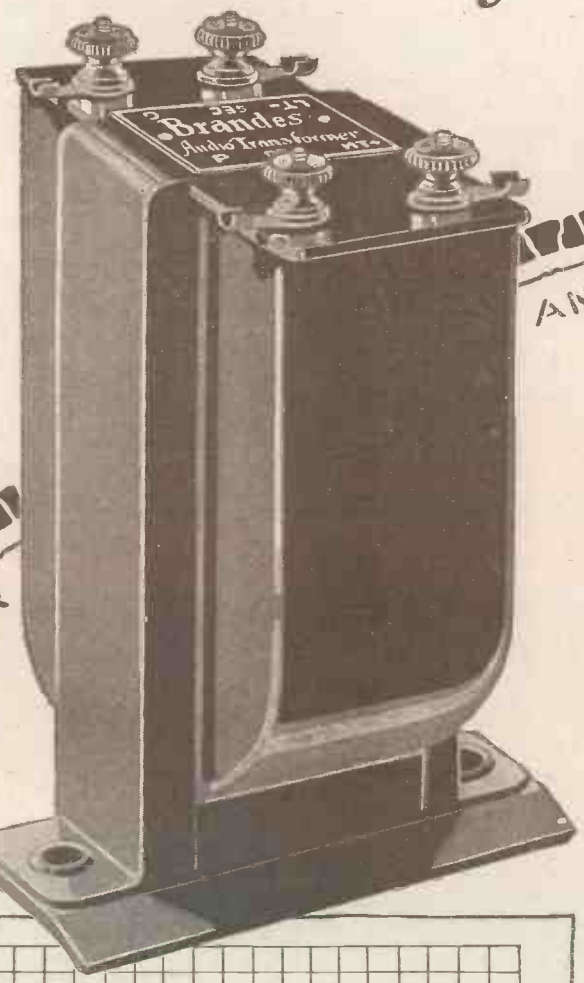
Good Reports from India.

This theory has also been proved from my own station, G 2 N M. For instance, I have put telephony across to an amateur in Gisbourne, New Zealand, who has received it perfectly upon the loud speaker, whilst upon the same occasion amateurs picking it up within a distance of 100 miles reported "unintelligible speech."

As another instance take my Sunday evening tests with India and Iraq. These distant stations report "every word received with crystal clearness," but amateurs within a radius of about 100 miles grumble because they cannot sort out anything intelligible! Just before penning these words I completed a test with a station at Kabul, India, and I never had to repeat a single word. In this case again, my speech was reported as being "crystal clear," but I daresay some of my "P.W." readers were also listening upon the short waves, and at this very moment are writing to me to say my modulation was very bad.

So I have tried to tell you in this short article some of the mysteries we are up against. I have touched upon one or two of the fascinating problems to be found below 100 metres, and tried to explain some of the vagaries of the short wave-lengths. Can you still wonder that sleep is sometimes lost when we are trying to solve the mysteries of this new and fascinating branch of radio science?

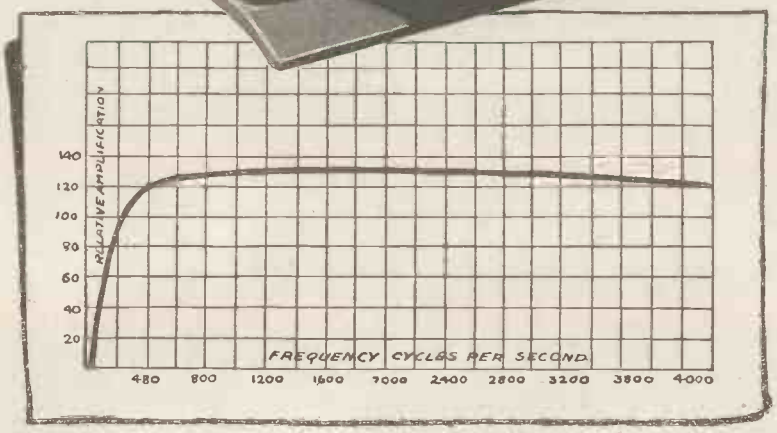
Brandes Audio Transformer



THE CURVE SHOWS GREATER AND MORE UNIFORM

Ratio: 1 to 5

17/6



RELATIVE AMPLIFICATION

Watch the amplification frequency curve of the new Brandes Transformer. If you know what it means you'll be pleased that there is such an excellent transformer being built for you. "You" because this will determine your choice—the chart practically shouts its advantages over your existing Transformer. To the uninitiated it should be explained that the Brandes Transformer brings greater volume, clearer tones and requires less valve current to perform its duties. Technically, it gives greater and more uniform relative amplification, and a vast improvement from 400 cycles downwards. The straight line amplification-frequency curve is coupled with high amplification of applied voltage. That is to say, for a given input voltage the amplification is constant over a wide band of frequencies. *Now look at the price!*

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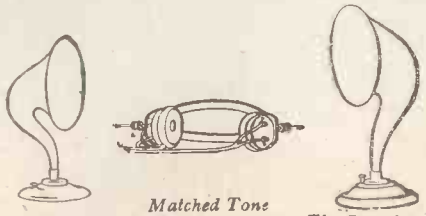


The Table Talker **30/-**

Matched Tone Headphones **20/-**

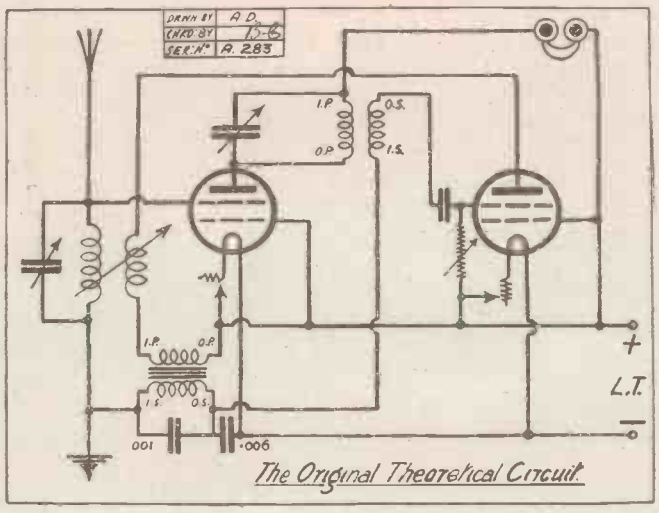
The Brandola **90/-**

This photograph of the completed Reflex Unidyne Receiver shows the layout of the main components and the relative positions of the tuning controls.

AN IMPROVED REFLEX UNIDYNE SET.

Designed and Described by
G. V. DOWDING and K. D. ROGERS.
(Technical and Assistant Technical Editors.)
Constructional Work by G. V. COLLE *(Technical Staff).*

SINCE the evolution of the Unidyne circuits last year a great many ingenious modifications of the original circuit have been tried. Some of these were invented by readers of "P.W.," and details of one of the most ingenious of these modified circuits were published in "P.W.," Nos. 117 and 120, under the title of "The Unidyne Reflex Receiver." The circuit described on that occasion was an attempt to apply the well-known dual amplification principle to the Unidyne system, and very considerable success was attained by Mr. S. W. Davies, who wrote the articles referred to above.



The Original Theoretical Circuit.

Further Improvements.

Further experiments by the inventors have since proved that the principle is thoroughly sound, but several rather important modifications were found to be necessary before the set could be considered a perfectly stable one, likely to prove successful in the hands of the average home constructor.

The circuit as originally designed and published in "P.W." is shown in the theoretical diagram, Fig. 1, in which it will be seen that the aerial coil is tuned by a parallel condenser and connected to the main grid of the first valve, and to the L.T. negative through the fixed condensers marked ·001 and ·006.

In the anode circuit of this valve telephones and the primary of an H.F. transformer are connected, the latter being tuned by a variable condenser. The secondary of this H.F. transformer is connected to the main grid of the second valve through the usual grid condenser, and to the L.T. negative through the ·006 condenser.

The plate current of the second valve was passed through the primary of an L.F. transformer and through a reaction coil, the latter being coupled to the aerial coil in a two-coil holder. The secondary of the L.F. transformer impressed the magnified impulses from the second valve upon the grid circuit of the first valve, and it was the reflexed currents flowing in the plate circuit of the first valve that were heard in the 'phones connected there.

Theoretically, the arrangement was a good one, but in practice it was found to depend very greatly upon the components used, the spacing of the wires, and other small details of construction. It was therefore decided to construct a set in the "P.W." laboratory, laid out in such a way that these faults were eliminated, and capable—even in inexperienced hands—of the complete success attained by the other Unidyne circuits.

Modifications.

The first modification that was tried was the adaptation of series-parallel tuning in the aerial circuit. Both on the score of efficiency and economy, the three terminal system is an improvement upon the method of using a switch for changing over the condenser connections, and it was completely successful in this case. The use of a rather large aerial coil of 75 turns was found to be so advantageous that its use with the tuning condenser in series was in itself sufficient to materially improve the operation of the set. Using such an arrangement, however, some difficulty was still

(Continued on page 624.)

COMPONENTS REQUIRED.

	£	s.	d.
10 Valve sockets			10
1 4-pin valve holder		1	0
11 Terminals W.O. type		1	5
1 Variable grid leak (Bretwood)		2	9
2 Filament rheostats (Lissenstat majors)		15	0
1 ·0002 mfd. fixed condenser (Dubilier)		2	0
1 ·006 ditto		3	6
1 L.F. transformer (Sullivan)		3	0
1 ·0005 mfd. variable condenser with vernier (any good make)		7	6
1 ·0003 mfd. ditto		6	6
2 ·001 mfd. fixed condensers (Dubilier)		6	0
1 Bowyer Lowe H.F. transformer 300-600 metres		7	0
1 Panel, 10 in. x 8 in. x ¼in. (Peto-Scott)		13	6
1 Box to fit, 5½ in. deep			
1 2-way coil holder, right hand (Peto-Scott)		10	6
2 Coils of Glazite wire		3	0
2 Thorpe K.4 valves	1	8	0

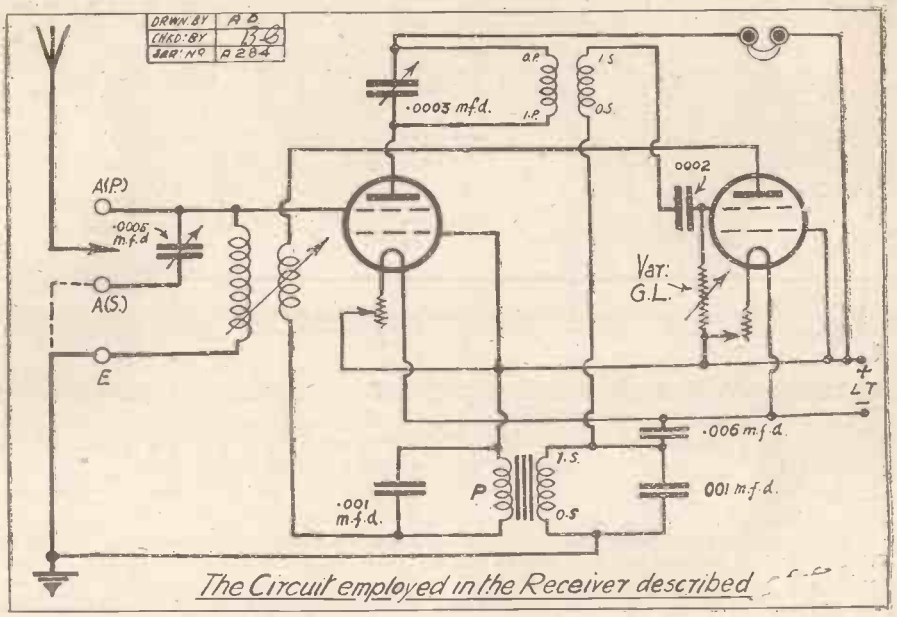
The nature of the under panel wiring can be clearly seen from this photograph taken after the completion of the set.

AN IMPROVED REFLEX UNIDYNE SET

(*Continued from page 623.*)

experienced in obtaining the ready operation of the second valve, especially if the L.F. transformer and H.F. transformer were not carefully chosen.

This trouble was traced to the undue damping existing in the plate circuit of the second valve, and was ultimately overcome by by-passing the primary windings of the L.F. transformer with a fixed condenser—value ·001 mfd. Without this condenser shunted across the primary the tuning on the H.F. condenser was flat, and the size of the reaction coil was unduly critical. The insertion of the fixed condenser completely altered the behaviour of the receiver, which in its present state is capable of giving louder signals than the straight two-valve Unidyne (Det. and L.F.).



The Circuit employed in the Receiver described

Results on Test.

Tested at a distance of five miles from 2 L O, the selectivity of the set was found to be a marked improvement on most reflex receivers. Using verniers on the tuning condensers, it was possible at this distance to cut out London and tune in other stations without a wave-trap or similar device. Four or five carrier waves were tuned in with one revolution of the dials, and the Birmingham programme was sufficiently strong on telephones to be enjoyable, although 2 L O was still working.

The list of components required to construct the set is on the previous page, giving the actual makes used in the set shown in the photographs. It will be seen from the photographs showing the back of the panel that the set is very compact. It is decidedly advantageous to use square law condensers incorporating a vernier movement, but, nevertheless, good results can be obtained on the less expensive types.

Another useful refinement for long-distance work is the provision of extension handles for fine adjustment of the controls, and these will already be in the possession of most experimenters.

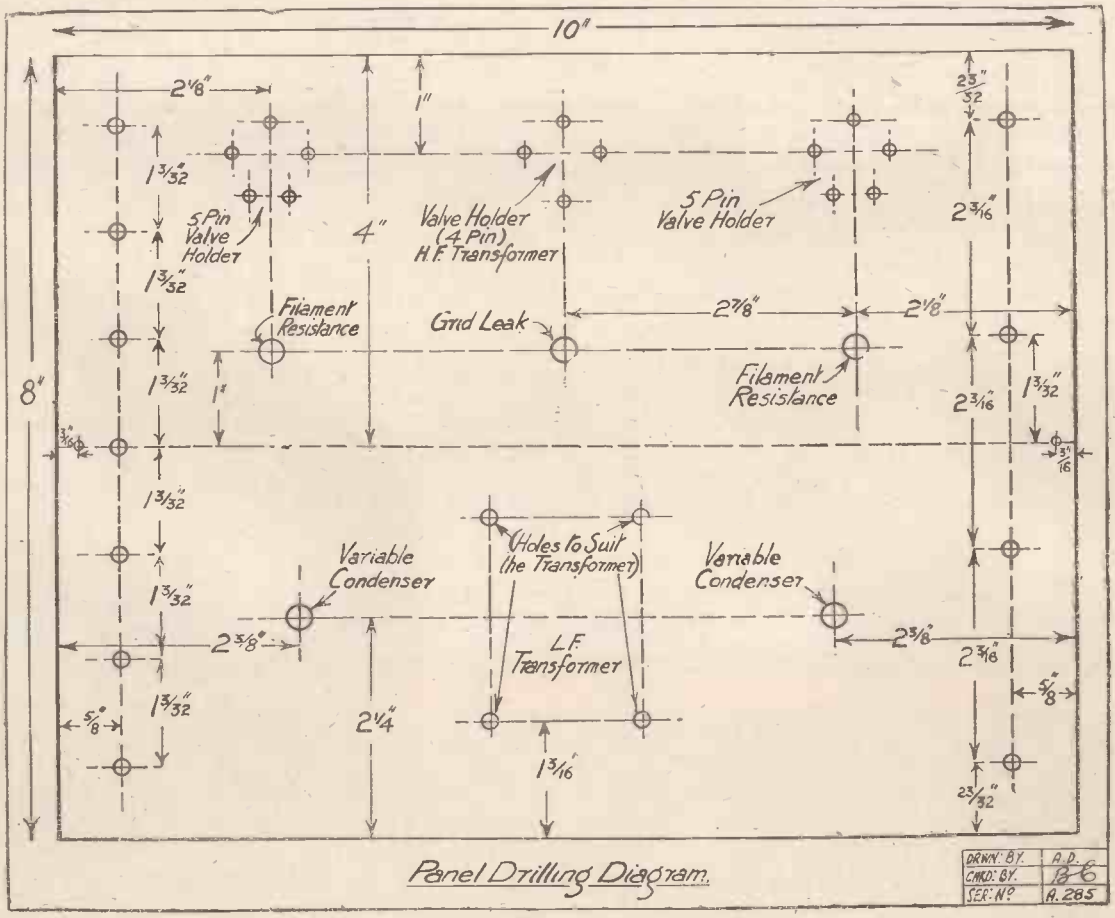
When the case and panel have been overhauled, the drilling of the latter is carried out in accordance with the panel drilling diagram which appears on this page. The spacing of the valve sockets may present some difficulty at first, but this may easily be overcome by using the valve itself as a template. Probably the easiest method of all is to use a little white soap, ointment, or similar paste, and with this coat a thin film on the bottom of the valve pins; then press this lightly in position, and so transfer the position of the legs to the panel.

The smaller the spot of soap on the valve pins, the more accurate will be the position transferred to the panel, and if a fine punch is used the position can be accurately marked before the soap marks are wiped away.

Final Details of Construction.

The dimensions of the L.F. transformer are not given in the panel drilling diagram, as these vary with the different makes;

(*Continued on page 625.*)



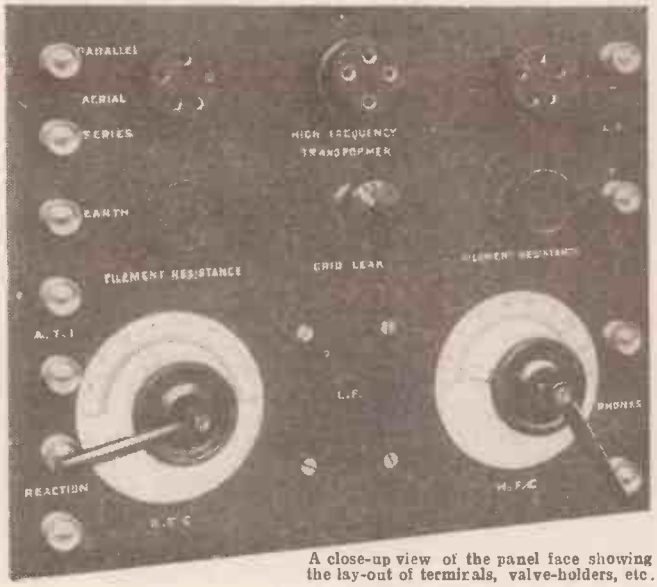
Panel Drilling Diagram.

DRWN: BY. A.D.
CHKD: BY.
SER: No. A.285

AN IMPROVED REFLEX UNIDYNE SET.

(*Continued from page 624.*)

but ample room has been allowed, and the best relative position is easily found by standing the transformer on the panel between the variable condensers and



A close-up view of the panel face showing the lay-out of terminals, valve-holders, etc.

marking its position from the instrument itself.

When all the components have been mounted in position the wiring is carried out, as shown in the diagram.

The original set was wired up with "Glazite," which is obtainable from almost any wireless dealer, and was found to be very effective. The wiring diagram shows the back of the panel connections very clearly, but it will be noted that the primary windings are not marked IP and OP. The reason for this is that the best connections to these will be found to vary according to the make of transformer, and the best plan, therefore, is to solder *flexible* leads from the lower reaction terminal and from the L.T. plus terminal. These can then be reversed to find out which is the best position (IP or OP) to employ for the permanent connection.

The Tuning Coils.

Particular attention, also, is drawn to the contacts of the variable grid leak, as it is important that the L.T.-plus-to-inner-grid-lead should be connected to the variable grid leak on the lower end, which is closer to the panel, in order to avoid undesirable hand capacity effects.

Apart from these minor considerations, there is no special difficulty about the wiring, but great care should be taken that the panel is scrupulously clean and free from filings or flux.

When the wiring is completed the panel can be engraved or the transfers affixed, and the set can be tested out.

As with all Unidyne *two*-valve sets, a 6-volt accumulator is essential for best results, and either Lissenagon or home-made basket coils of the single layer type are recommended. Several other well-known makes of coil were tested in this receiver and gave quite good results (which was somewhat contrary to expectations, as in most Unidyne circuits the type of coil employed is of the utmost importance).

Series tuning with a 75-turn coil on the aerial is generally to be preferred to the parallel connection, except for 5 X X or the long-wave stations.

The coils used upon the set shown in these photographs, and the settings of the variable condensers, were as follow:

For 5 X X:
Aerial coil, 200.
Reaction coil, 150.
Setting of condensers:
A.T.C., 35°.
H.F.C., 55°.

For this station the coils were about 1½ inches apart, and the aerial lead was connected to the parallel terminal, the series terminal being shorted to earth, as shown in the theoretical diagram on page 623. The H.F. transformer used for 5 X X was of the Bowyer-Lowe type, marked 1,100-3,000 metres.

For 2 *L O:* Aerial coil, 60 turns (home-made basket coil).
Reaction coil, 100 turns (Lissenagon).

Settings of the condensers: A.T.C., 45°.
H.F.C., 40°.

POINT-TO-POINT CONNECTIONS.

(Back of panel wiring.)

One filament socket of each valve holder to one side of each filament rheostat.

Inside grid socket of the first valve holder to the remaining side of the first filament rheostat, to the bottom contact of the variable grid leak, to the inner grid socket of the second valve holder, to the remaining side of the second filament rheostat, to the + L.T. terminal, and to one 'phone terminal.

Remaining filament leg of the first valve holder to one side of the ·006 mfd. fixed condenser, to the remaining filament leg of the second valve holder and to the − L.T. terminal.

Aerial parallel terminal to the main grid socket of the first valve holder, to the fixed vanes of the ·0005 mfd. variable condenser (A.T.C.), and to the top A.T.I. terminal.

Aerial series terminal to the moving vanes of the ·0005 mfd. variable condenser (A.T.C.).

Earth terminal to the bottom A.T.I. terminal and to the O.S. of the L.F. transformer.

O.S. of the H.F. transformer to the remaining side of the ·006 mfd. fixed condenser and to the I.S. of the L.F. transformer. A ·001 mfd. fixed condenser is connected across the secondary of the L.F. transformer.

Plate socket of the first valve holder to I.P. of the H.F. transformer, and to the moving vanes of the ·0003 mfd. variable condenser (H.F.C.).

O.P. of the H.F. transformer to the fixed vanes of the ·0003 mfd. variable condenser and to the remaining 'phone terminal.

Main grid socket of the second valve holder to the top contact of the variable grid leak and to one side of the ·0002 mfd. fixed condenser.

Other side of the ·0002 mfd. fixed condenser to I.S. of the H.F. transformer.

Plate leg of the second valve holder to the top reaction terminal.

Bottom reaction terminal to one side of the primary of the L.F. transformer. Other side of the primary of the L.F. transformer to the +L.T. lead.

A ·001 mfd. fixed condenser is connected across the primary of the L.F. transformer.

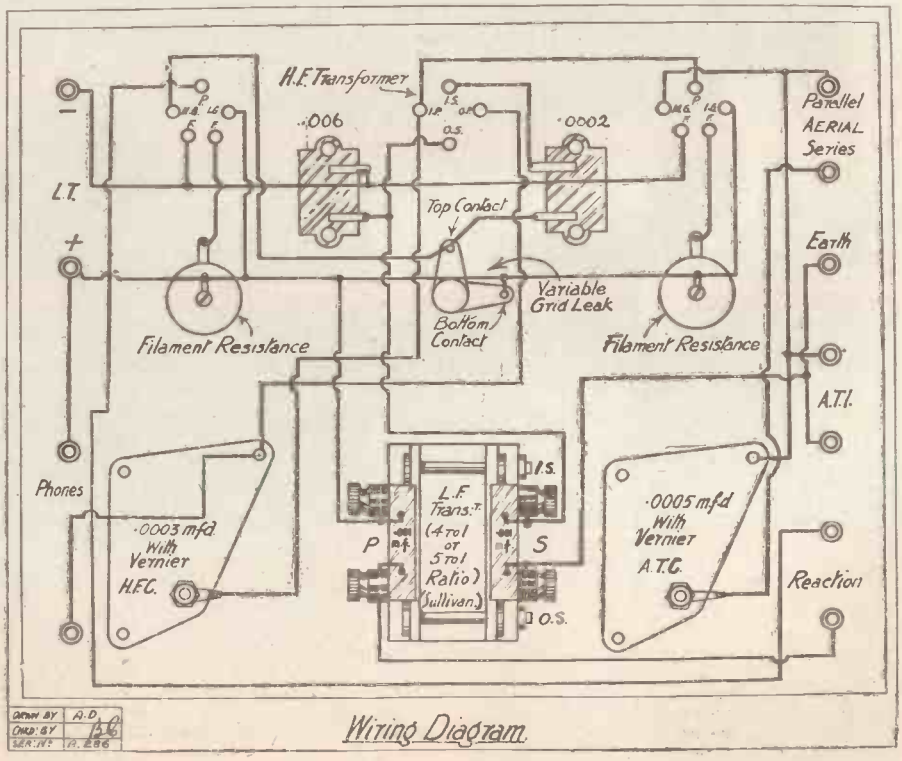
The coil holder fitted to the side of the box is connected as follows:

The leads from the fixed coil holder are connected to the A.T.I. terminals, and the leads from the moving coil holder to the reaction terminals.

The H.F. Transformer.

In this case the aerial lead was on the series terminal, and the parallel terminal was left without external connection. The

(*Continued on page 626.*)



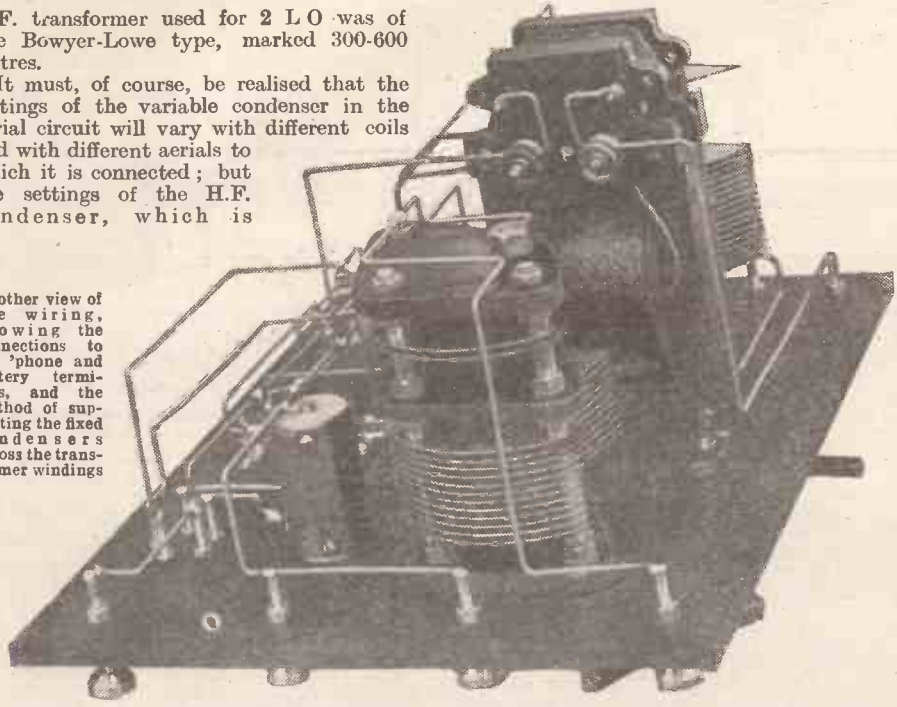
Wiring Diagram.

AN IMPROVED REFLEX UNIDYNE SET

(*Continued from page 625.*)

H.F. transformer used for 2 L O was of the Bowyer-Lowe type, marked 300-600 metres.

It must, of course, be realised that the settings of the variable condenser in the aerial circuit will vary with different coils and with different aerials to which it is connected; but the settings of the H.F. condenser, which is connected across the primary of the H.F. transformer, will be approximately as stated, if the Bowyer-Lowe H.F. transformers are utilised. Other H.F. transformers which were found to give good results are the "Discol" (Gent & Co., Faraday Works, Leicester) and the "McMichael." The Sullivan L.F. transformer was found to be very efficient, but other makes will give good results, provided that the constructor is willing to experiment with the reversal of the primary connections, as already explained.



Another view of the wiring, showing the connections to the 'phone and battery terminals, and the method of supporting the fixed condensers across the transformer windings

Best results were obtained with an L.F. transformer having a ratio of not less than 4 to 1.

The Valves.

The question of the valves to use is a very important one, as in a set of this kind where there is no high tension voltage, it is essential that all the parts and components should work together smoothly.

On test, by far and away the best results were obtained with bright-emitter valves of the U.C.5 type. These valves are rated to take a filament voltage of from 3½ to 4. The current consumption under these conditions is ½ amp. per valve. This set, therefore, would under ordinary working conditions consume a current of one ampere, and a 30-actual-ampere-hour accumulator would last just about a week when used for about four hours per day.

The Thorpe K.4 valves which were originally used for Unidyne circuits gave equally good results on test, their characteristics being very similar to U.C.5 valves.

Another valve which gave good results was the U.C.-4, which has a base of the ordinary four leg type and is shaped to fit into an ordinary valve holder. Such a valve, with an ordinary valve holder, could be used quite easily in this set, the only difference being that beside it on the panel a terminal must be placed that can be connected to the extra grid of the valve externally by a piece of flex. The underside of this terminal, of course, takes the connections which would normally have gone to the inner grid terminal.

There are at present on the market valves with a similar standard arrangement of the legs and extra terminal, but embodying filaments of the dull emitter class. A number of these valves have been tried, and, although several of them gave quite good results, it was found that the U.C. valves were on the whole far more satisfactory.

As a great deal of confusion may exist in the minds of those unacquainted with the arrangement of the electrodes in valves of the four-electrode type, it will perhaps be advisable to re-state briefly how the electrodes of such valves are arranged with respect to the external connections.

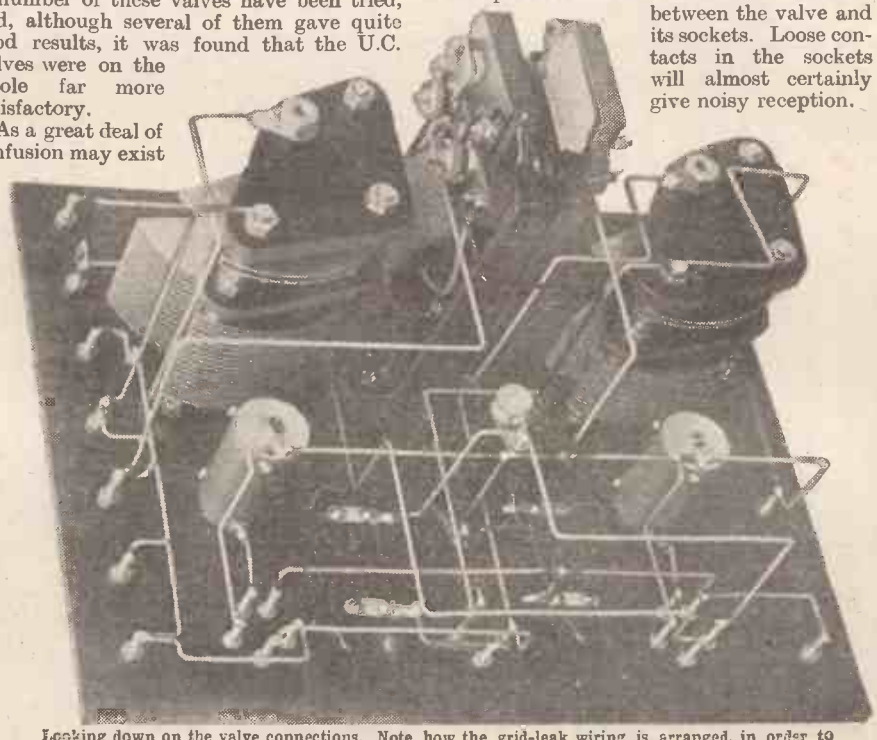
The valves of the U C.4 type have four valve legs arranged in the standard grouping with grid and plate terminals opposite to each other and with the plate terminal at a greater distance from the centre than the grid and filament terminals. On these valves an extra terminal is arranged for the extra electrode, and this extra terminal is connected to the inner (or auxiliary) grid.

A Good Contact Hint.

In five-pin valves of the U.C.5 type, the arrangement is quite different. Turn the valve upside down and look down on the valve legs, and it will be seen that two of these are placed close together, in the position usually occupied by a plate leg. These two legs, which are placed close together, are the filament pins and opposite to them is the plate terminal. Still looking down on the valves (with the filament pins nearest the observer), the main grid is the right-hand centre socket. The inner grid is, therefore, the left-hand socket.

Another point about the valve sockets is that the constructor must see that the valve pins on the valves make firm contact with the sockets. Many sets have been sent up to the Technical Department as faulty and for overhaul, and it has been found on test that the only trouble has been faulty valve contacts.

Many constructors do not seem to realise that the idea of having split valve pins is to enable listeners themselves to adapt the valve pins in accordance with any vagaries in the diameter of the sockets. These pins should always be opened slightly before the valve is plugged into the holder, this procedure then ensures firm contacts between the valve and its sockets. Loose contacts in the sockets will almost certainly give noisy reception.



Looking down on the valve connections. Note how the grid-leak wiring is arranged, in order to minimise undesirable hand-capacity effects.

Start right by using PARAGON PANELS

Guaranteed Genuine Ebonite

PRICES.

Standard Sizes.	Matt finish Black ¼ in.		Matt finish Black 5/16 in.		Polished finish Black & Mahogany ¼ in.	
inches.	s.	d.	s.	d.	s.	d.
6″ x 5″	2	5	2	1	3	0
8″ x 6″	3	7	3	0	4	10
9″ x 6″	3	11	3	4	5	5
9″ x 9″	6	4	5	1	8	2
10″ x 7″	5	5	4	4	7	1
10″ x 8″	6	0	5	1	8	1
10″ x 9″	6	11	5	7	8	11
12″ x 7″	6	3	5	3	8	5
12″ x 8″	7	2	6	0	9	8
12″ x 9″	8	1	6	11	10	11
12″ x 10″	9	0	—		12	0
12″ x 12″	10	10	—		14	5
14″ x 7″	7	6	—		9	11
16″ x 8″	9	7	—		12	10
16″ x 9″	10	10	—		14	5
18″ x 7″	9	7	—		12	7
18″ x 9″	12	3	—		16	3
18″ x 12″	16	3	—		21	8
20″ x 7″	10	6	—		14	1
20″ x 8″	12	0	—		16	3
21″ x 7″	11	1	—		14	10
24″ x 8″	14	5	—		19	4
24″ x 10″	18	0	—		24	0
24″ x 12″	21	7	—		28	10
36″ x 9″	24	3	—		32	5

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FIXED CONDENSERS AND OTHER WIRELESS SPECIALITIES. YOU ARE SAFEGUARDED BY THEIR UNRIVALLED REPUTATION

DO NOT BLAME all your losses to Capacity Leakage and inferior components. Look to the insulating properties of your panel.
Many constructors have found from bitter experience that it does not pay to use inferior brands of "ebonite"—so called—which often do not even possess the insulating properties of wood. Unfortunately the testing of EBONITE requires instruments which are out of reach of most home constructors, therefore

REMEMBER

to insist upon a panel properly sealed and bearing the well-known trade mark PARAGON which is a guarantee of perfect insulation.

Ask Your Dealer—

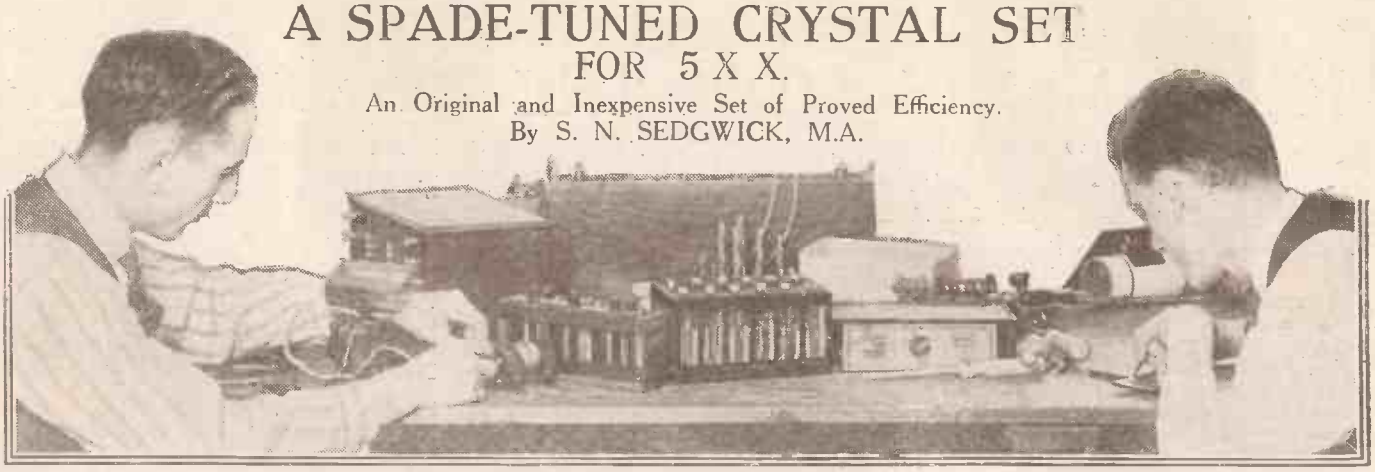
but if he does not stock PARAGON PANELS write to us giving his name and address and we will arrange for him to supply you.

The Paragon Rubber Mfg Co. Ltd., Sculcoates. Hull.

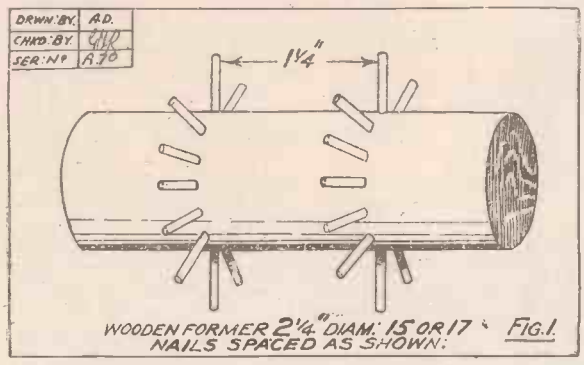
A SPADE-TUNED CRYSTAL SET FOR 5 X X.

An Original and Inexpensive Set of Proved Efficiency.

By S. N. SEDGWICK, M.A.



THE set which is about to be described is one of which the author has made several examples, all giving complete satisfaction to the people using them. Living 90 miles from Daventry and outside the range of any of the other broadcasting stations, he was interested in designing a crystal set which could be used by invalids and by people who lived in out-of-the-way places, and whose pockets were not deep enough for valve sets.



The advantage of this set is that it can be made of almost any "junk"; its cost is a few shillings; it is absolutely fool-proof; it will easily take two pairs of 'phones; whilst, if Mr. Miller's discovery of "a separate crystal for each pair of 'phones" is used it will serve a whole family.

In addition, it can be made up in all sorts of novel forms, entirely unlike the stereotyped ebonite-panel (bristling with knobs, dials, and terminals), square-box or sloping-desk design. The latest model consists of a charming ornamental pen-box measuring inside 6 by 4 by 1¼ inches; but other sets have been built into ladies' work-boxes, cigar-boxes, a clock-case, a pipe-rack, a flower-bowl, etc.

With a two-valve amplifier, it works a loud speaker at comfortable strength in a small room, and no doubt those who live within shorter range of 5 X X will get far louder results.

Fixed Detector.

The design can, of course, be applied to sets for use with any of the B.B.C. stations—it is purely a matter of using a different coil—but the author's home being too far from any of them, he has had to be content—and well content, too—with 5 X X.

As there is no doubt that Daventry provides for an increasing circle of crystal-users, this set will be of interest to prospective "listeners-in."

First, a word about the cost. Here let it be understood that the author prefers a fixed detector to any combination of crystal and cat's-whisker. The latter is, of course, entirely efficient in the hands of those who have good eyesight and patience, but for elderly folk and invalids, and for those generally who want the smallest amount of preliminaries before getting the programme, a fixed detector is a very real advantage.

The author has built the following into one or other of his sets; they all give equal satisfaction, though they vary in price from 2/6 upwards—the Extraphone, the H.S.H., the Lion-King, the R.I., all of which have been favourably reviewed in "P.W."

The materials required, then, are as follows:

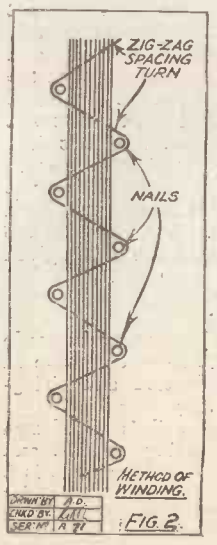
One fixed detector, 2/6.

Four terminals, 4d.

Wire for the coil, varying from 1/- to 1/10 according to the gauge of the wire used.

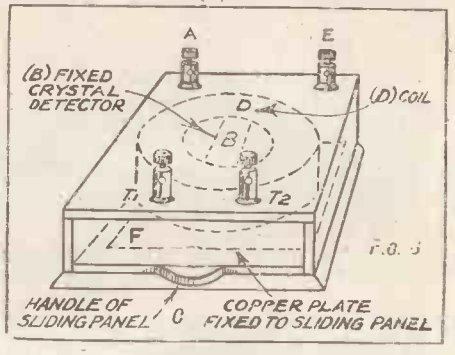
The Tuning Plate.

No ebonite is required, since the four terminals can be mounted on the case where required by means of home-made insulating bushes, or on scraps of rubber, celluloid, vulcanite, or fibre. A fragment of a worn rubber heel, a discarded bicycle pump, a scrap from a broken accumulator have all served their turn.



As to the home-made bushes, a yard of "fibre-strip" will make scores. All that is required is to drill a hole in the case for each terminal, slightly larger than required, screw up a fragment of the fibre to form a tube, and thrust it in the hole, cutting it flush with a sharp knife so that it just lines the hole neatly, cut two washers, one for each side of the hole, and pass the terminal through, making fast underneath with its nut.

A small piece of copper-plate, aluminium, or even tin (though this latter is very poor, and only to be resorted to as a last resource) is required to make the spade or shield by which the coil is tuned. It should be the same diameter as the completed coil, and about the thickness of a sixpence. A disused lid from an aluminium saucepan and an empty tooth-powder tin have been successfully pressed into service. The copper can be picked up for a few pence out of a working plumber's junk. But if no such material is at hand, then a threepenny coil of copper wire (for hanging pictures, etc.) can be used as it stands, if mounted on the sliding wooden panel mentioned below. The total cost of materials, excluding the case and phones, will vary, then, from 4/- to 6/-, but the result will be equal to the most expensive crystal set in the market.



Winding the Coil.

The coil is the most important part, but if the reader shrinks from making it himself, he can buy two of the so-called "Daventry Coils" sold unmounted for 1/- or 1/6 each, join them together (the outer end of one to the inner end of the other) keeping them slightly apart by means of a strip of fibre, or rubber, or even cardboard between them, and tune this "twin-coil" with the spade.

The dimensions of the two used by the author were as follows:

No. 1.—4½ inches diameter, 33 turns on outside.

No. 2.—4 inches in diameter, 28 turns on outside.

These can be bought at any wireless shop.

(*Continued on page* 639.)

EXPERIMENTS WITH THE "P.W." ULTRA COIL.

By G. H. WILLIS.

FOR some time past, in what seemed to be a vain search for a coil sufficiently selective to "lose" a B.B.C. main station working about two miles away, the writer has been juggling with various types of windings and different values of coils.

Lack of selectivity was in all cases the great trouble, and it seemed impossible to achieve the desired end unless a three-coil holder was taken into use and the additional trickery of a loose-coupled circuit mastered. Laziness or not, an aerial circuit "with only one knob to turn" was required, and rather doubting the ultimate value, an auto-coupled coil was wound on a spider and made rigid in the usual way by binding with thread.

Based on the information given in a recent number of "P.W.," this coil consisted of about 60 turns. Actually it was three balanced 20's. By balanced I mean that the length of wire in each section was the same. This coil certainly gave me my local station—any coil would on a reasonably efficient receiving set—but it gave me no other station. It was much too big. But I found that I could cut out the local station by quite a small movement of the A.T.C. This was distinctly hopeful.

A word here as to the aerial system in use would not be out of place. The aerial itself is short, actually 35 feet of wire in an attic with a down lead of about 15 feet. Earth goes to a tap on the top flat, probably 45 feet from the ground. For ordinary tuning the usual coils are required, 35 to 50 parallel and 75 for series tuning.

Varying the Turns.

I therefore commenced to cut down this original 60-turn coil stage by stage, and after many trials I got to a coil of 39 turns in all, composed of three similar basket coils wound with a single pitch on eleven spokes, each coil having 13 turns. They were mounted side by side tightly coupled permanently, with the end of the first coil connected to the beginning of the second and the end of that coil connected to the beginning of the third. (To anyone who constructs this coil: It is, of course, essential that each of the three coils should be mounted so that the windings are in the same direction and not opposed to each other in any way.)

I now had a coil of 39 turns, wound, by the way, on a former 2¼-in. in diameter, divided as far as possible equally into three sections with two tappings. This proved considerably more selective than the larger coil, and subsequent experiments seemed to show that the smaller the untuned centre portion the more selective the coil. I say "seemed to show," because I am not quite certain that this is actually the case. I came to the conclusion that a lot depended on the wave-length of the station concerned—e.g. a coil with a centre tapping of 20 turns would be more responsive, say, to Aberdeen's wave-length rather than to Cardiff's, and consequently less selective at Aberdeen than a coil having, say, 10 or 11 turns in the untuned primary. This is a theory I have not developed as yet, but further experiment will show whether this is so or not.

Plugging in my 39-turn coil with high hopes, I found it was also essential to reduce the size of the reaction coil if the best results were to be obtained, and after trying many sizes in this position I find that the best for all-round use is about 28 or 30 turns, when the A.T.I. is used "Ultra" style, when sufficient oscillation will be obtained. (This size coil will, of course, be much too small to have any effect if the A.T.I. is used in the ordinary way.)

With A.T.C. square law ·0005 mfd. across the complete 39 turns, and aerial and earth connected to the 13th and 26th turns respectively, the coil tunes from approximately 315 metres to 450 metres—a very useful range.

Dundee, a relay station 90 miles away (331 metres), comes in strongly at 21 degrees. Glasgow at 143 degrees and Belfast 151 degrees are received with no interference between the two, there being a difference of five metres only in their respective wave-length. Curiously enough, Edinburgh comes in at 98 degrees (approx. 386 metres), but according to the published wave-length this station works on 328 metres. There is no sign of the station at the setting of the condenser which corresponds to a wave-length of 328 metres. This data will probably be of interest to Scottish readers.

Reaction Control.

A vernier movement on the reaction coil is absolutely essential, and about eight different stations can be brought in, using the small reaction coil, with but slight alteration of its position and with little difficulty in tuning. Where a larger coil is used there is more liability to go off oscillation suddenly, and the tuning of distant stations becomes correspondingly difficult.

A curious feature of the Ultra coil is the fact that with the aerial connected to either tapping, and no earth, or the earth connected and no aerial, practically similar results can be obtained. The volume merely diminishes slightly and tuning becomes much more critical.

A SPADE-TUNED CRYSTAL SET FOR 5XX.

(*Continued from page* 629.)

But it is easy to make the coils. Those used by the author are ordinary lattice coils on cardboard formers, spaced either by string, or by a zigzag of the wire itself between each set of single layers.

To make such a coil, take a small length of curtain-pole, 2½ inches in diameter, and, say, 6 inches long. See Fig. 1. Drill two rows of holes (the rows being 1½ inches apart) to receive a number of 2-inch nails; 15 or 17 holes in each row, the holes about ⅓ inch deep. A cardboard ring, 2 inches in diameter, is placed on the former before the nails are inserted, and the coil is built on that. The beginning of the wire is passed through a hole in the edge of the cardboard, and 6 inches or so left for connecting, then the first layer of wire is wound on the cardboard till it is full; the second layer consists of a zigzag of the wire round the nails (the one row, by the by, being staggered as to the other), and then a third full layer is wound over the zigzag, to be followed, when full, by another zigzag. And so on till the amount of wire, the weight of which is given below, is exhausted.

Useful Data.

Instead of wire, the zigzags may be made by string, but there is little difference in effect between a wire-spaced and string-spaced coil. (See Fig. 2.)

When complete, the coil is withdrawn from the former by removing the nails and sliding the cardboard ring off, and it is a simple matter to bind the coil together by passing string or thread through the holes in the angles left by the nails.

The following particulars of actual coils of different gauge wire may be useful.

No. 1.—D.C.C. 24. Built on the 2½-inch former, 1 inch wide, weight of wire just over 3 ounces; 6½ layers, the zigzag turns made by the wire.

No. 2.—D.C.C. 22. Built on the 2½-inch former, 1 inch wide. Wire-spaced. 10 to 11 layers. Weight, 9¾ ounces.

No. 3.—D.C.C. 18. Former 2½ inches diameter, 2 inches wide. String-spaced. Weight, 1 lb. 2 oz. 8½ layers.

Fig. 3 shows the complete set. The actual outside dimensions of the case are 5 by 5 by 2 inches, for coils 1 and 2. For coil No. 3 the dimensions are 5½ by 5½ by 3. These figures are only given to show the compactness of the instrument.

The coil is suspended from the top of the box, by stout thread or twine. The crystal is fixed in position in the centre of the coil former (it may be placed wherever convenient).

C is the handle of a wooden panel of thin wood (three-ply) which slides in and out, under the coil, and carries the copper or aluminium spade (shown in the drawing as the rectangle F).

Tuning is effected by drawing the copper in and out till signals are loudest, a matter of very simple manipulation. The copper plate should lie as close to the coil as possible without actually touching.

The terminals can be placed to suit the maker's own requirements. In one of the author's sets no terminals are visible at all, being concealed within the case, four small holes (fibre-lined) being all that can be seen.

The wiring-up is as simple as the set itself. One end of the coil is connected to A, the other to E. One terminal of the crystal to A, the other to T1. Terminal T2 is connected to E by a straight bit of ordinary covered wire.

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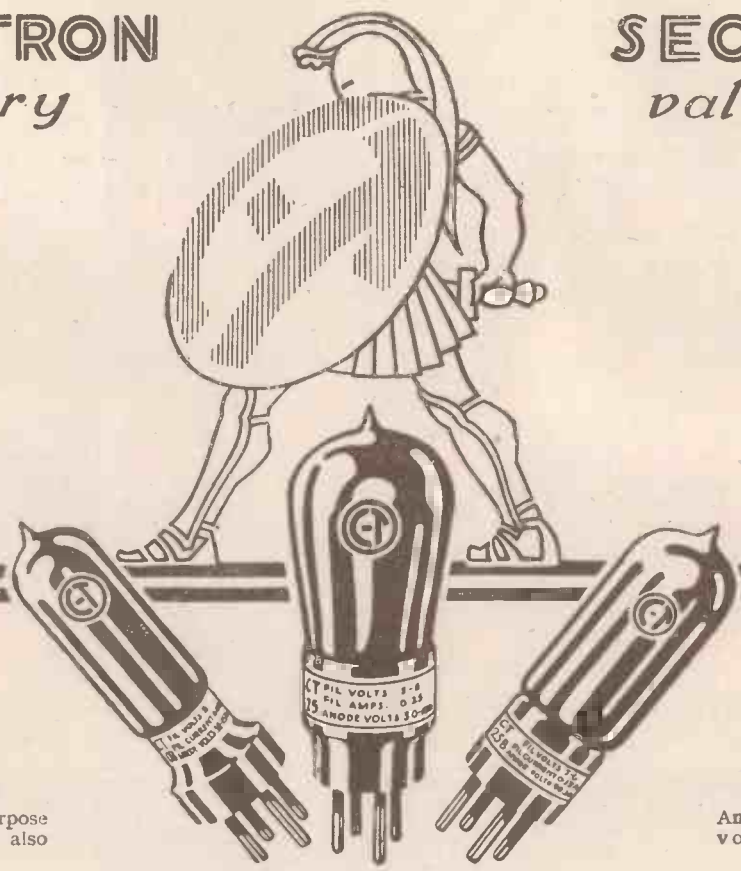

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BROADCAST NOTES.

By O. H. M.

Irish Free State—Inter-Continental Broadcasting—The Announcer Problem — Sir Harry Lauder — The Radio Revel — Topicality in Programmes—Future of the Crystal User.

I HEAR that the Irish Free State are at last getting on with their broadcasting scheme, and it is hoped that the first radio broadcasting station will be operating in Dublin within the next two or three months. No wave-length has yet, I understand, been fixed, though it is understood that the power will be about 1½ kw. The people at Geneva will have to be careful over the allocation of wave-length, or the European ether will suffer, and the mix-up will be worse than it is at present. Cork is also to be a station, I hear, though this time only relay work will be done, a land-line being laid between the two stations.

I do not know how the licence arrangements will be made, but as far as my information goes it appears that the service is to be controlled by the Post Office and financed by the licence fees.

International Broadcasting.

A lively exchange of wireless messages is going on across the Atlantic in connection with the rebroadcasting of programmes, to take place early in the New Year. The Radio Corporation reports that its new international receiver and transmitter in Northern Maine will be ready in a few weeks' time. About November 20th there will be preliminary tests between this station and 5 X X. Part of a programme from Pasadena, California, will be passed across America by wireless link, handed on from Northern Maine to Daventry and once again relayed in Germany and Italy. The return transmission will be of a combined programme broadcast from 5 X X. While on this trans-atlantic affair, I confess to great interest in the idea of using the new 200 kw. Post Office Telephony Station at Rayley as the real link for broadcasting to America. This might also provide at least a partial solution of the difficult problem of Empire broadcasting.

The Ideal Announcer?

The announcer question is still occupying the thoughts of many listeners, and every now and then fresh energy is brought to bear upon the point, and criticisms and advice pour in to the B.B.C. from every quarter. As the "Times" remarked the other day, "the requirements are so numerous that one could hardly expect to find them all in the possession of a single individual."

That is just the point, and the B.B.C. are faced with no easy task when they attempt to fill all the requirements that go to make up the ideal announcer. Clear diction, well modulated voice and firm delivery are only some of the essentials. Pronunciation is perhaps one of the greatest stumbling blocks; not so much of words occurring in the news bulletins and other announcements, though there one is apt to come across most unusual words and names, but in musical and scientific announcements. The "Times" suggests a fixed curriculum for would-be announcers to follow, and puts forward the suggestion that a course of instruction might well be the means of finding some announcers "with special talents, to the material benefit of all concerned."

Sir Harry Lauder.

The B.B.C. are to be congratulated on inducing Sir Harry Lauder to broadcast. I hear he is practically booked for December 23rd, and for two other dates early in the New Year. I prophesy an enormous success for this broadcast. Harry's voice should come over very well.

Donald Calthrop is a great find for the B.B.C. He is tremendously keen on wireless and his are just the qualities most needed at the moment. His dash and flair are already galvanising the programmes where they needed it. His new broadcast revue will be heard for the first time on November 13th.

The Duke of York speaking during the closing ceremony of the Wembley Exhibition.

The Radio Revel.

The Radio Revel of December 15th has been temporarily obscured in the enthusiasm about the Birthday Festival Week. But I hear that great preparations are in progress behind the scenes. Land lines are being installed, connecting dance halls with B.B.C. stations all over the country. The London centre, Olympia, will be supported by special simultaneous occasions in a number of suburban dance halls. Dancing will begin about 8 and will go on until 4 the following morning. There will be several intermissions, during which the whole British radio public will dance to music relayed from Paris, Vienna, Rome, New York and Berlin. The stars of the stage will join with the stars of the studio in the entertainment of vast gatherings of listeners. America is keenly interested, and the Radio Corporation proposes to rebroadcast substantial chunks of Britain's Radio Revel throughout the Union.

Topical Talks Needed.

Some months ago, we heard a good deal about B.B.C. plans for more topicality in programmes. There was then an intention to keep abreast of the big news stories with appropriate follow-ups. The idea was sound and most of us greeted it with acclamation. Well, I may be wrong, but I fail to spot the feature that was promised. To me it looks as if there had been a hitch. I have a suspicion that the trouble lies in over-organisation of the talk side of the programmes. Education is all very well, and it may be necessary to arrange courses months in advance, but it certainly does not follow from this that nearly *all* the talk periods of the programmes should be arranged months ahead. There is crying need for a topical period of from ten to fifteen minutes every day except Sunday. This is bound to be one of the points raised at the Broadcasting Committee and I would like to see the B.B.C. have it in operation before they are questioned about it. The job is not easy but the B.B.C. have handled many a harder task.

Crystal Reception.

In connection with the new system of high power transmitters for British broadcasting which will be in operation in 1927, certain influences have been at work to discount the crystal users and consider only the valve users. It speaks well for the public spirit and judgment of the B.B.C. that these influences have been completely foiled. Under the new scheme, as under the old, the first concern of the B.B.C. is the crystal user, who still forms more than 80 per cent. of the regular broadcast constituency in this country. It will be the endeavour of the B.B.C. under its new scheme to place two good programmes within the reach of all crystal users throughout the country. I am absolutely confident both that the scheme is sound and that the B.B.C. and the B.B.C. alone can carry it out successfully.

FOREIGN RADIO NEWS.

FROM OUR OWN CORRESPONDENT.

A Two-metre Transmitter.

PROFESSOR ESAU, of Iena University, claims to have perfected a wireless transmitter specially adapted for telephony, which works on a two-metre wave-length. The professor asserts that before Christmas he will be able to hold regular conversations with America.

In conjunction with this transmitter, Professor Esau is using a new directional aerial. The two-metre waves are stated to use the earth's surface as a transmission medium, and are unaffected by interference as is the case with longer wave-lengths.

Listeners Hear "Unedited" Remarks.

Public speakers who speak into the microphone are apt to forget that the public can hear every sound, and that even whispered remarks are heard.

During M. Caillaux's "swansong speech" a day or two before the fall of the Government in which he was Finance Minister, he was apparently annoyed by someone in his audience. Listeners to his speech were suddenly startled and amused to hear him snap out impatiently: "That fool's a perfect pest——" followed by one or two words somewhat stronger than are usually employed in public speaking, even at a dinner, or after it! Everybody is now wondering to whom he referred.

Toulouse Establishes a Record.

The officers of the French liner "Commandant Mages," of the Messageries Maritimes, have just notified the officials in charge of the Radio-Toulouse station that its programmes were picked up regularly and with the greatest clarity in Ceylon waters, latitude North 7° 47, by longitude 74° 24. This represents a distance of over 5,000 miles.

This reception was regular from September 2nd to 12th, and is believed to constitute a record for a station of the power of Toulouse.

Radio as Help to Aviation.

The Belgian Government has just signed conventions with the British, French, Luxembourg, and Dutch Governments to ensure that radio is used to assist aviation.

Radio stations on air routes are divided into two classes: control stations and collaboration stations. The former will keep aeroplanes constantly informed as to direction of flight, while the task of the latter will be to help the 'plane determine its position.

Heligoland Radio Station.

The German authorities have resolved to put up a powerful radio station on Heligoland, the rôle of which, it is stated, "will be similar to that of Keston in England."

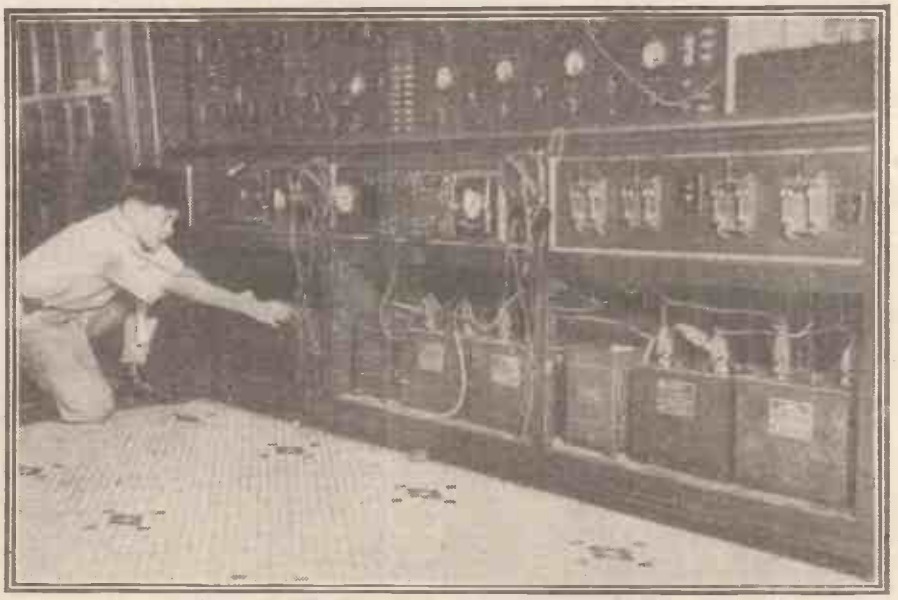
The decision is somewhat sarcastically commented upon in some of the German papers, as, since the removal, in terms of the Treaty of Versailles, of the elaborate concrete breakwaters that protected the island, the friable rock of which Heligoland consists is rapidly crumbling away and the disappearance of the once British island is merely a matter of time.

German Amateurs Increasing.

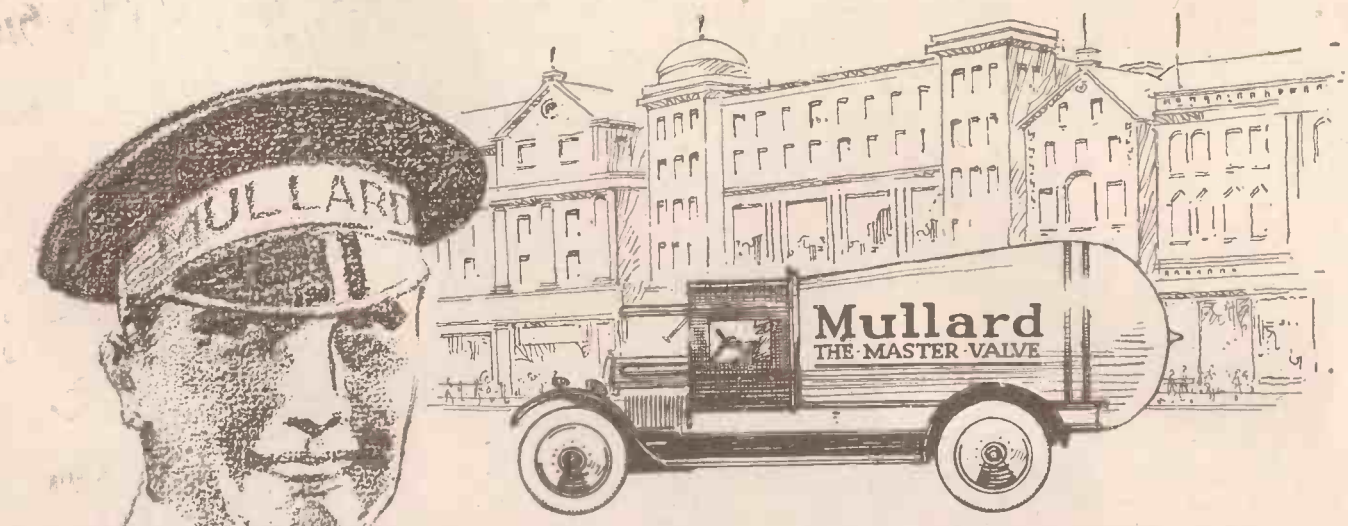
The number of radio amateurs having receiving stations in Germany was officially stated to be 872,695 on October 1st. This figure shows the startling increase of 20,158 over that for September 1st.

The average increase of over 600 a day has been fully maintained throughout October.

(*Continued on page* 666.)



Another view of the 23-valve set shown on page 638 of this issue.



IN AND OUT

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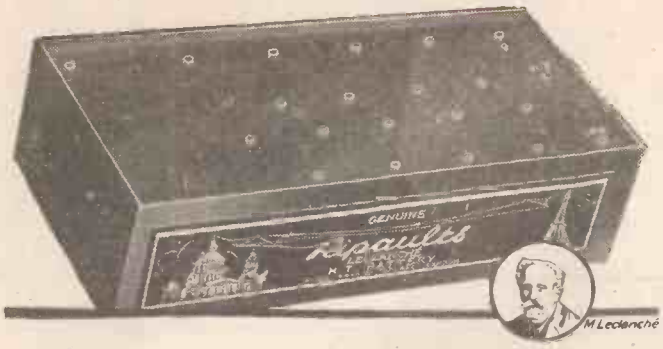

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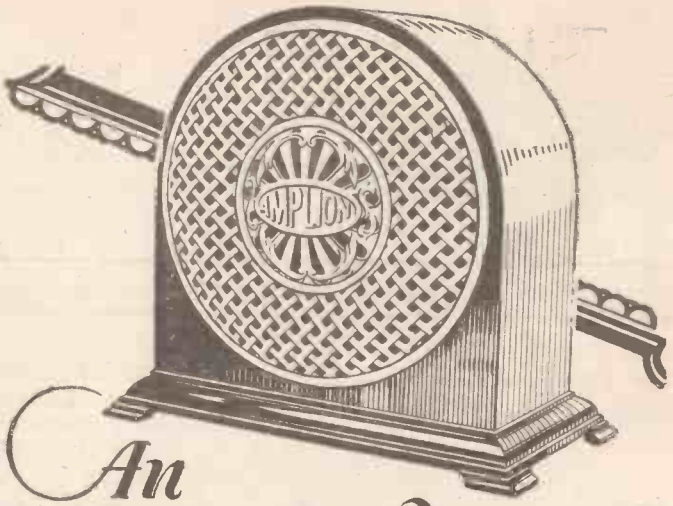

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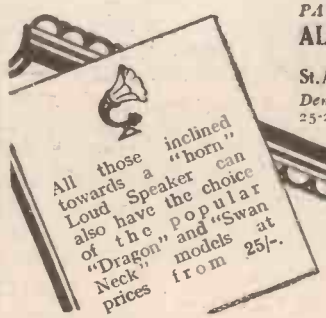

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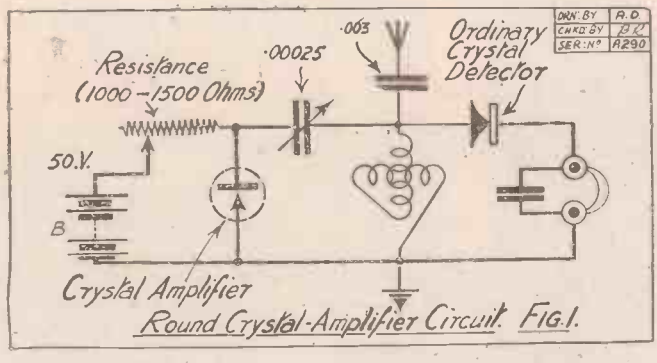
THE "ROUND" CRYSTAL AMPLIFIER.

A New Regenerative Crystal Circuit.

FROM A CORRESPONDENT.

An interesting article discussing the salient features of a patent recently granted to Captain Round, Chief Research Engineer of the Marconi Co.

LISTENERS who still pin their faith to the simple crystal and live in hopes of one day seeing it rival the valve for long-distance and loud-speaker work, will be interested to learn that a patent (No. 236648) has recently been granted to Captain Round and Mr. Noel M. Rust for a "regenerative crystal circuit" capable of actually amplifying the strength of received signals.



Round Crystal-Amplifier Circuit. FIG. 1.

The term regenerative crystal embraces of course the same principle as the so-called "crystal oscillator," which when first published some months ago by the Russian inventor Lossev created a considerable stir in wireless circles generally. The circuit of the Round patent is, in fact, very similar to that already described by Lossev, but as the patent is dated April 9th, 1924, it appears to have been filed several weeks prior to the first publication of the Russian inventor's work in this country.

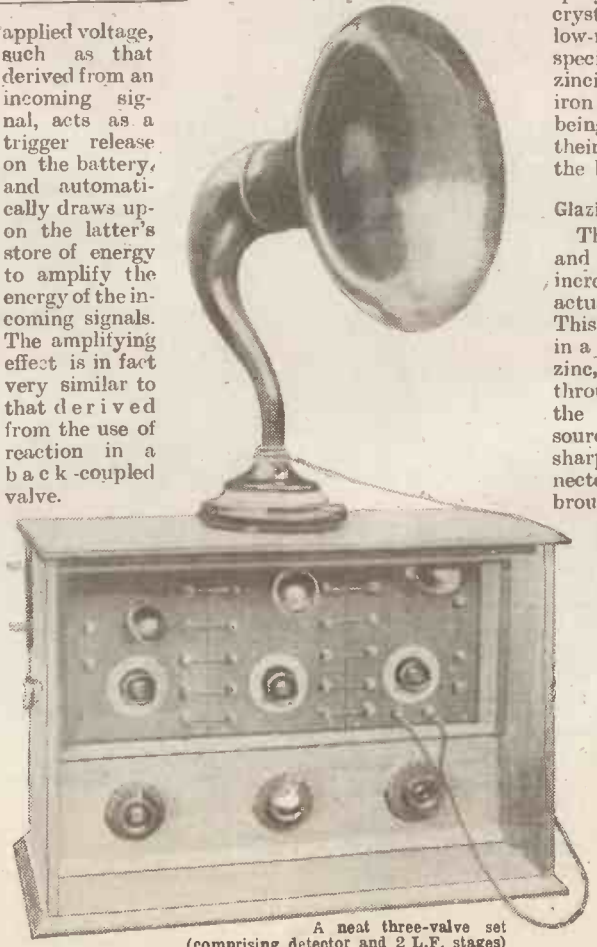
Economical Amplification.

Quite apart, however, from any question as to who was first in the field (and in this respect the early work of Dr. Eccles must not be overlooked), the present association of Captain Round's name with the subject is in itself a proof that the crystal oscillator is a practical proposition, and not merely a theoretical or "freak" circuit.

It may be some time before the full possibilities of crystal regeneration will be available to the general public, but in this connection it must not be forgotten that for some time after Fleming's original discovery of the thermionic valve, the latter was regarded merely as a scientific curiosity and relegated as such to the laboratory, whilst the coherer, magnetic detector, and even the crystal were utilised for practical work.

The crystal amplifier, then, is admittedly still in the experimental stage, but keeping the history of its rival in view, it may yet take the place of the valve for loud-speaker and long-range work. Its great merit is economy. The only addition necessary to the ordinary crystal-set equipment is a high-tension battery of 50 volts (a dry cell of 12 volts has given satisfactory results) and a high-resistance winding of between 1,000 and 1,500 ohms. The dry-cell battery will last for many months so far as current consumption is concerned, and there is no accumulator to be re-charged or other "wasting" component to be renewed.

The theory underlying the regenerative action of the crystal depends upon a peculiarity in conductivity (called negative resistance) which it possesses in addition to its ordinary unilateral or rectifying property. Briefly stated, when a certain initial potential-difference from a high-tension battery is applied across the crystal contact, any further applied voltage, such as that derived from an incoming signal, acts as a trigger release on the battery, and automatically draws upon the latter's store of energy to amplify the energy of the incoming signals. The amplifying effect is in fact very similar to that derived from the use of reaction in a back-coupled valve.


A neat three-valve set (comprising detector and 2 L.F. stages) built on the unit system by Mr. W. Blackledge, of 321, Tonge Moor Rd., Bolton.

The standard circuit used by Captain Round and Mr. Noel Rust is shown in Fig. 1. A single-wire aerial 80 ft. long and 20 ft. high was employed with a ·003 condenser in series with an ordinary broadcast variometer.

The variometer is shunted on the left-hand side by a variable condenser of not less than ·00025 capacity in series with the crystal amplifier CA, the latter being again branched by a dry-cell battery B of 50 volts and a resistance wire R of 1,500 ohms provided with a sliding contact. It is advisable to provide the H.T. battery with 1½ volt-tappings. On the right-hand side, the aerial inductance is shunted by an ordinary crystal detector CD and the usual pair of 'phones. The function of the left-hand circuit is to release and feed energy from the battery B into the aerial circuit, the amplified oscillations then being detected by the crystal detector and 'phones in the right-hand circuit in the ordinary fashion.

The amplifying or "negative resistance" crystal is preferably one of the low-resistance type. Arzenite (a special form of zinc oxide), silicon, zincite, tellurium, magnetite, and iron pyrites are suitable, the names being arranged in the order of their sensitivity, arzenite giving the best results.

Glazing the Crystal.

The natural efficiency of arzenite and zincite can be considerably increased by slightly fusing the actual surface or area of contact. This is done by fixing the crystal in a metal cup by means of melted zinc, and then connecting the cup through a 7·5 ohms resistance to the positive pole of a 100-volt source of direct current. A small sharply pointed carbon is connected to the negative pole and is brought up to the crystal until an arc is struck between the two. The slight crater of glazed surface thus formed is found to possess particularly good sensitivity.

By similarly treating the surface of certain metals such as zinc, aluminium, or copper, the resultant oxide coating or glaze is found to acquire regenerative properties and to be capable of amplifying received signals in the same way as the crystalline substances above mentioned. An ordinary cat's-whisker contact is used with these metal-oxide plates as with the actual crystals.

(*Continued on page* 638.)

THE "ROUND" CRYSTAL AMPLIFIER

(*Continued from page 637.*)

In particular Captain Round states that by taking a zinc plate which has been coated with white oxide and then subjecting it to treatment by an arc, as previously described, a reddish-brown oxide is formed upon the original white coating, and the parts of the surface where the brown oxide merges into the white give excellent regenerative effects. It appears to be more difficult to obtain short-wave results than long from the crystal generator, but oscillations varying from 350 to 600 metres have already been successfully produced by the methods described above.

Fig. 2 shows a regenerative crystal circuit capable of giving a higher degree of amplification than that shown in Fig. 1. Here there are two crystal amplifiers CA both feeding energy from the batteries B, B into the aerial circuit, when the latter is impulsed by the received signals. The resultant amplified energy is transferred through a coupling M into the lower circuit, and is then detected by a crystal rectifier CD of the ordinary type.

Super-regeneration.

In addition the lower circuit is provided with a third crystal oscillator CA, which acts regeneratively upon the energy received from the coupling. The natural damping of the aerial circuit is, therefore, reduced practically to zero by the two upper crystal amplifiers, whilst the damping of the lower circuit is similarly lessened by the third crystal amplifier, the net effect being to greatly increase signal strength.

By adjusting the lower circuit so as to oscillate at a frequency slightly different to that of the received signal, this arrangement could be utilised for heterodyne reception.

It is interesting to note that Captain Round claims that when the crystal circuit shown in Fig. 1 is adjusted so as to generate sustained oscillations—by suitably reducing the value of the resistance R—he is able to obtain super-regenerative effects similar to that of the well-known Armstrong circuit.

It will be remembered that ordinary super-regeneration depends upon the rapid quenching of a self-oscillating valve, so that the latter is maintained on the "threshold" point, where it gives a far higher degree of amplification than is normally obtainable.

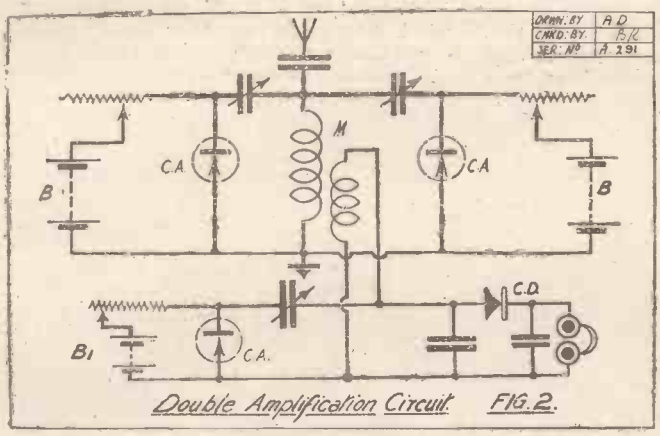
To secure this effect, Armstrong used either a separate "quenching" valve or, in the so-called "flivver" or single-valve circuit, he added a heavy back-coupling which set up a second super-audible quenching frequency.

Super-imposed Quenching Frequency.

It has since been found by Flewelling and others that a similar result can be obtained by causing the grid condenser of the oscillating valve to "choke up" and then discharge at a suitably rapid rate. If the grid condenser is perfectly insulated from the filament, the valve will choke up naturally. The grid-leak resistance, however, provides a relief path, and by suitably adjusting the value of this resistance an intermittent discharge can be obtained which automatically quenches the oscillating valve at a super-audible frequency, thus allowing it to act as a super-regenerator.

In the case of the oscillating crystal, the characteristic curve is, within limits, similar to that of the valve. Accordingly, by superposing a quenching frequency such that the crystal is maintained constantly on the threshold of oscillation, super-amplification is obtained similar to that described above.

The quenching frequency in the Round circuit is stated to be derived from the ordinary rectifying or detector crystal shown on the right-hand side of Fig. 1. The precise action is not clearly understood, but it is probably due to fluctuations in the normal voltage existing across the oscillating crystal. These fluctuations are automatically set up as the rectified pulses of current from the aerial flow past the right-hand crystal into the 'phones, and are sufficient to "swing" the left-hand crystal into and out of the point of self oscillation, thus giving the super-regenerative effect.



Double Amplification Circuit. FIG. 2.

This particular application of the new crystal-amplifier probably calls for a high degree of patience and considerable skill in manipulation. It is, however, highly significant of the future possibilities of crystal technique, and is particularly interesting as pointing out a new parallel between the crystal and its more powerful thermionic competitor.

The "Cold" Emitter.

The whole subject of crystal amplification opens up a fascinating field of research for the ordinary amateur, particularly in view of the fact that no expensive apparatus is required. It is therefore quite likely that further valuable discoveries in this direction may be made by the home experimenter.

The imagination of wireless enthusiasts has always been stirred by the possibility of discovering a "cold" emitter which shall be capable of emulating the performance of the thermionic valve without necessitating the use of a heated filament, and the associated trouble of providing filament "juice."

Some progress has been made in this direction by recent discoveries connected with the rectifying properties of colloidal silver—i.e. extremely minute particles of metallic silver held in liquid suspension (though not in solution) and exhibiting the peculiar Brownian movement.

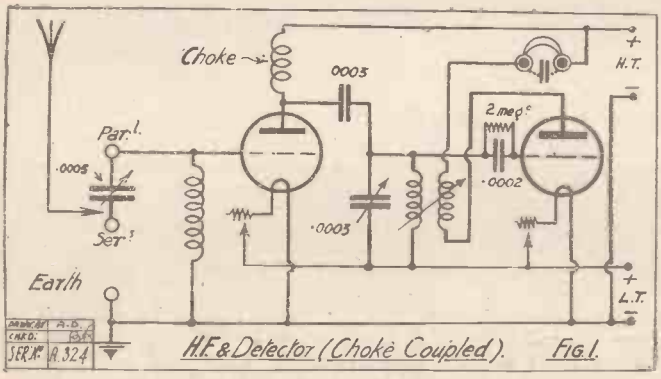
Whether the final solution to the problem of the cold emitter will be found in the colloidal rectifier, or whether it will be developed from the crystal amplifier or possibly neither, remains to be seen.

This 23-valve set is claimed in America to be the largest receiver in the world. It will be remembered, however, that "P.W." still holds the "record" with the 24-valver built last year.

A Long Range Two Valver

The Set Designed and Described by
P. R. BIRD
(Assistant Technical Editor).
Constructional Work by
G. V. COLLE and H. MEADOWS
(Technical Staff).

OWING to the present congested state of the ether it is exceedingly difficult to pick up any but the local station and perhaps 5 X X with any degree of clarity. Jamming from ship stations, heterodyning from Continental broadcasters wandering about on the wavelengths of the British stations, and bubblings due to commercial arc transmitters all combine to spoil any programme that the listener is able to pick up. To try and push distant reception through a loud speaker is sheer folly, for the result hardly ever resembles intelligent speech or music; but it must be admitted that, despite all the difficulties it is *possible*, with a well-designed receiver, to pick up and *enjoy* many of the sixty odd programmes that are broadcast nightly in Europe alone.



In order to enjoy such transmissions it is advisable to use a single stage of H.F. amplification (two stages would give greater selectivity, but might tend to distort the results), and a detector valve with reaction. L.F. amplification is best left out of the question, so that telephones only should be used for reception.

An Unusual Circuit.

The set to be described is as selective as is practicable without being too selective and thereby causing the sidebands of the modulation to be cut off.

The circuit chosen for this receiver is shown in Fig. 1, and consists of an ordinary H.F. amplifier followed by a detector valve with reaction. The coupling between the amplifier is a little unusual, however, and provides greater selectivity than the well-known tuned anode methods, and also makes the set much less liable to suffer from self-oscillation.

In order to obtain the necessary voltage variations in the plate circuit of the H.F. valve, so that the effect of the amplification can be passed on to the detector, an H.F. choke is employed. This is coupled at the plate end to the grid of the detector valve in much the same way as a tuned anode is coupled, through a condenser having a capacity of ·0003 mfd.

So far only one circuit—the aerial circuit—has been tuned so that the selectivity of the set will not be great. It is necessary, therefore, to still further increase the selectivity, and this is done by tuning the grid circuit of the detector valve by means of a coil and condenser. Reaction is obtained by coupling the usual reaction coil to this grid coil, and efficient regeneration is thereby accomplished without any noticeable amount of energy being transferred to the aerial. By this means interference to neighbouring listeners is cut down to a minimum, and the set can be thrown into oscillation without fear of upsetting the reception of others round about.

Rectification is carried out by the grid leak and condenser method, the leak and condenser being placed in series with the coupling condenser from the plate of the first valve and the grid of the detector valve.

Concerning the Components.

Reference to Fig. 4 and the photographs will show how the components are laid out, the American type of mounting being employed. This has many advantages over the older methods, in that it enables all working parts to be enclosed and free from dust. The panel and baseboard, together with cabinet to fit, can be obtained ready prepared, so that it should not be necessary for the constructor to trim the panel before drilling is commenced.

The necessary components are given in the list on page 640 and should be adhered to in every detail if success is to be assured. This does not mean that other types or makes of components from those stated will

(Continued on page 640).

A photograph of the complete receiver which gives a good idea of the neat appearance of the set. The positions of the three controls makes the receiver extremely easy to handle.

A LONG RANGE TWO-VALVER.

(*Continued from page 639.*)

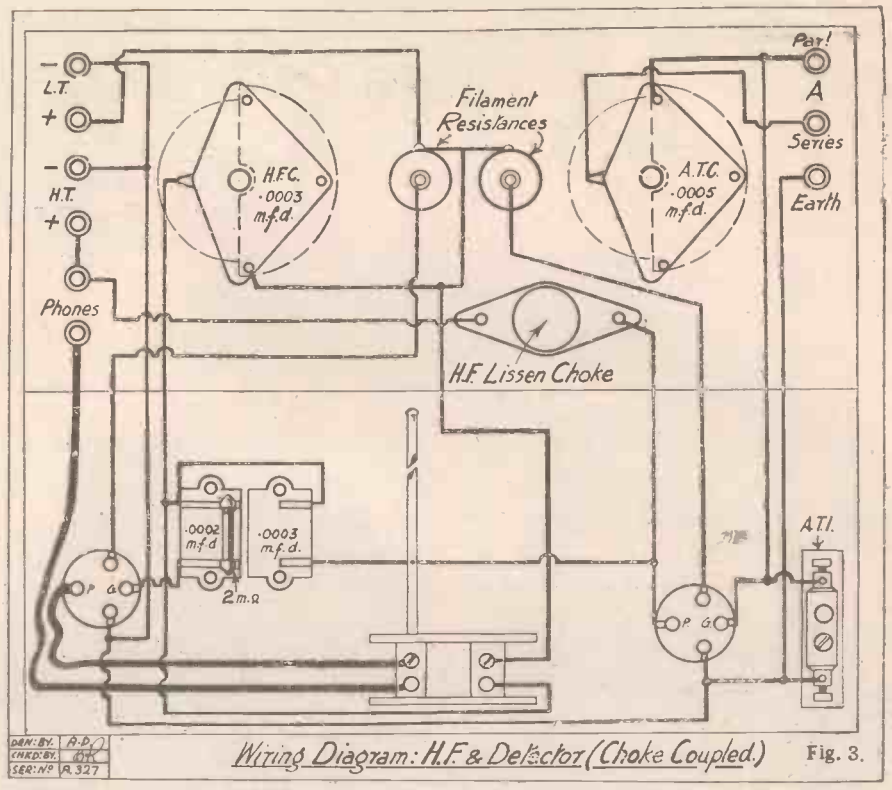
not operate successfully, but the substitution of different pieces of apparatus would probably alter the lay-out, and the wiring diagram and panel drilling dimensions would no longer hold good.

Assuming, then, that the same types of components as are mentioned in the list are to be used, the drilling of the panel can be carried out according to Fig. 4. If a drill large enough to make the holes for the variable condensers cannot be found, smaller holes should be drilled and then enlarged to the requisite diameters by means of a reamer—a three-cornered tapered instrument that can be purchased for 1s. 6d.

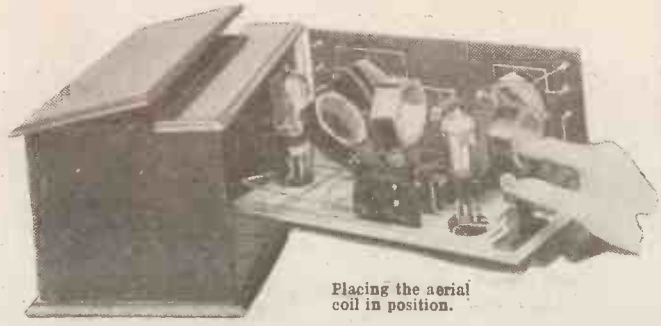
After the drilling has been accomplished, the panel should be fixed to the baseboard and all the components should be mounted, their relative positions being shown in Fig. 3.

Making the Connections.

With regard to the coil holder chosen for this set, it will be noticed that it is of the well-known "Lotus" type, with geared movement, and it is very well suited for inclusion in the set being described. Fine adjustment of reaction is possible and this is, of course, an essential feature when the reception of weak telephony is the main objective.



Wiring Diagram: H.F. & Detector (Choke Coupled.) Fig. 3.



Placing the aerial coil in position.

Unfortunately these coil holders are not, at present, available with long handles, making them suitable for baseboard mounting, but an adaption easily fitted has been placed on the market by another concern, and this allows the holder to be used as desired. Care should also be taken when mounting the baseboard components to make sure the coil holder (single) and the right-hand valve holder will clear the fillets in the case when the baseboard is pushed in.

The connections between the components are made by means of square section tinned copper wire of about 16 gauge. This wire is easily handled and bent to any shape, while it enables good spacing to be arranged between the various connections. All joints, except to the coil holder, should be soldered, care being taken that all traces of flux are removed from the junctions of the wire, terminals and valve sockets, or bad connections may develop.

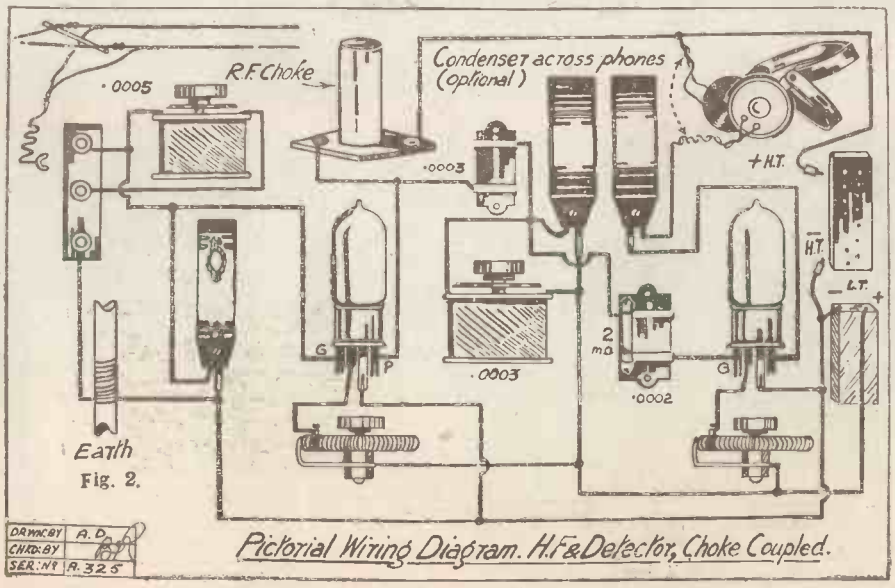
Results on Test.

"Dry" joints should be watched for, as should these be present noisy reception if not complete failure will result. These "dry" joints look just as good as proper connections, and can only be located by testing the joint either with a battery and lamp or, better still, by pulling fairly vigorously but steadily at the joint. If a bad connection has been made the solder will probably break completely away from one side, leaving the wire as it was before, without a trace of solder on it. A thin film of dirt has prevented the solder from gripping the wire, forming a very poor connection, if that term can be used under such a circumstance.

The wiring up of the receiver should be carried out according to Fig. 3, and after completion it should be checked by the point-to-point list of connections on page 00.

On actual test the receiver whose photographs appear with this article gave extremely satisfactory results. An aerial coil of 75 turns was used with a moderate sized horizontal aerial, the latter being connected to the set by means of the "series" terminal. This places the aerial tuning condenser in series and enables a larger coil than would otherwise be possible

(*Continued on page 643.*)



Pictorial Wiring Diagram. H.F. & Detector, Choke Coupled. Fig. 2.

B 508.

B. 508. FIXED MICA CONDENSERS. Built up with copper foil and best ruby mica di-electric. High insulation and capacity adjusted to within 5 per cent. Stocked in capacities from 0·0001 to 0·01 mfd. 2/- to 3/6 each.

B. 558. VARIABLE CONDENSERS. For use as Independent Units. Strongly constructed on the same principle as variable condensers for panel mounting. Enclosed in dustproof non-inflammable Celastoid covers, and fitted with dial, knob, two terminals and three feet for fixing to table or board if required. Price 12/- each.

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Buy Silvertown WIRELESS ACCESSORIES

Quality guaranteed by over 50 years' electrical manufacturing experience.

AN AID TO ENTHUSIASTS.
We have prepared a logging chart for recording wave-lengths, condenser settings, etc., of those stations which require careful calibration to tune in. A copy of this chart, printed on stiff card, with hanger, can be obtained free of charge at any of our Branches or from any high-class dealer.

B. 601. SILVERTOWN VERNIOMETER. (Patent applied for.) The Silvertown Verniometer is a most ingenious device for applying slow motion to variable condensers, variometers, etc., consisting of an ebonite dial and knob (0—180°), fitted with worm-wheel, bracket and worm-spindle, micrometer barrel and pointer, complete with fixing screws.
Gear ratio 240—1. Fitted with instantaneous release. Backlash entirely eliminated. Hand capacity reduced to a minimum. Suitable for the following makes of condensers: —Silvertown, Burndept, Igranic, Polar, Sterling, Ormond, Jackson, Devicon, Utility, Ashdown, Lamplugh, Ediswan, Edison-Bell, Bowyer-Lowe, Atlas, W. & M., A.J.S., etc. State type of condenser for which they are required when ordering. Price 6/- each.

B 601.

MAKERS:

THE SILVERTOWN COMPANY

106, CANNON STREET, E.C.4. Works: SILVERTOWN, LONDON, E.16.

BELFAST: 75, Ann Street.
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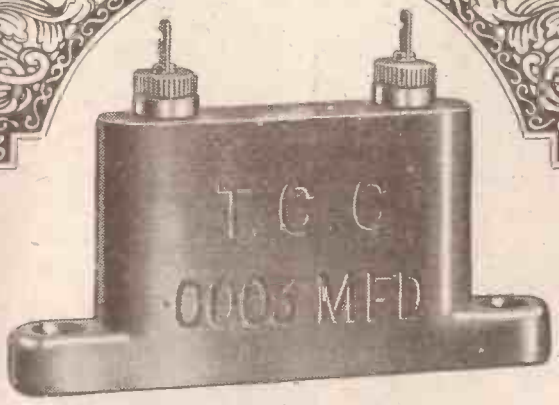
CARDIFF: Pier Head Chambers, Bute Docks.
DUBLIN: 70, Middle Abbey Street.
GLASGOW: 15, Royal Exchange Square.
LEEDS: 1, New York Road.
LIVERPOOL: 54, Castle Street.
LONDON: 100 and 102, Cannon Street.
MANCHESTER: 16, John Dalton Street.
NEWCASTLE-ON-TYNE: 59, Westgate Road.
PORTSMOUTH: 49, High Street.
SHEFFIELD: 88-90, Queen Street.

B 506.

B. 506. CRYSTAL HOLDERS. Mounted on ebonite base (3 in. x 2 in.) with glass tube to protect crystal from dust. The cat's-whisker is of silver wire. A feature of this crystal holder is that it can be easily taken to pieces and set up again. Price 4/- each.

B. 530. Single-Valve Type. MOUNTED VALVE SOCKETS. Single, double and triple. Suitably engraved for use with valves or for plug-in type high-frequency transformers. 5/6, 9/- and 13/6 each.

B 530.



The new T.C.C. Mica Condenser

Here is the latest T.C.C. production—an accurate mica Condenser in a green moulded case with duplex terminals. Owing to its convenient shape it takes up very little room on the panel, and because it is sealed from below instead of from above it is proof against the heat of the soldering iron. For those who do not wish to solder their connections, a convenient milled head is provided to ensure a perfect electrical contact.

No need to ask if it is accurate —the name T.C.C. guarantees it.

Every T.C.C. Condenser—whether Mica or Mansbridge—has to pass so many tests before it is released for issue that its accuracy within a very small percentage of error is a foregone conclusion.

Your fixed Condenser—on which so much depends—is one of the least expensive of all the components you buy. The difference in cost between one of doubtful reputation and a genuine T.C.C. may only be a copper or two yet the difference in results may be phenomenal. Experts say that the majority of faults in home-built receivers are traceable to the use of inferiorand badly insulated condensers.

If your own Set is not giving the results you should expect, suspect the condensers—substitute T.C.C. Mica (for small values) and T.C.C. Mansbridge (for large values) and you obtain a permanent insurance against Condenser breakdown.

Prices:

No. 33, all capacities between ·004 and ·001 mfds. 2/4

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From all Wireless Shops

T.C.C. Mica Condenser

Advertisement of Telegraph Condenser Co. Ltd., Kew, Surrey.

Gilbert Ad. 3916.

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THE PERFECT SYNTHETIC CRYSTAL

EASIEST FIXING.
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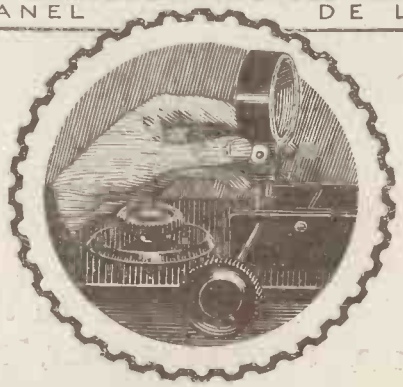
THE GUARANTEED CRYSTAL

THE PANEL DE LUXE



THE real wireless enthusiast goes over his Set inch by inch. Shortening a connection here—replacing an inefficient component there, he knows that success depends on the most careful attention to seemingly insignificant details. Such men are now standardising on Radion as the panel material de luxe.

¶ *Radion is available in 21 different sizes in black and mahoganite. Radion can also be supplied in any special size. Black 1d. per square inch, mahoganite 1½d. per square inch.*

RADION

American Hard Rubber Company (Britain) Ltd.

Head Office: 13a Fore Street, London, E.C. 2

Depots: 120 Wellington Street, Glasgow. 116 Snow Hill, Birmingham.

Irish Agents: 8 Corporation Street, Belfast.

Gilbert Ad. 3909.

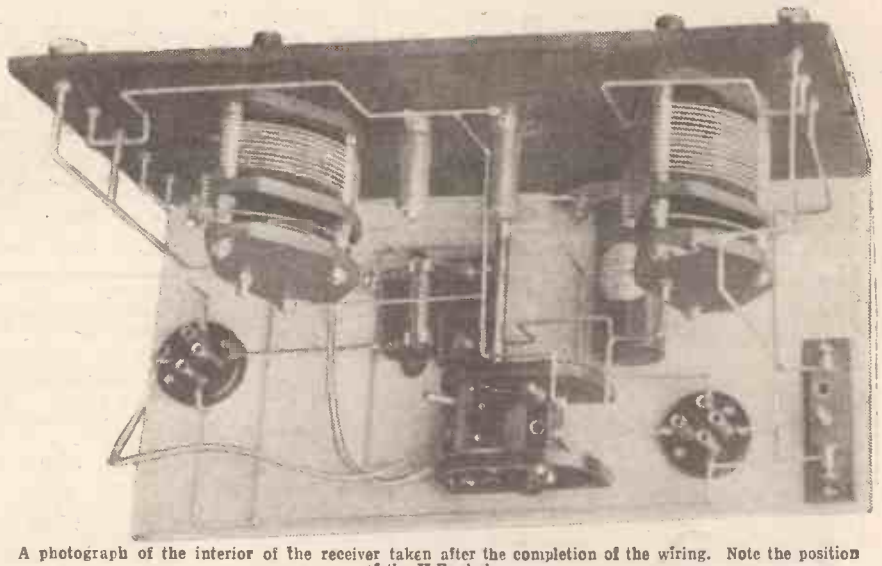
A LONG RANGE TWO-VALVER.

(*Continued from page 640.*)

to be employed in the grid circuit of the first valve, always advantageous when dealing with the broadcast wave-lengths.

A 50-turn grid coil was placed in the "fixed" side of the two-coil holder, and a 50-turn reaction coil was used. Tuning on both condensers was sharp, and it was possible to cut London completely out for some of the higher wave-length broadcasting stations during daylight—no mean accomplishment for two valves used within three miles of 2 L O's aerial.

Various types of valves were used, and it was found that, provided the valves were chosen for the test they had to perform, the set gave consistently good results. By this is meant that for the H.F. side of the set a valve designed for H.F. amplification should be employed, and a valve suitable for use as a detector should be placed in the detector valve holder.



A photograph of the interior of the receiver taken after the completion of the wiring. Note the position of the H.F. choke.

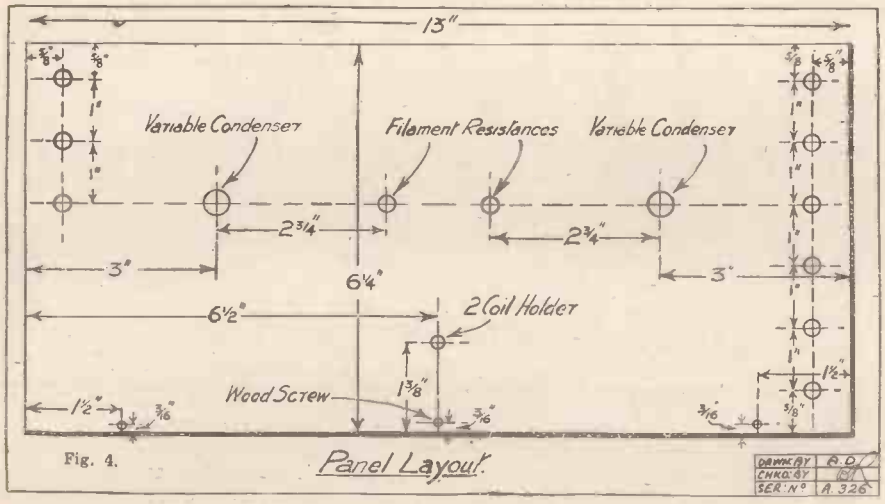
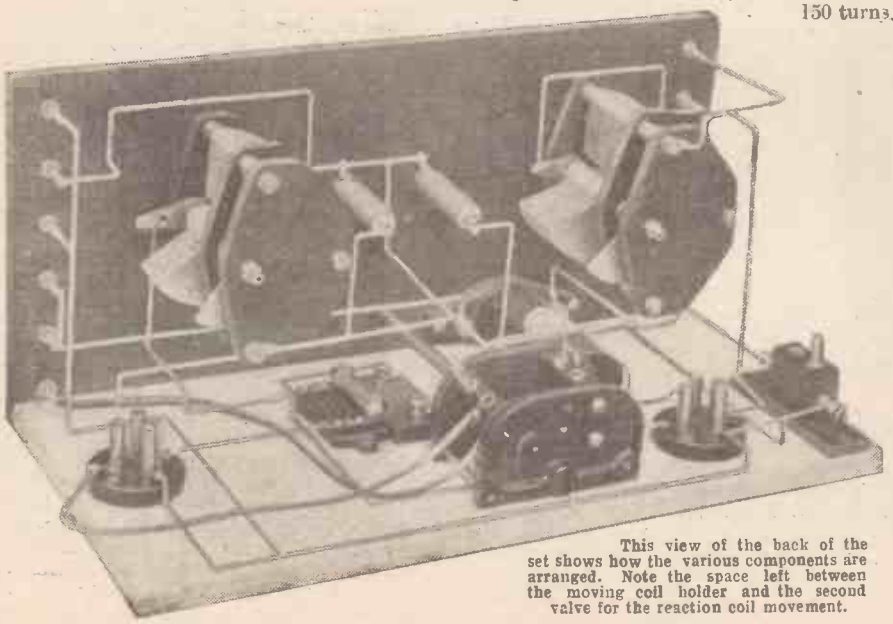


Fig. 4. Panel Layout.

For Daventry larger coils will, of course, be needed, the aerial coil being of 200 turns, the grid coil of 200 turns, and reaction of 150 turns.



This view of the back of the set shows how the various components are arranged. Note the space left between the moving coil holder and the second valve for the reaction coil movement.

POINT-TO-POINT CONNECTIONS.

Aerial parallel terminal to fixed plates of ·0005 variable condenser, grid of first valve, and A.T.I. socket.

Aerial series terminal to moving plates of ·0005 condenser. Earth terminal to plug of A.T.I. holder, L.T. — to H.T. —.

Plate of 1st valve to one side of H.F. choke and also one side of coupling condenser, other side of which connects to one side of grid leak and condenser, the other connection of grid leak and condenser being taken to grid of second valve. The other side of H.F. choke is taken to H.T.+. At the junction of the two fixed condensers a lead is taken off to the moving plates of the ·0003 mfd. variable condenser, and to one side of the grid coil, the other side of grid coil being connected to fixed plates of variable condenser and to L.T. +, which also connects to the two rheostats, the other sides of which connect to one filament leg of each valve holder. The L.T.– is connected to the remaining filament legs. The reaction coil is connected to plate of Det. valve, and 'phones by means of flex leads; the other 'phone terminal is connected to H.T. +.

LIST OF COMPONENTS.

	£ s. d.
1 Panel, 13 in. × 6½ in. × ¼ in. 1 Box to fit, 6½ in. deep (Peto-Scott)	1 6 0
1 Var. cond. ·0003 mfd. with vernier (Peto-Scott) ..	9 3
1 Ditto ·0005 mfd. (Peto-Scott)	10 6
1 Coil holder extension handle (L.E.S.)	1 0
1 Grid leak and condenser (Dubilier) ·0002 and 2meg.	5 0
2 Filament rheostats (Lissenstat minors)	7 0
2 Baseboard mounting valve-holders (Burwood)	2 6
1 H.F. choke (Lissen) ..	10 0
9 Terminals W.O. type ..	1 1
1 ·0003 mfd. fixed condenser (Lissen)	2 0
1 Two-way Lotus coil holder ..	7 0
1 Single coil holder (panel mounting type) (Peto-Scott)	1 6
Wire, screws, transfers, etc. ..	2 6

Technical Notes

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

The "U.C." Valve.

SINCE the publication of the new 1926 Unidyne circuit and the advertisement of the "U.C." four-electrode valve, an enormous number of inquiries have been received from readers (many of them addressed to me) as to whether this U.C. valve is equal in quality to the other four-electrode valves previously sold, and whether it is really reliable for the purpose in view.

In reply to these questions, perhaps I may enter into a little explanation. The letters U.C., which have been adopted as a trade mark by the sellers of the valve, are merely the initial letters of the words "Unidyne circuit." I am informed, however, that the valve itself has been specially designed for use in Unidyne circuits, and that special arrangements have been made for it to be sold, for a limited period, at a reduced rate, in order to enable a larger number of readers to make up the 1926 Unidyne circuits. The price, I understand, will, however, soon be raised to that of 13s. 6d. I also am given to understand that the four-electrode U.C. valves are all being carefully tested before sale, in order to make quite sure that they are perfect for the work in hand. The proper operation of the Unidyne sets depends upon the parts being correctly chosen in accordance with the instructions of the inventors, and upon the valve being properly tested for the work. The U.C. valve has been tested by the testing department of this journal, and reported on in the highest terms; they are the valves which the inventors themselves use, and which they find excellent in every way.

Unidyne Parts.

Owing to difficulties experienced by many constructors in various parts of the country in getting the necessary parts for making up the Unidyne sets, the inventors, Messrs. Dowding and Rogers, inform me that they have made arrangements with this journal for temporary licences to be given, under their patents, to retailers in different parts of the country to supply sets of parts. All retailers anxious to do this should communicate with Messrs. Dowding and Rogers, care of POPULAR WIRELESS. I understand that one stipulation will be made, that retailers must satisfy the inventors and POPULAR WIRELESS that they are offering satisfactory parts, so that purchasers shall be sure that the parts will make up a satisfactory and efficient set. All dealers anxious to retail complete sets should also communicate with the inventors, in order to obtain the necessary permission.

An Excellent Proposition.

By the way, whilst on the subject of the Unidyne I should like to say that, although I was one of those who were somewhat sceptical in the early stages, a year or more ago, I have now been fully convinced, by the actual performance of sets which I have myself tried out, that the Unidyne, when properly made from proper parts, is an excellent proposition as a receiver, and, moreover, is a set with which many most interesting experiments may be made. I believe that in the near future even further improvements and developments in it will be made, and that it is full of possibilities for the keen experimenter.

Resistance Coupling.

I should like to take the opportunity of giving a simple explanation of resistance coupling, which seems not to be clear to many of my correspondents. Resistance coupling, as a matter of fact, is simplicity itself. Incidentally, it is a method of coupling which is adapted to both direct and alternating currents.

Suppose we have a primary circuit in which current is flowing—let us suppose from a battery for the sake of simplicity. If there is a resistance in this circuit, there will be a voltage difference at the ends of this resistance, and the amount of this potential difference, in volts, will be equal to the current flowing through it, in amperes, multiplied by its resistance, in ohms. Since the current is often represented by the letter I, and the resistance by R, this drop of potential is sometimes called the "I.R. drop."

If tappings are taken across a portion of this resistance, and these leads are taken to another or secondary circuit, we shall evidently be able to reproduce in the secondary circuit the variations which take place in the primary. If the tappings are wide apart, so as to include a considerable proportion of the resistance in the primary circuit, the coupling will be greater than if the tappings are close together, embracing only a small portion of the resistance. Thus the degree of the coupling may be varied in a very simple manner.

Resistance coupling, apart from its simplicity, has the great advantage that interaction between circuits is avoided, and furthermore, there is much less liability to distortion than with transformer coupling.

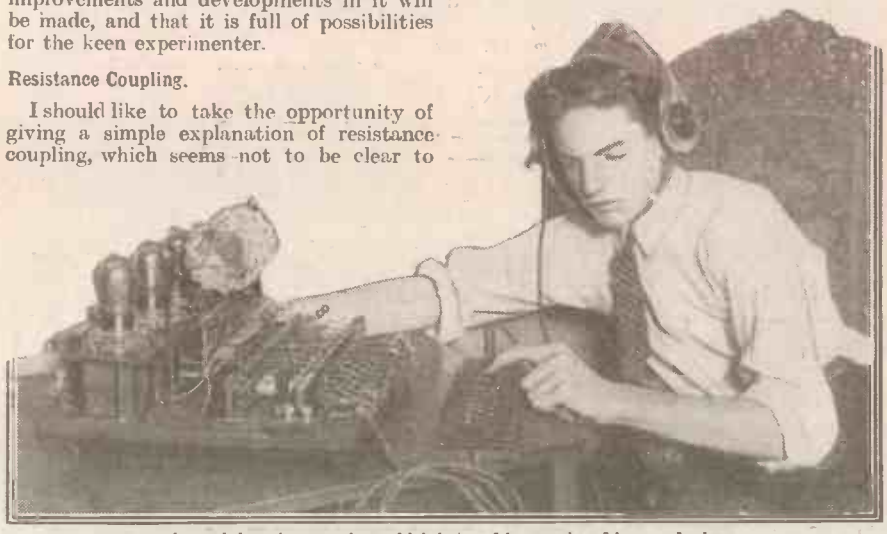
Further hints on different methods of coupling and their special advantages will, however, be postponed for another occasion.

Plastic Broadcasting.

The new stereoscopic or plastic broadcasting is making rapid headway and promises to become a popular development of the art. I think I gave a short description of the *modus operandi* in these Notes some little time ago. The principal drawback, of course, is the fact that two separate receiving systems are necessary, each feeding a separate headphone to each ear.

Cage Aerial Spreaders.

I noticed an interesting little device sent by a correspondent to one of the foreign papers the other day—I forget the paper:



A novel American receiver which is tuned by a series of keys and relays.

I think it was a German one—in which a gramophone record was put to novel use as a spreader for a cage aerial.

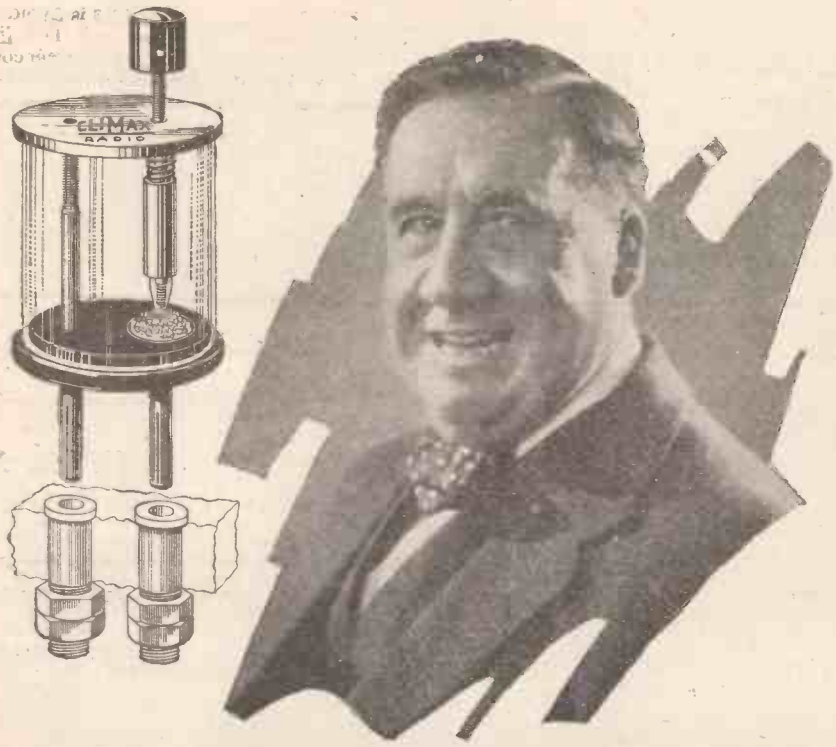
A number of holes were drilled in the record near the edge, and the wires of the aerial were threaded through these and secured in any appropriate manner. The material of the record has considerable mechanical strength, so that, apart from the drilling of the holes, which requires some little patience if a fracture is to be avoided, the idea would seem to be a useful one.

Ultra Short Waves.

Some remarkable experiments have lately been carried out by a Russian woman physicist in connection with the production of extremely short wireless waves. It will be remembered that Nichols and Tear, in America, recently produced wireless waves of a wave-length of about half a millimetre, and identified these with "heat waves" of about the same wave-length. They also succeeded in receiving heat waves by wireless methods. The Russian physicist mentioned above, however, has produced waves of a length of only 0·08 mm.

The generator which she uses for these experiments is very simple in principle, although the technique of its operation is at present somewhat troublesome. A

(*Continued on page* 667.)



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That is the great difference between the Climax Popular Plug-in Detector and the ordinary Catwhisker Detector. IT DOES STAY PUT.

You see it all hinges on the special catwhisker—The Climax Auto-micrometer Catwhisker (Prov. Pat. No. 21001/25).

The trouble with crystal sets in the past has been the difficulty to find a sensitive spot on the crystal and to keep it when found. The crystal has usually had the blame, but the seat of the trouble has really been the type of catwhisker employed. The Climax Auto-micrometer Catwhisker is undoubtedly the common-sense solution of crystal setting difficulties. The unique design based on the stylographic pen point eliminates all difficulties. In addition an independent pressure is maintained between the catwhisker container and the crystal surface which ensures complete stability when set.

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CLIMAX POPULAR CRYSTAL SET.

A perfectly finished set, remarkable for its high efficiency tuning system and fitted with the wonder Climax Auto-micrometer Catwhisker. The tuning system, which is by specially designed "D" shaped variometer gives remarkably close coupling, wide wavelength variation, fine tuning and good selectivity. Long wave tuning is accomplished by an adjustable plug-in coil giving unusually close tuning.

CLIMAX POPULAR CRYSTAL SET fitted with Climax Popular Plug-in Detector with Climax Auto-micrometer Catwhisker and Climax Superb Crystal. Wavelength range 300-500 metres.

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UNDOUBTEDLY THE BEST FRAME AERIAL

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This frame aerial is very attractive in appearance, extremely efficient in operation, remarkably simple in construction, and is very easily folded into a conveniently portable form. The stand also folds. It is offered at a particularly attractive price

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The Climax Insulated Shock Absorber Set—for aerial insulation de luxe.—

One pair of Climax Insulators linked with a Climax Shock Absorber spring at each end of a single span wire, means perfect insulation, while the aerial wire is relieved from sudden strains due to mast sway or halyard rope shrinkage.

Each Climax Insulator (Regd. Design No. 708718) will stand four times the flash-over voltage of the ordinary insulator, while it has far less capacity to earth.

It will stand a direct pull of hundreds of pounds. It is entirely non-hygroscopic.

It cannot absorb moisture even if fractured. IT INSULATES PERFECTLY DURING RAINFALL. It is self-cleaning on all surfaces.

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Price 7/6, complete, ready to fix.

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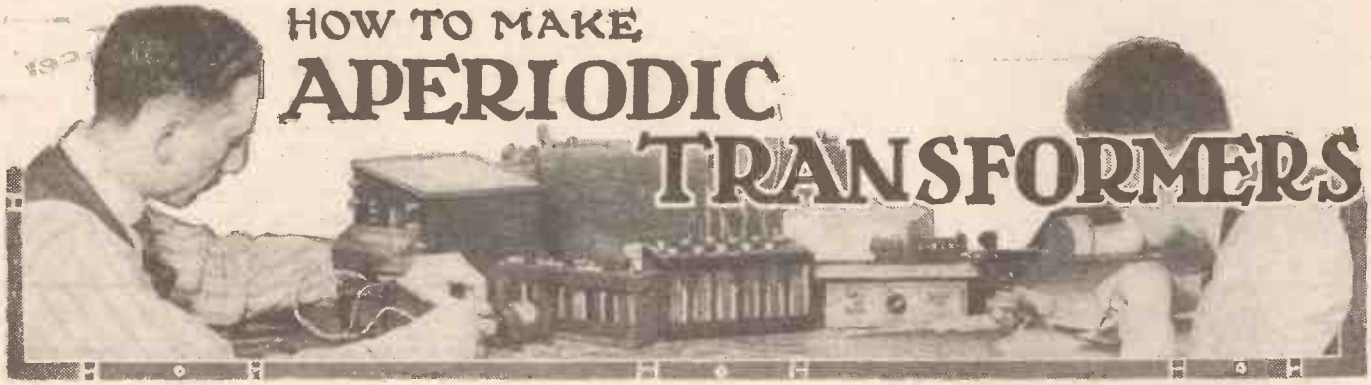


HOW TO MAKE APERIODIC TRANSFORMERS

A Practical Article for Constructors.
By
O. J. RANKIN.

THERE is no doubt that the aperiodic transformer method of coupling high-frequency valves is becoming very popular amongst experimenters, not only because such a system enables one to use three or even four stages of H.F. amplification successfully, and with a minimum number of controls, but also because of the general simplicity in the construction and use of this particular type of H.F. transformer. An aperiodic transformer, as its name implies, is simply an untuned transformer, and although it is not capable of giving the same degree of amplification per valve as an ordinary H.F. transformer or tuned anode coupling, it is nevertheless far more stable in operation, an obvious fact considering it would be impossible to control three or four stages of H.F. amplification when employing ordinary transformer or tuned anode couplings.

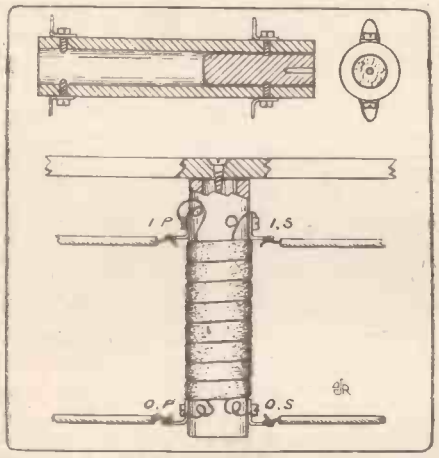


Fig. 1.—Constructional details of one type of transformer.

Method of Winding.

An aperiodic transformer consists of two single layers of No. 36 Eureka resistance wire wound one over the other on a 1 in. diameter ebonite former, which may be about 4 in. long if the transformer is intended for use on the usual B.B.C. wavelengths. The first layer constitutes the primary and the second the secondary winding, a sheet of waxed paper being placed between the two layers and an outer protective covering of Empire tape bound tightly over the completed windings.

Using a 1 in. diameter former the effective number of turns for any wave-length can easily be determined by observing the simple rule: One transformer turn per metre of wave-length for both primary and secondary windings. Thus, assuming the H.F. circuit is to be tuned to 365 metres (2 L O), we would wind on 365 primary turns and 365 secondary turns. This would give us a fair margin either side of the actual wave-length desired.

Fine Wire an Advantage.

Similarly if the receiver is to be tuned to 500 metres, then 500 primary and 500 secondary turns would be required. The finer the wire used the greater the latitude in tuning, or in other words the transformer becomes more aperiodic and consequently more efficient when very fine wire is used; but owing to the difficulties encountered in handling wire finer than No. 36 gauge, the reader must, unfortunately, overlook this fact unless, of course, he happens to possess a delicate winding device.

Fig. 1 shows a very simple but thoroughly efficient form of aperiodic H.F. transformer

(*Continued on page* 648.)

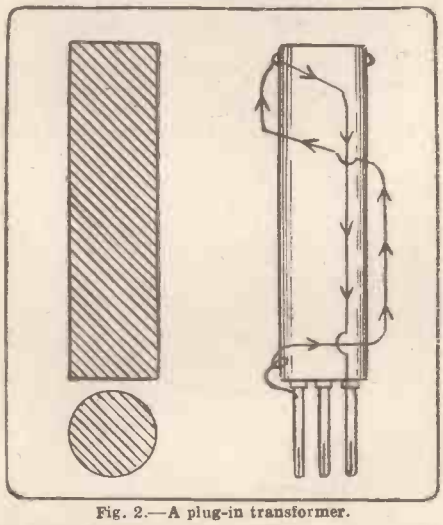


Fig. 2.—A plug-in transformer.

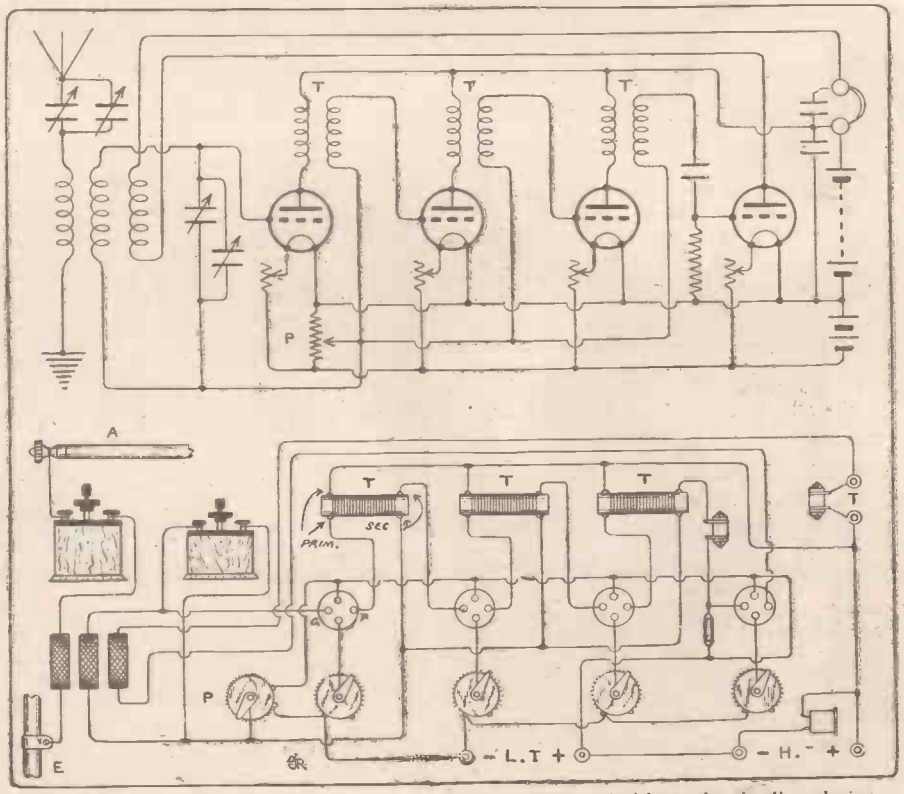


Fig. 3.—These diagrams show in theoretical and pictorial form an efficient four-valve circuit employing aperiodic transformers.

APERIODIC TRANSFORMERS.

(Continued from page 647.)

which is wound, as described above, to cover the wave-length of 2 L O or other stations working on similar wave-lengths. This consists of a 4 in. length of matted ebonite tubing, which is fitted with four small screws and brass soldering tags, and plugged at one end with a piece of round hard wood, this being secured to the inside of the tube with a little seccotine or by means of one of the tag screws.

The plug forms a fixing lug for mounting the component on the under side of the receiver panel by means of an ordinary countersunk wood screw. The sketch is self-explanatory, and needs no further comment. It should not be necessary to add that the ends of the windings should be soldered to the screw heads, and that the circuit leads to the instrument should be soldered to the tags provided for that purpose.

Interchangeable Transformers.

Fig. 2 indicates a simple method of arranging the transformer on the interchangeable system, similar to the orthodox plug-in mushroom type of H.F. transformer. Here the former consists of a length of solid ebonite rod, which is drilled and tapped at one end, and fitted with four ordinary valve pins which engage four panel sockets in the usual way. The method of winding the former is as follows: Commence by soldering the end of the wire from the bobbin to one filament leg (shown on left in diagram), and wind upwards towards the top. Anchor the end of the winding to a small screw near the top of the former (left) and leave a free end of wire about 6 in. long.

Wind on and attach the secondary winding in the same way, and then bring down the two leads, over the outer protective binding of tape, and solder them to their respective pins. The leads can be held flat against the sides of the transformer by means of a few narrow strips of tape. The arrows shown in Fig. 2 should make the idea quite clear; both layers of wire are simply wound from the base of the former upwards, the ends being anchored under the heads of the small clamping screws and subsequently brought down to the base and soldered to the pins opposite those from which the windings were commenced. In all cases both windings should be in the same direction.

A Useful DX Circuit.

Fig. 3 shows a four-valve circuit employing three stages of aperiodic H.F. amplification, and this should be of interest to any "distance merchant" who has not yet tried such an arrangement. Except for the aperiodic transformers (T), all other components and circuit connections are as usual; the circuit is more or less "straight"—simply a standard 1-V-0 circuit, with two extra stages of H.F. amplification, and with the three transformers untuned. The ·001 mfd. variable condenser in series with the primary tuning coil, and the ·0005 mfd. variable condenser in parallel with the secondary coil, are both shunted with 3-plate vernier condensers, which are preferably embodied in the one instrument as shown in the pictorial or practical circuit arrangement directly beneath the conventional diagram.

The reaction coil may be coupled to the secondary coil as shown, to the aerial coil, or to the first aperiodic transformer, as desired. In either of the two former instances an ordinary three-coil holder would be used, and in the latter case the primary and secondary coils would be mounted in a two-coil holder and some special device rigged up for varying the coupling between the first transformer and the reaction coil. To control any tendency to self-oscillation the O.S. leads of the transformers are all joined to the arm of a 400-ohm potentiometer, P, which is bridged across the filament battery in the usual manner.

Other arrangements are as usual, the orthodox ·0003 mfd. grid condenser and 2-megohms grid leak being connected in the grid circuit of the rectifying valve, a 2 mfd. Mansbridge-type condenser being placed across the H.T. battery, and the usual ·002 mfd. fixed condenser across the telephones. It is most important that all transformers in a multi-stage aperiodic H.F. amplifier should be of identical value.

WHAT STATIONS SHOULD I RECEIVE?

FROM A CORRESPONDENT.

EVEN in these days, when you might have thought everyone possessed a wireless receiver, one is continually hearing the question: What kind of a set should I use to receive such and such a station?

The range of a receiver depends upon a number of factors, not the least of which is the efficiency of the aerial. Assuming you have a good outdoor aerial, you ought to be able to receive on a crystal set from a distance of 15 to 20 miles, using good headphones, and of course, cases are on record of amateurs receiving on a crystal set from enormously greater distances. If you use a crystal set with an indoor aerial, 5 miles may be put down as the limit of general reception. If using a crystal set with a loop aerial (not a wise thing to do) you might get 1 to 3 miles. All distances refer to results obtainable from main B.B.C. stations. Where relay stations are concerned they should be reduced by about 75 per cent, while in the case of 5 X X longer distances will be recorded.

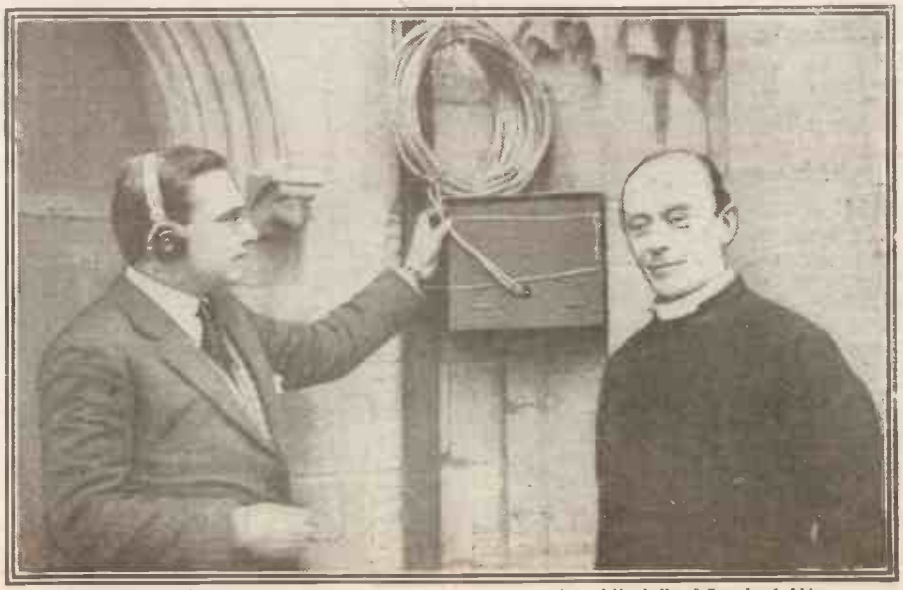
Now if you use a valve detector with good outdoor aerial, you may receive from anything up to 50 miles, here again cases being on record of much greater distances of reception. Using an indoor aerial, perhaps 30 miles might be expected, whilst with an outdoor aerial and a loud speaker you might get 5 miles.

If you go in for L.F. amplification, say two stages, you should get really loud reproduction in the loud speaker from a distance of 35 miles, and in 'phones from 150 miles. The difference here is not in the distance you can reach, but in the loudness of the reproduction you get.

H.F. Amplification.

If, in addition to all this, you want distance of reception, you must go in for one or more stages of H.F. amplification. The high-frequency amplifying valve (or valves) gives you amplification of the incoming signals before they are passed to the detector.

For receiving the local station only, it is quite unnecessary (and, in fact, undesirable) to use H.F. amplification. All you need is a loud speaker and one or two stages of L.F. amplification.

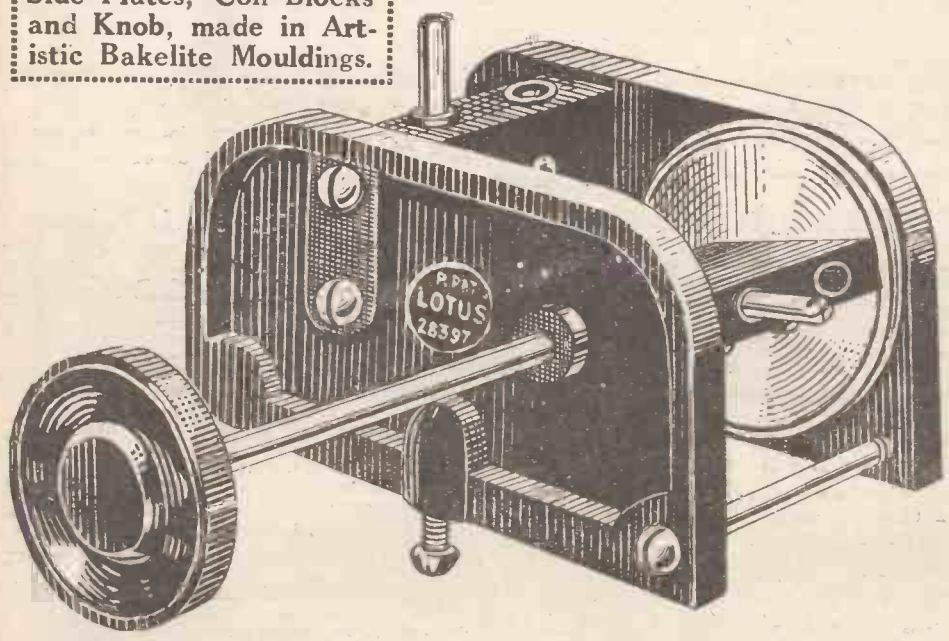


Capt. West (left) carrying out tests before the recent broadcasting of the bells of Crowland Abbey.

Scrap that obsolete Coil Holder and get the utmost pleasure from your set by fitting a

Lotus Geared Vernier Coil Holder

Side Plates, Coil Blocks and Knob, made in Artistic Bakelite Mouldings.



You have experienced that annoying and irritating fading away of volume after tuning your coils. This is due to the moving block falling. **The Lotus Moving Block CANNOT FALL.**

The Vernier movement comprises three sets of enclosed precision machine-cut gears, and reduces the speed of the moving coil block by eight times

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"I take the opportunity of congratulating you on putting such a sound engineering job on the market as this coil holder at such a reasonable price. After experimenting for three years, I have not found its equal."

Ask to see a Lotus and you will buy it

THERE ARE TWO TYPES OF LOTUS COIL HOLDERS
For Outside Panel Mounting: Two-way, 7/-; Three-way, 10/6. For Inside Baseboard Mounting with 6 in. handle: Two-way, 8/-; Three-way, 12/6.

THESE CHARMING and EFFICIENT "LOTUS" COIL HOLDERS HAVE ACHIEVED SUCCESS THROUGH A DISCERNING PUBLIC.

The best appreciation of the superiority of the Lotus is that it has the largest sale of any type of Vernier Coil Holder.

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CURRENT TOPICS.

By THE EDITOR.

The Amateur and the B.B.C.—Great Interest Aroused—Captain Eckersley's Opinion of the Unidyne—A Unidyne Announcement.

WHEN the B.B.C. agreed to allow an amateur to bring his set down to the Hayes station and "try it out" against the special sets used for picking up foreign programmes, it is rumoured that the engineering staff shivered in their shoes. Other reports show that copies of "P.W." were at a premium in the Hayes district on the day of the test. . . Whether or not the above reports be true we cannot say, but it must be admitted that, if the B.B.C. engineers did shiver in their shoes, they shivered in vain, because the attempts made by the amateur to obtain a better collection of foreign programmes was not conspicuously successful. That is—as far as the listener was concerned. What really happened at Hayes is another story.

Due to judicious inquiries we are acquainted with the name and qualifications of the amateur who issued the friendly challenge to the B.B.C.; and we also know that, unfortunately, he was using a reflex set on the night he went down to Hayes and backed his set against the Neutrodyne receivers used by the B.B.C. As our readers probably know, when the B.B.C. manage to tune in a foreign station, the set is switched over to the land line amplifiers, and the result passed along to the London station.

Great Interest Aroused.

We understand that several yards of flex separated the receiver at Hayes from the land-line amplifiers, and consequently, when the amateur (whose identity we have promised to keep secret) managed to tune in a good healthy signal from a foreign station, and then switched it over to the amplifier—the set, being a reflex, behaved badly; the wave-length changed—pretty considerably we should say, judging by what we heard of the experiment—and our unfortunate amateur found all his adjustments thrown completely out of gear.

However, he has had a useful experience, and when he challenges the B.B.C. again he will probably leave his reflex set at home. In any case, he deserves hearty congratulations for a real plucky attempt. We learn that he picked up some stations, free from interference, which the B.B.C. had consistently failed to do, and had it not been for the unfortunate capacity effects caused by the connections to the amplifiers, it is quite likely that some foreign programmes would have been relayed with considerable success. It is to be hoped that the B.B.C. will give the amateur—and others of that ilk—another chance; whatever the results, the experiment aroused a great deal of interest. That in itself was valuable.

* * *

We would like to draw the attention of our readers to the opinions of Captain Eckersley on "Methods for doing away with H.T. batteries." Under the words just quoted he devotes about a page and half to the question in his interesting book, "All About Your Wireless Set."

We quote from Captain Eckersley:

"A good deal of publicity has been given to a circuit which derives its H.T. from the L.T. battery. Any valve connected this way has, obviously, a general anode potential, which is greater than the filament; one end of the anode, one may say, is 6 volts above the filament, and thus all the effects described in Chapter IX. can be manifest.

"With the three-electrode valve, the crowd of electrons between grid and filament

One of the huge "winsulators" (self-cleaning insulators invented by Mr. G. V. Dowding, Tech.-Editor) used on the Fleetway House aerial.

(called the space charge) prevents lively effects taking place, unless the anode is made more positive than the ordinary 6 volts supplied by the L.T. battery. Could we, however, obtain a method for thinning the crowd, or draining away surplus electrons from between grid and filament, or more scientifically neutralising the space charge, this same difficulty is not manifest. This is done in the so-called Unidyne circuit by connecting a fourth electrode to drain away the space charge.

A Very Fair Account.

"The inventors of the device claim that a four-electrode valve connected in this way is as sensitive with 6 volts plate potential as the three-electrode valve with 60. This claim has, I believe, been substantiated. I am unaware if the method is seriously suggested for use with L.F. amplification, but from first principles it is a little difficult to see how distortionless amplification can be obtained in this way.

"There seems to me a danger in expecting that all sets using H.T. batteries will become immediately obsolescent. At any rate, quality is more use concentrating upon than quantity, but if the device can give us as pure amplification as the more conventional methods, it should appeal to many who fight shy of H.T. batteries. I am certain that H.T. batteries will give way to power derived from house mains in time; this is the obvious conclusion."

The foregoing quotation from Captain Eckersley's book is exceedingly interesting in view of the development of the improved 1926 Unidyne.

Captain Eckersley has given a very fair account of the original Unidyne, and admits, by the style of his text, that he has not tested a two-valve Unidyne (Det. and L.F.) and therefore refrains from flatly refusing to agree that good L.F. amplification can be obtained with an H.T.-less receiver.

He quite legitimately admits he finds it difficult to believe how distortionless amplification can be obtained—but that, we feel, could be overcome by sending a set to Captain Eckersley to test.

We have, therefore, made arrangements to loan a two-valve 1926 Unidyne set to Captain Eckersley in the hopes that he will find time to try it out and judge for himself whether our claim—that the Unidyne, among other things, gives distortionless reproduction—is justified or not.

* * *

In another page in this issue an announcement appears concerning the retailing of Unidyne parts. We have, as will be seen, made arrangements whereby licences will be granted for limited periods to any reputable British manufacturer or trader without any other obligation than those enumerated below. The Unidyne is now, if possible, more popular than it has ever been, and it is hoped that the above step will still further benefit the "Unidynites" of this country.

The licensed periods will vary in length, with circumstances, and in certain cases will no doubt run into several months. Applications will be judged on their merits and an undertaking provided that the firms concerned will conscientiously fulfil their obligations to constructors and supply first-class and suitable components at a reasonable price. Readers will realise the value of the above concession both from the point of view of the trade and the amateur.

CAUSING INTERFERENCE

By H. V. WILLIAMS.

"It is this striving to reach the limits of a receiver's capabilities that causes most of the trouble."

THE last wire connected into position, the last transfer neatly secured, and the task is finished But is it really finished? Doubtless the so-far successful constructor is at first apt to imagine it is, but he is wrong.

In the progress of an amateur probably the hardest job of all is that one which has to be faced after his first set is built, and that is to get results, and get results without interfering with all the other listeners in the neighbourhood. Constructors must, for the sake of the "listening" community, realise that almost any valve set employing reaction can, in certain circumstances, be transformed into a small transmitter capable of transmitting waves which can interfere with those due to the broadcasting station.

"Crystal Scratching."

The above point is so important that it could not be given too much prominence. In the case of a crystal set, interference with immediate neighbours can be caused by undue "crystal scratching." The interference evinces itself quite noticeably in the form of harsh grating noises which can be sufficiently loud, when sensitive valve receivers are being used, to cause considerable annoyance. Again, in the case of a valve set in which no reaction is employed, excessive tuning control juggling will, at times, interfere with the reception of neighbours. It causes a kind of "fading" and is due to an interaction between aerials.

Therefore, whatever the type of set the constructor has built, it will be seen that while he is adjusting it "on aerial," he can be causing at least a certain amount of trouble in the ether. Although an owner of a valve set using reaction is handling dynamite in comparison with the "coal" of the crystal man, between the two extremes is a long, long programme of squeakings, wailings, gratings and fading which nightly battles with, and, incidentally, scars the broadcast waves of B.B.C. and other stations.

Having connected up his first set, or the first set of a new type, the amateur should not then and there endeavour to squeeze the last ounce out of it. It is this striving to reach the limits of a receiver's capabilities that causes most of the trouble. Quite apart from that point of view, it should be remembered that quality of reception will suffer if a valve set is worked right on the point of oscillation.

Handling Tuning Controls.

The constructor, bearing the foregoing in mind, should therefore make it a rule to allow plenty of margin in point of sensitivity in his set so that he can get "tuned in" and leave well alone with the minimum of delay. Haphazard knob and dial twisting will not accomplish this purpose, he must set about the job with some well-ordered system in mind.

A crystal set will present but little trouble. Providing a broadcasting station is well within range and that aerial and earth conditions are O.K., almost as soon as the cat's-whisker makes contact with the crystal music or speech should be heard. When it is, the detector should be adjusted irrespective of the tuning controls until loudest signals result, then the tuning can be varied until maximum volume is obtained, and then listening-in should follow, not an evening of "crystal scratching." There is a distinct limit to what can be extracted from a crystal set, so it is useless to search and search for that "little extra"; most probably it doesn't exist.

Before a valve set is connected to the aerial and earth for the first time the batteries and telephone or loud speaker should be joined up and the valves lighted, remembering that a very dull red is sufficient "light" for dull emitters. The reaction coil should then be separated as far as possible from the coil to which it is coupled and then earth and aerial should be connected.

We wonder whether Mr. Whitman, an American inventor, is causing interference with his new coils which, acting as small but efficient aerials, he is seen manipulating in this photograph.

We are taking it for granted that the set and aerial and earth are in order and that signals *should* be obtained. Now this being the first set and one built for broadcast reception, sufficient margin should exist to allow signals to be tuned-in *without resource to the reaction coil as a primary adjustment.* That is, by keeping this coil as far apart from the coil nearest to it, it should be possible to hear the broadcasting station when the other controls are arranged in their correct order.

These other controls will generally consist of variable condenser dials and filament resistances. The former should be carefully adjusted until optimum volume results, while the latter should be handled so that this condition obtains with the valve filaments at their dullest possible temperature. It is an excellent rule to always turn down the valves as near as possible to that point when further decrease in brightness produces weakening of signal strength. There is a definite point when increased filament temperature will not cause stronger signals but every degree of heat above this will tend to shorten the life of the valves.

Subsequently the reaction coil can be very, very carefully brought nearer to its companion, and considerable increase of volume will result, although simultaneously with this adjustment the setting of the variable condenser should be very slightly altered as the reaction control affects tuning slightly.

Identifying a "Squeal."

The moment that music or speech becomes harsh and distorted the reaction coil should be brought back, for the set is oscillating and transmitting an interfering wave. It can be left in a position just a little "behind" the danger point, but for the time and until the constructor has mastered all the other controls he should not attempt to "juggle" about with it until it is so close that a movement of the hand near the set causes "squeals." In any case, to obtain such a fine adjustment it is certain that the set must be caused to burst into oscillation, and when it does it will play havoc in the local ether.

It frequently happens that valve sets are made to oscillate badly without their owners realising what is going on. A very simple test will prove whether or not a valve set is oscillating.

If a movement of the tuning condenser produces a howl in the telephones or loud speaker, and this howl varies in pitch with that movement then the set is oscillating. If there are howls and squeaking which vary in pitch when nothing is being moved it is probable that neighbouring "oscillators" are at work. If again there are prolonged "howls" which do not vary in pitch when the condenser or other tuning controls are moved but vary in intensity only, then that again is probably some form of "external" "heterodyning," but not essentially, as what are known as L.F. "howls" can be produced in a set, and these do not obey the above law.

When a set is oscillating all sorts of "mush" comes in. There is a hollow, coarse, rushing sort of sound with a background of thin piping interrupted musical notes (C.W. morse signals), distorted music or speech and harsh grating regular noises due to "heterodyned" spark signals from ships, etc. This is a condition seriously to be avoided for all the time this is happening penetrating squeals will be caused in other receivers.

Not Economical.

Another reason why "oscillating" should not be allowed to take place is because it tends to run down H.T. batteries very quickly. As much as six times the current necessary for excellent signals is sometimes extracted from the H.T. battery when a set is oscillating. From a personal point of view this is an item to be considered, but what is one H.T. battery more or less in comparison with the enjoyment of thousands of listeners, but both can be preserved very easily.

It may be pointed out, and quite rightly

(*Concluded on page* 668.)

A Word to Advertisers

Our Issue for Dec. 12

will be a **SPECIALLY ENLARGED CHRISTMAS NUMBER** with many new and important features.

SECURE YOUR SPACE NOW
NO INCREASE IN RATE

Traders and manufacturers are invited to submit wireless sets and component parts to the "P.W." Technical Dept. for test. All tests are carried out with strict impartiality in the "P.W." Test Room under the supervision of the Technical Editor, and the general reader is asked to note that this weekly article is also intended to provide a reliable and unbiased guide as to what to buy and what to avoid.—EDITOR.

MESSRS. R. I. LTD., have sent us one of their new H.F. Intervalve coupling units. An extract from their own description is as follows:

"The range of wave-lengths covered by this unit is 200 to 4,000 metres, arranged by the provision of five tappings, giving a wave-length in conjunction with variable condensers, as indicated on the table below.

Wave-length metres.
New H.F. Intervalve Unit.

MIN.	MAX. ·0001 mfd. condenser.	MIN. ·00025 mfd.
200	350	450
325	550	700
500	880	1000
850	1750	2000
1650	2600	4000

By referring to this table, it will be seen that the broadcasting wave-lengths of the British stations can be obtained alternately by three separate tappings, which gives a very wide choice for the optimum efficiency of different areas.

"The coil is wound on a grooved insulated cylinder, with double silk-covered wire, and the electrical values of the coil are such that the impedance of each tapping has been calculated to keep the reactance values approximately uniform for all the wave-lengths."

The workmanship and finish of the unit is well up to R.I. standard, which is always of the highest order. It is designed for one-hole mounting, and being very neat and compact occupies but quite a small back-of-panel area.

The mechanical action is excellent, and we note that a similar section shorting arrangement for reducing dead-end effects to that supplied in the R.I. Retro-active Tuner, is included.

On actual test it gave excellent results and operated efficiently over all the ranges. Those given, by the way, we found to be so close to those registered by our own wave-meter that the same instrument might have been used in both cases.

This new R.I. component is priced at 25s., and in view of the fact that it replaces the ordinary tuned anode method where plug-in coils are used, it is quite an investment for the range it covers.

* * *

The risk of "shorts" in the L.T. circuit of a valve set is always present with bare or untidy wiring, and externally to the set quite a number of things can happen to cause such. Therefore the "Protex" accumulator safety device, a sample of

A new C.A.V. loud speaker, the "Tom Tit," which sells at 27/6.

(*Continued on page* 658.)

APPARATUS TESTED.

(Continued from page 656.)

which recently reached us from Messrs. Ward & Goldstone, Ltd., of Frederick Road, Manchester, should prove a valuable gadget. It can be readily attached to an accumulator, and acts as a terminal extension placing in direct series a piece of fine fuse wire. The "Protex" is sold in two types, one as described and the other for replacing inter-cell strap connections, at 1/- each.

* * *

Messrs. Falk, Stadelmann & Co., Ltd., have inaugurated an interesting ballot competition in order further to popularise their already well-known products. A number of prizes ranging from £100 downwards are offered.

* * *

From Messrs. The Engineering Supplies, Ltd., 235, Blackfriars Road, London, S.E., a number of well-made and attractive components were recently to hand. Included among these was a "Yesly" square law variable condenser with vernier (·0005 mfd., 14s.). It is "one-hole mounting," except for an extended pillar which is thoughtfully provided to prevent rotation. Should a constructor object to this little addition he could very quickly whip it off with a hacksaw, but we do not advise this; the one-hole mounting fad is apt to be rather overdone, and we consider the above provision an innovation that should be extremely welcome. In several other respects the "Yesly" variable reveals the hand of the careful, methodical designer. For instance, not only are "pigtails" provided to make an absolute connection to the moving vanes, but these little springs do not, as in some makes, show a definite "unwinding" action and cause "backlash"; ample play is allowed. The action of the "Yesly" is smooth and positive, and the movements of the vernier and main vanes are absolutely independent; there does not appear to be the slightest tendency for the one to move the other. The vernier knob is provided with a small ivorine pointer, one of these happy little refinements that can make all the difference to a component. Certainly the "Yesly" variable can be thoroughly recommended to the attention of our readers.

Of the "Yesly" combined grid leak and condenser, which retails at 3s. 9d., little may be said here, as it has been used on several of our receivers; notably that popular set the "P.W." Continental.

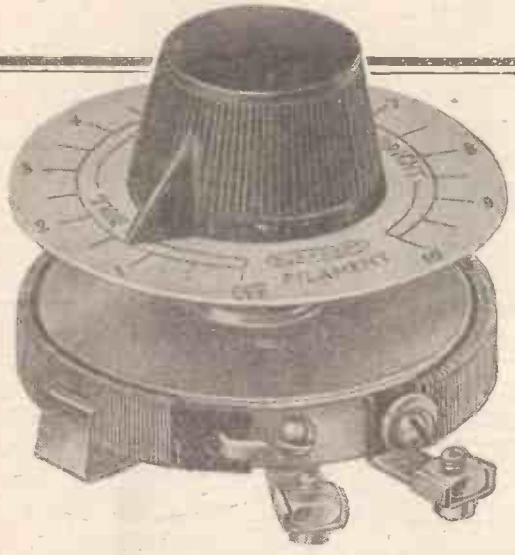
Undoubtedly one of the best filament resistances we have yet examined is the "Yesly" "velvet touch." Of typical American design it is neat, "bright," and has such a velvety movement that it tempts one to turn the knob merely for the pleasure of experiencing its smoothness. Placed under close test observation it operated as efficiently electrically as it does mechanically.

The "Yesly" components can be fully recommended.

* * *

In our August 15th issue we reported upon a weatherproof switch for aerial earthing outside the house from inside. The Jessol Manufacturing Co., Wilstead, Bedford, have now sent us an improved model (price 3/6). Both aerial and earth connections are taken through the spindle which operates the switch. This might be criticised as not a particularly efficient arrangement, but, of course, from a listener's point of view, the loss occasioned by the resultant capacity effect is not a serious matter, and the tidiness of bringing both leads through the one neat fitment is ample compensation. Various lengths of spindle as required are available.

A scenery setting representing a coastal wireless station shown in the Amplion pavilion at the Paris Radio Exhibition.



Burndept Rheostats quickly become popular

ON account of the Burndept reputation as makers of "quality" components, it was natural that the new Burndept Rheostats should attract considerable attention. Not only have they found favour in the public eye, but they have added to the reputation enjoyed by Burndept as producers of the world's best wireless apparatus.

In appearance, efficiency and durability, these new Burndept Rheostats are a distinct advance. The movement is perfectly smooth and absolutely noiseless. The Rheostats are very easy to fit, and are each supplied complete with a scaled aluminium plate, and a neat pointer-knob, ready for mounting on any panel.

In addition to our well-known Dual Rheostat, we now market a Super-Dual Rheostat, which enables one to use *any* valve with *any* battery (up to 6 volts). It is truly described as a "universal" rheostat.

Full particulars and prices of the new Burndept Rheostats will be sent on receipt of the coupon below.

The Burndept Range includes everything for radio reception, from components to complete installations.

BURNDEPT
WIRELESS LIMITED

Head Office: ALDINE HOUSE, BEDFORD STREET, STRAND, LONDON, W.C.2.

Branches and Agents Everywhere.

-CUT HERE-

To BURNDEPT WIRELESS LTD.,
Aldine House, Bedford Street, Strand, W.C.2.

Please send me Publication No. 281;

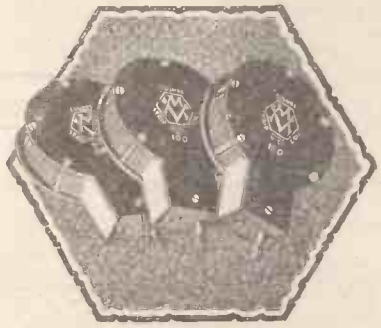
NAME:.....

ADDRESS:.....

.....

DATE:..... Popular Wireless, 14-11-25

N.P.L. Tested Coils at remarkably low prices



COSMOS

STRIP INDUCTANCE COILS

The table given below shows the results of tests carried out by the National Physical Laboratory. As will be seen, the Self-capacity of these coils is exceptionally low, particularly in the coils used for the B.B.C. waveband.

Coil No.	Inductance Micro-henries	Self-Capacity m/mfds.	Approx. Wave Length ·0001 mfds.	·0005 mfds.	·001 mfds.	Price each
20	12·5	9	70	150	210	3 6
25	25	9	100	215	300	3 6
35	50	10	145	300	425	3 6
40	100	10	200	425	600	3 6
50	150	10	245	520	735	3 6
75	300	10	340	740	1040	3 9
100	700	11	530	1130	1590	4 8
150	1000	16	640	1360	1900	4 8
175	1400	18	765	1610	2250	4 8
200	2500	17	1020	2150	3000	5 4
300	5000	24	1490	3060	4260	6 6
400	9000	28	2030	4130	5740	8 6

In addition to Low Self-capacity "Cosmos" Strip Coils have a Low H.F. Resistance, Minimum Ohmic Resistance, are sound in construction, entirely enclosed, and neat in appearance.

NOTE THE LOW PRICES

METRO-VICK SUPPLIES LTD.
(Proprietors: Metropolitan-Vickers Electrical Co. Ltd.)
4, Central Buildings, Westminster, London, S.W.1

RADIOTORIAL

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

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

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 wireless 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.

TECHNICAL QUERIES.

Letters should be addressed to:
Technical Query Dept.,
"Popular Wireless,"
The Fleetway House,
Farringdon Street,
London, E.C.4.

They should be written on one side of the paper only, and MUST be accompanied by a stamped addressed envelope.

Queries should be asked in the form of the numbered questions: (1), (2), (3), etc., but may be accompanied by a short letter giving any necessary additional particulars as briefly as possible.

For every question asked a fee of 6d. should be enclosed. A copy of the numbered questions should be kept, so that the replies may be given under the numbers. (It is not possible to reproduce the question in the answer.)

IMPORTANT.—If a wiring diagram, panel lay-out or list of point-to-point wiring is required, an additional fee of 1/- must be enclosed.

Wiring diagrams of commercial apparatus, such as sets of any particular manufacture, etc., cannot be supplied. (Such particulars can only be obtained from the makers.)

Readers may submit their own diagrams, etc., for correction or for criticism. The fee is 1/- per diagram, and these should be large, and as clear as possible.

No questions can be answered by 'phone.

Remittances should be in the form of Postal Orders.

Questions and Answers

INDOOR AERIALS.

S. P. (Cardiff).—I intend fitting up a set in the near future, but unfortunately as I have little room for an outdoor aerial, I shall be forced to use an indoor one. I have been told that an indoor aerial running round the walls is very inefficient. I shall be pleased to have your suggestions as to a suitable arrangement.

We do not think you can do better than to erect across the ceiling of the room a replica of an outdoor aerial. It should consist of three or four wires about 12 to 18 inches apart and running parallel with each other. The wires should be suspended about 9 to 12 inches from the ceiling, and must be insulated by small egg insulators at each end.

If a three-wire aerial is used the centre wire can have its down-lead a continuation of the horizontal

(*Continued on page* 662.)

RADIOTORIAL QUESTIONS & ANSWERS.

(*Continued from page 660.*)

portion, the down-lead being twisted round the insulator and then taken to the set. The two outside wire down-leads are then twisted round their respective insulators in the same way as the centre wire, and soldered to the centre down-lead about 24 inches from the insulator. This completes the aerial.

UNIDYNE VALVES.

P. M. (London).—Is the new U.C.5 four-electrode valve suitable for the Unidyne?

We have recently tested this valve and can fully recommend it for Unidyne circuits. It has practically the same characteristics as the Thorpe K.4, and requires the same L.T. battery, namely four volts for the single-valve Unidyne and six volts for the two-valve Unidynes. No alterations are required in the wiring of existing Unidyne sets, if it is desired to incorporate this valve in place of the Thorpe K.4.

SUITABLE CRYSTAL SETS.

"Novice" (Hatfield).—I intend making a crystal set, but as there are so many sets and circuits, I cannot make up my mind as to which is the most suitable. Can you please advise?

As you do not state your requirements we cannot do better than to give a list of sets suitable for purposes mentioned hereunder:

For receiving 2 L O and 5 X X. A plug-in coil tuned by a ·0003 mfd. variable condenser.

For receiving 2 L O and 5 X X when interference is experienced from 2 L O when tuned to 5 X X. Plug-in coils, loose-coupled set (primary and secondary): set tuned by two variable condensers (·0005 variable condenser in series with the primary and a ·0003 mfd. variable condenser across the secondary coil).

For receiving 2 L O only when 5 X X cannot be heard (in London), a single tapped coil or variometer tuned crystal set.

For receiving 2 L O on one pair of 'phones at maximum signal strength (one pair of 'phones only) ultra coil crystal set.

For receiving 2 L O and 5 X X with minimum tuning when both can be received well on a crystal set. A Marconiphone variometer crystal set tuning from 230 to 1,630 metres in one complete revolution of the dial.

All the above sets are for attaching to an outdoor aerial, while the choice of a suitable crystal detector can be left to the reader. We should like to point out, however, that it is an advantage to use a perikon detector with the Marconiphone variometer crystal set as this will also help to reduce tuning adjustments to a minimum.

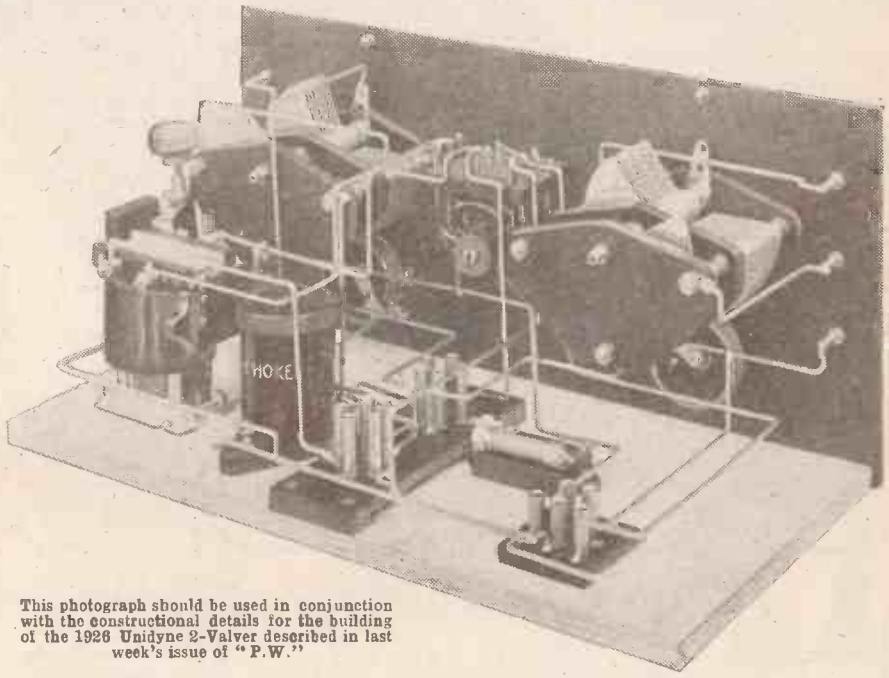
1926 UNIDYNE TWO-VALVER.

B. H. T. (Roehampton), and others, inquire as to the photograph of the wiring of the 1926 Unidyne 2-Valver, which should have appeared on page 584 of last week's "P.W."

The correct photograph is reproduced herewith, and it should be compared with the wiring diagram which appeared last week on page 587.

The action of the switch shown in Fig. 1 (page 584),

(*Continued on page 664.*)



This photograph should be used in conjunction with the constructional details for the building of the 1926 Unidyne 2-Valver described in last week's issue of "P.W."

RADIOTORIAL QUESTIONS AND ANSWERS.

(*Continued from page 662.*)

is from top to bottom, and not from side to side, but the actual switch connections shown in both wiring and theoretical diagrams are O.K.

"P.W." FOUR-VALVE SET.

W. J. R. (Holloway Road, London, N.).—What are the point-to-point connections of the "P.W." Four-Valve Set which was described in "P.W." No. 173?

POINT-TO-POINT CONNECTIONS OF THE 4-VALVE SET (H.F., Det. and 2 L.F.).

One side of each filament rheostat to one filament socket of each valve holder.

Other filament valve sockets of the first and second valve holders joined together and taken to the plate socket (secondary) of the H.F. transformer holder, to the earth terminal, to socket side of fixed coil holder, to other contacts of the third and fourth filament rheostats, to minus H.T. terminal, and to the minus L.T. terminal.

Other sides of the first and second filament rheostats to the plus L.T. terminal.

Other filament valve sockets of the third and fourth valve holders joined together and taken to plus L.T. lead.

Aerial parallel terminal to fixed vanes of the ·0005 variable condenser, to grid socket of the first valve holder, and to the plug side of the fixed coil holder.

Aerial series terminal to moving vanes of the ·0005 variable condenser.

Plate socket of the first valve holder to one filament socket (primary) of the H.F. transformer holder, and to fixed vanes of the ·0003 variable.

Other filament socket (primary) of the H.F. transformer holder to moving vanes of the ·0003 variable condenser and to the centre plus H.T. terminal.

Grid socket (secondary) of the H.F. transformer holder to one side of the grid leak and condenser.

Other side of the grid leak and condenser to the grid socket of the second valve holder.

Plate socket of second valve holder joined to socket inside of the moving coil holder by a piece of flexible wire.

Plug side of moving coil holder is joined to O.P. of L.F. (1st) transformer by a piece of flexible wire.

I.P. of same L.F. transformer to one side of the first ·5 mfd. fixed condenser, and to the centre plus H.T. terminal lead.

A ·002 mfd. fixed condenser is now connected across the primary of the first L.F. transformer.

I.S. of the first L.F. Transformer to grid socket of the third valve holder.

O.S. to the other side of the first ·5 mfd. fixed condenser to one side of the second ·5 mfd. fixed condenser and to the minus L.T. lead.

Other side of the second ·5 mfd. fixed condenser to the bottom plus H.T. terminal.

Plate socket of the third valve holder to centre right-hand contact of the D.P.D.T. switch.

Plate socket of the fourth valve holder to one 'phone terminal and to the bottom right contact of the D.P.D.T. switch.

Top right-hand contact of same switch to I.P. of the second L.F. transformer.

O.P. of the second L.F. transformer to the centre plus H.T. terminal. A ·002 mfd. fixed condenser is connected across the primary off the second L.F transformer.

Other 'phone terminal to the centre left-hand contact of the D.P.D.T. switch.

A ·002 mfd. condenser is connected across the 'phone terminals.

Bottom left-hand contact of the D.P.D.T. switch to the centre plus H.T. terminal lead.

Top left-hand contact of the same switch to the bottom plus H.T. terminal.

I.S. of the second L.F. transformer to the grid socket of the fourth valve holder.

O.S. of the same L.F. transformer is joined to the (black) negative grid bias plug by a piece of flexible wire.

The red (positive) grid bias plug is connected to the minus L.T. lead by a piece of flexible wire.

PHOTOGRAPHS.

Readers are invited to submit photographs of wireless interest for publication in "Popular Wireless." Every photograph accepted and published will be paid for at the rate of 10/6 per photo.

Correspondence

Letters from readers discussing interesting and topical wireless events or recording unusual experiences are always welcomed, but it must be clearly understood that the publication of such does in no way indicate that we associate ourselves with the views expressed by our correspondents, and we cannot accept any responsibility for information given.—Editor.

REF. EDWARD'S WIRING STRIP.

The Editor, POPULAR WIRELESS.

Dear Sir,—In reference to your Report on the above Strip in the current issue of POPULAR WIRELESS—a paper which I have always considered to be the best and fairest of the bunch, I think that you do the inventor of this strip a big injustice.

After reading an account in another paper devoted to wireless, I obtained some lengths of this strip, and without any previous knowledge of its properties proceeded to wire up firstly a simple one-valve set, with grid leak (variable) and one or two other devices not found on ordinary sets.

The wiring process was delightfully easy, and the finished set gave rather better results than my standard one, which is used for professional work, and is very efficient.

Secondly, I was so fascinated with the simplicity of the above that I next built up a two-valve choke coupled amplifier, with a wiring circuit which gave some intricate bends and turns to the Strip. The wiring process was again extremely easy, and the results well up to standard.

Finally, a three-valve set has been built with the Strip, and with the same results.

In view of these tests, and of the fact that the messy job of soldering and also the inconvenient business of bending and fitting ordinary wire is obviated, that the H.F. resistance is very much lower (for the strips can always be arranged edge-on), the low frequency resistance also lower, I repeat that your report is misleading.

Indeed, I begin to wonder whether you have really tested it! (We did—carefully. Tech. Ed.)

Personally, I don't think much of it as an aerial.

I trust you will with your usual spirit of fairness give this letter the same prominence as your report, in your paper. The interlead capacity effect you mention, although theoretically a factor, in practice, as my tests show, is not apparent.

Yours faithfully,
A. W. JUDGE,
A.R.C.Sc. (Lond.), etc.

"Sandhurst," Runfold,
Farnham, Surrey.

D X RECEPTION IN DEVON.

The Editor, POPULAR WIRELESS.

Dear Sir,—I have recently been successful in receiving broadcast concerts from three Florida stations (W Q A M, U M B F and W G B U) on three valves, straight circuit, 1 H.F., Det., 1 L.F. Here is an extract from a letter written to me from station W G B U, of Fulford, Florida: "Station W G B U, of Fulford by the Sea, Florida, is a 500-watt station, and is located nine miles north of Miami, Florida. We broadcast daily on a wave-length of 278 metres at 12-1 p.m., 6.30-7.30 p.m., and 10 p.m. till 1 a.m."

In a further extract:

"Your letter of September 20th regarding reception of Radio Station W G B U on August 26th, 28th, and September 13th, was received by us to-day, and we believe that this establishes a new record in radio history."

Hoping this may be of interest to you,

I am, Yours faithfully,
H. J. FLUCK.

16, High Street, Bideford, N. Devon.

MORE CHITOS RESULTS.

The Editor, POPULAR WIRELESS.

Dear Sirs,—Doubtless you are always pleased to hear of readers of "P.W." who have constructed successfully (and otherwise) sets as described within its pages.

I have just hooked up the Chitos one valve and results simply stun me: range seems to be unlimited and volume marvellous for a one-valver, all stations coming through loud enough for 'phones to be worn comfortably.

There is one peculiarity about this little marvel which perhaps readers might solve. When used with two or three pairs of 'phones the signal strength is ever so much greater than when only one pair is in use. Why is this?

Congratulating you in bringing such a wonderful little set before your readers. I remain,

Yours faithfully,
N. HOCKEN, Jr.

Gt. Lizzen, Polperro, Cornwall.

RESTORING SOLDERING IRONS.

To the Editor of POPULAR WIRELESS.

Dear Sir,—I think perhaps the following may be of interest to your readers:

There must be thousands of men to-day whose first acquaintance with a soldering iron was made when wireless became their hobby, consequently the

(*Continued on page* 666.)

FOREIGN RADIO NEWS.

(*Continued from page* 634.)

Serbia Relaxes Radio Regulations.

The Jugo-Slavian Government announces the abrogation of a number of regulations hitherto in force.

Among these are the prohibition of receiving sets being owned by foreigners, or being set up by anyone within a radius of twelve miles from the frontier. This decision is the result of persistent effort by Serbian amateur radio clubs.

Budapest Alters Wave-length.

The Budapest station intimates that, consequent to the Geneva tests, it has altered its wave-length to 565 metres, starting on November 1st.

Three New Austrian Stations.

If next year, while groping for some new station, you are startled by that shrill, melodious cry known as a "jodel," do not think you are intercepting a message from Mars; it will probably be the proposed Innsbrück or Salzburg stations broadcasting the characteristic "jodel" of some Tyrolese mountaineer.

Up to recently Vienna was the only Austrian station, but as intimated in these notes, Graz opened one a short time ago, and it has proved such a success that the other Austrian provinces are clamouring for their own stations. These will be constructed provided, as seems assured, that the provincial governments guarantee the concern a minimum number of 5,000 subscribers at two shillings per head. The company undertaking this is the "Ravag," which already owns the Vienna and Graz stations.

The Innsbrück station will be at Hall, the Salzburg one at Klesheim, and one at Klagenfurt in the town itself.

Germany to Relay K D K A.

It is announced that German stations are making arrangements for relaying K D K A, Pittsburg, programmes this winter.

An Original Radio Competition.

A very original competition has been devised by the editor of a French radio journal. Listeners are invited to state the colour of the hair of the various singers being broadcast.

To a correspondent who objected that this was a mere guessing contest, the organiser replied that this is by no means the case; science has established that blind persons can often tell the colour of a speaker's or singer's hair by the sound of the voice, and the purpose of the competition is to determine whether ordinary persons, when deprived of sight of the speaker, can exercise a similar gift.

Persia Interested in Radio.

The Persian Government is sounding French radio firms regarding tenders for the erection of a powerful central broadcasting station at Teheran and six relay stations in various parts of Persia.

Broadcasting Russian Politics

It is announced that the entire proceedings at the All Russian Communist Party Congress to be held in Moscow in December, will be broadcast from all Russian stations.

This is believed to be the first instance of a political congress being diffused in its entirety by radio.

CORRESPONDENCE.

(*Continued from page* 665.)

majority of these have experienced that, after a while, the iron does not pick up and plant those delightful little globules of solder, so necessary to good contact in a wireless set.

The cause of this failing is usually that the iron has been made red hot occasionally, thereby "killing it."

The cure is to deliberately make the iron white hot and then plunge it into cold water. This will restore the iron at once. File it up bright, heat again till the green flame appears, then tin all over the copper bit with the solder and the iron is ready for service. This treatment may be repeated whenever the iron becomes "dead."

Yours respectfully,
R. T. SAUNDERS.

12, Dudley Road,
Folkestone.

THE "P.W." "CONTINENTAL."

The Editor, POPULAR WIRELESS.

Dear Sir,—I thought the following results, obtained with one of your sets, might be of interest, coming as they do from a point situated 100 "wireless" miles north of our most northerly station, Aberdeen.

On coming up here on a month's leave, I decided to bring with me my "P.W." Two-Valve Continental set, but on the journey one of my valves "went West," and as it would take several days to obtain a spare (wireless shops do not abound here) I altered the first half of my set to the "P.W." One-Valve Ultra set. With the exception of the addition of a potentiometer, it was constructed exactly as described. Before winding the "Ultra" coil, I decided to test the lay-out as a straight one-valver with reaction, and the results have so exceeded my expectations that I am going to add a stage of L.F. and keep the set as a permanency.

Results on two evenings' work are: All the main B.B.C. stations (Cardiff almost as loud as London, and Bournemouth easily loudest of all), Leeds relay, Edinburgh or Dundee relay—not yet definitely identified, and, of course, 5 X X.

Of the foreigners, Oslo is loudest, with the high-power Madrid station a good second. In addition, Trollanttan, Seville, Munster, Radio-Toulouse, San Sebastian, Munich, Hilversum, Radio-Paris, and Eiffel Tower, have all been clearly heard and identified; others have been tuned in but not, so far, identified.

Not such a bad record for a single valver, I think. It rather makes one wonder if high-frequency is worth the trouble.

The addition of a potentiometer has been of immense assistance, for by rotating it towards the negative end a point is reached where the set is so sensitive that an extra strong signal will throw it momentarily into oscillation. The H.T., too, is very critical, about 35 volts being suitable for a B.T.H. B5 valve, in this set. Once adjusted near the oscillation point the coils can be left alone and tuning carried out with the condenser and potentiometer only. I am next going to try the "Ultra" coil and compare results for volume and sharpness of tuning.

I might add that the above results have been obtained on a single 60 ft. 7/22 aerial, 15 feet high, screened by a wood at the southern end. I have now built some 20 sets, but this one "beats the band."

Best wishes for the continued success of your excellent little magazine.

I am,
Yours faithfully,
"MULTUM IN PARVO."

Whinhill,
Dornoch,
Sutherlandshire.

IN PRAISE OF THE UNIDYNE.

The Editor, POPULAR WIRELESS.

Sir,—I have made up the One-Valve Unidyne and am very satisfied with it. 2 L O and 5 X X come in very loud. Radio-Paris, Petit-Parisien, Hilversum, Madrid are others I have logged, and also a station which concludes with the Austrian national anthem, which I assume is from an Austrian station. I have not been very successful so far with other B.B.C. stations, they seem very difficult to tune in, but the Continental stations come in all round the scale. I have followed the many suggestions as given by correspondents in "P.W." and find the best results are obtained by using a ·006 grid condenser with a ·002 across the 'phones, also by attaching the earth lead to the 'phone terminal from the reaction coil for DX work. My object in writing to you is to ask you to cater more for "Unidynists" in "P.W.," the ordinary circuits with H.T. have no interest for us and the only interest there is is a chance letter from someone suggesting improvements.

What about a Unidyne Booklet with all the circuits in? It is a fag looking up all the back numbers. Also, a circuit for short-wave work would, I am sure, be very welcome, especially for K D K A on 68 metres. Hoping these hints will be of some use to you and thanking the inventors of the Unidyne for this marvellous little set.

Yours sincerely,
E. W. GAIN.

24, Bourne Road, Bexley, Kent

TECHNICAL NOTES.

(*Continued from page 644.*)

slowly rotating wheel dips into a vessel of oil, the latter having a quantity of iron filings suspended in it, kept thus suspended by the mechanical stirring of the oil. As the wheel rotates it carries up on its edge a quantity of the mixture, and this is subject to the discharge from leads brought from an induction coil. In this way waves are emitted whose length depends, amongst other things, upon the size of the iron filings. The wave-length is measured by a method involving the use of a thermo-couple and interferometer. There is not a single wave-length emitted, of course, but a large number, owing to the fact that the filings vary in size. A much more intense radiation is said to be produced by this method than by the method of Nichols and Tear. The latter used, it will be remembered, an oscillator consisting of two small metal tips inserted in the ends of two glass tubes. In the new method, owing to the large number of the iron filings taking part at any time, much greater radiation would be expected.

The interest of this new series of experiments is not so much in the results already obtained, as in the possibilities which are opened up. It is intended next, for instance, to use tiny metal pellets of the same size and shape, in order to obtain intense radiation of one wave-length.

An Interesting Loud Speaker.

A French amateur has introduced a new feature in connection with loud speakers for which great claims are made. He places at the narrow end of the loud speaker trumpet a diaphragm, and an inch or two away from this, towards the open end of the horn, another diaphragm, the space between the two diaphragms being filled with liquid. Thus there is, in effect, a liquid "plug" inserted in the narrow end of the horn, with a resonant diaphragm at each end of the liquid. The diaphragm nearest to the reproducer unit is connected to the latter by means of a pin, and the vibrations are communicated in this way. The sound has to pass through the liquid plug in order to gain access to the loud-speaker horn. The inventor claims that a much more mellow tone is produced, and that all harshness and rattle or blast are eliminated.

I have not heard this particular type of instrument, but the idea in general is not new, and from experiments of a very similar kind which I have witnessed, I should expect that the reduction in volume would more than counterbalance any good results obtained.

Concerning Dull-emitting Filaments.

Much has been written at different times on the theory of the action of the dull-emitter filament. It will be noted that there are, in the main, two types of dull-emitter filament, the coated type and the thoriated type. In the former type the extra-emissive material is coated upon the filament, whilst in the latter a special ingredient is mixed in the substance of the filament and gives it its increased emissivity.

One of the scientists of the Edison Lamp Works of the General Electric Co., U.S.A., has published an account of his experiments

(*Continued on page 668.*)

TECHNICAL NOTES

(*Continued from page* 667.)

on this subject in the "Physical Review," and he finds many interesting things. He has discovered, for example, that even a trace of oxygen in the valve has an enormous effect in diminishing the emission from the filament. It is concluded from this that the oxides which are generally used as coatings upon these filaments must first be converted into the pure metals before they can be effective in increasing the emission. This would bring the coated filament into line—as regards the theory of its action—with the thoriated filament; in the case of the latter it is commonly assumed that a layer of pure metallic thorium comes to the surface, and there acts to enhance the emission. As to why a layer of metallic thorium or barium should have this particular effect, that is a point which has never yet been fully explained.

Novel Variable Condenser.

A new idea in variable condensers is the "spiral" condenser. This consists of two spiral "plates" in shape not unlike the turning which sometimes comes from a piece of solid metal rod when run down in the lathe. One of these plates is fixed, and the other is mounted on a screw of the proper pitch, so that, as it is rotated, it moves forward and interleaves with the fixed one, the capacity depending upon the amount of the movable vane engaging with the fixed vane. The two "plates" are of the same screw-pitch, and the screw mounting, by which the movable one is made to advance, is also of the same pitch.

Apart from the novelty of the design, there would appear to be no technical advantage in this construction. An ordinary variable condenser, operated by means of a reduction gearing, or with vernier, serves exactly the same purpose and is easier and cheaper to make.

International Radio Week.

As most experimenters will now be aware, International Radio Week will commence on January 24th, next. It is expected that transmissions between England and America will give much better results than last time. Probably short waves will be used in relaying, and American stations will rebroadcast on their regular wavelengths. It is probable that extensive preparations will be made to enable those who have the right kind of sets to endeavour to receive direct.

An "Exhausted" Accumulator.

It is commonly supposed that if you run down an accumulator below 1·85 volts, or thereabouts, you may as well write it off. That this is not necessarily so was proved in an accidental way in my laboratory recently. One of my assistants left a 2-volt accumulator connected to an apparatus which was taking about half an ampere when the cell was fully charged (that is to say, a resistance of about 4 ohms). When the mistake was discovered, the cell was absolutely innocent of the slightest trace of electric charge; it had about as much "juice" in it as a piece of wood.

It was put on slow charge, however, for a few days, and eventually was restored to its original condition, having since been in continual use and being apparently none the worse for the experience. As this would be too good an advertisement for the cell, I must refrain from telling you the maker's name.

CAUSING INTERFERENCE.

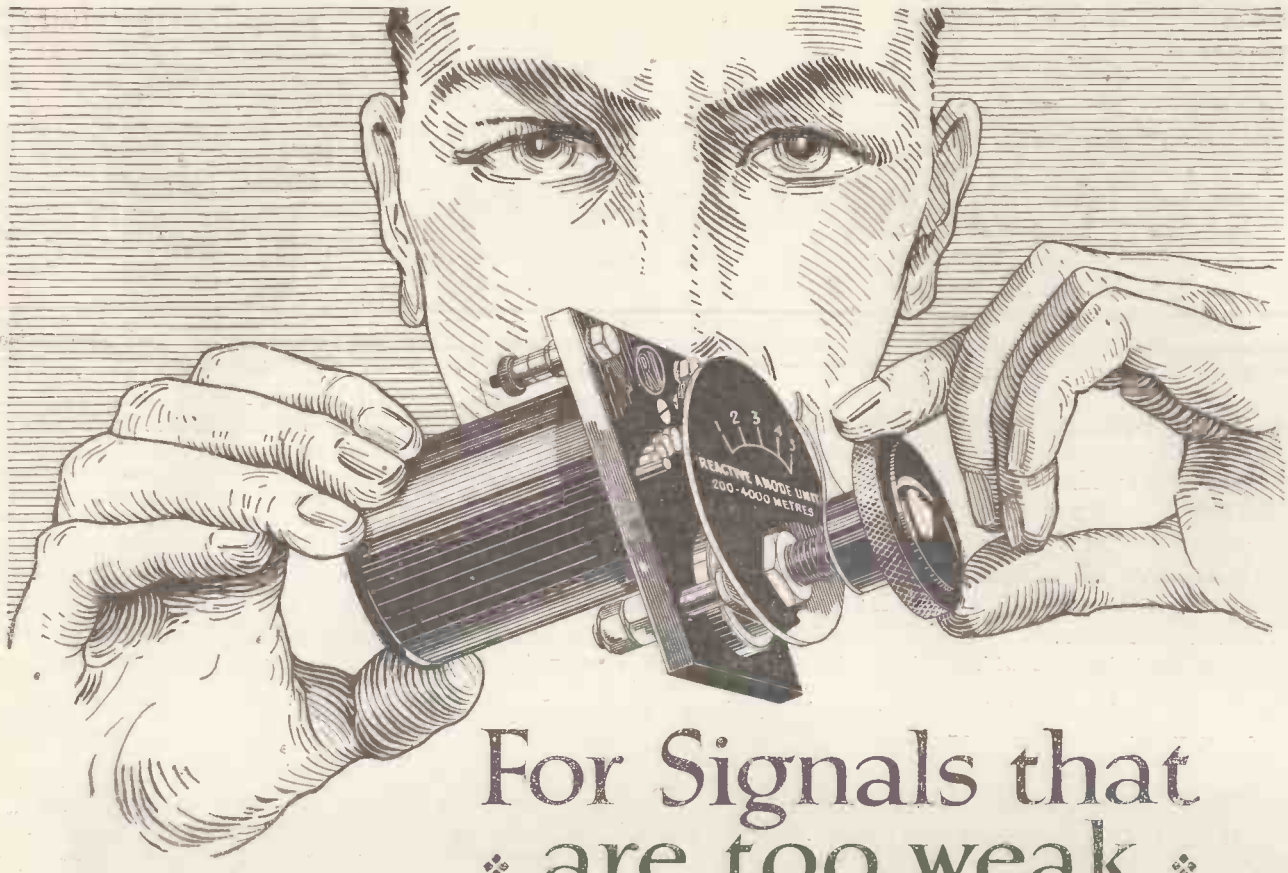
(*Continued from page* 652.)

too, that it is sometimes impossible to get distant stations without "pushing" the reaction to its finest maximum. To this I would reply that until a constructor has carefully experimented for some time with his set on transmissions from the local station and obtained considerable experience, it is not fair to the community for him to endeavour to "reach out."

After this, if he finds that he cannot bring in the distant stations he requires without heterodyning their carriers and playing hide-and-seek in and out of oscillation for lengthy periods, then he should either build a more sensitive receiver employing more valves, or he should give up DX and return to nearer stations. There are nowadays a score of B.B.C. stations, including one of very high power—*carpe diem—finis coronat opus*—or, freely translated, why try to tune-in harsh ghosts of foreign music in preference to clear, loud British ether goods.

Just as Bad.

A great deal has been said about the wickedness of the "oscillator," and many exaggerated forms of punishment have been suggested, but there is little doubt that a great percentage of "oscillators" oscillate in ignorance. Those amateurs who, when they are heterodyned by an oscillator, deliberately oscillate themselves in order to "get one back," and there are many who do so, should remember that they are just as bad in a way as the original oscillator. If everybody took the etheric law into their own hands in a similar manner, one inadvertent squeak might cause a bedlam to arise which would only cease at closing down time. Far better to endeavour to seek out the offender and give him a few gentle hints or to place the matter in the hands of the local radio society.



For Signals that ❖ are too weak ❖

R.I. again leads the way in placing on the market a wireless component which has been specially designed to amplify weak signals from distant stations; signals by which any other methods of intervalve coupling would be almost inaudible. The NEW R.I. REACTIVE ANODE UNIT operates as a coil in parallel with a condenser with which when tuned to the required wave-length forms an effective resistance to currents on this wave-length with the result that it acts as an efficient H.F. Amplifying stage.

THE NEW R.I. REACTIVE ANODE UNIT.

There are five tappings which cover all wave-lengths from 200–4,000 metres, three of which serve to cover the broadcast band, giving excellent adjustment. The coil is wound on a grooved ebonite cylinder in such a way that the impedance of each tapping has been calculated to keep the reactance values approximately uniform for all wave-lengths.

This method of radio-frequency amplification is perfectly st ble, while for single stage amplification it is as efficient as, and simpler to operate than a H.F. Transformer. If desired, it can be followed by H.F. Transformers where additional stages of radio-frequency amplification are required.

This new unit completes the series of components required to build 2, 3, or 4-Valve Sets, and is used in our latest 4-Valve instrument in conjunction with the Retroactive Tuner.

Two terminals are provided at the back or the necessary connections, and an engraved scale and pointer are supplied to indicate the wave-length in use. The complete unit, which is one-hole fixing, is perfectly finished; the workmanship, design, and materials being further examples of the high standard of all R.I. Products.

BRITISH

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Price 25/-

Write for descriptive brochure on the New R.I. Reactive Anode Unit.

❖ THE MARK OF BETTER RADIO ❖

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POPULAR WIRELESS AND WIRELESS REVIEW, November 21st, 1925. REGISTERED AT THE G.P.O. AS A NEWSPAPER

MAKE THE "SIMMONDS" SHORT-WAVE RECEIVER.

Popular Wireless

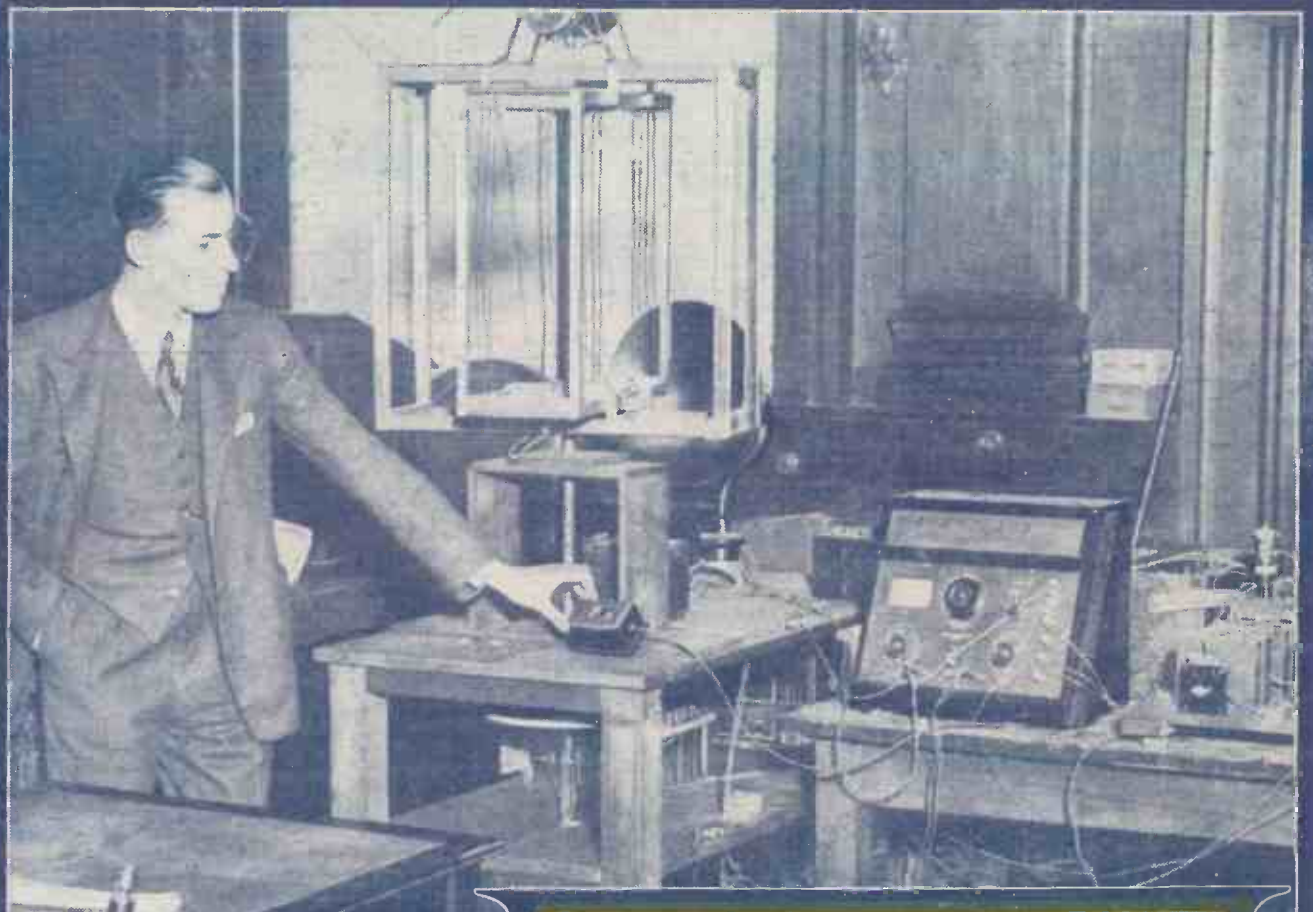
Every Thursday PRICE 3d.

No. 182. Vol. VIII.

and Wireless Review

November 21st, 1925.

Scientific Adviser: SIR OLIVER LODGE, F.R.S., D.Sc.



Features in this Issue.

How to Construct

A HOUSEHOLD THREE-VALVER

and

THE CHEAPEST CRYSTAL SET.

A Simple Clock Switch.

Interesting Sidelights on Valves.

Distortionless Reception.

When the Loud Speaker "Howls."

Experiments with a "Three-Electrode" Crystal Detector.

Our cover photograph shows Major Binyon, O.B.E., experimenting with his new automatic direction finder, which is intended for use at sea.

Do you burn Money?

YOU DO—every time you inadvertently try to put a valve into its holder the wrong way round. An accident that can easily happen, it can be permanently prevented by using the Dubilier Dubrescon.

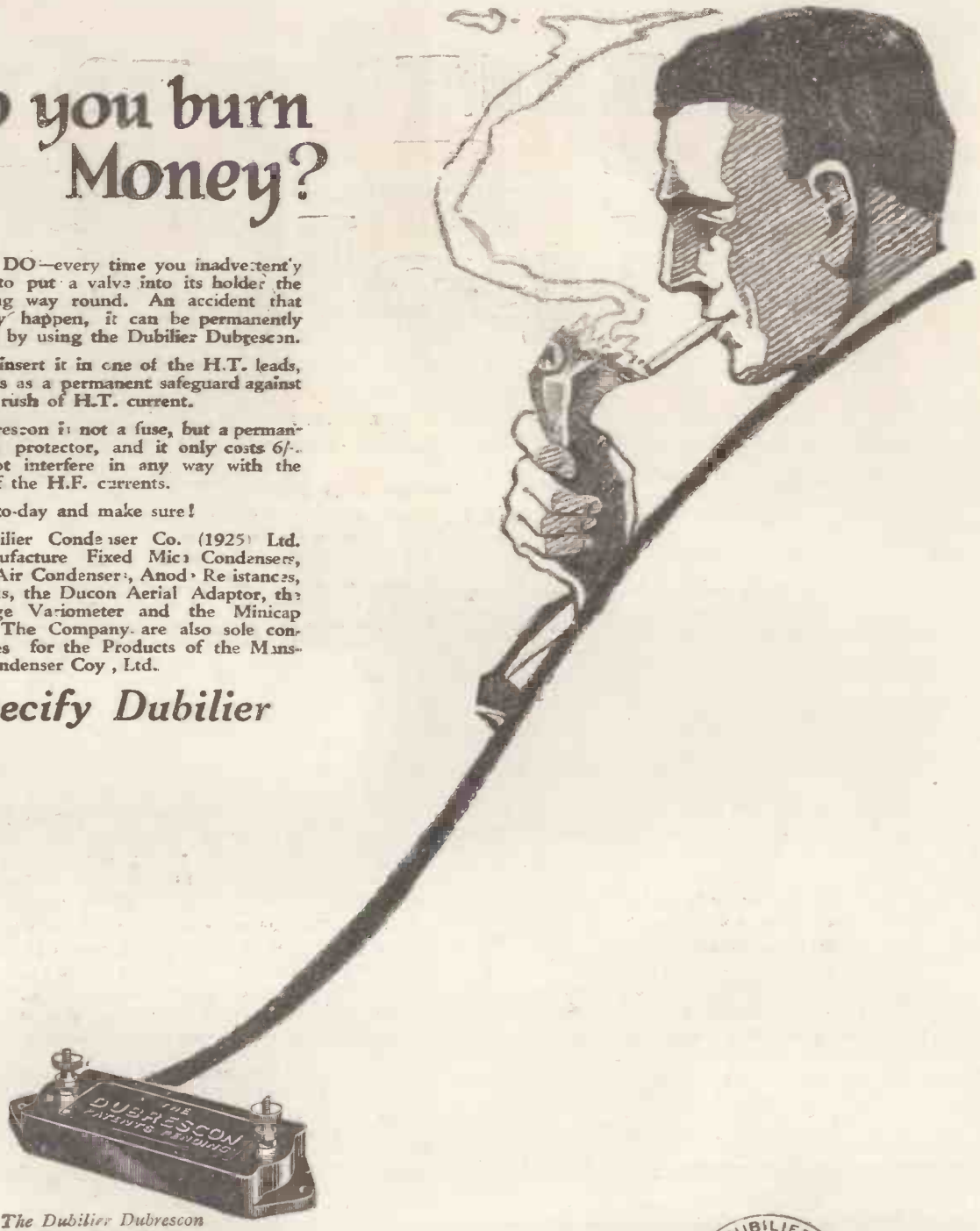
You just insert it in one of the H.T. leads, and it acts as a permanent safeguard against a sudden rush of H.T. current.

The Dubrescon is not a fuse, but a permanent valve protector, and it only costs 6/-. It does not interfere in any way with the passage of the H.F. currents.

Buy one to-day and make sure!

The Dubilier Condenser Co. (1925) Ltd. also manufacture Fixed Mica Condensers, Variable Air Condensers, Anode Resistances, Grid Leaks, the Ducon Aerial Adaptor, the Mansbridge Variometer and the Minicap Switch. The Company are also sole concessionaires for the Products of the Mansbridge Condenser Coy, Ltd.

Specify Dubilier



The Dubilier Dubrescon Valve Protector, 6/-

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CONDENSER CO (1925) LTD

Brown H.4.

30/-

WE have good reason to be proud of the new Brown H.4. To produce a complete Loud Speaker —a miniature in every respect of the larger Brown models—at the price of a pair of good headphones is a wonderful manufacturing feat. You must remember that this new H.4 is a real Brown—it is fitted with a similar tuned reed movement to that found in Brown Loud Speakers costing four times as much. The Brown H.4 is the only low-priced *sensitive* loud speaker on the market.

Owing to its extreme sensitiveness it requires considerably less power to operate it. Comparative tests have proved that the Brown H.4 will give loud and clear results from two valves when other low-priced Loud Speakers require at least three valves to produce the same volume. There's a simple explanation for this. The Brown uses a cone-shaped aluminium diaphragm of extreme thinness actuated by a vibrating reed. The slightest movement of the reed is transmitted to the diaphragm and converted into audible sounds. The ordinary small Loud Speaker, however, uses a flat diaphragm of iron. The diaphragm must be made substantial in order to give it the necessary springiness to vibrate. The smaller the diaphragm the less resilient it will become—and the more power it will require to actuate it.

Don't judge the Brown H.4 on its price —the only fair test is its actual performance. Because only the Brown can use the tuned reed principles of reproduction only the Brown can obtain such sensitiveness and volume from a Loud Speaker standing but 10 inches high. If your Dealer has not one in stock yet, place your order right away. Our works are making every effort to cope with the huge orders we have already received for this amazing little H.4.

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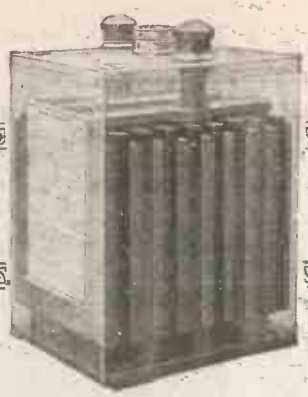
Retail Showrooms: 19 Mortimer Street, W.1. 15 Moorfields, Liverpool. 67 High Street, Southampton.

Depots (Wholesale only): 13 Bushy Park, Bristol; Cross House, Westgate Road, Newcastle.

A genuine Brown at the price of a pair of 'phones

Gilbert Ad. 3986.

Type H Z



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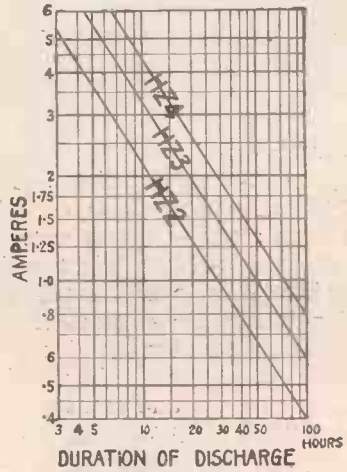

DURATION OF DISCHARGE
Characteristics of Cells, Type HZ.

A TYPE FOR SLOW DISCHARGES

The H Z series of batteries has been designed specially for use in circuits where the number of burning hours between charges is, say, 30 hours or longer.

The standard Exide construction and quality of the plates which are particularly robust, and the unusually liberal quantity of acid, greatly reduce the tendency to sulphation, when left for long periods in a partially discharged condition.

H Z type Exide Batteries have been specially designed to work for long periods on slow discharges.

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2 Volts (1 Cell)	1-HZ2	40	1½	4½	2⅜	7½	6	0 17 6	1 3 6
	1-HZ3	60	2	4⅞	3¾	7½	8½	1 1 0	1 8 0
	1-HZ4	80	3	4⅞	4⅞	7½	10¾	1 4 6	1 12 6

* These capacities, though ACTUAL, are only obtainable on slow or intermittent discharges (see curve).

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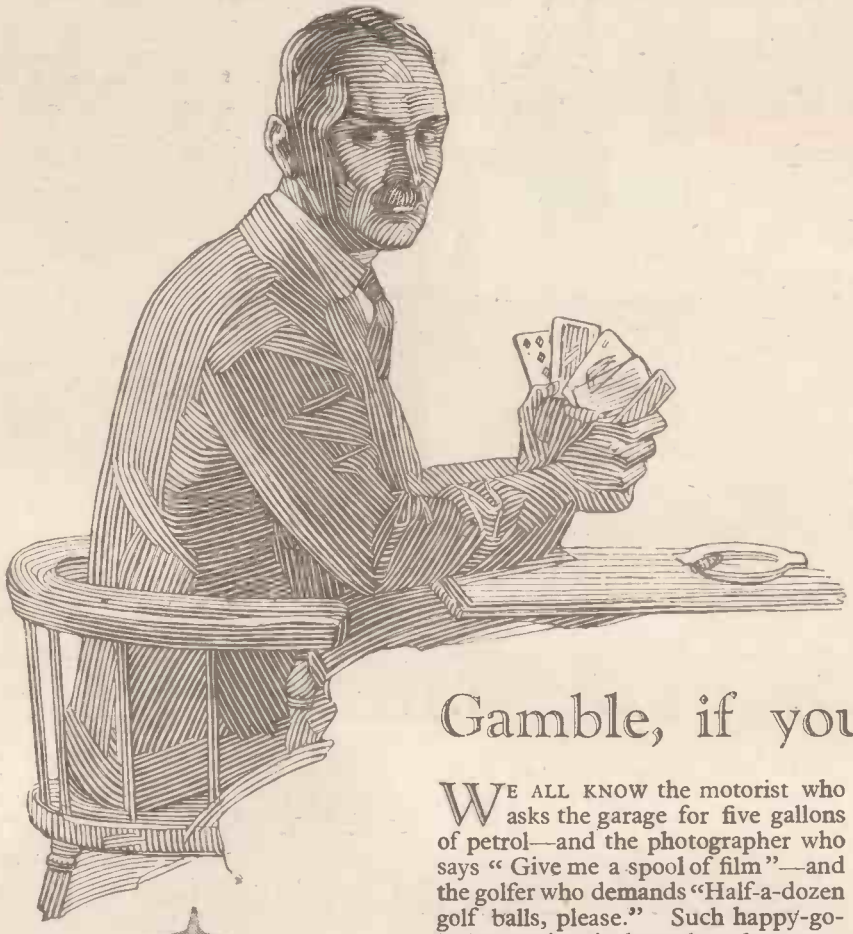

Gamble, if you will, but . . .

WE ALL KNOW the motorist who asks the garage for five gallons of petrol—and the photographer who says "Give me a spool of film"—and the golfer who demands "Half-a-dozen golf balls, please." Such happy-go-lucky buying is bound to have unfortunate results. The first finds his engine losing power on hills. The second detects an irritating inconsistency in his picture-making records. While the third discovers, to his chagrin, that he has lost his usual form.

Now had these three exercised a considered judgment in making their purchases all would have been well. It is just the same in Radio. Don't go into a shop and say, "I want a Dull Emitter Valve," and expect to obtain the most suitable one for your Set. Exercise some discrimination. Ask your friends which they find most satisfactory for long life, economy of operation and sensitiveness. You'll probably find that the majority favour the Wuncell—the Cossor Dull Emitter.

Its extraordinary popularity is due to its unique filament and its original design. While most Dull Emitters use a thoriated filament, the Cossor Wuncell makes use of one embodying entirely new principles. It is a filament built up *layer upon layer* until its diameter approximates that used in a standard bright emitter. But in addition to stoutness the Wuncell filament possesses one other special feature. Its intense emission is such that it can function at the exceptionally low temperature of 800° C. So low in fact is its working temperature that the glow in daylight is practically invisible. At such a low temperature the Wuncell filament suffers no harm from the stretching and contracting inevitable when electric current is switched on and off. In other words, the Wuncell filament is one of the greatest contributions made by Science in the unceasing search for an "everlasting" valve.

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

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

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

Cossor

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Gilbert Ad. 3981.

Popular Wireless

Scientific Adviser: Sir OLIVER LODGE, F.R.S.
Consultants: Dr. J. H. T. ROBERTS, F.Inst.P. J. F. CORRIGAN, M.Sc., A.I.C. C. E. FIELD, B.Sc.

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

Technical Editor G. V. DOWDING, Grad.I.E.E.
Assistant Technical Editors: K. D. ROGERS. P. R. BIRD.

RADIO NOTES AND NEWS.

A Low-Power Feat—Tonic in the Ether—2 O D Again—Listener Aids Distressed Ship—Hilversum's Wavelength—5 X X Programmes—New Dublin Station.

A Low-Power Feat.

LOW-POWER radio work is going to be just as exciting as low wave-length experimenting, according to the reports I have been getting lately. This week the palm goes to Mr. L. J. Fuller (6 L B), who has been transmitting over two and a half miles, using a T-15 valve with only three volts at one milliamp. on the plate. The power involved here is incredibly small, yet when Mr. Fuller lifted up his voice amongst the flats and sharps of Wanstead, his speech was clearly received by a friend in Woodford, who was listening on a two-valve set (Det. and L.F.). At this rate, most of us are using sufficient power on our loud-speaker sets to enable us to transmit to the Continent.

A Tonic in the Ether.

HERE is a human document which I ask you to read carefully. If it doesn't make you forget your own troubles, and feel that this isn't such a bad old world, after all—well, there's something seriously wrong with the blood-pump that serves you for a heart.

"I am a discharged soldier and consumptive, and have done no work for four years, and prior to taking your paper twelve months ago, I was always in bed for two weeks out of four because I was not allowed to do anything, and so had nothing to occupy my mind. But since I took your paper (sounds like taking somebody's pills, eh?) I have not spent *one day* in bed, because I am nearly always trying new crystal circuits obtained from 'P.W.'"

Doctor "P.W."

"I HAVE now got a set copied out of your paper with a little addition added to it, so that I have picked up all the B.B.C. stations except four, and Toulouse comes in so clearly that I am able to hear every word the announcer says very plain indeed, also two other Continental stations that I cannot identify. In conclusion, I may say that your paper has done more for me than the doctors who come to see me, including their medicine and the fresh air. In fact, I am firmly convinced that it has prolonged my life, and I am now looking forward to the time when I am able to work once again."

I reckon that's the best bit of radio news I've heard this week!

NEXT WEEK.

Important Hints on 1926 Unidyne Sets,

How to Make a "Straight" 3-Valver,

and

Building the "P.W." "D" Crystal Set.

Members of a well-known South London Radio Society photographed outside their club-house.

2 O D Again.

THE high efficiency of experimental short-wave communication in these days has just been demonstrated by that famous amateur-transmitter, 2 O D (Mr. E. J. Simmonds, of Gerrard's Cross). He recently received a 130-word message direct from Australia without asking for a single repetition or querying a single word! The message was received at 7 a.m. G.M.T., and was sent upon 35 metres and low power by a well-known Australian experimenter, Mr. Maclurcan (A-2 C M).

The Sister Sciences.

FORWARDED by permission of the Australian Government, the message was addressed to Mrs. Gray (daughter of Lawrence Hargrave, inventor of human flight), 9, Willoughby Road, Hampstead. It stated that the Wireless Institute of Australia (N.S.W. Division) unanimously carried the following motion: "That as Radio and Aeronautics are the sister sciences that do not recognise man-made boundaries in the world, and so symbolise universal peace—an ideal that Lawrence Hargrave ever held and worked hard to realise—a message of sweet remembrance from Australia be conveyed by workers in the sister science of Radio, to the daughter of Lawrence Hargrave."

Listener Aids Distressed Ship.

DURING the recent fierce gales which have swept round our coasts, a Dublin listener overheard an SOS signal, and learned that a ship was in distress in Dublin Bay. He 'phoned through to the Civic Guard station at Howth, and it was found that a Cardiff steamer was in difficulties off Lambay Island, with her rudder and propeller damaged, drifting in terrific seas.

A lifeboat and tug were despatched to the rescue, and later the vessel was towed to Dublin—a good example of timely assistance rendered by radio.

(*Continued on page* 674.)

NOTES AND NEWS.

(*Continued from page 673.*)

An Accumulator Tragedy.

LIFE-SAVING by wireless is an every-day experience, but it was revealed at a Mersham inquest recently that an accumulator used for wireless probably caused the fire which resulted in the death of a resident. It is thought that the L.T. positive and negative connections became entangled accidentally, causing a wire to become red hot and set fire to the celluloid casing of the accumulator. After evidence had been given that such a fire might give off fumes that would make people unconscious, a verdict of accidental death was returned.

Helping the Hospitals.

HOUNSLOW and District Wireless Society are installing wireless receiving apparatus at the Hounslow Hospital, for which a Hospital Wireless Fund has been started in the district. It was only the other day that one of the doctors at Guy's Hospital was telling me of the splendid effect of radio upon the patients there, so other wireless societies might do a good turn to the community by helping the local hospital to get going, as the Hounslow society is doing.

Tribute from the Navy.

MEMBERS of the American Radio Relay League have just received the official thanks of the Navy Department for their efforts in promoting the development of short-wave communication on the part of the Navy. One of the amateurs (Mr. F. H. Schnell) was granted the rank of lieutenant in order to accompany the "Seattle" upon her Pacific cruise, and from this vessel he kept in touch with the U.S.A. by means of short-wave radio. Good work was also done in maintaining communication with this country from the Pacific, details of which are given in the articles now appearing in "P.W." under the title "2 N M Calling."

A Transatlantic Experiment.

DECEMBER 15th is the date provisionally fixed for the first America-Europe broadcast of the season. I understand that the transatlantic transmission will probably be via the Pittsburg station, K D K A, and several European countries will receive the signals directly or indirectly and re-broadcast them to their listeners. There is a rumour that the great British P.O. station at Rugby may eventually be pressed into service to transmit European programmes to the States and Canada—but I don't think that the Old Country is likely to be calling up Columbusland in this way until after Christmas.

New Beam Station.

I HEAR that the new "beam" station at Milnerton (South Africa) is practically completed and ready for traffic, so short-wave workers are likely to overhear test transmissions during the next few weeks. Not only Milnerton, but the various other beam stations will soon be pricking up their ears for signals from Britain, and in the light of Senatore Marconi's short-wave revelations at the "P.W." meeting, the results of the tests should be extremely interesting.

Marconi and Short Waves.

DETAILS of what Senatore Marconi said about short-wave wireless at the "P.W." meeting are still appearing in the technical press. Generally these accounts have been somewhat garbled, which is a great pity, for although the meeting was organised by "P.W.," the great speeches made there were addressed to all radio workers. It is a truism that the greater a man is, the less he says about his achievements; and remembering this, I can't decide which is the more marvellous—the modesty of the real inventors of wireless, or the nerve of some of the would-be's.

Hilversum's Wave-length.

"IS it true that Hilversum is increasing its wave-length to 25 kilowatts?" asks a correspondent. If this should indeed prove to be the case, I shall believe the rumour that 2 L O's range in microfarads is to be extended from one millimetre to four volts!

SHORT WAVES.

"I am convinced that the public has a need, and has a right to be made familiar with what is best in human culture. . . . Can you imagine any instrument that will do this on a larger scale or do it more effectively for the many than radio?"—CARDINAL HAYES.

* * *

"The most perfect programme ever devised would never be free from its detractors. The irascibles, the instinctive grousers, the man whose set is giving him trouble and the woman whose man is giving her trouble—all would mobilise to destroy the illusion of harmony and perfection. Every time I hear the wistful voice at the microphone pleading for guidance on certain radio items, I smile to myself and think: "Well, now they're asking for it!"—SYDNEY A. MOSELEY, writing on "The Value of Criticism" in the "Radio Times."

* * *

"I'm very glad to meet you, Mr. Eckersley, 'cos last night I couldn't manage to get Sir Oliver Lodge, and I don't like missing 'im."—A farm-labourer, in a chat with Capt. Eckersley.

Oslo Offending.

THERE is no doubt that the recent heterodyning trouble at Manchester was caused by the Oslo station, and I have to thank a great many correspondents who were good enough to send details. With one exception all agreed that Oslo was the offender, and one Nelson reader says: "I have heard the name announced many times, and have often had to change over to 5 X X on account of the jamming. My set is a Unidyne, which explains why I can get those DX (long-distance) call-signs."

Boy Scouts and Wireless.

THE Boy Scout standard of wireless is a pretty high one, if one may judge from the examination which has to be passed before a scout can qualify for the wireless badge. It has been suggested that where the individual's funds would not permit the use of more than a crystal set, the members of a scout troop should combine together to buy and operate a valve set. Such a scheme has great possibilities, and might easily extend itself to a troop-transmitting set, whereby long-distance communication could be carried out.

5 X X Programmes.

A NUMBER of irate listeners have written to me bitterly denouncing the B.B.C. because the Daventry station is now giving fewer alternative programmes than formerly. There is no need to get panicky over this change. It is simply an attempt to give every listener the best possible programme, and the provision of alternative entertainment is being aimed at quite apart from 5 X X.

The day is coming when every set will have an easy choice of at least two good programmes; and every time that "5 G B testing" is heard from Chelmsford, the scheme gets one step nearer realisation.

A Cape Town Idea.

CAPE TOWN organised a novel broadcast recently, in connection with the report of a Rugby football match. By an arrangement with the "Cape Argus," a news-reporter telephoned his "write-up" of the match to his sub-editor at the "Argus" offices, and this was broadcast together with the editorial replies! An hour or two later the paper was on sale in the streets, and listeners were able to appreciate the speed that goes into a "special edition."

Tuning-in to Canada.

A GOOD measure of success attended the recent attempt made by C N R A (the Canadian station at Moncton, N.B.) to get in touch with British listeners. Clear reception of certain of the items was obtained at the offices of the Canadian National Railway Co., in Cockspur Street, London, using a super-het. and frame aerial. A listener at Worsley, near Manchester, tuned in a pianoforte solo, upon a four-valve set, whilst a Southampton listener succeeded in receiving the announcement quite clearly when using only three valves.

New Short-wave Station.

MR. T. PALMER ALLEN, B.Sc., 19, Ardgreenan Drive, Strandtown, Belfast, informs me that he has been allotted the call-sign G 6 Y W, for use on 23, 45, 90, and 150/200 metres. Reports of reception will be gratefully received and acknowledged. Mr. Allen will be using the 45-metre wave mostly.

New Dublin Station.

THE Irish Free State's first broadcasting station has just been erected in the McKee Barracks in the outskirts of Dublin, by Marconi's Wireless Telegraph Company. The call-sign 2 R N has been allotted to it, and the transmissions will take place upon a wave-length of 390 metres. It is expected that the station will be picked up quite easily in this country, and the fact that its wave-length is only just below Newcastle's will ensure that a large number of listeners in the North of England will tune in the signals with only a very slight movement of the dials.

Reception in Britain.

THE transmitting plant at the new Dublin station is of the same type as used at the majority of the B.B.C. main stations. It is known as a 6-kw. "Type Q" transmitter, and, as a good many of the popular foreign stations employing this type are already well received in this country, there is no doubt that the Dublin programmes should come through well. The service will be officially opened during December, so tests may be on the air by the time these lines are in print.

ARIEL.

Distortionless Reception

This article will prove extremely useful to every amateur who is anxious to get the best and clearest reproduction of broadcast concerts. It is safe to say that at least 75% of the distortion heard from loud speakers is due to an impure input or to sheer over-loading.

By J. ENGLISH.

PROBABLY every amateur at some period of his career desires to reproduce on the loud speaker the programmes of the local station, and, having set up the necessary apparatus, he soon becomes absorbed in getting volume and more volume. When the zest for noise has declined somewhat, he begins to realise that the sounds emitted by his loud speaker, although tremendous in volume, can hardly

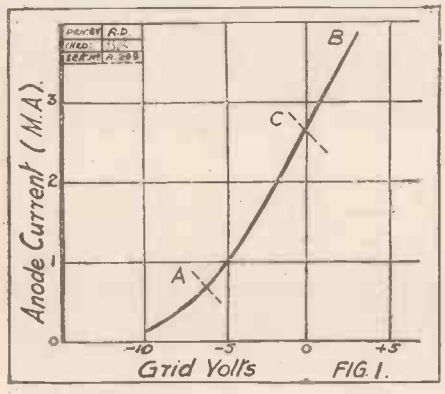
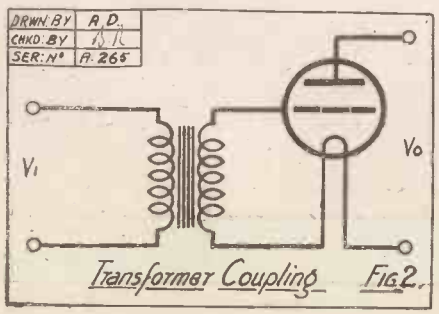


FIG. 1.

be called faithful reproductions of the original music. Henceforth he strives for a greater degree of purity, with less regard for volume, and is not content until the best results possible are obtained, while if he is a truly conscientious experimenter, it is doubtful whether he will ever feel satisfied.

My own experiences in search of ideal loud-speaker reception have followed somewhat similar lines, and it is with the hope that someone may be spared the trouble and expense of pursuing the same stony path that I propose to discuss the reception,



Transformer Coupling FIG. 2.

amplification, and reproduction of broadcast telephony, primarily from the point of view of the experimenter within crystal receiver range of a B.B.C. station.

Now in order to understand where distortion is liable to arise, and how it may be prevented, it is necessary to examine separately the three distinct stages of the receiving system, namely, the detector, the amplifier, and the reproducer or loud speaker, each of which is liable to introduce a type of distortion peculiar to itself.

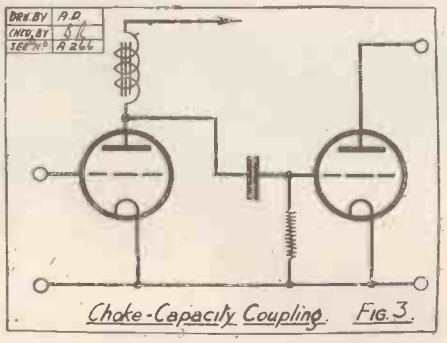
Almost a Perfect Rectifier.

The first and most important stage is the detector, which for ideal results *must* be distortionless. Two popular forms of detector are the crystal and the valve with "leaky grid condenser." The latter, as can be shown theoretically, is, under all conditions, an almost certain cause of distortion. While it may be said that the introduction of reaction increases the efficiency of the valve as regards output and range, even more distortion is introduced, for, besides increasing the rectifier distortion, reaction sharpens tuning. This is highly detrimental to perfect reproduction, for, as a modulated carrier wave covers a fairly wide frequency band, a sharply tuned receiver will weaken or even cut out the side portions of that band, and the remainder, when rectified, will result in telephony weak in higher harmonics and top notes. On the whole, it is a wonder that an ordinary regenerative detector valve gives results as good as it does, considering the theoretically frightful mangling process to which signal currents are subjected.

The crystal detector, on the other hand, for signal amplitudes exceeding ·4 volt and under suitable loading conditions is almost a perfect rectifier, as has been shown by F. M. Colebrook, who regards the crystal as a transformer of H.F. energy into D.C. energy, efficiencies as high as 90 per cent being cited for ordinary galena detectors. Thus, besides being in practice the ideal distortionless rectifier, the humble crystal is very efficient in operation.

The First Stage.

Incorporating the conclusions arrived at so far, the first stage of the ideal receiver will consist of a tuner and crystal detector—in other words, a simple crystal set, which,

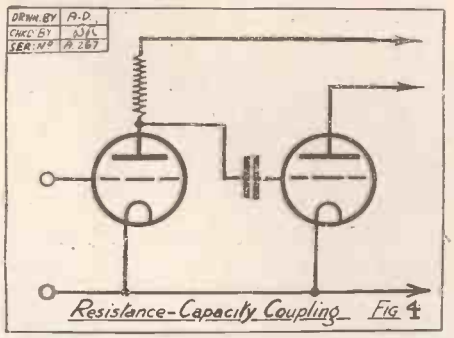


Choke-Capacity Coupling. FIG. 3.

however, must be designed for maximum efficiency, as it is to our advantage to obtain from it the largest possible rectified current in order that the number of L.F. stages to obtain the required volume may be small, thus minimising possible sources of distortion.

Details of various highly efficient crystal receivers have appeared in this periodical from time to time, and it would be out of place here to discuss the design and construction of such apparatus.

We now come to the second stage of the receiving system, the amplifier, which may consist of several L.F. amplifying



Resistance-Capacity Coupling FIG. 4.

valves in cascade or of a microphonic relay. Although good results have been claimed for the latter, valve amplification is undoubtedly the system most widely used, and, as it can be responsible for the greater portion of the distortion usually encountered in a receiving system, I propose to discuss in some detail the problem of L.F. amplification.

(*Continued on page* 676.)

DISTORTIONLESS RECEPTION.

(*Continued from page 675.*)

In any L.F. valve amplifier there are two factors governing the quality of the output, namely, the intervalve coupling and the functioning of the valves themselves, the former introducing frequency distortion and the latter wave distortion.

While the degree of the first is more or less fixed for any particular receiver, the second factor is within the control of the operator, and as it is perhaps the simpler of the two, we will deal with this first.

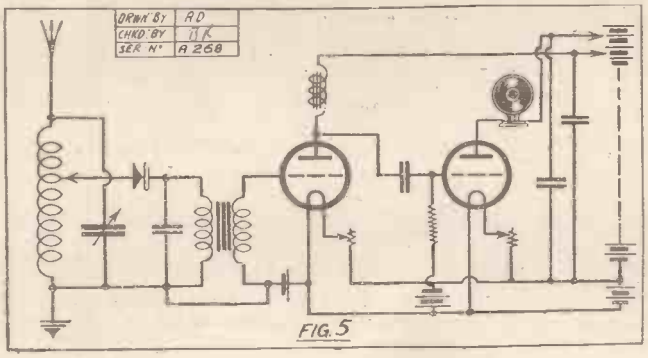


FIG. 5

The rectified currents from the detector cause voltage fluctuations to be impressed upon the grid of the first L.F. valve, and these variations in grid voltage cause proportionate fluctuations in the anode current, which in amplitude and wave form are amplified replicas of the original rectified currents, but this is true only up to a certain point. The ratio of anode current change to grid volt change must be constant for distortionless amplification.

Referring now to Fig. 1, which is the characteristic of a general purpose D.E. 3 valve, adjusted to function as an L.F. amplifier, it will be seen that the section A to B is the only portion of the curve that is a straight line, and thus suitable for perfect amplification, as from A to B the desired constant ratio of grid volt/anode current change is obtained.

Choice of Valves.

But over the section C to B the corresponding grid potentials are positive, thus causing grid current to flow, which is fatal to good reproduction. Thus the only portion of the curve suitable to our purpose is the section A to C, which we will call the permissible grid voltage swing section, the corresponding grid voltage variations being 0 to -6 volts.

The normal grid voltage must now be adjusted to the mean value of the swing, that is, 3 volts negative, so that, if the input grid volts do not exceed 3 volts negative or positive, then the operating point of the curve will not move off the section A to C, thus securing perfect amplification.

It is unlikely with a crystal detector that the voltage fluctuations on the grid of the first valve will exceed 3 volts, so that an ordinary general purpose valve, preferably having a high amplification factor, will be quite satisfactory for the first stage.

At the second stage, however, the grid voltage fluctuations are much greater, and a valve of the ordinary type is incapable of handling this input power successfully. Hence a valve with a longer permissible grid voltage swing section must be used, such as a power valve of the type D.E. 5, with suitable negative grid bias.

Where very large input voltages are to be amplified at further stages, a valve having a still larger grid voltage swing must be used, such as the L.S. 5 type.

Correct Grid Bias.

In an L.F. amplifier, therefore, for distortionless amplification, we must use a valve having a permissible grid voltage swing section sufficiently long to include the maximum input voltage fluctuations, anode voltage and filament brilliancy being adjusted to make this section as long as necessary, while negative grid bias must be adjusted to a value midway between zero and the value corresponding to the beginning of the bottom bend (A of Fig. 1). It is easy to ascertain the value of the correct grid bias for any particular anode voltage, and also the permissible grid voltage swing, from the characteristic curves issued by the valve manufacturers. This is a more scientific way of operating valves than the more usual haphazard aural method.

Turning now to the intervalve coupling, there are three methods in general use, as follows, the degree of magnification decreasing and the degree of purity increasing in the order in which they are arranged:

(1) Transformer coupling.
(2) Choke-capacity coupling.
(3) Resistance-capacity coupling.

Transformer Coupling.

This method is undoubtedly the most popular, owing to the high degree of amplification obtainable per stage, and perhaps to the seeming simplicity of the apparatus. The design of iron-cored transformers, however, for efficient and distortionless amplification presents a very formidable problem, far too complex to be studied here. (See Fig. 2.) The most important feature of the transformer seems to be the impedance of the primary, which should be of a high order, and it is due to the fact that the primaries of cheap transformers are small that they give such poor results. The great advantage of using transformer coupling is that a voltage step-up is obtained, but this is not constant with frequency, being greatest over the middle range.

Such a peaked curve of voltage step-up results in frequency distortion and, in extreme cases, in "blasting" on certain notes; but an improvement can be effected in many cases by connecting a resistance of 1 to 2 megohms across the secondary terminals. A small condenser across the secondary will also improve the tone, but there are so many sources of loss and distortion that one cannot use more than two transformer-coupled stages without introducing some distortion, however carefully they may be designed and operated. In practice I have found it inadvisable to use more than one transformer, and, as will be shown later, this can be used in such a manner that amplification over this stage is practically distortionless.

Choke-Capacity Coupling.

While not giving quite as great a degree of magnification as transformer coupling, this method certainly presents a far simpler problem, and introduces considerably less distortion when several stages are used. For perfect amplification, a choke coil, included in the anode circuit, should offer a constant impedance to L.F. currents fluctuating through it, whatever the frequency.

Hence, to be efficient over the wide band of audible frequencies—say, 50-10,000 p. sec.—this impedance must be of a high order, and, as can be shown theoretically, a minimum value is round about 50 henries. Moreover, the self-capacity of the choke must be low, for if it is appreciable a lower impedance will be offered to the higher frequencies, resulting in weaker amplification of high notes.

However, in practice, well-designed chokes costing less than a transformer give extremely good amplification, certainly superior in quality to that obtainable with the first method, bass notes being reproduced in a manner impossible to obtain with transformer coupling.

(*Continued on page 677.*)

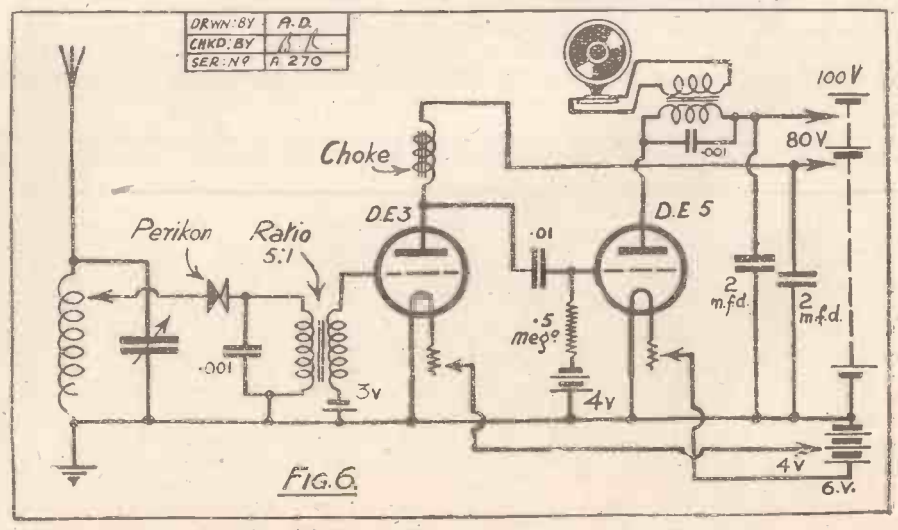


FIG. 6.

DISTORTIONLESS RECEPTION.

(*Continued from page 676.*)

The grid-coupling condenser takes no part in the amplification proper, but serves to insulate the grid of the succeeding valve from the anode potential of the previous stage, and to pass the L.F. potentials developed at the anode end of the choke to the grid of the next valve. The value of this condenser is not critical, about ·05 to ·25 being satisfactory; but its insulation resistance must be of the highest, so that only the very best condensers should be used.

A suitable value for the grid leak is ·5 to 1 megohm, connected for later stages through a grid bias battery to an L.T. negative. The value of this leak seems to be of more importance when dealing with large input voltages, and it should then be about ·25 to ·5 megohms.

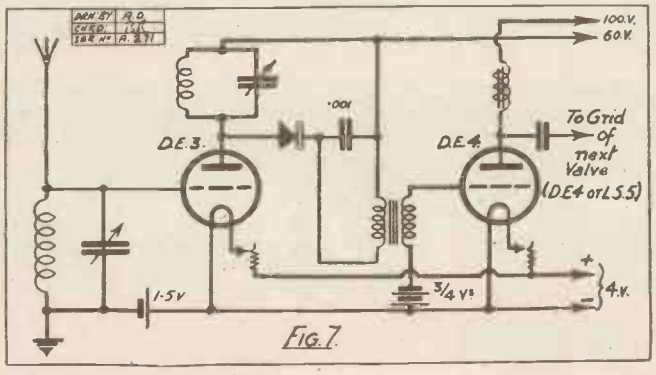


FIG. 7.

Resistance-Capacity Coupling.

The third method is, theoretically, the ideal system of L.F. amplification, as the impedance of a non-inductive resistance is constant for all frequencies, so that equal amplification is obtained over the whole frequency band. For efficient amplification the anode resistance should equal the internal resistance of the valve, and, except for special valves now obtainable, it has to be of the order of 50-100,000 ohms, and capable of carrying a current of several milliamperes without change of value. As regards grid condensers and leaks, the same remarks apply as for choke coupling.

The great disadvantage of resistance-capacity coupling, from the point of view of the average amateur, is the high anode voltages necessary, as, in order to compensate for the voltage drop across the resistance, voltages of 150 or more must be used to obtain a suitable working value on the anode.

Moreover, unless the H.T. battery is large and constant in output, hissing and crackling noises will be heard on the loud speaker, and any defects in the coupling condensers and grid leaks will make themselves apparent by all kinds of unpleasant sounds. In fact, a slightly faulty resistance amplifier can be capable of more distortion than the other types. But in expert hands, and where expense is no object, this method is undoubtedly of great value.

In my opinion, the best and most convenient form of coupling where strong signals are to be amplified is undoubtedly the choke-capacity method, which, associated with suitable valves, properly adjusted, gives results hard to surpass, and for this reason choke-coupled amplifiers are receiving more and more attention.

A Good Circuit.

In view of what has been discussed above, we are now in a position to formulate the design of a complete receiver capable of distortionless reception, the question of loud speakers being dealt with later, as it is a subject of comparatively lesser importance.

The circuit of the receiver that I have used for some time for reproduction of the programmes of 2 L O, distant six miles, is given in Fig. 5, and results obtained have yet to be surpassed, loud-speaker volume being quite ample for a large room or for outdoor work, and not noticeably less than with two transformer-coupled valves. Anyone who has not used such a circuit as this will be astonished at the remarkable purity of reproduction.

In exceptional cases where enormous volume is required, a third choke-coupled valve of the type L.S.5 may be added, using an anode voltage of 150 to 200 with appropriate grid bias.

It will be noticed in Fig. 5 that the crystal detector is coupled to the first valve by means of a transformer, and, as shown by Colebrook, the transformer used in this position introduces little, if any, distortion. A high step-up ratio, such as 8 to 1, should be used in conjunction with a galena detector, but with a perikon or permanent detector of higher resistance a 5 to 1 transformer is very suitable.

The coupling chokes may be of the type specially manufactured for this purpose, but one of the best chokes obtainable is an intervalve transformer with primary and secondary connected in series in such a way that the mutual inductance of both windings is added together. Such a choke has an inductance of more than 100 henries. The values of other components are indicated in Fig. 6, and it will be noticed that two microfarad condensers are connected across each H.T. tap, the use of these condensers being necessary to smooth out any inequalities in the anode current supply, and to act as a shunt to the internal resistance of the battery, which, may set up howling where these condensers are not used.

H.F. Amplification.

The circuit of Fig. 6 is only suitable where the initial received H.F. current is large, such that the tuning note can be heard, using a crystal receiver, one to two feet from the 'phones. Where signal strength does not come up to this standard, it is better to introduce a stage of H.F. amplification using a circuit similar to Fig. 7, and, as a greater input voltage is passed to the crystal, the latter functions more efficiently as a distortionless detector.

We come now to the final stage of the receiving system, the loud speaker, which, since the advent of broadcasting, has most erroneously been blamed for all and every kind of distortion. Almost any reputable type of loud speaker, if not too small, is capable of singularly pure and faithful reproduction, *provided* that it is supplied with undistorted audio-frequency currents from the amplifier.

For the best results, the experimenter would do well to purchase the largest and best loud speaker he can reasonably afford, as the more ample the dimensions of this instrument, the more perfect will reproduction be. There is not a great deal of difference as regards purity between the hornless and the usual type, the former giving slightly better reproduction, but with slightly less volume.

Various tone control devices have been advocated from time to time, but, in my opinion, these are unnecessary where little or no distortion arises in the amplifier; and I have found it advantageous to use a low-resistance loud speaker in conjunction with a step-down transformer, a ·001 mfd. fixed condenser being connected across the anode circuit winding.

Use of Shunt H.T.

Where a high-resistance loud speaker is used, the method of Fig. 8 has much to recommend it, as the windings are only traversed by the relatively minute audio-frequency currents; and where a high anode voltage is used on the last L.F. valve, this method of connection is almost essential.

If the experimenter is fortunate in possessing two loud speakers, preferably of different types, he should try running them in series; and if one has a high tone and the other a low, the blending of the two will reproduce music more realistically than a single instrument. Where large volume is to be handled by the loud speaker, it is highly preferable to use two or more instruments in series or parallel, the use of a single loud speaker involving risk of overloading, which is the cause of a great deal of distortion in this stage.

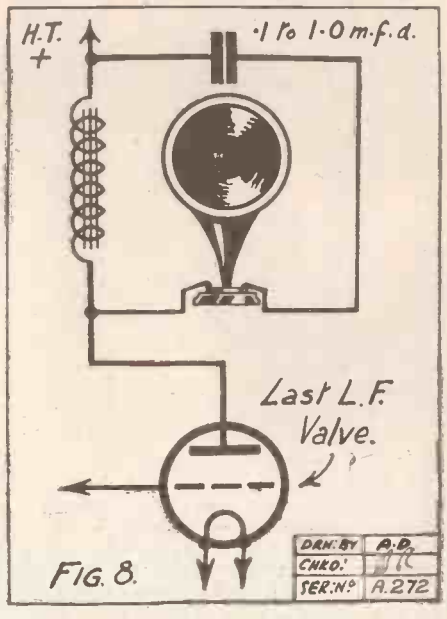


FIG. 8.

The study of the problems of distortionless reception is very fascinating, and there is still a wide field for development open to the amateur experimenter.

Technical Notes

Conducted by our Staff Consultant, H. T. ROBERTS, D.Sc., F.Inst.P.

H.T. from Mains.

THE provision of the plate supply by means other than batteries or accumulators is still occupying the attention of inventors and designers in various parts of the world, and from the United States comes news of a new vacuum tube rectifier, of the well-known "S" type, which is expected to mark a great step forward in this direction. The new valve is of the two-electrode rectifying type, except that it is provided with two anodes and one filament instead of one anode and filament. The additional anode enables the tube to rectify both halves of the alternating current. Tubes of this kind have been on test for 10,000 hours apparently without any signs of deterioration. This in itself is a great testimonial to the tube, as one of the principal drawbacks to the usual valve type of battery-charging and H.T. rectifier is the short life of the valve.

The new tube may be built up into an H.T. supply unit by means of the usual condensers and chokes, and is said to give very excellent results, free from ripple or "hum."

Valve Cartons.

Little attention appears to have been given by valve manufacturers to the important question of the boxes or cartons in which their products are sent out. I mean as to the safety of the valves. There seems to be little doubt that many of the broken filaments could be avoided if proper boxes were used which would safeguard the valves. In this connection, I saw recently a new model of box which, I understand, is shortly to appear on the market, which was indeed a revelation in simplicity and ingenuity. I should imagine that a valve could be thrown down the stairs or subjected to the most vulgar use, when contained in the box in question, without suffering in the slightest.

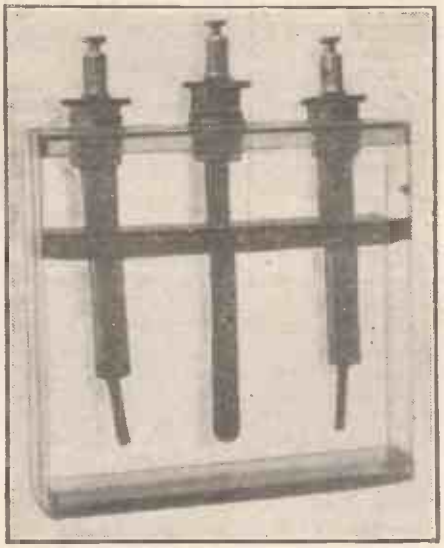
Having regard to the great amount of research and trouble which have been devoted to valves and valve holders, it seems strange that the same anxious solicitude should not extend to the packing and carriage of the product.

The Straight-Line-Frequency Dial.

A good deal of interest seems to have been taken in the straight-line-frequency dial which I mentioned in these Notes recently, and readers have asked in many instances for further information on the subject. The purpose of this dial is to permit of an ordinary variable or tuning condenser being operated as one of the straight-line-frequency variety, thus obviating the need for purchasing and installing another condenser and scrapping the old one.

It is probably well-known that the ordinary condenser crowds the stations together, especially at the higher frequencies, whilst at the longer wave-lengths, the stations are unduly spread out on the dial. It is estimated that for two stations not to interfere, there should be a clear frequency band to each of about 10 kilocycles. In tuning at the lower settings, a small change in condenser capacity will cause a considerable variation in the frequency to which the tuned circuit responds, whilst at higher condenser settings, a larger variation is required for the same change in the tuning.

This problem becomes, of course, more acute still when wave-lengths much below the present broadcast lengths are required to be received.



The original model of the "Rectalloy" charger described in recent issues. Further important details about "Rectalloy" will appear shortly.

In order to overcome these troubles, various types of condensers have been brought out in which the variation of capacity at the lower wave-lengths, for a given number of degrees on the dial, is comparatively small. The so-called "straight-line-frequency" condenser, which is rapidly coming into favour, when properly designed, actually does space the frequencies more or less evenly round the dial, which is evidently a very desirable feature. In passing, I should say, as I have said before, that in my opinion there is no very great advantage in a straight-line-frequency condenser over an ordinary type condenser, if the latter is properly equipped with a good vernier adjustment.

Automatic Gearing Variation.

However that may be, the straight-line-frequency condenser has caught the imagination of a section of the radio public, and so in order to assist those who already have the old type (semi-circular vane) condenser, the straight-line-frequency dial has made its appearance. The principle of this dial is simply as follows. The condenser vanes move as before, but the dial is geared to the moving set of vanes through a special gearing, which has the effect of making the dial move more rapidly, for a given movement of the vanes, towards one end of the scale than towards the other. Thus in effect you have a straight-line-frequency condenser so far as operating is concerned. Which, if you think of it for a moment, only bears out the statement I have made above that, provided you can move the vanes sufficiently slowly with sufficient vernier effect, it does not matter whether they move more quickly at one end than at the other. In an actual dial of this kind, the ratio of the gearing is about 24 to 1 at one end of the scale, and is automatically and gradually reduced to about 3 to 1 at the other end of the scale.

H.T. Leakage.

Many amateurs do not trouble to disconnect their H.T. battery from the set when the latter is not in use, whilst others are particular always to remove the wander-plugs, in the belief that the battery is thereby conserved. This raises the question as to whether any current flows from the H.T. battery when the set is not in use. Theoretically, since the H.T. battery is connected to the plates of the valves, there should be no current flowing from the battery when the filaments are not alight, as the H.T.current is, in fact, the electron emission current from the filaments, which is zero when the filaments are cold.

This is all right so far as it goes. But it does not take account of the fact that there may be leaks of various sorts in the set, and although these leaks may be very small, when measured in milliamperes, or even in microamperes, nevertheless, owing to the very long time during which they flow, if the battery is left "on" the total amount of electricity taken from the H.T. battery, in the course of a month or a few months, may be quite appreciable. Furthermore, there may be (although, of course, there should not be) some quite important cause of leak in the set, due to defective insulating material or what not. All things considered, therefore, and having regard to the short life of the average H.T. battery, it is a wise precaution always to disconnect the H.T. battery when the set is not in use. This should not be done merely by removing the common negative wander-plug, but by removing each of the positive wander-plugs. If there is only one common positive wander-plug, it is immaterial whether the positive or the negative wander-plug be removed, but if there are two, or more, positive wander-plugs, plugged in at different H.T. voltages, then these should all be removed.

Valve Rejuvenators.

The rejuvenating of valves by the "flashing" method, which used to be recommended (with great caution) for amateurs to practise on their de-vitalised dull emitters, has now been placed on a commercial basis, and a number of "rejuvenators" have been put on the market, especially in America, with which either amateurs or dealers may with confidence undertake the renewing of valves for themselves. In principle, the rejuvenator consists of a step-down transformer, working from the 110 or 220 volt A.C. electric-light mains, and giving perhaps 20 or 30 volts on the secondary side. A number of tappings are provided on the

(Continued on page 724.)

An air of Satisfaction

20/-

DESIGNED FOR EFFICIENCY AND COMFORT

THAT elusive distant station will readily respond to Standard Head Receivers.

Remember that the best components give the best results in the long run and you cannot do better than pin your faith to apparatus that has been proved by all wireless experts.

Standard Head Receivers are fitted with a leather-covered head band to ensure greater comfort for the listener. Write for our new booklet No. W 546.

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Standard FORMERLY *Western Electric* **Head Receivers**

The new T.C.C. Mica Condenser

Here is the latest T.C.C. production—an accurate mica Condenser in a green moulded case with duplex terminals. Owing to its convenient shape it takes up very little room on the panel, and because it is sealed from below instead of from above it is proof against the heat of the soldering iron. For those who do not wish to solder their connections, a convenient milled head is provided to ensure a perfect electrical contact.

No need to ask if it is accurate —the name T.C.C. guarantees it.

Every T.C.C. Condenser—whether Mica or Mansbridge—has to pass so many tests before it is released for issue that its accuracy within a very small percentage of error is a foregone conclusion.

Your fixed Condenser—on which so much depends—is one of the least expensive of all the components you buy. The difference in cost between one of doubtful reputation and a genuine T.C.C. may only be a copper or two yet the difference in results may be phenomenal. Experts say that the majority of faults in home-built receivers are traceable to the use of inferiorand badly insulated condensers.

If your own Set is not giving the results you should expect, suspect the condensers—substitute T.C.C. Mica (for small values) and T.C.C. Mansbridge (for large values) and you obtain a permanent insurance against Condenser breakdown.

Prices:

No. 33, all capacities between ·004 and ·001 mfds. 2/4

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From all Wireless Shops

T.C.C. Mica Condenser

Advertisement of Telegraph Condenser Co. Ltd., Kew, Surrey.

Gilbert Ad. 4007.

Telling Testimony to the Efficiency of Ericsson Telephones.

"I am ever so pleased with your 'phones. If I had bought them first I should have been money in pocket. I took them round to a friend who tried them against his (by another well-known maker) and he has decided to have yours—he went quite 'potty' over them."

"About 11 months ago I bought two pairs of your telephones for the simple reason that by comparative test they were better than all the others I have ever tried. I have never had reason to regret the purchase or had reason to believe I might have bought better instruments."

USERS of **Ericsson Super Sensitive Telephones** often go to the trouble of writing us to express their appreciation of their wonderful clarity, sensitivity and *tone*.

This is easy to understand. **Ericsson Super Sensitive Telephones** are *built* by telephone experts (we have had a generation's experience in telephone manufacture), not merely factory assembled.

As proof of their wonderful efficiency the Admiralty adopted them *as standard* in 1909, in 1917 the R.A.F. Since then they have been immensely improved, and to-day they stand supreme as the world's best 'phone *bar none*.

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At all good dealers.
Agents everywhere.

Write to-day for lists containing full information on our sets (crystal and valve), Super Tone Loudspeakers, Components, etc.

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22/6 All Resistances

120, 2,000 4,000 ohms.

Ericsson SUPER SENSITIVE Telephones

The Cheapest Crystal Set

Designed, built, and described by the "P.W." Technical Staff.

Here is a little receiver costing but a few pence to construct that will prove as efficient in operation as that most successful and popular receiver, the "Cheapest One-Valve Set."

OWING to the instantaneous success attained by the "Cheapest One-Valve Set," which was published in POPULAR WIRELESS recently ("P.W." No. 174, week ended September 26th), a great many readers have expressed a desire for details of a crystal set built upon similar lines.

The chief factors which were borne in mind when the one-valve set was designed

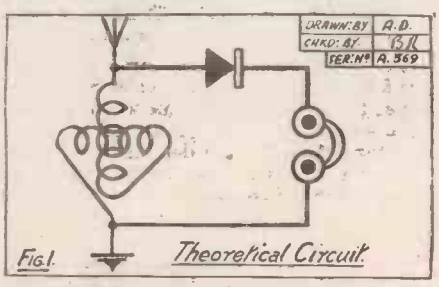


Fig. 1. *Theoretical Circuit.*

were, firstly, cheapness; secondly, the utmost efficiency obtainable with inexpensive parts; and thirdly, simplicity of construction. No attempt whatever was made to enhance the appearance of the set, and, although the finished article may have left much to be desired in this respect, its efficiency was certainly surprisingly high, as many readers have testified.

The Few Parts Necessary.

The construction of a really cheap crystal receiver which could be relied upon to give good results in inexperienced hands was therefore started, and the complete set which resulted is illustrated in the photograph on this page.

It will be seen that the "panel" is a piece of ordinary white wood upon which are four terminals, for the aerial and earth connections, and for 'phones. The crystal receiver shown is made from a set of parts, such as can be obtained from almost any wireless dealer for 1/- or less. The actual model shown cost 8d., and, although its finish is not elaborate, it worked quite well and required but little "tinkering" for good reception. As the cost of such a set of parts is so small it was thought unnecessary to go to the trouble of making the crystal detector. This would have been quite possible—indeed, it is quite an easy job for those with plenty of patience and the necessary tools. The majority of readers, however, will prefer to buy the parts or utilise crystal detectors that are already on hand.

The following components will be necessary in order to make the set:

One wooden baseboard, measuring approximately 8¼ by 4½ in.

A sheet of cardboard to make the formers upon which the spider-web coils are wound.

¼ lb. of No. 24 D.C.C. wire.

The various parts for the crystal detector.

Four terminals; and a skewer or other short wooden rod upon which two small wooden discs can be mounted.

Mounting the Moving Coil.

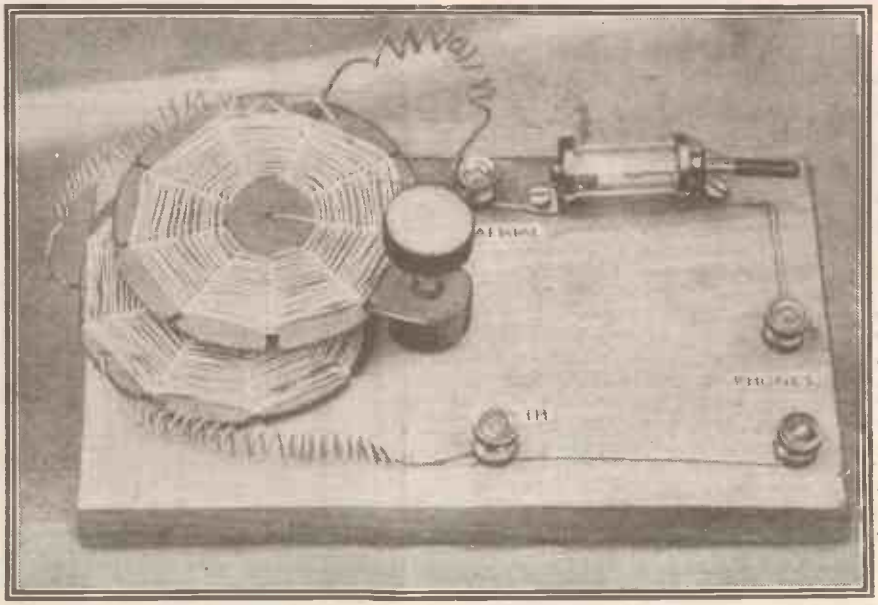
One of these discs serves as a control knob, and the wooden rod is tapped half-way through it and securely fixed by a little gum or by being tightly driven into place. The other wooden disc has a hole through its centre, into which the wooden rod makes a tight fit, and its purpose is to hold the moving coil in position and to act as a bush for supporting the moving part of the coil-holder upon the "panel." The terminals used may be of any type and will probably not be quite sufficiently rigid if merely screwed into the wooden baseboard. It is a better plan to carry the holes through to the other side of the baseboard and secure a locknut there in a hole previously countersunk for the purpose.

Constructing the Coils.

Referring to the theoretical diagram which appears on this page, it will be seen that the circuit is the simplest possible, and consists of an aerial connection, a variometer for tuning, and an earth connection. Across the variometer are connected the crystal detector and telephones in series with each other, the telephones being joined next to the earth terminal. The variometer will be seen to consist of two ordinary spider-web coils. One of these is permanently secured to the "panel" by a screw through the centre of the cardboard former, but the other is free to slide over it, the movement being controlled by the upper wooden knob.

The construction of coils of this type presents no difficulties whatever, but, for the benefit of those who have not tried to make them before, the following details are given: Stiff cardboard should be used, and it must be perfectly dry. To remove any traces of moisture, it is a good plan to place the cardboard in a warm oven under a flat weight for half an hour.

(*Continued on page* 684.)



The complete set. Note how the cardboard former of the upper coil is fitted on the wooden disc through which the control-rod passes.

THE CHEAPEST CRYSTAL SET.

(*Continued from page 683*).

Then mark out two circles with a common centre. The outer one has a diameter of 3½ in. or so, whilst the inner one measures about 1 in. across. The outer circle is then divided into nine equal spaces, and a line is drawn from these towards the centre and ending upon the inner circle. Parallel to each of these nine lines, at a distance of $\frac{1}{16}$ in., two other lines are drawn, so as to make slots from the outer circle to the inner circle, which will measure ⅛ in. across. Now take a sharp pair of scissors and cut round the outer circle and down the slots.

A good idea of the former can be obtained from the photographs and diagram, which, although showing the wire wound in position, clearly indicates how the former has been made. The second former is made in the same way, but, in this case, one of the nine divisions is left elongated, so as to leave a projecting piece for fixing to the bush which supports the upper (moving) coil.

Fixing the Coil-winding.

The method of winding the coils is well known, so that it will be sufficient to explain it briefly as follows: Make a small hole near the centre of the former and push about 6 in. or 8 in. of the wire through it, leaving this length for the connections. Then wind the wire round the former through each slot in turn, the winding being done in a clockwise direction. Each time the wire passes the starting point one turn is completed, and 40 of these turns will be needed for one of the coils. Then finish off by pushing the wire through a small hole near the edge of the former, leaving a good length, say 6 in. or 8 in., before cutting the wire. Lay this coil aside and make the other one in the same way, with about 30 turns. The loose ends are then neatly wound in coils round a pencil so as to make a kind of wire spring.

The photograph of the complete set on page 683, which shows the moving coil in position, indicates how the fixing to the holder is accomplished. The projecting piece is tacked by two pins or tintacks on to the wooden bush and cut round to shape. A hole is then cleanly made in the centre to correspond with the hole in the bush, and a wooden rod is passed through, the bush being adjusted in the desired position.

The Baseboard.

Any kind of wood may be used for the baseboard, and the results obtained with American white wood certainly left nothing to be desired. The important part about this "panel" is that it should be perfectly dry. It may be "baked" in an oven to ensure that no moisture remains, and it is a good plan to coat it lightly with shellac varnish, although this is not essential. Similarly, the coils themselves may be lightly coated with shellac, but it is questionable whether the disadvantages, owing to the increased self-capacity of the coils, are not greater than the advantages which would be gained by the exclusion of moisture.

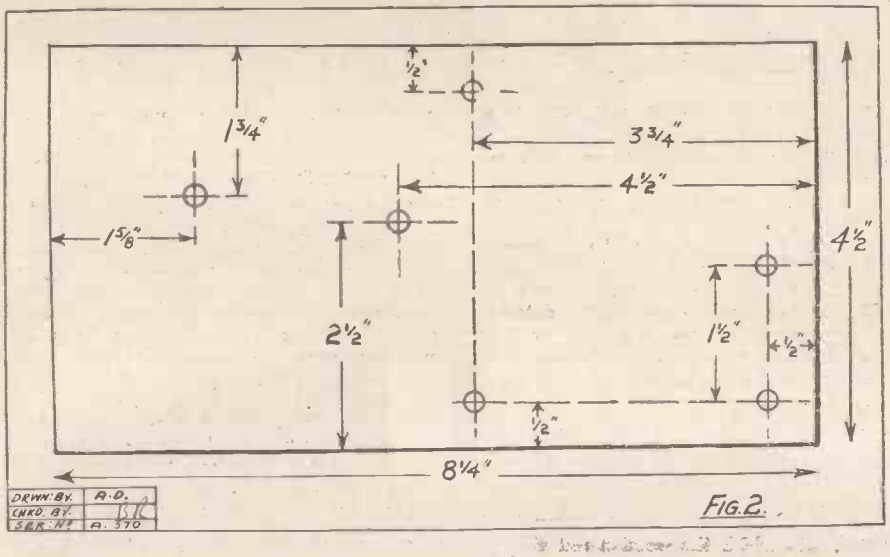


FIG. 2.

The mounting of the set is simplicity itself, but, in accordance with our usual custom, we are showing a wiring diagram of the connections (Fig. 3). To assemble the set all that is necessary is to mount the fixed coil by a single wood screw through the former in the position indicated by the plan of the panel. The outer edge of this coil will be connected to the earth terminal, but its inner end must be connected to the outer end of the moving coil.

In this way it will be found that the direction of a current traversing the two coils would not be reversed (See Fig. 3). For instance, tracing the current flowing from, say, the earth terminal, it will be seen to enter the lower (fixed) coil on the outside and flow through this coil in a *clockwise* direction. Emerging at the centre of the coil it will pass through the flexible ends and enter the moving coil on its outer edge. It will traverse this coil also in a *clockwise* direction, and eventually flow from the centre of the upper coil along the flexible connection to the aerial terminal. The two coils may thus be considered as separate sections of one continuous coil, and the wave-length which such an arrangement will cover will be found to vary according to the relative positions of the two coils. If placed close together the wave-length is at a maximum, which decreases as the coils are moved farther and farther apart.

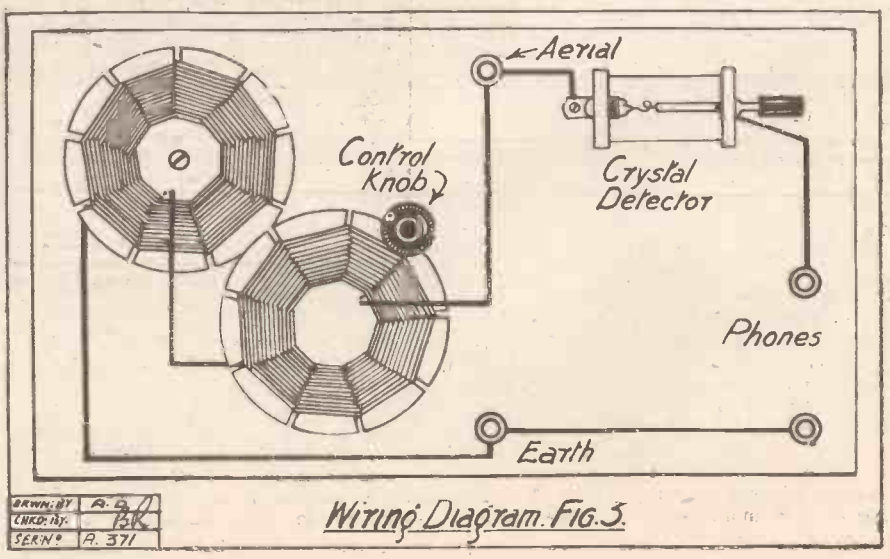
Testing the Tuning-range.

The exact number of turns of which either coil consists may be varied experimentally, as the best value for this largely depends upon the aerial and earth system.

To test whether the coils are of suitable size for your aerial, all that is necessary is to notice the strength of signals when varying the position of the moving coil. If it is possible to "tune through" the desired signals, the value of the coils is correct. The expression "tune through" simply means that a continuous movement of the control knob will vary the signals from a minimum value, increasing to a maximum value as the movement continues and falling again to a minimum before the movement is completed. It does not matter in what position the coils are when maximum signals are being obtained, so long as a slight movement either way will tend to weaken them.

It is advisable not to mount the terminals and crystal detector until the wires are ready for connecting up. The same wire

(*Continued on page 685.*)



Wiring Diagram. FIG. 3.

THE MANCHESTER WIRELESS EXHIBITION.

By 6 P L.

THE second Wireless Exhibition held in the City Hall, Manchester, under the auspices of the "Manchester Evening Chronicle," seems to have been more successful than its predecessor. The exhibits were numerous, varied, and very interesting, but we were very surprised to find that many of the biggest firms in the wireless industry were not represented. We understand that their absence was due to trade restrictions, and think this a great pity, because the provincial listeners are quite as keenly interested in the wireless industry as Londoners.

Valve-making processes

Perhaps the most interesting stand in the exhibition was that of Messrs. Radions, Ltd. Besides samples of valves in various stages of construction, they had a machine in operation which was making what is known as the "pinch" of the valve; the skill with which the operator threaded fine wires through tiny holes, together with the simple ingenuity of the machine, easily accounted for the crowd of onlookers which were always to be seen round the stand.

We think that one of the best arranged stands was that of Mr. Walter C. Barraclough (Burndepts). The stand was carefully arranged, nothing was crowded, and there was no unnecessary repetition of any particular component. The elaborate apparatus was shown on one side, and the components on the other. The quality of workmanship was obviously of the highest class. We noted an interesting innovation in the new "Ethodyne," a seven-valve super-heterodyne. The front panel of the receiver, on which the controls are mounted, is not made of ebonite, but ordinary mahogany. This greatly enhances the appearance of the receiver.

Super-Sets on Show

The number of super-heterodyne sets exhibited by various makers is one of the most striking features of this year's exhibition; there is scarcely a maker of any standing that has not got a model on show. The one which interested us most was the model shown by the Igranic Company. The set was shown completely assembled, but glass had been substituted for the wooden sides and ebonite panel. This particular set received a well-merited share of attention.

There were a vast number of different types of loud speakers—all shapes and sizes were represented; but, with one notable exception, we failed to find one of the newer models which was as attractive in appearance as a well-designed and well-finished model of the horn type, such as the well-known Ethovox of Messrs. Burndept. The notable exception was a small model of the bracket clock type, called a Beco. The 3-in. diaphragm is made of a prettily coloured substance with the appearance of mother-of-pearl; the whole appearance was neat, compact, and very attractive. What its actual performance would be it is impossible to say, but the makers are evidently very confident, as they offer it on a week's free trial.

The other newer types of loud speakers are very disappointing. Some were either ugly, or bulky and cumbersome, and we are doubtful whether the considerable extra cost of a few of the "vastly improved" models would be justified by the improved results which, the makers say, will be obtained by using them. It is interesting to note that only two of the paper diaphragm type were to be seen at the exhibition, whereas last year there were literally dozens of them.

Short-wave Components

We were very sorry to hear complaints from the stand holders of the loud-speaker demonstrations. We were not at the exhibition while one was in progress, but were given to understand that they had not been very satisfactory. This is a great pity, for a pour loud-speaker demonstration will do the stand holders a lot of harm. This side of an exhibition is so important that the promoters ought to go to great trouble and expense to make sure of getting the best results.

Of the stands exhibiting components we will only comment on Messrs. Webber's, whose short-wave low-loss apparatus was strikingly different from the components on any of the other stalls. Their apparatus, though not as finely finished as many of the components produced by some of the bigger firms, seemed very well designed and sturdily made. In general, all components were of good design and, in the majority of cases, exceedingly well finished.

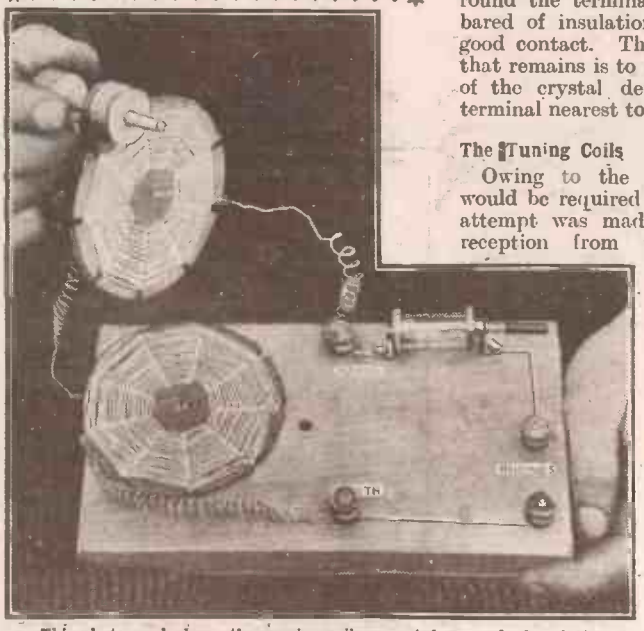
Goodwork by 2 Z Y

We cannot close our brief account of the most interesting parts of the exhibition without mentioning the stall which the Uncles and Aunties of 2 Z Y were running. The proceeds of the stall, the materials for which have been sent in by children and, in many cases, by parents of children, are to be devoted to the fund for equipping children's hospitals with wireless apparatus. We were glad to learn that the stall was doing very well indeed.

In conclusion, we think that thanks are due to the "Manchester Evening Chronicle" for organising the exhibition, and we should like to express the hope that they will give us another next year, and that they will be able to arrange for all the big firms in the wireless trade to take part.

THE CHEAPEST CRYSTAL SET.

(*Continued from page 684.*)



This photograph shows the moving coil connected up ready for placing in position on the panel.

that is used for the coils will do for this purpose, and, if plenty of surplus has been left at the coil ends, there is no need to actually break this wire at the aerial or earth terminals. Instead, the side of the fixed coil which goes to the earth terminal may be twisted round this terminal and carried on to make connection with one 'phone terminal; and, similarly, the wire from the centre of the moving coil may pass round the aerial terminal and on to the crystal detector.

Care must be taken when passing the wire round the terminals that it is completely bared of insulation, so that it will make good contact. The only other connection that remains is to join up the opposite side of the crystal detector to the telephone terminal nearest to it.

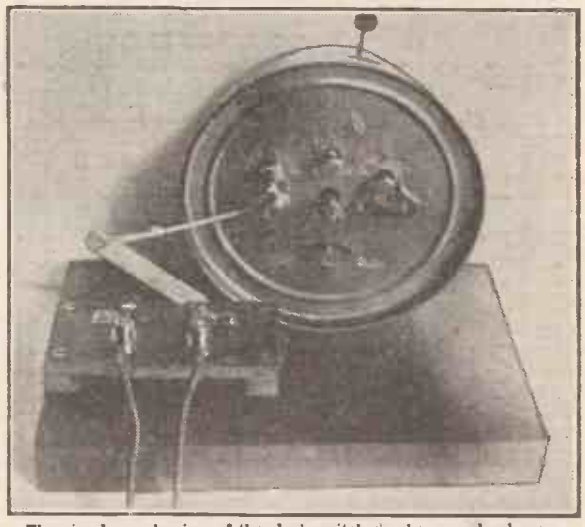
The Tuning Coils

Owing to the very large coils which would be required for tuning to 5 X X, no attempt was made to adapt the set for reception from the Daventry station. Nearly one hundred turns would be necessary upon each coil in order to tune up to 1600 metres, and, as most listeners are within range of a main or relay station, such a wave-length alternative is generally unnecessary. For 2 L O and stations below 400 metres, a total of 70 turns (40 fixed and 30 moving coil) gave good results on average aerials, but for Aberdeen and other stations whose wave-lengths lie between 400 and 500 metres, the total number of coils should be 80, i.e. 40 on each coil.

When the set is connected up for use, the results will astonish those who think that only by paying a high price can one obtain an efficient crystal receiver.

A SIMPLE CLOCK SWITCH.

By J. NASH.



The simple mechanism of the clock switch can be very clearly seen in this photograph.

THERE are many wireless enthusiasts who leave their sets in one part of the house and run extension leads for the 'phones or loud speakers to the other rooms. The advantage of having a clock switch is that, if one does not wish to remain up late at night to hear any special items, the alarum indicator can be set at the time one requires his sets to be switched off, and he may then go to bed and rest assured that the valve, or valves, will be safely switched off at the desired time.

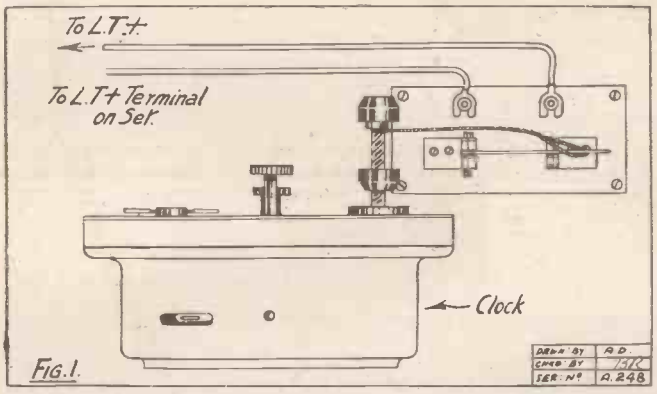


FIG. 1.

It is also very useful if one wishes to leave the receiver with anyone who does not understand the operation of the set.

Quite Inexpensive.

All that is required to make up the clock switch is an alarum clock (most people have a spare one of these about the house, or one can be purchased for about 3s.). A S.P.S.T. switch; this can either be made by the constructor, or purchased, the small panel mounting type being quite suitable for the purpose, and a few nuts and screws.

It is first necessary to fasten the clock on to a piece of wood about 8 in. by 6 in. by ¾ in. I found the best way to mount the clock on to the wood was to unscrew the two brass legs of the clock and to screw in their places two small pieces of 4 B.A. rod (I might add that, fortunately, all the fittings take 4 B.A. size on these clocks) and these can easily be secured to the wooden base by nuts. The switch must then be mounted on a small piece of ebonite about 3½ in. by 1¾ in., and this screwed on to the wooden base, as shown in the diagrams.

Two terminals (from which connection is made to the L.T. battery) are also mounted on the ebonite, and these are connected by small pieces of wire to each end of the switch. It is then necessary to unscrew the alarum winder, and a small piece of 4 B.A. rod being fixed into place, as shown in Fig. 3, to the end of this is fastened a small length of twine by a nut. The twine is also connected to the end of the switch arm.

It will be seen that when the time arrives for the alarum to go off the rod will revolve, lift up the arm of the switch, and so break the L.T. circuit. A much lengthier description could be given, but I think what I have said is sufficient to show how really simple and effective is the "clock switch."

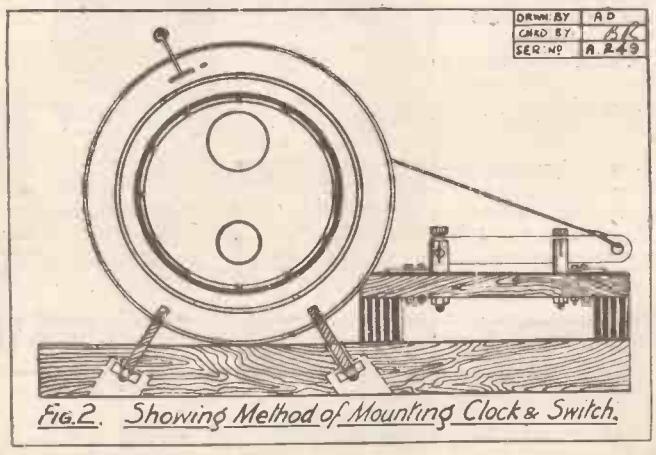


FIG. 2. Showing Method of Mounting Clock & Switch.

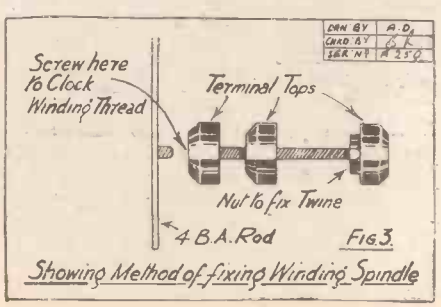


FIG. 3. Showing Method of fixing Winding Spindle

USEFUL TIPS.

IF you are using separate H.T. batteries for each valve, do not throw them away when their voltage drops below useful limits. Connect them up in series with each other, thus adding their voltages. The combination will probably give sufficient voltage to serve one valve for many months.

* * *

Sometimes you may wish to tune down to a wave-length below the lower limit of wave-range to which your set is designed. The introduction of a variable condenser in series with the aerial will allow you to do this. You may not be able to tune the secondary circuit as well, but as a make-shift the expedient often answers sufficiently well. It is generally better to connect the condenser between the earth and the earth terminal than on the aerial side.

Similarly, connecting a condenser across, i.e. in parallel with, the aerial inductance, increases the wave-range of the aerial circuit.

* * *

Telephone noises are frequently traceable to ill-fitting plugs in H.T. batteries. Keep a few scraps of "silver" paper from chocolate handy, to wrap round the plugs and ensure a better fit. What are wanted are a standard plug and standardised sockets in the batteries. As a rule the *sockets* are not deep enough.

* * *

Have a little confidence in your set and do not begin to hunt for "faults" directly signals fail. B.B.C. stations and others have been known to break down. Listen, and fix in your memory the sounds you hear. There will be a "breathing" sound, like a current of tiny noises, mingled with occasional X's, which are rarely absent entirely.

The circuit will sound "alive." Once learn to recognise the characteristic sound of space and you will not go panicky when the music stops in the middle of a bar, but will say, "They've trouble at ——. Have a cigarette." Receivers break down more often than B.B.C. stations, but not necessarily yours.

A Household 3 Valver

The Set Designed and Described by
G. V. DOWDING, Grad.I.E.E.
(Technical Editor).
Constructional Work by
G. V. COLLE
and H. MEADOWS
(Technical Staff).

PRIMARILY, this receiver is for loud-speaker work, although, of course, using two valves, considerable ranges of reception are possible with telephone receivers. However, the main requirements of a "household" loud-speaker receiver are pure reproduction with ample volume, and a switch so placed that once the tuning controls are "set" for one particular and favourite station, the instrument can be switched on or off at any time by anybody. It should also be possible to employ extension loud-speaker leads without trouble being experienced.

The household three-valver fulfils all the above requirements and is a set that, once built and installed, will continue to do so with a minimum of expense and trouble. The initial cost of the specified components may be rather high, but, on the count of reliability, they are to be recommended—reliability being an all-important asset in anything connected with a "household" set.

The range of reception possible with the receiver will, of course, vary to some considerable extent under varying conditions. With a good aerial and earth, however, 40 to 50 miles should be comfortably covered in the case of main B.B.C. stations, 10 to 12, relay stations, and 150 or so in the case of 5 X X. These are very conservative estimates, and ones that can be more or less safely accepted as minimums.

Straightforward Circuit.

It will be noticed, on reference to the photographs, that an R.I. tuning and reaction unit is employed. This, of course, takes the place of a coil holder and coils, and enables a very comprehensive wave-length range to be covered without involving the changing of coils.

As will be seen by the theoretical diagram, Fig. 1, and the pictorial diagram, Fig. 2, the circuit is quite straightforward and consists of a detecting valve followed by two stages of transformer-coupled L.F. amplification.

Series-parallel aerial condenser tuning is provided, and provision is made for grid bias. By means of a choke and condenser the loud speaker is isolated from the steady plate current of the last valve, and this, as well as protecting the windings on the magnets of the loud speaker, also eliminates "howling" tendencies, etc., when long loud-speaker leads are employed.

A separate H.T. tapping for the last valve is arranged so that the detector and first L.F. receive a similar plate voltage, but the second L.F. stage, in which a power valve should be used, can be given a higher H.T., the same H.T. battery being used. The switch, which cuts out the last valve, also arranges the H.T. so that no adjustment in that voltage is required when either two or three valves are used.

A list of the components and materials required is given separately. There is little in it that calls for comment, as practically everything used in the receiver can be identified in the various photographs. Quarter-inch ebonite is essential for the panel, as it has to bear a rather considerable weight. In addition, brass brackets should be used to strengthen the fixing of the panel. For these ⅛ in. by ⅝ in. brass strip should be employed, although, if the panel and case is purchased complete, suitable brackets will be supplied, or, at least, constructors should ascertain that they will be supplied before completing their purchase.

LIST OF COMPONENTS.

	£	s.	d.
1 R.I. tuner	1	19	6
1 R.I. ·0005 mfd. variable condenser	1	4	0
1 Eureka "Concert Grand" transformer	1	5	0
1 Eureka "No. 2" transformer	1	1	0
1 Lissen L.F. choke		10	0
1 Grid leak and condenser (Dubilier)		5	0
2 ·002 fixed condensers (Dubilier)		6	0
1 1 mfd. Mansbridge condenser (T.C.C.)		4	0
3 Magnum valve holders (Burne-Jones)		15	0
1 Lissen key switch		2	6
1 Nesthill D.P.D.T switch		2	0
3 Precision rheostats		9	0
1 Grid bias battery (Siemens G2)		2	3
1 Panel, 16 in. x 6 in., with baseboard and cabinet (Peto-Scott)	1	15	6
Wire, screws, transfers		2	6

Commencing Construction.

The panel drilling is the first constructional step to take. Fig. 3 gives as many measurements as possible for this. The R.I. tuner is a fairly difficult component to mount. The ivorine scale should be carefully removed and used as a drilling template. Great care should be taken in marking out the holes, as even a slight deviation from a true centre will cause trouble. The same precautions should be applied to marking out and drilling the holes for the D.P.D.T. switch.

The remainder of the drilling is quite straightforward, and the careful use of metal-working drills will result in clean-cut holes with sharp edges and no chipping. The terminals and switches can be mounted before the panel is screwed on to the baseboard, and after the latter operation the baseboard components can be screwed down into position.

The Lissen L.F. choke should be mounted with two 4 B.A. countersinking screws tapped into the panel to a depth of ⅛ in. or so. No sign of the screws therefore will be seen on the front of the panel.

All the components should be mounted exactly as shown in the diagrams and photographs.

(Continued on page 690).

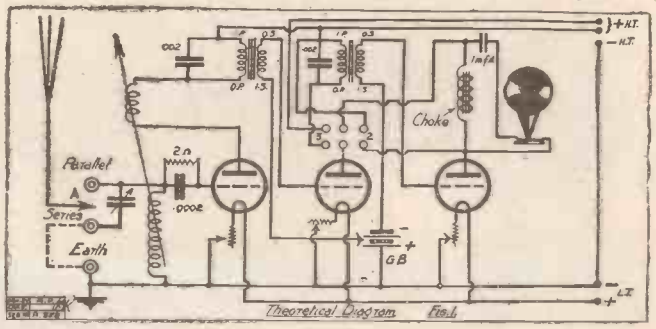
The complete receiver. This photograph gives a good idea of the general appearance of the set and of the positions of the various controls.

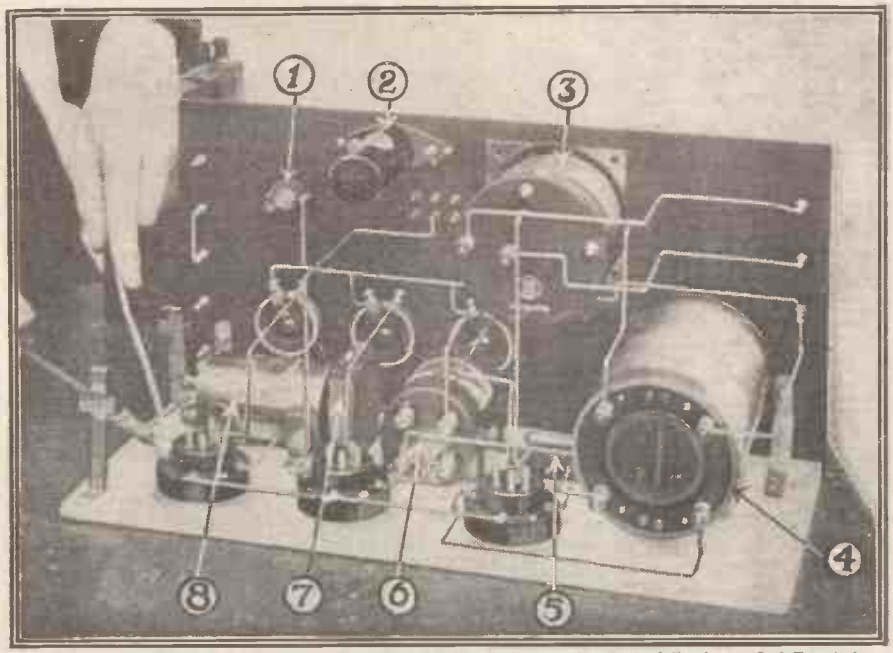
A HOUSEHOLD 3-VALVER.

(*Continued from page 689*).

otherwise the wiring will prove to be more difficult. It is admittedly fairly complicated for a "straight" receiver, but not the slightest unnecessary complication has been introduced, and everything has been arranged with a view to rendering the wiring as easy as possible.

leads, all the wiring can be carried out with square section tinned copper wire of 16 or 18 gauge. With regard to the grid bias leads: although in some of the photographs only two are shown, three should be used. One, of course, is connected to the L.T. minus terminal—this is the plus connection to

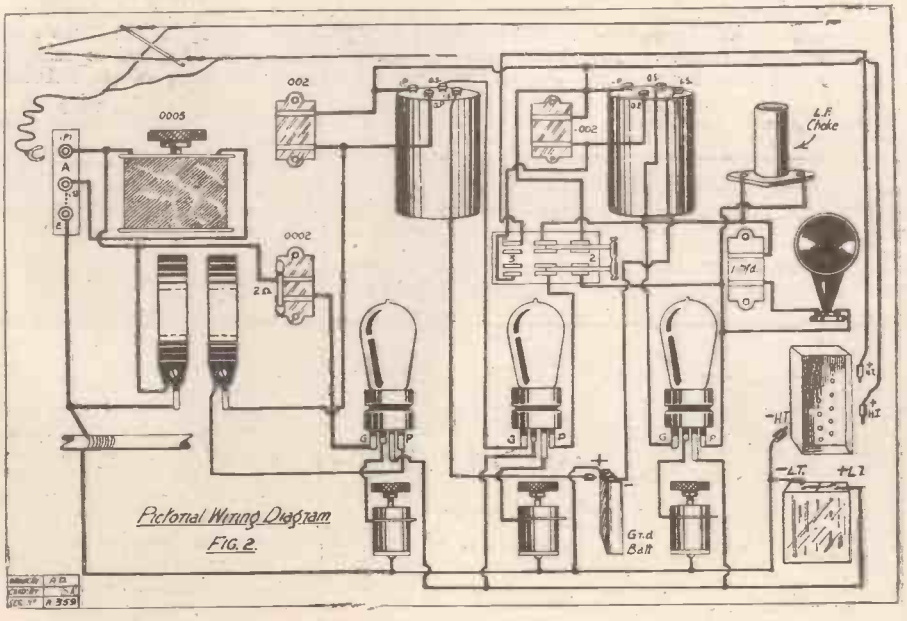




Soldering one of the filament leads. The figures on the photograph denote the following: (1) L.T. switch; (2) L.F. choke; (3) A.T.C.; (4) R.I. tuner; (5) grid leak and condenser; (6) Eureka grand transformer; (7) 1 mfd. condenser; (8) second stage transformer.

The 1 mfd. T.C.C. fixed condenser should not be mounted until the lead from the loud-speaker terminal to the D.P.D.T. switch is connected.

With the exception of the three grid bias the bias battery; the other two are connected to the I.S. terminals of the L.F. transformers, and are minus connections. Thus both L.F. stages are provided with grid bias, as per Fig. 4, the wiring diagram.



It is not always essential that the first stage should have grid bias, but it is sometimes very advisable, and it is useful on a "household" set to be able to introduce it when required.

Final Considerations.

There is little else respecting the wiring that calls for comment, and Fig. 4 and the point-to-point wiring guide should prove self-explanatory.

POINT-TO-POINT CONNECTIONS.

Top aerial terminal (parallel) to fixed plates of variable condenser, also to terminal "A" of R.I. tuner and to one side of grid leak and condenser. The other side of grid condenser and leak to grid of first valve. Aerial terminal (series) to moving plates of variable condenser.

L.T.—is connected to plus grid bias, —H.T., and also to one side of key switch.

Other side of this goes to the three rheostats, "E" of tuner and earth. The other sides of rheostats go to one filament socket of each valve.

Top left-hand terminal (plus L.T.) is connected to the remaining filament sockets of the three valves.

Plate of first valve is connected to one terminal "R" of tuner, the other terminal "R" of which is connected to the OP terminal of the first L.F. transformer, which also has one side of a ·002 mfd. fixed condenser connected to it. The IP terminal and the other side of the fixed condenser are taken straight to H.T. plus; fourth terminal down on the left-hand side. OS of transformer to grid of second valve, and IS to grid bias flex.

Plate of second valve to centre bottom contact of D.P.D.T switch. Right-hand bottom contact to one side of loud speaker, one side of L.F. choke and plate of third valve. The other loud speaker terminal is taken to a 1 mfd. condenser, the other side of which is connected to top centre contact of switch and other side of choke. Bottom left-hand contact of switch to OP of transformer and one side of ·002 mfd. condenser, IP to the other side of condenser, plus H.T. (fourth terminal down) and top right-hand contact of switch. Top left-hand contact is taken to bottom left-hand terminal (plus H.T.). OS of second transformer connected to grid of third valve, IS to—grid bias.

Care should be taken that the leads are kept well spaced, and that every connection is well and truly made, and that no "dry joints" are allowed to remain.

Two clips for the grid bias battery should be cut from hard, thin brass sheet. This is

(*Continued on page 693*).

CLIMAX
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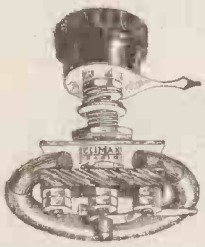
METAL FOR ME.

All the hard jobs in this unfeeling world are given to metal. If it's hard service, or long service, or exact service, then the man who knows says at once, "Metal for Me." Climax Metal-Cooled Rheostats are metal-wound on metal cooling cores. Except for the Bakelite knob and terminal bar they are 100 per cent. metal.

THE CLIMAX METAL-COOLED RHEOSTAT

(Prov. Pat. No. 220,124/23)



is wire wound on a solid metal rod, and insulated by high temperature vitreous enamel, capable of standing over 2,000 volts. The cooling thus obtained far exceeds that of any other method, and keeps the resistance cool even on excessive overload. This method of construction is a Climax Patent. No other can be "just as good." Being to all intents solid, the resistance element gives a perfectly smooth adjustment.

PRICES:—Climax Metal-Cooled Rheostat, 30 ohm, universal pattern for all D.E. or bright valves .. .. 4/- each.
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THE CLIMAX ANTI-MICROPHONIC VALVE SOCKET.

The Climax Anti-Microphonic Valve Sockets have anti-microphonic metal contact springs housed in metal sockets. They employ no rubber. Except for the insulating sleeves they are 100 per cent metal.

These sockets are made on an entirely new principle. The valve floats on metal springs. Each separate socket contains a patented hour-glass contact spring which is truly anti-microphonic and at the same time makes excellent electrical contact.

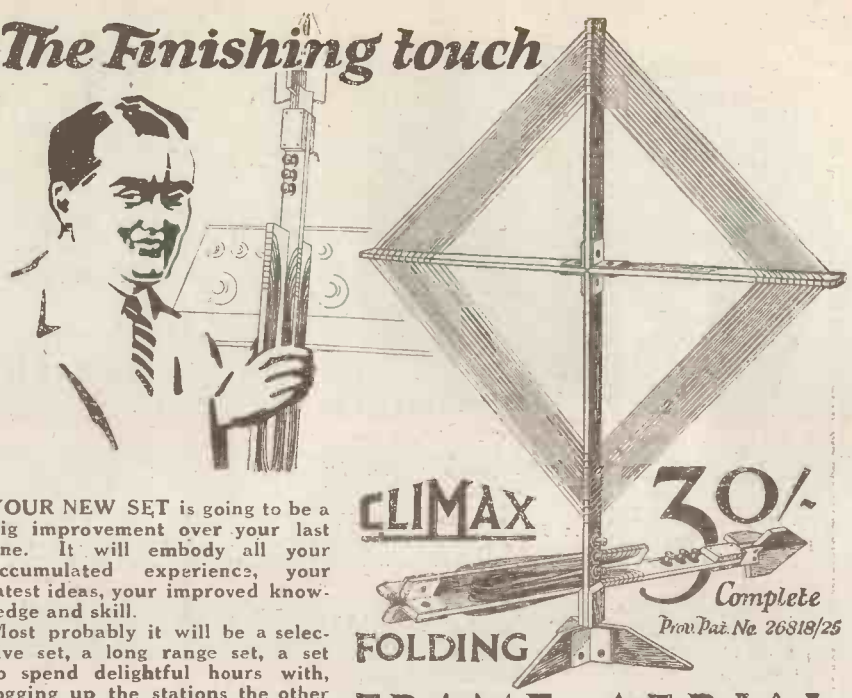
The socket is provided with a circular rim for mounting flush on the panel, the upper surface of this rim being insulated to prevent accidental burning-out of the valve. The Valve Stem is supported on the Climax Patent Hour-glass Spring, the waisted portion of which makes excellent electrical contact and keeps the stem absolutely clear of all other parts of the mechanism.

The use of Climax Anti-Microphonic Valve Sockets is confidently recommended in place of the ordinary built-up valve-holder, which has relatively high capacity, big dielectric losses, and consequent low efficiency, particularly for high-frequency work.

PRICE: One set of four Climax Anti-Microphonic Valve Sockets, fitted with patent hour-glass contact springs, complete with nuts and washers, Prov. Pat. Nos. 17,339/25 and 17340/25. Per box, 2/-.

MAKE SURE IT'S CLIMAX.

The Finishing touch



YOUR NEW SET is going to be a big improvement over your last one. It will embody all your accumulated experience, your latest ideas, your improved knowledge and skill.

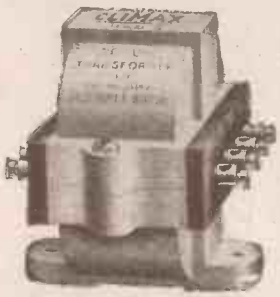
Most probably it will be a selective set, a long range set, a set to spend delightful hours with, logging up the stations the other fellow cannot get.

If so, it will need to be a frame aerial set, and the frame aerial will need to be carefully chosen.

A good choice in frame aerials would be the Finishing Touch to all your energy and patience. Make your choice the CLIMAX HIGH EFFICIENCY Folding Frame Aerial (Prov. Pat. No. 26818/25). The CLIMAX is undoubtedly the best Folding Frame Aerial.

THE CLIMAX FOLDING FRAME AERIAL is constructed on an ingenious mechanical system by which it may be opened or folded in a few seconds. The wire folds into the frame or opens out to its final form without the least trouble. The winding is arranged in two flat coils which are mechanically and electrically balanced. They combine the advantages of the pancake type of winding with the solenoid type. A centre tapping is provided for use with various special circuits.

This frame aerial is very attractive in appearance, extremely efficient in operation, remarkably simple in construction, and is very easily folded into a conveniently portable form. The stand also folds. It is offered at a particularly attractive price.



THE CLIMAX DE LUXE L.F. TRANSFORMER.

(Prov. Pat. No. 9549/25) Cruciform Design. Multiple Ratio. The workmanship and materials used are of the highest possible quality. The cores and windings are enclosed in a die-cast aluminium case, giving complete mechanical protection and handsome finish.

PRICE 27/6.

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L.F. AMPLIFICATION.

The Climax de Luxe Transformer is *constructed on a new method*. The laminations of the iron core are at right angles to the usual direction. The special construction enables a *much shorter iron path* to be employed, which means that a larger flux can be set up for a given magnetising current.

The primary and secondary coils are sub-divided to reduce capacity effects, and advantage is taken of this sub-division to bring out both primary and secondary circuits to two sets of terminals each. There are thus eight terminals altogether. The Climax de Luxe L.F. Transformer is therefore a multiple ratio transformer and can be connected to suit many different circuits and valves in a way not possible in the ordinary design.

The Climax Popular L.F. Transformer is a highly efficient transformer for general L.F. Amplification.

THE CLIMAX POPULAR L.F. TRANSFORMER.

This transformer is specially designed to give uniform amplification over the widest possible range of frequencies. Reproduction of speech and music is therefore exceptionally good and pure. It is robust in construction, being completely enclosed in a metal case. Substantial and conveniently arranged terminals are provided.

PRICE 17/6.

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Write for the Magazine Catalogue for full details of all Climax Radio Components and Sets

Two new Unidyne Sets

THE new 1926 Unidyne Sets are everywhere creating tremendous interest. The original Unidyne Sets were wonderfully efficient, but these new instruments are by far their superior.

For efficiency and economy you can't beat the Unidyne—the only practicable Receiving Set which successfully eliminates the H.T. Battery. Decide to build up one of these Sets for Xmas and let us have your order at once for quick delivery.

Special Note: ***When a complete Set of Parts is purchased with panel a Royalty of 12/6 per valve holder is payable with order.***

The 1926 2-Valve Unidyne

("Popular Wireless," Nov. 7th.)

The Component Parts required for this Receiver are as follows:—

1 Peto-Scott Square Law Condenser, ·0005, with Vernier and Spiral contact	11 6
1 Peto-Scott Square Law Condenser, ·0003, with Vernier and Spiral contact	10 3
1 Utility Switch	6 0
2 "C.H. Precision" Rheostats, 30 ohms	6 0
1 Dubilier Fixed Condenser with clips, ·0003	2 6
1 Dubilier Grid Leak, 2 megohms	2 6
2 Peto-Scott Fixed Condensers, ·001 mfd.	3 0
1 Bretwood Variable Anode Resistance	3 0
1 "R.I." Transformer	1 5 0
1 Coil Socket Unit Holder	1 3
2 5-pin Valve Holders	3 0
1 Unidyne "Efficiency" Choke	10 0
7 Mark III Terminals	1 2
Square tinned copper wire, screws, etc.	1 6
	£4 6 8
1 "Red Triangle" Ebonite panel, 13 x 6½ x 3/16th, drilled and tapped	6 0
Engraving extra	2 6
1 Polished Mahogany Cabinet, with baseboard	1 1 0
Extra if Required:	
Coil Unit for B.B.C. wave-lengths, comprising aerial, and reaction coils mounted on duplex plug-in base	4 6
Interchangeable Daventry Coils, similar to above	5 6

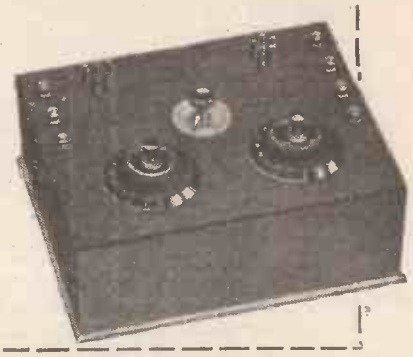
The 1926 1-Valve Unidyne

Unidyne Kit.

Includes the following: One Square Law Variable Condenser, ·0005 mfds., and one ditto, ·0003 mfds. Each with vernier and spiral contact. One 30-ohm Rheostat; one 2-megohm Grid Leak; one ·0003 Fixed Condenser; one Unidyne Efficiency Choke; 10 nickel-plated Valve Sockets; 7 Mark III plated Terminals; one plated Shorting-bar. All components tested by us and fully guaranteed. **41/-**

Extra if required:

"Red Triangle" Ebonite Panel, 10 x 8 x 3/16th, drilled and tapped	5/-
Engraving extra	1/6
Polished Cabinet to fit	8/6
Coil Unit for B.B.C. wave-lengths (comprising aerial and reaction coils mounted on duplex plug-in base	4/6
Interchangeable Daventry Coils, similar to above	5/6



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IT IS PURE EBONITE NOT JUNK.

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A Word to Advertisers

Our Issue for Dec. 12
will be a SPECIALLY ENLARGED CHRISTMAS NUMBER with many new and important features.

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NO INCREASE IN RATE

The Improved and Cheaper Coil Plug

SAVE 25%

Get your COIL PLUGS for 5/6 per doz. (4/6 gross lots).

Made of best tested materials throughout, these Plugs offer the advantages of nickel-plated side plate contacts, having patent lip. *Send 6d. to cover postage upon sample dozen orders.*

CECIL RIDLEY
35 & 37 DUNDAS MEWS
MIDDLESBROUGH

A HOUSEHOLD 3-VALVER.

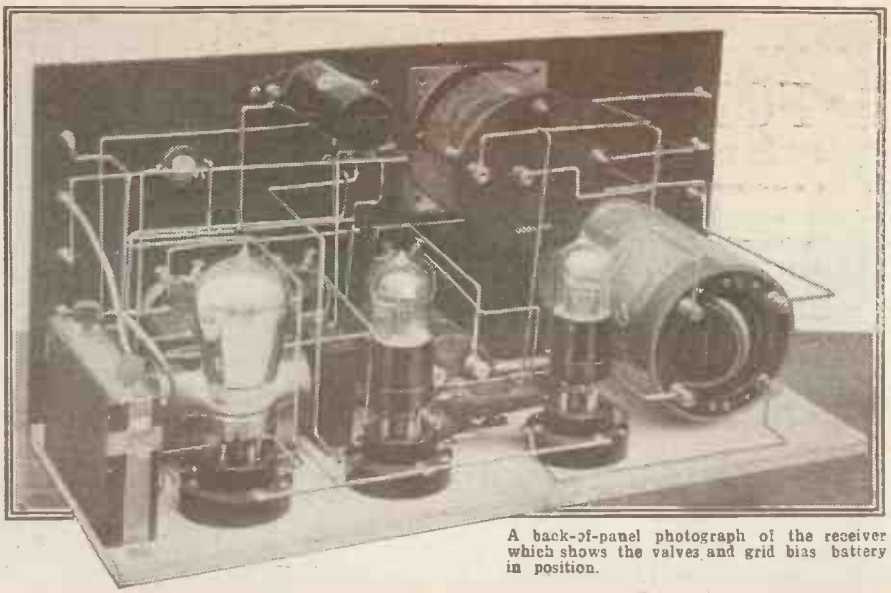
(*Continued from page 690*).

another *non-essential* refinement, but one that all constructors desirous of making a first-class receiver will desire to include. The shape of these clips can be gauged from the photographs, and can be cut to a size suitable for the battery used. A nine-volt battery tapped at every 1½ volts is recommended.

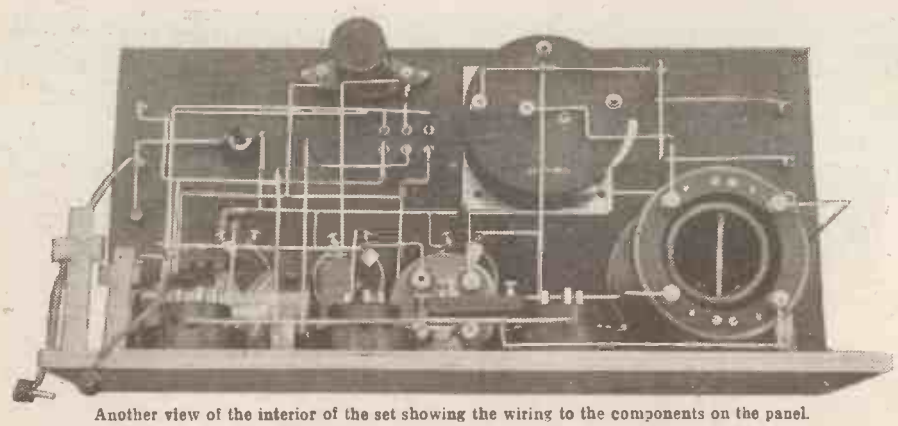
Suitable Valves.

The last task is the fixing of transfers on the panel; it is by no means a difficult one. Transfers are cheap, but vastly improve the appearance of a receiver.

Suitable valves to use are—using a six-volt L.T. accumulator—Cosmos A.45, Mullard R.A., Ediswan R, B.T.H. R, Louden F.1, Cossor P.1, for first position (detector) and second position; and Ediswan P.V.2, Radion Pyramid (1), B.T.H. B.4 for last stage—preference being given to the B.T.H. B.4. As a matter of fact, two B.4's in the L.F. stages give excellent results.



A back-of-panel photograph of the receiver which shows the valves and grid bias battery in position.



Another view of the interior of the set showing the wiring to the components on the panel.

Results Obtained.

Using a two-volt accumulator, Cossor Wuncells (W.1), B.T.H. B.3's, Cosmos S.P. 18's, can be used for first and second positions, and a small power valve, P.V.6 D.E. Ediswan or Cossor W.3, for the third position. Excellent loud-speaker results were obtained, using two valves, with a Cossor W.1 in the first position and an Ediswan P.V.6 in the second. Grid bias

(*Continued on page 697.*)

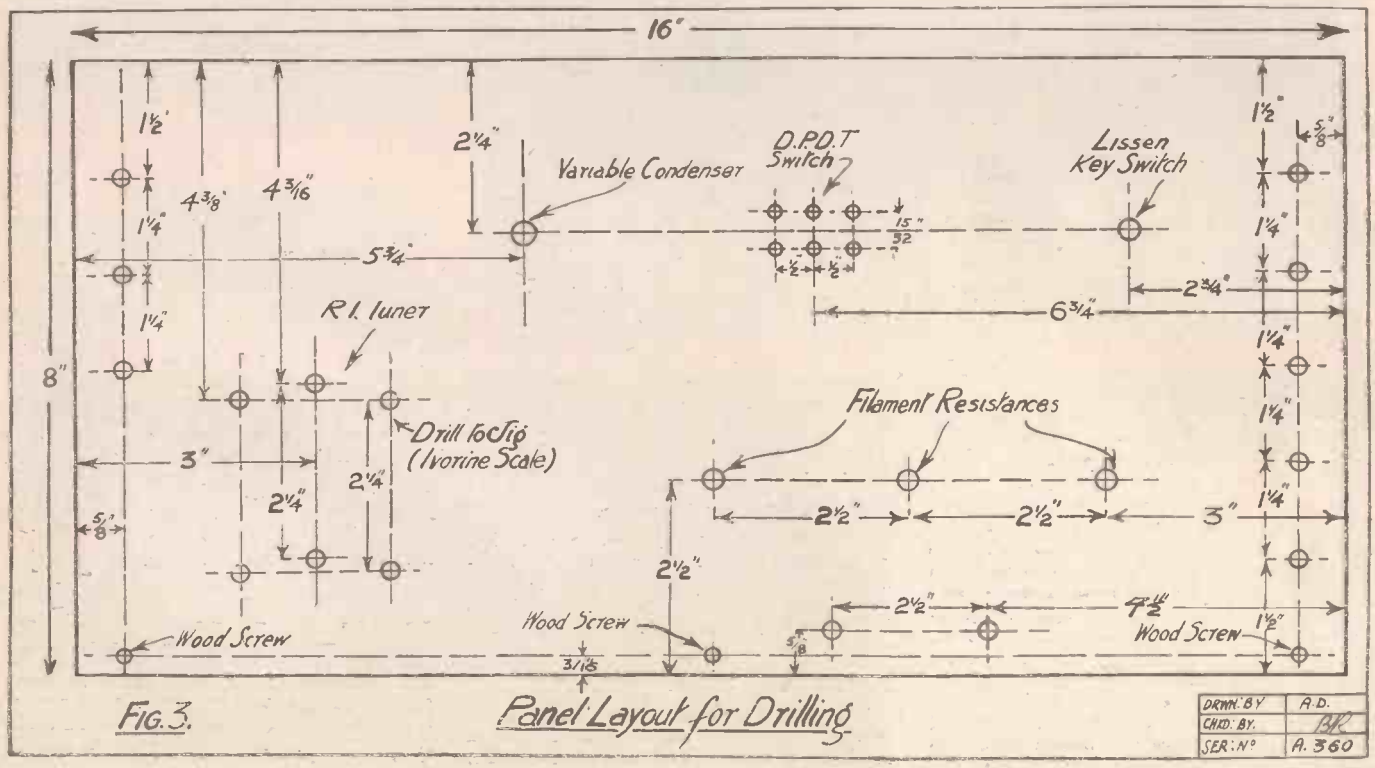


FIG. 3. Panel Layout for Drilling

FOREIGN RADIO NEWS.

FROM OUR OWN CORRESPONDENT.

German Invention Exaggerated.

INTERVIEWED by our special correspondent, a close associate and assistant of Dr. Karolus, in the latter's absence in America, pointed out that press reports of the Karolus invention adopted by the Telefunken people, had grossly exaggerated the importance of the discovery.

"The claim cannot justly be made for Dr. Karolus," he said, "that he has invented the way to send photographs, documents, and the like by radio. That was done some time ago by others. There are at the moment three or four ways of doing it, more or less efficiently. What he has done is to accelerate the processes hitherto used.

"The old-time coil, which demanded from seven to ten seconds for transmission, has been replaced by a new cell, which achieves the same result in one-tenth of a second. The discovery is in itself sufficiently important to render unnecessary and distasteful the exaggerations which reporters ignorant of the first principles of science have thought fit to cable all over the world about it.

"It is clear that at the moment the composition of this new cell cannot be disclosed, but the most rigorous tests have demonstrated that it is able to accomplish what I have just claimed for it."

Asked what future he foresaw for the invention, Dr. Karolus' assistant stated that there was no reason why, in a comparatively short time, there should not be in operation a photograph-transmission service by radio between Europe and America, for instance. It was even conceivable that this might be extended to the cinema, and that the day may not be far distant when entire films might be conveyed by radio. "The enormous rapidity with which transmissions of images was affected by the new Karolus cell brings this," he added, "well within the range of scientific achievement."

Operating one of the standard wireless sets installed in many British cargo vessels.

Belgian Radio Changes.

For some time past there has been trouble in the camp of Belgian radio amateurs and listeners, and these were ventilated at the recent Amateurs' Congress. Within the last few days steps have been taken to end this state of affairs.

The main trouble is the faulty reception of the Brussels programme in certain districts in Belgium, notably in the Antwerp and Liége provinces. This is the more remarkable since the Brussels station's programme is heard very clearly in France, for instance, and also in England and in Germany. Locally, however, transmission is very blurred, and suffers from almost constant interference. Radio experts have vainly tried to trace the trouble to its source, and it has been recognised that the best way out of the difficulty is to provide Antwerp and Liége with stations of their own.

In the case of Liége, this is already done. The newspaper "La Wallonie," published in Liége, has opened a broadcasting station which will be known as "Radio-Wallonie."

In the case of Antwerp, negotiations are still proceeding, but it is hoped that, before long, Antwerp also will have its own station.

Hungarian Radio Fatality.

Radio claimed its first victim in Hungary this week when a young employee of the Csepel radio station died instantaneously on his little finger accidentally coming into contact with a cable charged with 3,000 volts current. The unfortunate youth, twenty-one years old, was showing a friend of his round the station when the accident occurred.

Denmark Broadcasts Esperanto.

The Copenhagen station, which has recommenced work after its recent reorganisation, announces that, every Monday night, at 8.30, it will broadcast news items in Esperanto, using a wave-length of 308 metres.

New Station for Vienna.

The popular radio paper, "Die Radio Welt," has opened a new experimental station, which works daily from 9 to 10 a.m.,

(*Continued on page* 728.)

A HOUSEHOLD 3-VALVER.

(*Continued from page 693*).

to the extent of 3 volts was used with the latter, and 72 volts H.T.

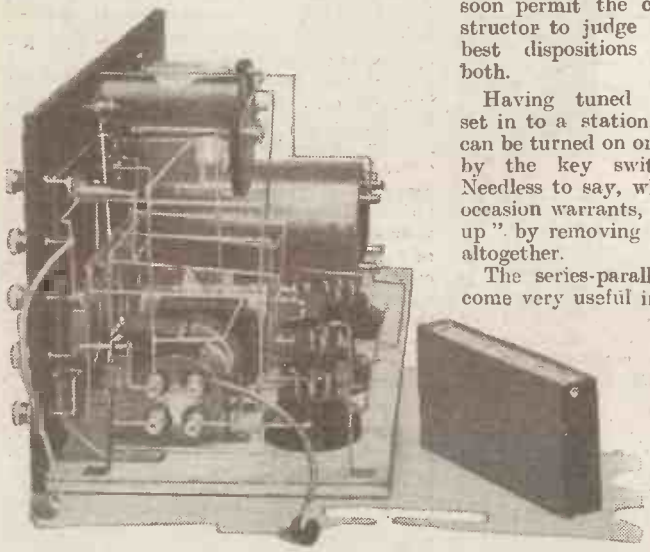
It should be remembered that the first stage, when it requires grid bias, will need only 1½ or 3 volts, but the second L.F. stage may need the full 9. Also, the last stage may need 100 or more volts H.T., but the first and second jointly only 60 or 70.

Anyway, a variation of both grid bias and H.T. values while the set is in operation will soon permit the constructor to judge the best dispositions of both.

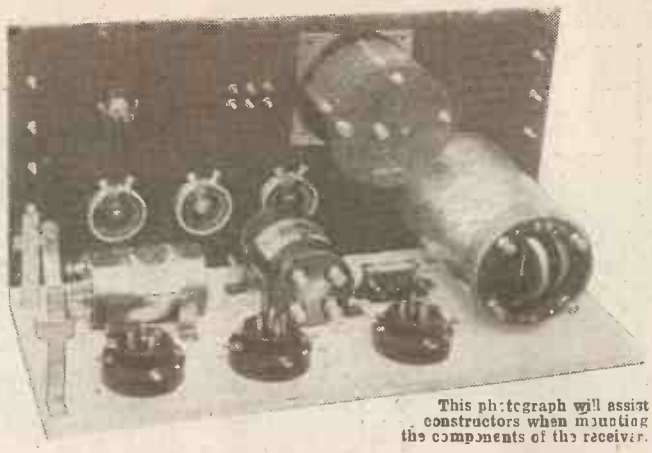
Having tuned the set in to a station, it can be turned on or off by the key switch. Needless to say, when occasion warrants, the set can be "locked up" by removing the key from the switch altogether.

The series-parallel aerial terminals become very useful in certain circumstances. For wave-lengths exceeding that of 2 L O, parallel condenser tuning can be employed. The aerial lead is connected to the parallel aerial terminal, and a small piece of wire connected from the earth terminal to the aerial series terminal. For the shorter wave-lengths series condenser tuning is to be advised, and to obtain this the aerial lead is connected to the series terminal and the parallel terminal left disconnected.

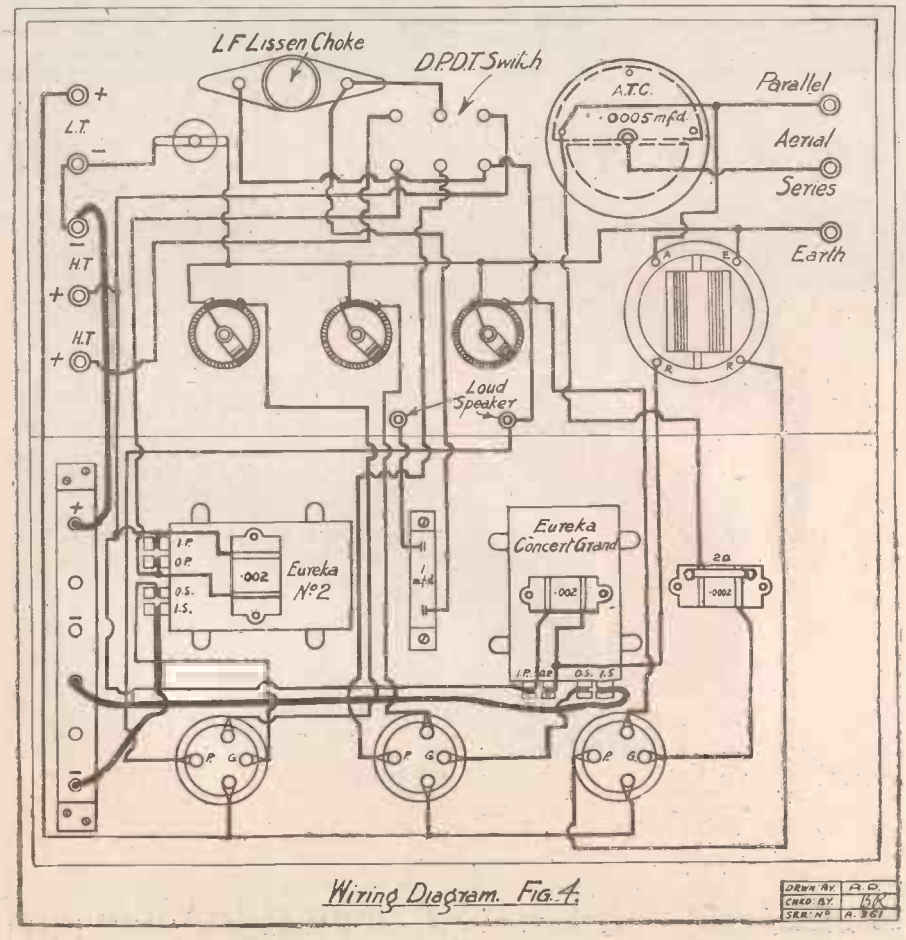
On test we discovered that with one particular aerial, both 2 L O and 5 X X could be brought in on the same condenser reading and the same reaction control setting with "series" tuning. Strength and purity of signals were everything that could be desired. It will thus be seen that this latitude of aerial tuning can have very great advantages in a "household" set.



A side view of the Household three valver with grid bias battery removed to show the second stage transformer.



This photograph will assist constructors when mounting the components of the receiver.



Wiring Diagram. Fig. 4.

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SER. No A. 961

MAINTAINING EFFICIENCY OF COILS.

IT is better not to use any sort of "binder" on your H.F. coils, as this has the effect of increasing the distributed capacity of the coils, and also of introducing leaks. The increased distributed capacity will make the coils tune broadly, and the leakage due to the varnish may be increased to a serious extent by reason of the absorption of moisture. The coils should always be placed in such a room, or in such a position in the room, that they are not liable to be exposed to moist air. They should not, for example, be placed near an open window or in a damp room.

If your coils should happen to have collected damp, it is a comparatively simple matter to dry them out, by placing an ordinary electric lamp somewhere near them. The gentle heat given out by the lamp, if the latter is left in position for a few hours with the current on, will have the desired drying effect without unduly heating the coils, or softening the "binder."

INTERESTING SIDELIGHTS ON VALVES.

By Dr. J. H. T. ROBERTS
(*Staff Consultant*).

The use of suitable valves is important if good results are to be obtained from multi-valve sets. Our photograph shows a 6-valve neutrodyne receiver constructed by Mr. C. W. Newson, of 16c, Sutton Dwellings, Finsbury.

THE valve has been described as the Aladdin's lamp of wireless, and certain it is that its mysteries and potentialities have as yet by no means been fully explored. Many a wireless enthusiast has but little idea of the wonderful intricacies of the interior of the valve, upon which the efficient working of the appliance, and in consequence the working of his receiver, so materially depend.

The manufacture of valves is probably the most difficult and hazardous adventure in the wireless industry. Many sanguine people, during the past two or three years, have essayed to manufacture valves, but, becoming involved in the morass of technical difficulties, have had to give it up, and the principal and now well-established makers of valves have only attained their position as a result of ceaseless experiment and research.

A little consideration of what goes on in the valve will not only give some idea of the difficulties in turning out valves on a manufacturing scale, but should prove of practical interest to the user.

Two Types of Filament.

Practically all valves on the market at the present time employ the tungsten filament. One reason for the choice of tungsten is the fact that it has an exceedingly high melting-point, whilst a special reason for its use in valves is the fact that, at a temperature of incandescence, its electronic emission is much higher than that of certain other metals which might otherwise be used. As every reader knows, valves may now be divided generally into the bright-emitter class and the dull-emitter class.

In the former, the electronic emission which controls the plate current of the valve is obtained by sheer high temperature. In the latter, certain special materials are either coated upon the surface of the filament, or introduced into its composition, these extra materials causing the filament to give the necessary volume of electronic emission at a much lower temperature.

The first question which probably arises in the mind of the reader is this: If the dull-emitter gives as large an emission at a low temperature as the bright-emitter at a high temperature, why not raise the dull-emitter filament to a high temperature, and so secure an enormously increased emission? The answer is that the special and characteristic properties of the dull-emitter materials would be destroyed if the temperature were raised much above the normal working temperature, so that the advantage desired would not be gained.

It is like killing the goose that lays the golden eggs—if you are in too much of a hurry, you lose everything. The real advantage of the dull-emitter filament is not in securing increased emission, but in securing the necessary emission with a minimum of expenditure of heating current.

Valve Efficiency.

This brings us to the interesting and important question of the efficiency of the valve; that is, the efficiency in the engineering sense, or relation of output to input energy. The input of energy, for the purpose of "producing" the electron emission (or, more accurately, of freeing the electrons from the filament) is represented by the heating current.

Anything which reduces this, for a given electron emission, obviously increases the efficiency of the valve (in the "power" sense we are considering).

In the case of a bright-emitter valve, the efficiency (always using the word "efficiency" as above mentioned) increases rapidly as the temperature approaches incandescence. A heating current of one ampere in a filament corresponds to the passage of about 6 by 10^{18} electrons per second through it, one milliampere thus corresponding to the passage of about 6 by 10^{15} electrons per second. Thus, when a filament is taking one ampere of heating current, and emitting one milliampere of electron current, there are six million million million electrons passing into the filament per second, and of these one thousand million million escape per second as emission current.

The temperature to which the filament is raised, or, in more practical language, the rated filament voltage of the valve, is a matter which has to be determined with great care by the makers, for a slight increase of temperature above the normal value will shorten the life of the filament very considerably, whilst a slight lowering of the temperature will diminish the emission, and so seriously impair the working of the valve. The designer, therefore, has to make an anxious compromise between these two opposing factors.

Interesting Data.

Some actual figures may help to illustrate this point. In the case of a filament 0·1 mm. in diameter, an increase in temperature from 2,400 deg. Cent. to 2,500 deg. Cent. was brought about by raising the watts consumption by 15 per cent, and this rise in temperature increased the electron emission by 100 per cent. It might therefore have been thought that it was much more economical to use the further 15 per cent of heating energy and get the extra 100 per cent. result. But, unfortunately, the higher temperature reduced the life of the filament to about one-fifth, namely, from 1,500 hours to 300 hours!

In a filament 0·3 mm. diameter, similar variations produced similar variations in the emission, but reduced the life from 2,000 hours to 600 hours.

This comparison between these two filaments raises another rather interesting point. It will be noticed that a filament three times the diameter has a life not very much longer than the thin one. The reason for this, or at any rate one important reason, is that a filament fails in a peculiar way.

It does not simply become gradually thinner all over; if it did, one might expect the thicker filament to have several times the life of the other. What happens is that, owing to some minute difference in diameter at some point initially, that point gets a little hotter than the average. Consequently, the "evaporation" or disintegration takes place somewhat more rapidly at that point, and, in consequence again, the thin part wastes away more rapidly than the rest. Thus a thin place gets worse, and the difference between a thin part and the rest of the filament increases, until finally the filament burns out at the thin part. This shows the importance of turning out a uniform filament, and it also indicates the need for care in the regulation of the filament temperature by the user. Always remember to try and avoid *starting* trouble with your filaments; once it starts it goes on with increasing rapidity.

There are many other interesting things about filaments, but these may be dealt with another time.

NEXT WEEK.

Important Hints on 1926 Unidyne Sets,

How to Make a "Straight" 3-Valver,
and
Building the "P.W." "D" Crystal Set.

Mr. E. J. Simmonds.

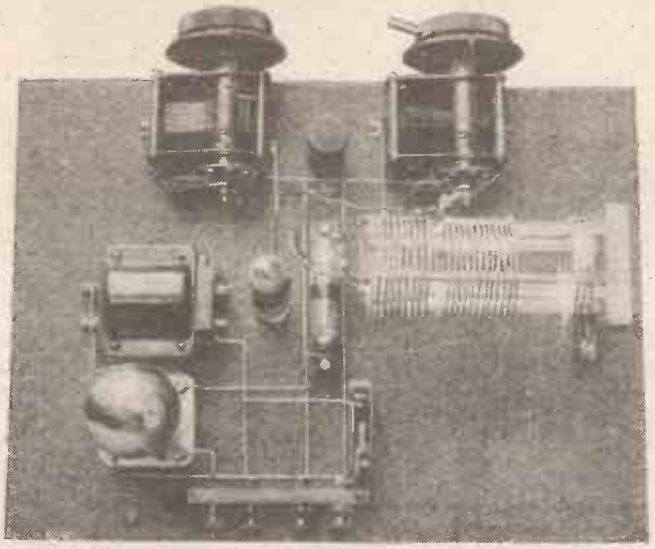
HOW TO MAKE THE "SIMMONDS" 10-METRE RECEIVER.

(Exclusive to "P.W.")

By E. J. SIMMONDS, M.I.R.E., F.R.S.A.

We have already had the pleasure of publishing the exclusive details regarding Mr. Gerald Marcuse's Short-Wave set, and in this issue we are glad to give exclusive details for constructors about the Short-Wave set designed by Mr. E. J. Simmonds. The set has been built, photographed and described by Mr. Simmonds specially for "P.W."—The Editor.

IN my last article I gave a rough outline of a new short-wave receiver which I have developed during the past few months. This receiver is the result of extensive experiments on the reception side of short-wave work, and was designed to enable the writer to have a receiver capable of covering a range of wave-lengths from about 10 metres up to 70 or even higher. In order to do this very careful consideration had to be given to the circuit employed, and more especially to the lay-out of components used.



This photograph of the receiver clearly shows the layout of the components.

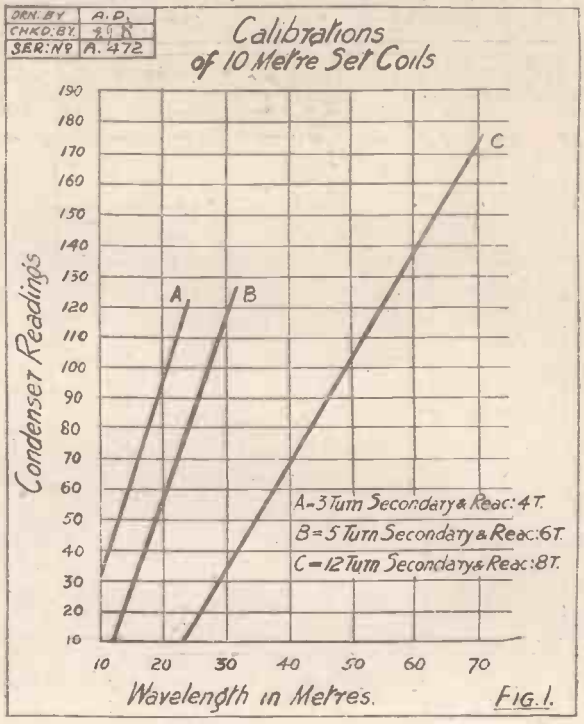
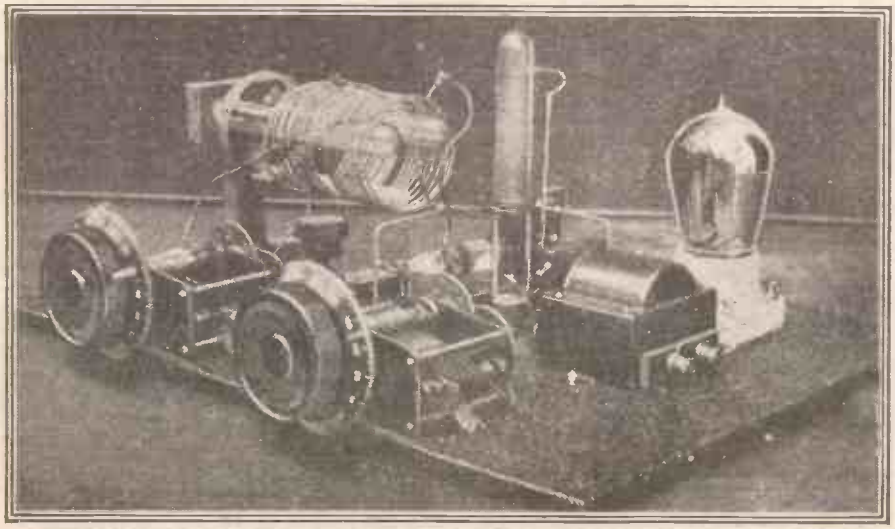


FIG. 1.



A three-quarter view of the 10-metre set. The transformer shown is of C.A.V. manufacture, while the valve holder is of American make.

The choice of components is, of course, of vital importance, as the frequencies dealt with are of a high order, and for efficient results all losses due to capacity must be cut down to the minimum. It is well known, of course, that all circuits have high and low potential points, and the object in the present arrangement was to effect the greatest separation possible between the high potential points of the circuit and portions of the apparatus at earth potentiude, while at the same time retaining reasonably short leads between the coils and condensers, etc.

Slow-Motion Condensers.

The condensers used for tuning purposes and for reaction control are of the well-known G.E.C. slow-motion type, as I have found that these condensers are extremely efficient and losses have been cut down to an extraordinary degree, while they are particularly smooth in operation.

In the circuit diagram of this receiver

(Continued on page 700.)

THE "SIMMONDS" 10-METRE RECEIVER.

(*Continued from page 699.*)

which was published in the last article, and is again reproduced on this page (Fig. 1a), it will be seen that the usual arrangement of connecting the H.F. choke to the anode of the detector valve has been modified. In this case the anode lead goes direct to the high potential end of the coil and both the H.F. choke and feed back condenser are placed in that part of the circuit which is at earth potential. This is a very important point, and has a great bearing on the successful operation of the set at very high frequencies.

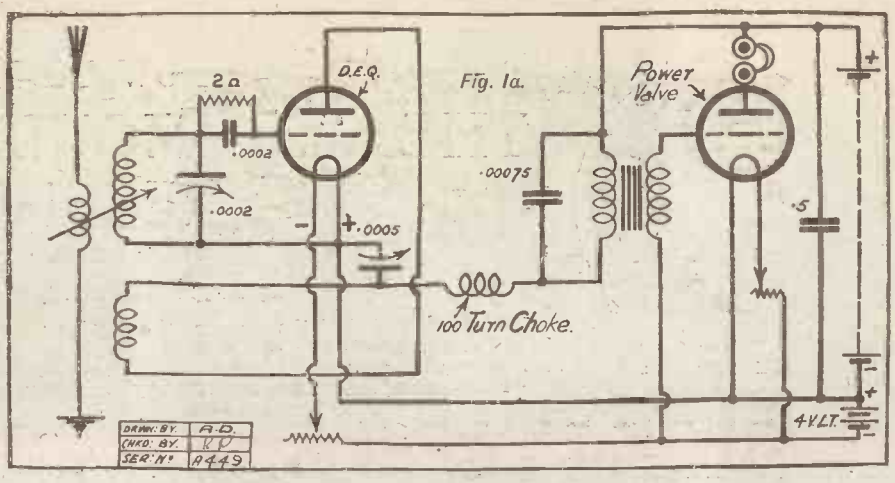
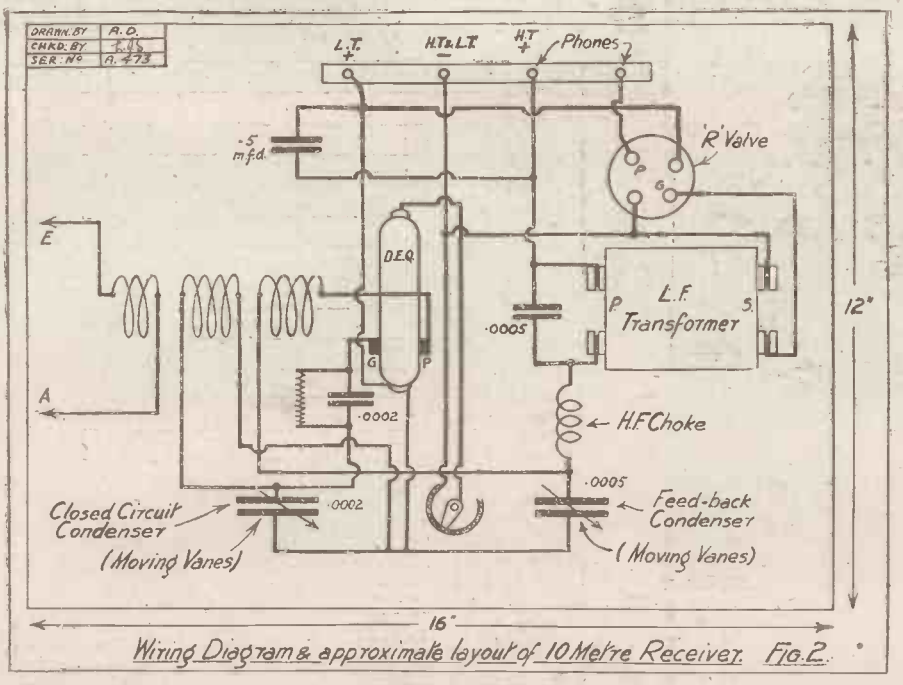


Fig. 1a.



Wiring Diagram & approximate layout of 10 Metre Receiver. Fig. 2.

A study of the various photographs of the receiver will give a good idea of the relative positions of the various components, and it will be seen that no panel has been used. Instead all the components are mounted on a wooden baseboard 12 in. by 16 in. covered with American cloth.

Components Necessary.

The components used are as follow:

1 baseboard, 12 in. by 16 in.
1 ·0003 variable condenser (slow motion).
1 ·0005 variable condenser (,, ,,).
1 valve holder.
1 ·0002 fixed condenser and 2 megohm grid leak.
1 Lissenstat major.
4 terminals.
About an ounce of 32 D.S.C. wire.
½ lb. 18-gauge tinned copper wire.
1 L.F. transformer of good design.
1 ·00075 fixed condenser.
3 test tubes, ¾ in. by 6½ in. long.
1 glass rod ¼ by 6½ in.
½ dozen spring clips.
1 0·5 Mansbridge condenser (paper).

The variable condensers are screwed to the baseboard by means of four brass clips near the edge of the board, and between them the Lissenstat major is mounted by means of a strip of brass which is attached to the screw on base of the rheostat. To the left of the ·0002 variable condenser, which itself is on the left-hand side of baseboard and a little (about 3 in.) behind it, is mounted the coil holder.

This consists of a wooden support 4½ in. high made of ½ in. wood and shaped according to the diagram, Fig. 3. In the wooden support are mounted horizontally the two test tubes and the glass rod. The third test tube is used to wind the choke on. The photographs will show the construction of the coil holder more clearly than any diagram.

The H.F. choke is wound upon the third test tube, which is mounted upon the baseboard by means of a cork fixed in the mouth of the test tube and screwed to the board.

The winding is carried out with the 32-gauge D.S.C. wire, of which 100 turns are wound on the tube simultaneously with thread of about the same diameter of the wire. When the 100 turns have been completed the ends of the wire are made fast, either by binding with small pieces of Empire cloth or by slight application of shellac varnish. The whole of the choke, of course, must be left free of varnish, otherwise its efficiency will be impaired.

The Six Coils.

After the ends have been secured the thread which has been wound simultaneously with the wire is removed, leaving the turns of the choke well air spaced. The wire must be wound tightly to obviate the turns slipping when the thread is removed.

The construction of these coils is a simple matter, all being wound on 2¾ in. formers, so that when they are removed they spring out to about 3 in. diameter. For wavelengths from 10 to 70 metres six coils will be required of 18-gauge tinned copper wire, and consisting of 3, 4, 5, 6, 8 and 12 turns.

Each coil is wound so that the turns are spaced by about the diameter of the wire. This spacing is made permanent and the coils rigid by interweaving thread (silk) and glass beads between the turns, there being one glass bead between each pair of turns. Three rows of beads for each coil will be needed, the rows being spaced 120 degrees apart. The coils are supported merely by sliding them over the two test tubes and the glass rods of the coil holder, and to give a larger area of contact for the clips the coil ends should be slightly flattened by hammering on an anvil.

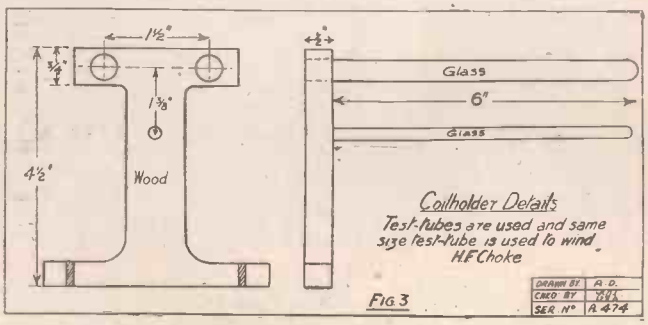


Fig. 3

(*Continued on page 703.*)

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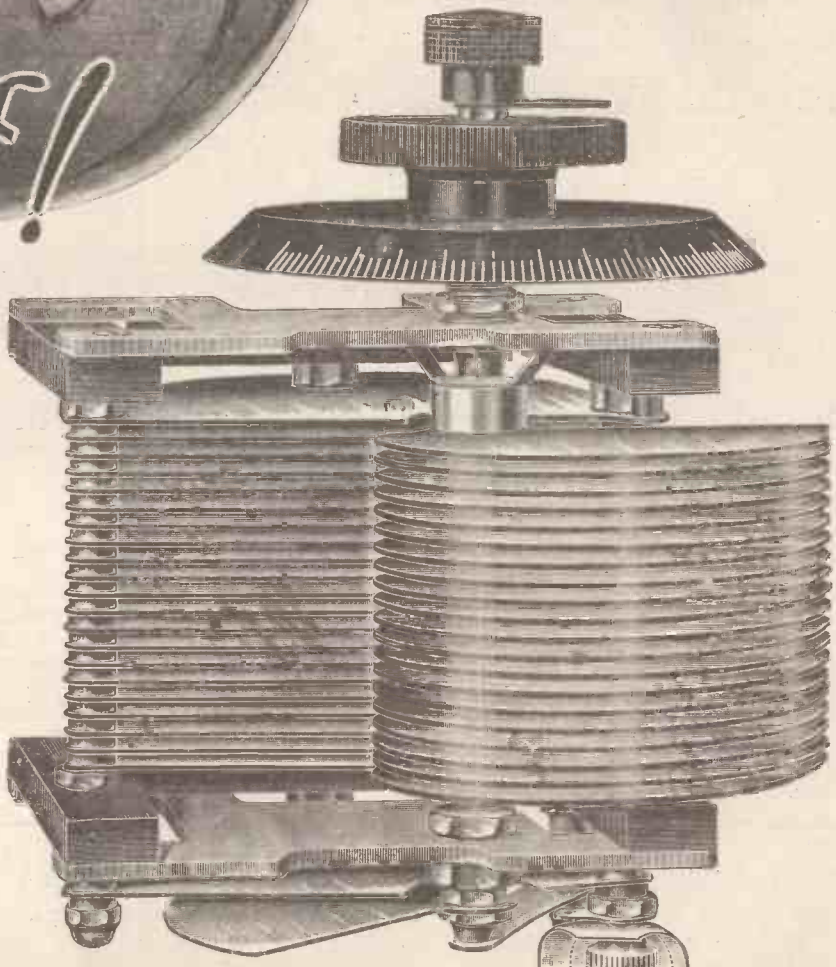

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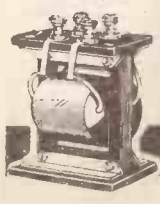

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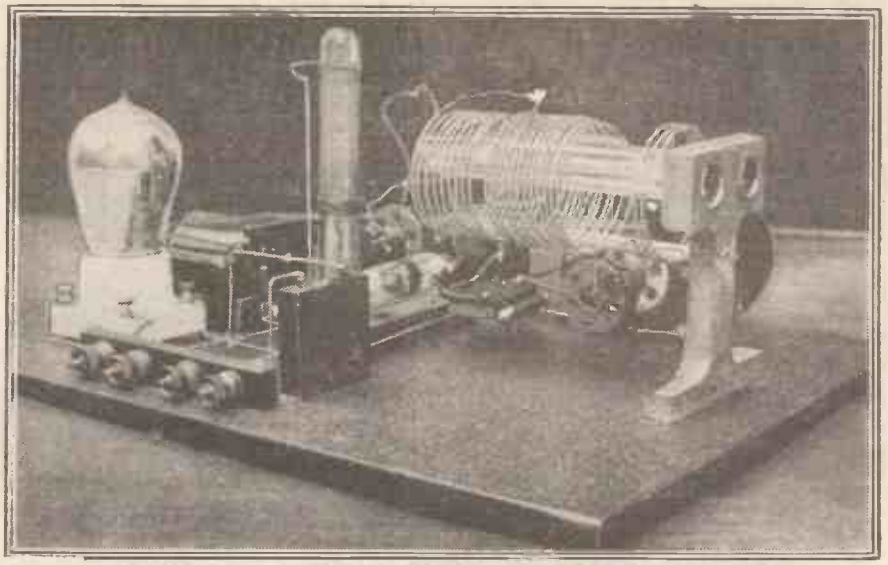
THE "SIMMONDS" 10-METRE RECEIVER

(*Continued from page 700.*)

A D.E.Q. valve is used for the detector, and this is mounted by its filament contacts only upon an ebonite strip just behind the rheostat. The two other connections, namely for plate and grid, are made by pieces of flex soldered to small brass clips which can easily be constructed from a small piece of springy brass.

An L.F. transformer of good design and moderate high ratio, 4 or 5 to 1, should be used (the one in the photographs is British C.A.V.), and this should be mounted to the right of the choke and behind the larger variable condensers. Behind the L.F. transformer is mounted the valve holder for the L.F. valve, while at the back of the panel a small terminal strip of ebonite should be mounted to take the four terminals.



This photograph clearly shows the terminal strip situated at the rear of the receiver.

Final Considerations

To the left of the terminal strip is placed a $\frac{1}{2}$ microfarad condenser which is to be connected across the H.T. battery. This completes the mounting of the components, and the wiring of the receiver may now be undertaken. This is carried out in my receiver with the same wire as is used for the coils, short direct and well-soldered connections being made, using resin as a flux and carefully tinning both surfaces to be jointed.

It will have been noticed that no aerial or earth terminals have been provided, all the connections to the coils being made by means of flexible wires provided with the metal clips, the ends of the coils being flattened to enable the clipping process to be carried out without fear of the clips slipping.

The grid condenser and leak are of Dubilier manufacture and are supported in mid air by means of the wirings between the variable condenser and the grid of the valve.

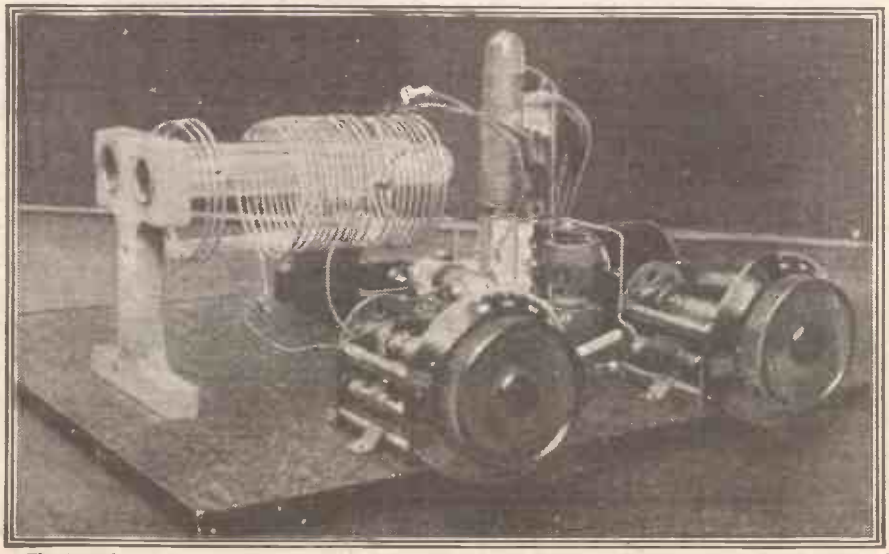
It will be noticed that in the diagram of the circuit two filament rheostats have been indicated while the receiver photographs show only one. If, however, a 4-volt battery is used, and an ordinary R valve is used in the L.F. stage, this extra rheostat can be omitted.

The terminals in the terminal strip read as follows, from left to right, looking at the back of the baseboard: Telephones, H.T. plus, L.T. minus and H.T. minus and L.T. plus. This will be made clear by considering the wiring diagram given in Fig. 2. The construction of the receiver is now completed with the exception of the wiring of the ·00075 fixed condenser across the IP and the OP of the L.F. transformer. This condenser is an important part of the set, and reduces greatly noises from arc and spark stations and atmospherics.

Operating the Receiver

The operation of the receiver is extremely simple, a small aerial coil of three turns being permanently in position at the left-hand end of the coil holder, while variation of the secondary and the reaction coils enables the operator to tune in on wave-lengths from 10 to 70 metres. The calibration chart given in Fig. 1 for the three sets of coils will act as a guide to the constructor as to his wave-length whereabouts when he is first handling the receiver. This chart is an accurate calibration for the receiver in use at my station, but each individual receiver will vary somewhat in readings, owing to unavoidable differences of coil spacing, lay-out, valve capacities, etc.

Reaction control is, of course, carried out by means of the ·0005 variable condenser, and the set should be kept just oscillating while slow movement of the left-hand condenser tunes in signals. Reaction coupling need not be varied after a convenient one has been found which gives smooth reaction control over the whole range of tuning of the ·0002 variable condenser. *Finally*, make a rule to use a very loose aerial coupling, with the set only weakly oscillating, this will give the strongest signal and obviate much radiation from your receiver and reduce interference. Always remember the other man who is also trying to receive the long-distance station, and therefore do not oscillate violently. Make a point of *carefully* and *slowly* searching up and down the wave-length band, by this means only can good results be obtained. If in the future it is proposed to use the receiver much below 20 metres it will be advisable to reduce the number of plates in the closed circuit condenser to five (three fixed, two moving).



The two slow-motion condensers and the coil-holder are clearly seen in the above photograph, with the choke fixed vertically to the right of the coils.

Concerning the Aerial

As regards aerials the best results can only be obtained by trying various kinds and sizes in accordance with the particular local conditions of the station at which the receiver is to be installed. As a general rule, however, a short aerial should be adopted, as nearly vertical as possible, or at any rate with only a short horizontal portion. A direct earth can be used for 40 metres, or thereabouts, but usually it is better not to use an earth at all, relying upon the capacity of the L.T. side of the set to act as a balance to that of the grid and aerial circuits. A counterpoise aerial is often well worth trying, but care must be taken to make sure that this is well insulated from earth and is of small size. A 20 ft. counterpoise is usually sufficient.

CURRENT TOPICS.

By THE EDITOR.

Alternative Programmes—Changes at 5 X X—Result of Radio Sounds Competition—Wireless Licences—The Chaliapine Recital.

THE policy of broadcasting only one original programme per week from 5 X X seems to have aroused a good deal of dissatisfaction among amateurs and listeners.

We have received many letters from our readers complaining that they are no longer able to make a choice of programmes. There is, of course, something to be said for these complaints, but it would seem that listeners forget that Daventry was erected for the primary purpose of enabling certain blind spots to be adequately served and to enable crystal set users in distant parts of the country to hear broadcast programmes.

The idea that it might also serve as a broadcaster of alternative programmes was, we believe, a subordinate one—but we are not aware that the chief *raison d'être* of 5 X X was to supply, consistently, alternative broadcasts.

Pickets and policemen outside Marconi House during the recent strike of operators.

Listeners' Grumbles.

The B.B.C. have, therefore, a legitimate right to curtail these alternative broadcasts; it cannot be said that they are breaking faith with listeners, but we feel that it can be said, and with emphasis, that their new policy is not a happy one.

We understand that the B.B.C. have made the change in deference to the wishes of listeners—but this deference is, we feel, being exercised on the behalf of a minority.

In a sense, listeners who grumble at the new arrangement have themselves to blame; they should co-operate and give strength to their grievances; isolated protests are not likely to effect much good.

The question of the alternative programmes from 5 X X is one which cannot definitely be settled one way or the other without a plebiscite being taken of listeners throughout the country, and as that method is quite impracticable, the nearest approach to a solution to the problem might be found by asking the Wireless League and the Radio Association to get a members' vote on the question, and to forward the evidence to the B.B.C.

* * *

We are now able to state that in our next issue we shall publish the names of the prize-winners in our "Radio Sounds" Competition.

The task of adjudicating this competition has been a particularly heavy one, as the entries well exceeded 50,000.

But a special staff has been busily engaged on the task for the last few weeks, and we are now confident that the final prize-winning lists will be available for publication in our issue on sale next Thursday.

The latest broadcasting licence figures issued by the Post Office show that 1,464,500 licences have now been sold—an increase of 41,500 over the figure for the end of August, which was 1,380,000.

This increase of 41,500 is not very satisfactory. In view of the technical arrangements made by the B.B.C. to serve 90 per cent of the population in this country, we should have expected after four years' broadcasting that the licence figures would have stood at least as high as 2,000,000.

The figures issued by the Post Office are, of course, no real indication of the actual number of people in this country who possess wireless receivers. Probably, if a reliable count could be made, the figure would exceed 2,000,000, for there is still, to our knowledge, considerable evidence of the fact that hundreds and thousands of people have not yet paid the 10s. licence fee.

The Pirates.

The Post Office have, so far, moved slowly in the matter; some publicity was given to the first conviction for non-payment of a licence fee, but the mild excitement caused by this act of justice quickly died down. Just as some people were indifferent to air raids, because they felt that, out of all the millions in London, it was long odds against their being hit, so there are people who are not moved by the conviction of one man who hasn't paid his licence fee.

The odds are a bit in favour of the pirates, and the only remedy would seem to be an organised campaign which would make them realise that discretion in the matter of "paying-up" was better than the rôle of pirate.

Chaliapine's Recital.

Having heard Chaliapine give a recital in the Albert Hall, and then having heard him broadcast, we cannot help feeling that, unless television comes to our aid on the occasion of his next broadcast, we shall be content with a visit to the Albert Hall.

Chaliapine's voice was not very impressive on the wireless; somehow the microphone chilled his voice, and the fact that his movements could not be seen robbed the recital of half its charm. Nevertheless, the recital was of great interest inasmuch as it clearly showed that, because a man is a great artiste in the concert hall, his art does not necessarily suit the exacting requirements of the microphone.

And it would seem all the more certain that broadcasting will, in time, create a new type of artiste—a type which will probably prove very popular for broadcasting purposes and possibly far from popular for concert hall purposes.

Perhaps the great pianists and the great violinists alone will prove exceptions; so far we have found them equally delightful, by wireless, or in the concert hall.

In any case, the B.B.C. are to be congratulated on their efforts to improve the programmes. Their "Radio Festival" week was, on the whole, excellently planned and carried out. Let us hope that for the remainder of the season the programmes will continue on the same high level. As for the quality of transmission—if any amateur in the world can justifiably criticise the relaying of the service in Canterbury Cathedral on Armistice night, we should like to hear from him. We thought it the finest relay we had ever heard.

M. Chaliapine, the famous Russian bass, singing at 2 L O

BROADCAST NOTES.

By O. H. M.

Wire Cutting Outrages—B.B.C. and the Law—Wireless League Proposals—Radio Revels—Lowbrow and Highbrow—Government Committee and Technical Problems—Areas of Reception.

THE latest wire-cutting outrage to interrupt broadcasting is reported from Manchester, where a determined attempt was made to spoil the charity concert which the B.B.C. had organised and was broadcasting from the Holdsworth Hall on behalf of the Nicholls Boys' Hospital of Manchester.

Not only the main line, but also the spare line was cut, and in a place that was difficult of access, so that it was obviously a carefully pre-arranged attempt. Police investigations served to cast doubt on the popular local theory that a practical joke was intended.

Only a few days before, wires involved in the broadcasting of the Crowland Bells from Peterborough were similarly cut, but on that occasion the malefactors forgot the reserve wire.

There are, of course, serious possibilities in the spread of organised attempts to upset the broadcasting system, and it is suggested in some quarters that in future this will be employed as a means of drawing public attention to alleged wrongs of minorities political and otherwise.

Whether or not this proves to be the case, there is at least no doubt that if those who deliberately interfere with the broadcasting service are brought to justice, they will suffer from public opinion as well as from the arm of the law.

B.B.C. and the Law.

Speaking of the arm of the law reminds me of how rarely the B.B.C. appears in the courts. This, I think, is altogether remarkable when one takes into account the fact that nearly all of the manifold activities of our broadcast service involve legal points of great complexity and novelty.

But apparently one of the very rare occasions has just happened, as I see that the B.B.C. has had to abide by an injunction about broadcasting a reference to an industrial dispute and its effect upon the availability of a book containing a play which was to be broadcast. I shall follow this case with interest.

New Proposals.

In preparation of its evidence for the Government Broadcasting Committee, the Wireless League is now gathering the opinions of its numerous branches throughout the country. I gather that a rapid survey of the majority of replies to the questionnaire sent out, reveals unanimity of opinion on the retention of unified control. There is, however, a general feeling that the British broadcasting service should devolve more responsibility and initiative upon stations directors and station staffs. There is also an unmistakable demand for adequate alternative programmes. There seems to be some division of opinion as to the advisability of allowing the big wireless manufacturers to retain their controlling interest. I imagine, however, that the weight of the Wireless League will be thrown into the scales on behalf of transforming the B.B.C. into a national trust. The Wireless League has in hand several new proposals.

Perhaps the most interesting is the formation of a Radio Red Cross organisation which will continue and develop the charitable and healing enterprises such as the Wireless for the Wards Fund in London. The first objective will be to equip all the hospitals of the country with adequate receiving apparatus. Subsequently it is hoped to develop the organisation internationally, in order that it may co-operate with other agencies of mercy in dealing with national calamities, such as earthquakes, floods, and great fires in whatever part of the world they may occur.

Capt. Alban Roberts with his new system of wireless transmission, which he claims cannot be jammed.

Radio Revels.

I continue to hear very good news about the broadcasting of the Radio Revels on December 15th. The movement has been taken up in Scandinavia, Russia, Germany, Italy, and Spain, and it is hoped that France will follow suit. Those who are accustomed to dance to wireless music in all those countries will be able to indulge themselves to international broadcast music from 10 p.m. on December 15th to 4 a.m. on December 16th.

The Programme Problem.

The eternal struggle between highbrow and lowbrow has taken a critical turn. The highbrows have been literally hoist with their own petard. They have been agitating for the inclusion of more opera, and mainly for more British National opera. Thus, in September and October their wishes were gratified; B.N.O.C. opera appeared several times a week in all the B.B.C. programmes. There is no doubt whatever that it was overdone. The situation was not improved by the difficulty of land-line transmissions, before the establishment of the switching station in Leeds.

The result was rapidly growing public indignation, and now the highbrows have been driven back to positions a good deal in the rear of those held before the grand opera offensive. The new principle to be enforced in programme building is that the educational periods must be considered first of all as entertainments, and no educational feature which has nothing of entertainment value is to be included in the programmes.

It has now been decided that on the average studio reproduction of opera is much better from the point of view of listeners than opera taken from outside.

Broadcasting Committee.

I was amazed to hear the other day that the Government Broadcasting Committee has no authority or instruction to examine any technical problems. How it will be possible to report on the future of broadcasting without any technical considerations is not easy to see. There is also another serious omission from the committee's terms of reference; and that is with regard to Empire broadcasting and the organisation required to develop it.

Cutting Out 2 L O.

There is quite a flare-up on the subject of "Areas of Reception." Several radio fans have taken serious exception to Captain Eckersley's statement that 2 L O can be cut out within two miles of the Oxford Street transmitter on simple receivers. Where the Chief Engineer of the B.B.C. went wrong was in asserting that simple sets of this standard of selectivity are procurable almost anywhere. In fact, they are not turned out in quantities for the reason that there is no demand for them. Distant listening is still the pastime of the few, most of whom adapt their sets with rejector circuits. But the main point of Captain Eckersley's contention is well-founded. He is quite right when he says that with a rejector circuit nearly any efficient simple valve set can be adapted to cut out 2 L O up to within about a mile and a-half from the Oxford Street transmitter.

The DX Unidyne Two-Valver.

Experiments with this receiver are still being carried out, and very promising results indeed have been obtained. Very shortly articles fully describing its construction will be ready for publication.

In our next issue an interesting article entitled "Hints on the 1926 Unidyne" will appear. It should prove very useful to all Unidyne constructors and to those many "P.W." readers who already possess Unidyne receivers.

Several multi-valve Unidynes are being designed, and will in due course be described in "P.W." They will no doubt cause considerable interest, and should appeal strongly to DX enthusiasts.

Experiments with a "3 Electrode" Crystal Detector

An article describing an interesting system.

By G. V. DOWDING, Grad.I.E.E.
(Technical Editor.)

DURING the course of the last few months I have carried out a considerable number of experiments with crystal circuits. Not that this is anything unusual, as I have always found the ubiquitous crystal quite as interesting as the valve, and my laboratory hours have been divided fairly equally between the two. In fact I hold a strong belief that finality in crystal circuits is still far away. But although developments in oscillating crystals *may* take astonishing turns I must admit that I do not consider investigations based on present practice will prove quite as fruitful as some would have us believe.

However, during the course of the above-mentioned experiments I discovered some very novel circuits, and while I do not claim that they are revolutionary in character, I feel sure that they will provide a strong element of interest for "P.W." readers, as they indicate a rather new field of research.

Naturally, when one commences a series of experiments in order, if possible, to find out something new, one first of all endeavours to discover some flaw in the theoretical or practical armour of known practice. Now take the case of an ordinary straightforward crystal set as used by millions of listeners for broadcast reception. Fundamentally it will consist of some sort of aerial tuning circuit, in which will be included a coil and variable condenser, or just a coil with tappings or a variometer, and across this aerial tuning system a crystal detector and a pair or pairs of telephone receivers will be bridged.

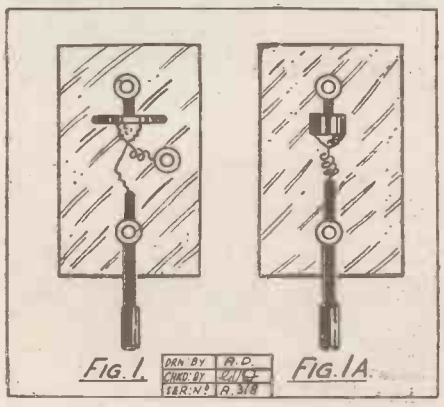


FIG. 1. FIG. 1A.

Quite Straightforward.

These latter, which form what is known as the detector circuit, by virtue of their "bridging" or "shunting" effect, are able to divert some of the energy from the aerial circuit. The crystal rectifies this energy, and the telephone receivers render it audible. This is only a brief description of what actually happens, but it will serve for the moment, and is at least substantially correct.

Now that is a very simple, straightforward business, and one very easy to apply in practice, as is proved by the simplicity of the ordinary single-tuning-circuit crystal set, but nevertheless it has its disadvantages. For instance, the "shunting" of a tuning circuit by a resistance which, in the case under discussion, is represented by the crystal and 'phones, causes what is known as "damping." The direct effect of this is loss of selectivity or "flat tuning."

A Special Detector Required.

Obviously, if this could be remedied without loss of signal strength or without introducing undue complications, even such as an additional tuning circuit, a considerable gain would be registered. And this is one of the things I attempted to do. Did I succeed? Well, readers must judge for themselves; anyway, some curious things happened, but of these, more anon.

It seemed that the most promising field of research lay in the direction of the crystal detector itself, so in the first place I determined to re-examine the theory of its operation. I have always inclined towards thermal theories, so my first step was to see if I could so place a crystal in the circuit that any current passing through the telephones or a micro-ammeter would be due to thermal effects only.

In order to carry out such an experiment a special crystal detector was required. Needless to say, one such did not at that time exist, so it was necessary that one should be designed specially for the purpose. Therefore the "three-electrode" crystal detector was evolved.

An ordinary detector of the "cat's-whisker" type is arranged something after the fashion of Fig. 1A. One terminal is connected to a small spiral of wire and the other terminal to the crystal. Between the two terminals, the cat's-whisker making contact with the crystal, some sort of "rectification" takes place and H.F. current pulses are transformed into unidirectional current. The "three-electrode" detector is provided with three terminals as per Fig. 1, and the two ends of the cat's-whisker are connected to two of these and the crystal to the third.

Contact with the crystal is made with the *centre* of the cat's-whisker, which is bent sharply in the middle for that purpose. My experimental "three-electrode" detector is a very rough and ready affair, as the photograph of it, which appears on this page, indicates, but nevertheless it answered its purpose fairly well.

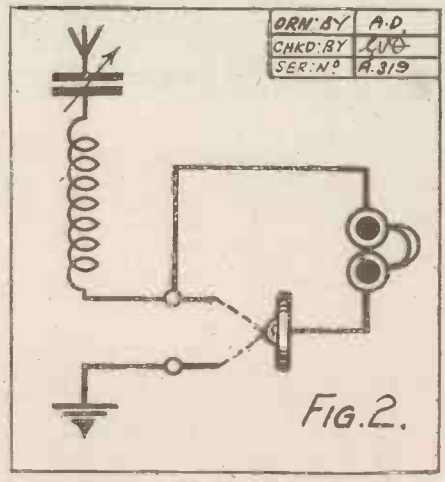
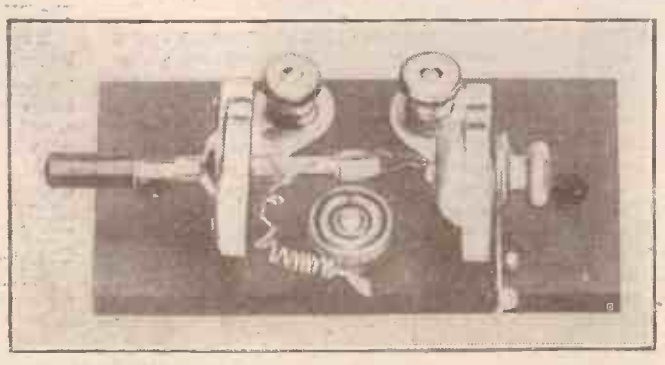


FIG. 2.

Actually it is an ordinary G.E.C. detector with its covering glass removed and an extra terminal mounted on its base. A small spiral or wire is fixed by its one end to the cat's-whisker arm in the usual way, its other end being connected to the additional terminal. It corresponds more or less with Fig. 1.


The detector which figured in the experiments described in the accompanying article.

Quite Satisfactory, But——

This peculiar device did not take much time to make, but it proved quite satisfactory as far as it went, but readers should not immediately rush off to their workshops and make one like it—they can spend their time in

(Continued on page 711.)

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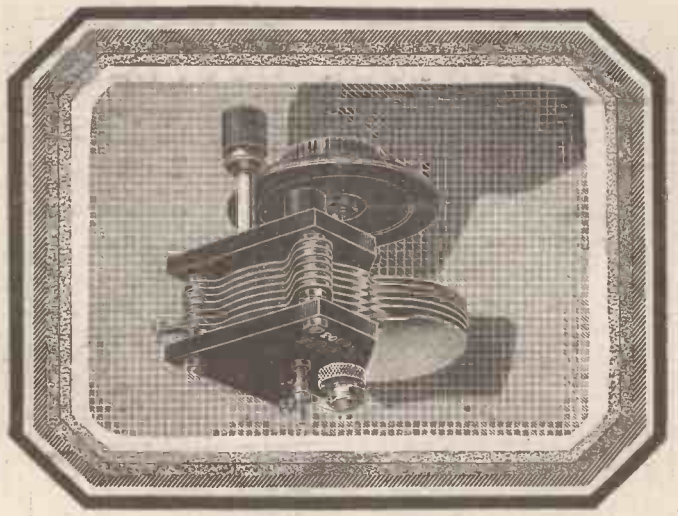

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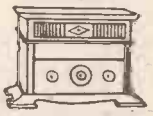

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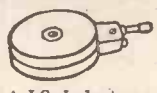

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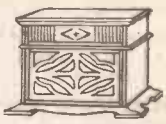

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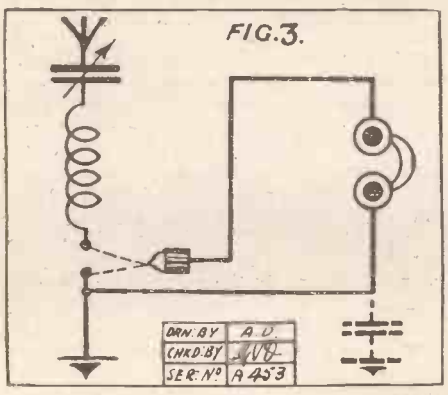
EXPERIMENTS WITH A 3-ELECTRODE CRYSTAL DETECTOR

(*Continued from page 708.*)

constructing something more efficient later on—after they know what the results of my activities were.

The First Circuit Tried.

The idea so far was to place the cat's-whisker in *series* with the oscillating system in order to observe whether its resultant heating would, when it was in contact with the crystal, generate electricity of a similar nature to ordinary "rectified" current. The expected heating, it must be pointed out, was not the heating one associates with a poker and a fire, at least not in intensity. But the "double" cat's-whisker consisted of fine (about 34 S.W.G.) resistance wire, and through this, or rather over its surface layers, the H.F. current would oscillate, and even the least technical reader will realise that by this means a certain amount of heat would be generated. That we can accept without question, but I was by no means sure that I could make use of it in the way I wanted to. Anyway, I connected up a circuit similar to Fig. 2. The coil and condenser



were of course quite normal. I argued that if nice loud signals resulted two things would be proved. One, that crystal rectification was definitely a thermal business, and incidentally two, that my task was not a hopeless one. Of course it will be seen right away that if the circuit operated efficiently a considerable degree of selectivity was bound to result, for the simple reason that the tuning circuit was free to oscillate (*through* the cat's-whisker) without the "damping" influence of a "shunted" detector circuit.

Capacity to Earth.

Good signals were obtained and tuning was *exceptionally* sharp, but—only when a capacity earth was used. Now, there was no reason to suppose that any form of magnetic coupling existed between the detector circuit and the oscillatory circuit, but in order to discount such a suspicion altogether, the cat's-whisker was straightened out so that it was no longer in the form of a spiral. It was "on the cards" that the bridging of a spiral cat's-whisker by the 'phones and crystal would introduce an auto-coupling—although, of course, it would be a rather inefficient one, as the inductance of such a tiny "coil" as the cat's-whisker would form would be an almost negligible quantity. However, straightening the cat's-whisker did not reduce signal strength in the slightest, as recorded on a micro-ammeter in place of the 'phones.

There was another factor to consider, however, and this was "capacity to earth," via the 'phones, as shown diagramatically in Fig. 3 by means of dotted lines. To cut a long story short I proved conclusively that capacity to earth did exist, and by that means rectification, not necessarily by thermal efforts, was taking place.

I was not disheartened by this discovery, for one learns to expect such setbacks in wireless research work, and I was fully convinced that I had not exhausted the possibilities of the "three-electrode" crystal detector. In a future article I hope to give readers a full account of some further interesting experiments with it, and how a new system of practical value was evolved.

WHEN THE LOUD SPEAKER "HOWLS."

WHEN two or more stages of especially transformer-coupled low-frequency amplification are employed, a considerable amount of magnification is obtained. Used for the local station, it is so great that a loud speaker can sometimes be felt to vibrate when the hand is placed on it.

This vibration can be transmitted to the valves through the table, or whatever the set and loud speaker are standing on, and if they are at all microphonic a sustained "howl" will be generated. Anti-microphonic valve holders will reduce such trouble to a great extent, but will not entirely eliminate it, as the vibration can be carried to the valves by the medium of air waves.

What is almost invariably a complete cure is to place valve boxes lined with felt over the valves in the set. Sometimes a cure can be effected by changing the position of the loud speaker. It is thought by quite a number of amateurs that the peculiar loud speaker howl which starts quite softly and works up a considerable volume is due to an acoustic "reaction" effect—in fact, that the loud speaker, acting as a microphone, picks up its own reflected sounds and re-emits them.

In some cases such an action does take place, and altering the position of the loud speaker so that it is directed against, not a wall, but an open door or other broken surface, effects a cure. Nevertheless the phenomenon is seldom noticeable when non-microphonic valves are used (the best of dull emitters are slightly more microphonic than the best of bright emitters), so that it is more often due to the vibration effect. This cannot be *proved* by "stuffing" the loud speaker with a handkerchief, as reflection can take place in the horn itself behind such a "shielding" object.

Anyway, whatever the cause of the howling, it is very troublesome, and frequently leads people to believe that a set is at fault when it is not, so that the above practical remedies, being of such a simple nature, should be tried before more drastic remedies are attempted.

True *loud-speaker* "howling" is very easily identified. It does not change in *note*, whatever adjustments are made in the set, neither does it change in volume unless the valve filaments are dimmed or the H.T. considerably reduced.

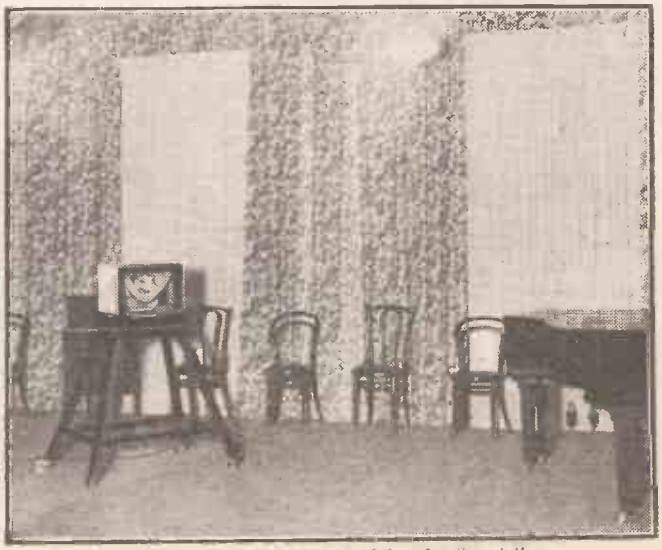
It commences generally quite softly, but rapidly increases in loudness until all music and speech is completely drowned. Howling due to electrical trouble in the set itself, such as interaction between L.F. transformers, etc., more often than not commences with an intensity that remains in proportion to received signals.

Grid Bias and H.T.

A receiver employing power valves of the dull-emitter type is very liable to generate loud-speaker "howls." Grid bias is, of course, no remedy, while to reduce the H.T. below a certain point causes distortion. The grids, particularly that of the last valve, will be "paralysed" by even moderate grid bias, and reproduction will consist of a series of "jerky" unconnected emissions. If a milliammeter be inserted in one of the H.T. leads its needle will flicker and not remain almost stationary as it does under normal conditions.

To reduce the H.T. and eliminate grid bias will cause distortion because the valves will not be operating under their designed conditions.

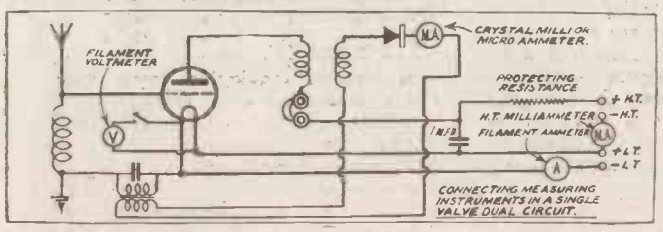
The above points do not directly concern the trouble indicated in the title of this short article, but it is hoped that they will prove useful to loud-speaker set owners.



The new studio at the Edinburgh broadcasting station.

This is an article of general interest to all interested in Radio work, by B. S. T. WALLACE.

SHOULD you ever be privileged to visit the interior of a large telegraph office and take careful notice of all the various types of apparatus used, there is one little instrument that will be seen to be common to all of them, from the simplest outfit working to a small country office and costing a few pounds to the large multiplex automatic printing instruments working between the big centres and costing upwards of



£2,000. This is the P.O. Standard galvanometer. It is placed in a part of the circuit that enables the officer in charge to see what is going on, and is indispensable for determining and localising various kinds of faults, such as the earthing or disconnection of a line, failure of one or more of the batteries, and faults in the apparatus itself.

It is not generally known that a similar sort of indicator, an eye that will enable the experimenter virtually to see what is going on and deduce the nature of many faults that arise in wireless, can be fitted to any type of receiver. This consists of a low reading moving coil milliammeter placed in the negative H.T. lead.

Inserting a Milliammeter.

This meter will indicate at sight the following faults: a full, partial or intermittent failure of either H.T. or L.T. battery; a breakdown in the primary or secondary winding of an intervalve transformer, or in the telephone receivers; leakage between the windings of the transformer or between the valve pins; and various other troubles that occasionally creep in, such as the sagging of the filament on to the grid and the consequent paralysis of the whole receiver. It can also be used for the correct adjustment of H.T. and grid voltage as given in the maker's specification and shown in the characteristic curve now issued with most valves, and to indicate whether or not the set is oscillating.

It is necessary to use a milliammeter with a fairly open scale giving at least ½ in. deflection per milliamp., as the total H.T. current in some instances may not exceed this value. On the other hand, multi-valve receivers using power valves may require an H.T. current of 10 or more milliamps. If it is desirable to provide for both extremes the best arrangement is to have a milliammeter with shunt giving two ranges from 1 to 3 milliamps and 1 to 15 milliamps.

The milliammeter should be placed on the battery side of a 1 mfd. smoothing condenser as indicated in the diagram. To minimise the risk of damage to the instrument that might otherwise be caused by an accidental short circuit or overload, the writer uses a non-inductive 4,000-ohm resistance in the H.T. positive lead. This is also a perfect protection for all valves, including ·06 dull emitters, as the total H.T. current on short circuit with a 60-volt battery is limited to 15 milliamps.

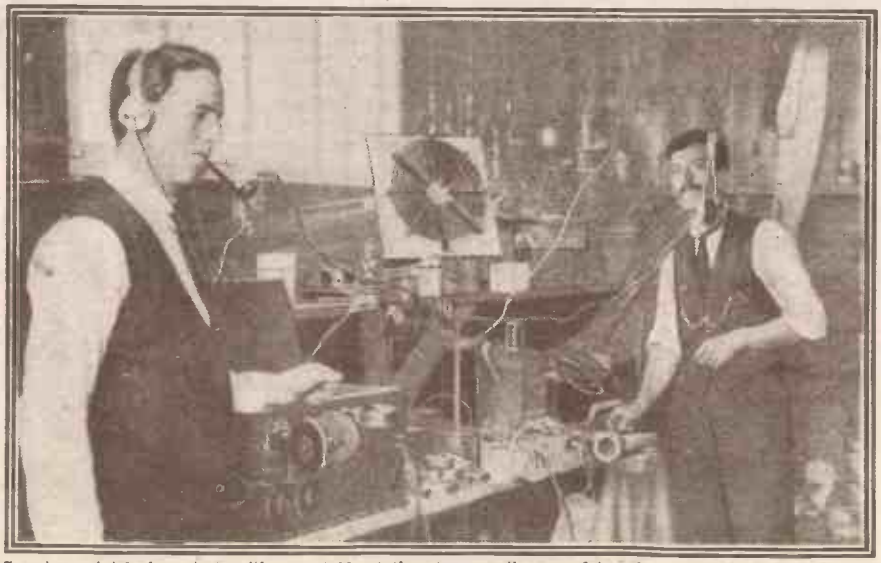
The insertion of these devices in the H.T. lead have no appreciable effect on the working of most circuits providing the 1 mfd. condenser is always placed across them. The omission of this condenser will cause a reduction of signal strength by preventing the full use of reaction.

Assume we have a 3-valve straight circuit with potentiometer control of the H.F. valve, and desire to use an H.T. milliammeter to observe the current fluctuations under varying circumstances. With normal average use and everything in good order the anode current will approximate to 3 milliamps. with the three valves alight. Now turn off any one valve and the current will be reduced one-third. (It is assumed the circuit is not oscillating.) Make a note of this value, for should the current drop to it unexpectedly when the three valves are alight it will be an indication that one of the three anode circuits is broken.

Tracing Faults.

The fault may be looked for in either the tuned anode plug and coil fitting or primary of H.F. transformer of the first valve, the primary of the L.F. transformer of the second valve, or the telephones in the third. The most common anode circuit fault is a break in a transformer or telephone. In the ordinary way these faults are very elusive, as they will pass fairly good signals with a complete break in the winding by virtue of the capacity in the two portions of the coil, except that the signals are usually accompanied by crackling noises. (Whenever persistent crackling is experienced which is proved not to be due to atmospherics or a

(*Continued on page* 713.)



Carrying out telephony tests with a portable station temporarily erected in a barn during a recent amateur "field day" in the Potteries.

MEASURING INSTRUMENTS IN RADIO.

(*Continued from page 712.*)

faulty H.T. or L.T battery. it is almost certain that the fault will be a broken winding in an L.F transformer or telephones.)

The next experiment can be a variation of grid potential by means of the potentiometer of the H F. valve. It will be found that the H.T. current increases with positive bias and decreases with negative bias. This alteration of anode current with variation of grid voltage proves that the grid circuit of the first valve is in order. If, for instance. the filament were sagging and touching the grid. there would be no variation on the meter with an alteration of grid potential. The most likely fault to occur in a grid circuit is a breakdown of the secondary winding of an L.F transformer. To test this, insert a single biasing cell in the grid circuit of the L.F. valve. If the anode current falls, all is well. Should it remain unaffected, then there is a break in the secondary winding.

Drop in H.T. Current.

With a three-valve receiver it may be observed when using the ordinary type of H.T. battery that after a few hours' running the anode current begins gradually to fall, although the filament battery is known to be remaining constant.

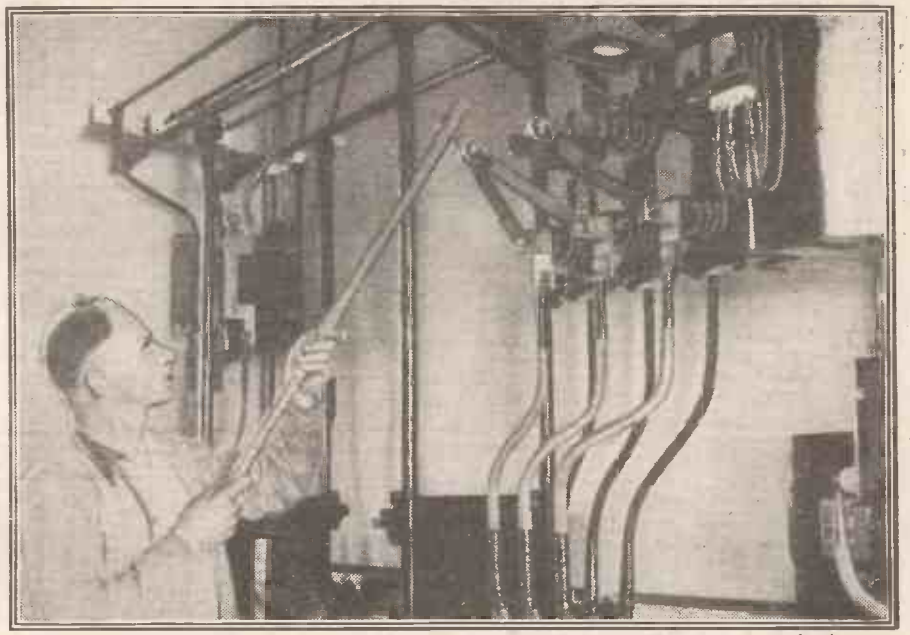
This is due to polarisation and is an indication that the H.T battery is not really large enough for the job it is called upon to perform As this battery becomes older the rate of drop in the anode current is more pronounced, till what should be a current of 3 milliamps. falls to 2 milliamps. in the course of an hour or so, and signals become weak and distorted This sort of thing is frequently happening with multi-valve receivers, and of course the loud speaker usually gets the blame.

Large specially made H.T. batteries should be used when more than two valves are employed. It is interesting to note that the largest manufacturers of dry batteries (Messrs. Siemens) are discontinuing the manufacture of the small type of H T. battery.

When a receiver is made to oscillate the anode current may be either increased or decreased; it depends on the grid bias of the oscillating valve. In most commercial receivers there will be a drop in anode current when the circuit is oscillating.

It may be noted in passing that reflex receivers, although giving stronger signals, do not consume more H.T. current. The explanation is that only a very small fraction of this current is actually used in the formation of the signal. If the total current could be turned into an operating signal, then one valve could be made to give the volume now obtained with six. At present this energy is wasted. A better utilisation of H.T. current is obtained in reflex receivers and certain special circuits employing four-electrode valves. If only some method could be devised for tickling the grid a little more, to use a modified American expression, such as some new form of reaction or a modification of valve design, then one valve would be sufficient for all our needs. A design of valve having its three elements much closer together would probably help towards achieving this desirable end.

When the filament battery is disconnected no current should flow in the H.T. circuit, but it may happen—especially with high voltages and in a damp humid atmosphere—that the milliammeter will still show a deflection of half to one division. This is caused by either a leakage between P. and S. of the L.F. transformer, inside one of the fixed condensers, or across the surface of the panel or its components. If the current persists after disconnecting *both* leads from either P. or S. of the transformer, then the leakage is elsewhere and can only be traced by carefully disconnecting and reconnecting the various leads that make connection with H.T. positive. It is essential to remove a leakage fault of this nature, as it will be the source of extraneous noises, if nothing worse. The H.T. milliammeter, used intelligently, will teach the experimenter more in a few hours than months spent in reading technical literature.



Some of the huge switches at the new 50 K. W. broadcasting station in erection in Brooklyn, N.J.

A Useful Instrument.

Measuring instruments can with profit be used in other parts of valve receivers. The writer, for instance, uses a micro-ammeter in the crystal circuit of a reflex receiver. This indicates at a glance the correct adjustment of the crystal, degree of rectification obtained from the local station's carrier wave, and the amount of H.F. amplification reaching the detector. It is independent of the guesswork inseparable from an aural adjustment on a telephony signal that is being continually modulated at the transmitting station. A useful reading for this instrument is a maximum of 500 micro-amps. In some instances, when used near a broadcasting station, higher readings may be obtained. On the receipt of speech or music there will be a slight fluctuation above and below the steady value of the carrier wave.

It can here be pointed out that the maximum current that can be rectified by any of the usual crystal detectors is 1·5 milliamps. However much H.F. alternating energy is put into them, this is the maximum amount they will rectify.

An ammeter, or even milliammeter, is a very useful adjunct in the filament circuit, especially when using dull emitters worked from dry cells. The voltage of dry cells is continually falling when in use, and it is a great help to have a milliammeter available to maintain the filament to its correct 60 milliammeters, as in the case of the ·06 type.

H.T Voltmeters.

Voltmeters are, of course, an almost indispensable item, but one must utter a warning against the cheap pocket variety. They are frequently marked with two scales, such as 1–6 volts 1–30 amperes. This is a farce, for if one attempted to pass 30 amperes through these things they would simply get red hot or melt in the hand! The correct type of voltmeter for reliable work is a moving coil instrument with a resistance of at least 100 ohms per volt. A good voltmeter has either the resistance marked on it, or supplied by the maker. As a practical guide to the purchase of a voltmeter it should be seen that the first two volts of the scale are evenly divided over a length of at least half an inch.

Have it tested on a large new single dry cell of well-known make such as Siemens. If the reading deviates more than 10 per cent above or below 1·5 volts, the voltmeter should be refused as being inaccurate. The higher readings up to 120 volts on the pocket instruments are frequently 20 per cent out.

In determining the voltage applied to a particular valve the measurement must be taken across the filament pins of the valve when the latter is alight. If the correct voltage for a valve is 3, one must not conclude that two idle dry cells measuring 3 volts will operate the valve satisfactorily.

It may happen that when connected to light the valve their voltage will drop immediately to 2 volts, owing to a comparatively high internal resistance. All voltage measurements should be taken with the battery at work or "on load."

Traders and manufacturers are invited to submit wireless sets and component parts to the "P.W." Technical Dept. for test. All tests are carried out with strict impartiality in the "P.W." Test Room under the supervision of the Technical Editor, and the general reader is asked to note that this weekly article is also intended to provide a reliable and unbiased guide as to what to buy and what to avoid.—EDITOR.

THE Bretwood Variable Anode Resistance is, we should like to point out, retailed at 3/- and not at 2/9 as was stated in our issue of the 7th inst, in connection with the "1926 Unidyne Two-Valver."

* * *

A variable condenser of refreshingly original design has been sent us for examination by Messrs. Bedford Electrical and Radio Co., Ltd., 22, Campbell Road, Bedford. It is known as the Peerless "Resicon" Low Loss. It is, at least as far as we are aware, unique in that in even the models supplied with verniers, only one spindle bearing is used. The spindle is ground to a precision fit in the bush and, of course, no spring washer is employed. The smooth, free action of the movement which results is most pleasing and one that should delight the heart of the DX amateur. The vanes are stout and the above-mentioned innovation, combined with a perfect alignment, has enabled a very small vane separation to be obtained with safety, so that the condenser is delightfully compact. For instance, the ·0005 mfd. with vernier occupies only some two inches of depth beneath the panel as against the more usual four or so inches. The Peerless Resicon is a square law and one-hole mounting. The ·0005 mfd. complete with vernier retails at 20/6, and in our opinion this is a distinctly competitive price for a precision instrument. We checked its maximum and minimum capacities on a capacity bridge and discovered that while the latter is extremely low, the former is, from a practical point of view, exactly as stated.

The same firm also sent us samples of their new "Peerless" dual rheostat, which is retailed at 3/9. Of clean, straightforward design they are well-made and operate smoothly and efficiently over the whole range. The two ranges are divided by an "off" position so that either range can be employed independently of the other.

* * *

The new P.M.4 valve due to Messrs. Mullards is as interesting as our tests prove it is efficient in operation. Its outstanding feature is an "N" shaped filament which is of an extraordinary superficial length. This filament is "dull" in the strictest sense of the word, for, as a matter of fact, not the slightest sign of "glow" can be seen when the valve is *alight*—but that word is decidedly out of place!

The characteristics of the P.M. 4 are as follows: Filament volts, 3·8; filament amps., 0·1; impedance, 9,000 ohms; H.T., 50–100 volts.

It is designed for power work, and in this capacity, with 3 to 6 volts grid bias, amplification and tone is of the highest possible standard. In first stages of L.F. it operates most excellently; it even functions as a detector as well if not even better than most valves which are designed specifically for that purpose.

A curious slip in the diagram on the leaflet which is sent out with every P.M. 4 shows 6 volts L.T. Of course 4 is ample, except in the case of dry batteries, when 4½ volts is necessarily required. However the P.M. 4 represents really true valve value at 22/6, and loud-speaker enthusiasts will

(*Continued on page* 716.)

APPARATUS TESTED.

(Continued from page 714.)

find in it definite proof of the resources of the great "Mullard-Phillips" combination.

Messrs. Mullards also sent us one of their new anode resistances. Wire wound to a resistance of 100,000 ohms they are both constant in value and silent in operation. Wire-wound resistances are vastly preferable to other types; they are slightly more expensive, but well worth their price. The Mullard component was tested on the "bridge" and found to be substantially accurate. Included in a circuit instead of a "carbon" element it functioned with every satisfaction and, indeed, a very noticeable improvement was effected by the substitution.

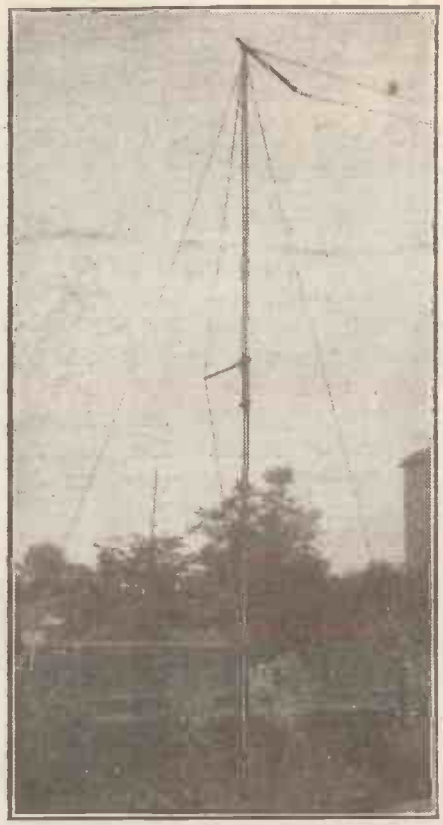
* * *

Messrs. British Central Electrical Co., Ltd., 6 & 8, Rosebery Avenue, London, E.C.1 have sent us a sample of "Briticent" Brand Hertzite for test. They were quite modest about their product, merely mentioning that the crystal has been adopted as standard by many manufacturers of sets. But a fact of this nature is, as they are doubtless well aware, of considerably greater value than unsupported optimism. However, we gave the crystal a very thorough test and in both crystal and valve-crystal circuits it gave every satisfaction, being both sensitive and stable. "Briticent" Hertzite used with a silver cat's-whisker is a detector combination that can be well recommended. At least, we preferred silver although good results were obtained with a number of other contacts.

* * *

In a letter accompanying a "Sferavox" disc-type loud speaker Messrs. Goodchild & Partners, Ltd., 56–58, Eagle Street, Southampton Row, London, W.C.1, said, ". . . you will be surprised at the very excellent results obtained." As readers may have noticed, our experience of hornless types of loud speakers has not been perfectly happy; in fact, at times our criticism of such instruments has been severe. Nevertheless, new arrivals are always received with an open mind, so we met the "Sferavox" without prejudice. It is very handsome in appearance, its glittering bright metal serving to accentuate its pleasing simplicity and cleanness of "line." It is provided with an exceptional length of lead, although we are not quite sure whether this would be universally regarded as an advantage; perhaps varying lengths are provided according to individual requirements.

On test, coupled to a two-valve set (det.-L.F.), results were obtained that certainly surprised us by their excellence. The sensitivity of the instrument is of an extraordinarily high degree, while both speech and music came through with most satisfactory purity. Rattling and buzzing, which are only too often associated with the disc type of loud speaker, were not apparent in the "Sferavox" and the almost imperceptible existing "periods" were discovered to be situated at most comfortable points. The £3 10s. asked for the instrument is in our opinion a very low price for a first-class loud speaker of that nature.



One of the new "Turret" junior 30 ft. masts sold by Messrs. Simpson & Blyth, Sherwood St., London, W.1, at 39/3. An invention of an ex-naval officer, the "Turret" can be erected by one man without assistance.

RADIOTORIAL

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

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

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 wireless 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.*

TECHNICAL QUERIES.

Letters should be addressed to:
Technical Query Dept.,
"Popular Wireless,"
The Fleetway House,
Farringdon Street,
London, E.C. 4.

They should be written on one side of the paper only, and MUST be accompanied by a stamped addressed envelope.

Queries should be asked in the form of numbered questions: (1), (2), (3), etc., but may be accompanied by a short letter giving any necessary additional particulars as briefly as possible.

For every question asked a fee of 6d. should be enclosed. A copy of the numbered questions should be kept, so that the replies may be given under the numbers. (It is not possible to reproduce the question in the answer.)

IMPORTANT.—If a wiring diagram, panel lay-out or point-to-point wiring is required an additional fee of 1/- must be enclosed.

Wiring diagrams of commercial apparatus, such as sets of any particular manufacture, etc., cannot be supplied. Such particulars can only be obtained from the makers.

Readers may submit their own diagrams, etc., for correction or for criticism. The fee is 1/- per diagram, and these should be large, and as clear as possible.

No questions can be answered by 'phone.

Remittances should be in the form of Postal Orders.

Questions and Answers

INTERFERENCE FROM SHIPS.

"JAMMY" (Southend-on-Sea).—Why is it so difficult to tune out the jamming from ships? Even when the interfering signals are not very strong they seem to persist over quite a wide tuning area, and do not weaken with every fresh adjustment of the tuning condenser in the same way that other signals do.

(*Continued on page* 720.)

RADIOTORIAL QUESTIONS & ANSWERS.

(*Continued from page* 718.)

The chief cause of the trouble lies in the fact that selectivity is not always so desirable at sea, and it is often better to design a ship's transmitting apparatus so that the signals have rather broad tuning in order that they should reach the greatest number of stations within range without a very critical adjustment.

A good deal of apparatus used is of obsolete design, and will eventually be replaced by instruments which will be equally effective in emergencies, but which can be tuned out quite readily during ordinary working. In the meantime, the best remedy is a circuit of the "rejector" type across the tuner, or the simpler expedient of loose coupling, which is sometimes unexpectedly effective.

TUNING COILS.

F. L. J. (Manchester).—I wish to wind a set of coils to cover the different wave-lengths used for broadcasting. Should the gauge of wire be the same for small coils as well as for those covering 2,000 metres or more?

How many turns are necessary for aerial, anode and reaction coils when used in conjunction with a ·001 variable aerial condenser in parallel, and an anode condenser of ·0003 mfd.?

I wish to make coils as efficient as possible, and am advised that it is better to fasten off the coil by sewing or tying with thread, rather than by immersing in shellac. Is this correct?

The list of plug-in coils printed herewith shows the coils necessary to tune between 260 metres and 25,000 metres, when used in conjunction with the standard tuning condensers.

The first column gives the size of wire recommended for use in home-made coils, and the second column shows the approximate tuning range in metres. It will be seen that there is a wide overlap between the ranges, so that, for instance, 500 metres, which is in the top range of the second line, is covered by the middle range of the third line, and by the bottom range of the fourth line, which tunes from just below 500 metres up to over 1,000 metres.

This flexible tuning is one of the great advantages of condenser-tuned coils, and it not only enables the wave-length to be changed quickly, but covers a very wide range with a limited number of coils.

Nevertheless, it must be remembered that in all cases where parallel condensers are used for tuning, it is invariably advantageous to keep the size of the coil large, and the condenser value as low as possible.

Where the aerial tuning circuit is coupled direct to the receiver the "secondary" column may be ignored, and the number of turns for the aerial coil is that shown under "Primary Turns." When loose-coupled tuning is employed the primary or aerial coil remains unaltered, but is coupled (in a coil holder) to a larger coil of the value shown under "Secondary Turns."

The use of shellac to strengthen the coils is very convenient, and it has been widely used for this purpose by manufacturers; but it is really undesirable and should either be used very sparingly, or else avoided altogether. Fastening with thread is decidedly more efficient, and is especially recommended for the smaller coils, which can be securely fixed in this way.

For those who wish to make their own basket coils, a correction factor is given below the table which shows how the wave-length alters when this type of coil is employed.

It should be noted that the reaction coil values are only approximate, and generally it is best to experiment with the different coils on hand until the best combination is found.

PLUG-IN COILS.

Wire for Primary	Wave-length with average aerial	Primary Turns	Secondary Turns	Anode Turns	Reaction Turns (approx.)
24	260–375	25	35	35–50	35–50
24	310–515	35	50	50–75	50–75
26	370–730	50	75	75–100	50–75
26	460–1030	75	100	100–120	75
26	580–1460	100	150	150–200	75
26	790–2200	150	200	200–250	75
26	1060–2850	200	250	250–300	75
26	1430–4000	250	300	300–400	75–100
28	1680–4800	300	400	400–500	75–100
28	2180–6300	400	500	500–600	100
30	3130–8500	500	600	600–700	100
30	4100–12000	600	700	700–800	100
32	5100–15000	750	850	800–900	100
32	6300–19000	1000	1100	1100–1200	100–150
34	7100–21000	1250	1350	1350–1450	100–150
36	8300–25000	1500	1600	1600–1700	100–150
		·001 mfd. in parallel	·0005 mfd. in parallel	·0002–·0003 in parallel	

For basket coils allow about 20 per cent. off the maximum wave-length. Wind on a former of 11 slots, with centre diameter of 1¼ in. For a ·0005 mfd condenser instead of ·001 mfd. allow 35 per cent. off. Many well-known coils are subject to letters patent, and the amateur and trader would be well advised to obtain permission of the patentees to use the patents before doing so.

D.F. AERIALS.

K. F. L. (Andover, Hants).—What type of aerial is used by direction-finding stations, and is it rotated like an ordinary frame aerial when taking bearings?

Usually the aerial system consists of two fixed aerials arranged exactly at right angles to each other, so that if one points North and South the other is East and West. The aerials are brought to a special tuner, inside which a rotating coil explores the magnetic field formed by the two aerial systems and the strength of the signal is found to depend upon the position of the coil. It is, therefore, only necessary to revolve the small coil in the magnetic field to obtain the same effect as would be gained by revolving an aerial. Owing to the great convenience and stability of the method, it is customary to utilise two fixed aerials in conjunction with the moving coil.

CHEMICAL RECTIFIER AND A.C. HUM.

"NODEN" (Plumstead).—I find that when using the A.C. mains for supplying H.T. to the plates of a two-stage power amplifier, using a tapped transformer and full-wave rectification, a continuous hum can be heard in the loud speaker, even when employing an efficient smoothing system. The rectifiers employed are of the Noden type. Can you tell me whether this can be cured, and if so, how?

This hum may be due to several causes. It will be found that in using a transformer that has not been carefully constructed the laminations will "rattle," and this will tend to emit an audible hum from the loud speaker. (This may also tend to decrease the rectifying properties of the Noden valves, as the result may be that another frequency is superimposed on the original A.C. frequency). To cure this the laminations should be tightened so that the tendency to hum is to a certain extent eliminated.

If, however, the transformer is badly designed or over-rated, as some transformers are, it will be found that the transformer tends to become quite warm, and in time may get very hot. Immersing the transformer in oil (of the thin lubricating type) will reduce this trouble, but it is far more efficient to employ a correct and carefully designed transformer at the beginning.

It is advisable to employ larger electrodes than are theoretically necessary; in fact, it may be found that to double the size of the electrodes means a marked increase in efficiency.

BETTER RECEPTION.

O. T. P. (Golder's Green).—I made a 2-valve set last August which, while giving good results from 5 X X and 2 L O, did not bring in distant stations. During the last two or three weeks, however, I have managed to log several other B.B.C. stations as well as several Continental ones. Why is this? Is it because the valves get more selective with use?

We are afraid you are under a misapprehension. The reason you are getting better results now is not due to the valves (which do not improve with use), but to the fact that signals on the broadcasting wave-lengths travel farther at night than by day. The reason put forward by scientists for this phenomenon is somewhat involved, but the effect is just as though sunlight absorbs signal energy, and thus when this is absent signals travel farther.

In any case, you will find that even during the day in the winter months signals seem to be stronger than during the day in the summer months.

RECTALLOY.

S. F. (London).—I have read with interest your articles on Rectalloy. Where can I obtain this substance?

Further details regarding this substance will be published in an early issue of "P.W."

(*Continued on page* 722.)

RADIOTORIAL QUESTIONS AND ANSWERS.

(*Continued from page* 720.)

FAULTY EARTH.

J. M. (Preston).—Why is it I obtain better signals with my earth wire removed than I do when it is connected to the set.

I may say that I have tried various sizes of coils for the A.T.I., so it cannot be due to the use of an unsuitable coil in this position.

In the absence of further particulars regarding the set, we are inclined to believe that the trouble is due entirely to the earth system, which appears to offer a very high resistance to H.F. currents passing through the A.T.I. from the aerial.

Fortunately this can be tested in the following manners:

(1) Connect one side of a flashlamp to one side of a pocket battery. Then connect the other tag of the battery to either a water pipe or another earth wire going *directly* to earth at some distance from the present one. If, on connecting the remaining side of the flashlamp to the existing earth wire, the lamp lights, the existing earth lead is O.K. It will be seen that the lamp lights (if everything is O.K.) at half its brilliance on connecting up as described, but should it not light at all, the earth lead is either faulty or else the earth connection requires overhauling.

If fitted to a water-pipe, remove the earth clip and clean the pipe with a piece of emery cloth or sand-paper. Then refit clip.

(2) It will be found that the set requires retuning on connecting the earth wire, but if signals are now as loud as when the earth wire was disconnected, but tuning is "flat" on the aerial condenser, this is due to causes other than a faulty earth, although a long aerial or a long earth lead might cause this trouble. To obtain selective tuning it is essential that both the aerial and earth *leads* should be kept as short as possible, while the aerial lead must be kept away from the walls.

Usually when an aerial has a large self-capacity or the earth lead is faulty and is offering a high resistance, the set will refuse to oscillate unless a big reaction coil is used.

After cutting down these losses, it will be found that distant stations are easily tuned in, or if the set is only intended for local reception, signal strength has improved considerably.

When a set oscillates easily, and with a minimum of reaction, the effect of disconnecting the earth lead at once becomes apparent.

The set will develop hand capacity effects to a marked degree, and tuning in a distant station will be quite a tricky operation. In fact, the whole set will appear unstable and will howl at the slightest use of reaction.

If the earth is O.K., reconnecting it should prevent all this unstability, and tuning in should then become an easy operation.

NEW UNIDYNE SETS.

L. M. (London).—I am afraid your instructions regarding the making of the H.F. choke are not quite clear to me. Can you please explain in detail the making of this choke?

We regret that owing to a printer's error "60 turns" was mentioned for one bunch instead of 40.

To construct the choke, wind 4 bunches of 40 turns per bunch for the first layer (of 32 S.S.C. or D.S.C. wire), then cover with insulating material (waxed paper is best), and commence the second layer at the *end* of first.

Repeat this for three layers, starting the third layer at the end of the second. This will give you 480 turns.

The 20 turns left over can then be distributed over the bobbin after covering the third layer with waxed paper.

The 4 oz. of wire stated to be required for the choke were found to be sufficient for making a choke for the one-valve Unidyne, and also for the two-valver in "P.W." No. 180.

We regret that owing to a misprint in the list of components the price of the Sullivan L.T. Transformer was shown as "3s. 0d." instead of 20s.

Other revised prices are Thorpe K 4 valves, 12s. 6d. each, whilst Bretwood variable grid leaks remain at 3s., and Dubilier .0002 and .006 fixed condensers at 2s. 6d. and 3s. respectively.

LEAKY ACCUMULATOR.

M. B. (Chadwell Heath).—Acid has crept or leaked from my accumulator, and is eating through the case in which it is contained. How can I stop this?

The acid can be neutralised by soaking the case in a solution of ammonia for a few hours. After this, the wood or leather, or whatever the material is, should be painted with what is known as anti-sulphuric paint, which is impervious to the action of acid. This will prevent further corrosion. Anti-sulphuric paint can be obtained from large electrical stores, and is supplied in two colours, black and red.

TECHNICAL NOTES

(Continued from page 678.)

secondary, one of which is suitable for the ordinary voltage for the filament under steady burning conditions. Other tappings give the "flash" voltages, and a special key or automatic switch is provided, operated by a spring (not unlike the shutter of a camera) which exposes the filament to the "flash" voltage for a very short period, which period can be arranged beforehand. In this way, there is no danger of burning out the filament, as there would be if the "flash" were controlled by hand. Various recipes have been given from time to time for reactivating dull-emitter filaments, some recommending the flash alone, others the flash accompanied by a prolonged running of the filament without applied H.T., and so on.

Synclastic Crystals.

A very large number of readers have written to me about Synclastic crystals, which I mentioned favourably in these Notes recently. I am informed by the Synclastic Co. that they have been overwhelmed with orders for these crystals and that, owing to the fact that they have had some difficulty in keeping up to the standard reached in the specimens which were sent to me, they have temporarily suspended sales. No doubt, however, readers will be duly informed when these crystals are again available.

H.T. from the Mains.

High-tension battery "eliminators," as they are called in the States, are becoming popular over here, and there is little doubt that in time there will be only two sources of H.T. supply for wireless receiving sets, the H.T. accumulator and the H.T. "eliminator" working direct from the mains. Of the two, I prefer the H.T. accumulator, although the "eliminator" is perhaps more convenient. Nothing could be more convenient than an apparatus working direct from the electric-light mains, but these eliminators have a certain drawback, which may not be apparent at first sight, and the seriousness of which depends upon the nature of the receiving set and the number of valves used. I refer to the fact that, apart from suppressing the Commutator hum (which is not, in itself, a very difficult matter), there is the liability to coupling of the valves and to distortion owing to the modulation of the plate current. Moreover, these eliminators, generally speaking, are apt to be expensive, and can only be used where there is electric supply.

An H.T. accumulator, however, particularly if equipped with a self-contained electrolytic rectifier, may be permanently connected to the mains, with a throw-over switch, and gives the same convenience of service, with the added and very important advantage that its internal resistance is negligible. Anyone who has ever used a set working from an H.T. accumulator will never, I think, again be satisfied with dry batteries.

New Rectifying Valve

In this connection, that is, in reference to "eliminators," a new rectifying valve has been lately perfected, called the Raytheon tube, which operates by the residual

(Continued on page 725.)

TECHNICAL NOTES.

(*Continued from page 724.*)

gas contained within the bulb, and therefore requires no heating current. This valve is provided with one cathode and two anodes and so rectifies both halves of the wave. It may be used in the usual H.T. eliminator circuits, and is said to give excellent results, although I cannot speak from experience, as I have not yet had a sample sent to me for trial. It is stated that the running costs are insignificant, about a penny for twelve hours.

Unidyne Valves Available.

Readers who are making up the new 1926 Unidyne circuits, as described by the inventors in this journal, will be interested to know that the original Thorpe K.4 valves are to be put on the market at a reduced price—I believe at 12/6 each. The Ludgate Radio Co. inform me that there has been such a demand for the U.C.5 valve that the supply is entirely exhausted. The Thorpe K.4 valve, however, has justly earned a reputation for giving excellent results in the Unidyne circuits, and I understand that it functions precisely as well as the U.C. valve. The Thorpe K.4 valve, however, is so well known to Unidyne enthusiasts that there is hardly any need to discuss its merits.

Correspondence

Letters from readers discussing interesting and topical wireless events or recording unusual experiences are always welcomed, but it must be clearly understood that the publication of such does in no way indicate that we associate ourselves with the views expressed by our correspondents, and we cannot accept any responsibility for information given.—Editor.

THE "P.W." TWO-VALVER.

The Editor, POPULAR WIRELESS.

Dear Sir,—I am writing to tell you of the excellent results I have received on the "P.W." 2-Valver, described recently in No. 178.

On Sunday, using 25 A.T.I., and series A.T.C. and 35 reaction, I logged all the following amateurs in broad daylight. They are all telephony, and the first six I got at loud-speaker strength, filling the whole room comfortably: 2 B G O, 2 L Z, 5 Q V, 6 Q Q, 5 V R, 6 W Q, 2 B M, 2 M I, 2 A U, 2 Q C, 5 F T, 2 P X, 5 X W, 2 U D (all 150-200 metres).

I also got many others on C.W. which I unfortunately cannot read.

I find the selectivity excellent on the above wavelengths. I have also logged most of the lightships on telephony, working on about 250 metres; several of these are audible all over the room on the speaker.

Of course, I need hardly touch upon the reception of the B.B.C. stations. Daventry and London both fill the house, and many of the continental stations come in on the loud speaker.

I made no alteration to the circuit, but I am using ·002 across the transformer instead of ·001, and I have a 1 mfd. Mansbridge across the H.T. My L.F. transformer, I may mention, I bought second-hand, and it is several years old, and of query make.

My aerial is about 38 ft. high by 60 ft. long, and I have a double earth, a buried plate and the water-pipe.

The construction of the set is simplicity itself, and the small expenditure on components is very productive in results, and I can recommend it to anyone for selectivity and quality, combined with simplicity and ease of control.

Wishing you every success.

Yours sincerely,
R. C. HORSNELL.

"The Anchorage," Burnham-on-Cronch, Essex.

THE ONE-VALVE "CHITOS."

The Editor, POPULAR WIRELESS.

Dear Sir,—I think, perhaps, you may be interested to hear of the success of a feminine reader with the "Chitos" circuit.

I have made several one, two and three valve sets, but this is quite the loudest one-valve set I have ever tried.

(*Continued on page 726.*)

CORRESPONDENCE.

(Continued from page 725.)

I am unable to use an outside aerial, and for the encouragement of other amateurs in a like position I can say that on a tiny indoor aerial, only 25 feet long, arranged round my bedroom window, and a counterpoise earth running down the side of the first flight of stairs, I get ample volume for five pairs of 'phones.

I have only roughly wired up the set, and none of the connections is soldered.

I shall certainly make it up properly and add an amplifier, when I'm sure the volume from the loud speaker will be splendid.

I am a regular reader of your excellent journal and find it quite invaluable.

Yours faithfully,
MARJORIE E. ROYLE.

17, Dealtry Road,
Putney, S.W.15.

THE ONE-VALVE LOUD SPEAKER CIRCUIT.

The Editor, POPULAR WIRELESS.

Dear Sir,—I have made the one-valve loud-speaker receiver as your contribution recently published in POPULAR WIRELESS, and, as requested, am pleased to give following particulars:

Receives on loud speaker from 2 L O O.K., but not very loudly.

Receives without H.T., as you say.

Last evening received Newcastle whilst they were carrying out experimental transmission, fairly loudly.

There's only one bad thing about it, i.e. oscillation, and it is very difficult to tune to distant stations.

Am using cheap French valve and a ·0003 instead of a ·0002 fixed condenser.

It is the best one-valver yet published, and I must congratulate you on having made it.

Sincerely yours,
C. WHITE.

285, Archway Road,
London, N.6.

THE AUTOMATIC WAVE-TRAP.

The Editor, POPULAR WIRELESS.

Dear Sir,—Of the various descriptive and constructional articles which appear from time to time in your columns, none appeal to me so much as those which deal with selectivity; as having the choice of a very short aerial or a very long one, I elected the latter with its resultant non-selectivity, and in view of this Mr. Dowding's article on "An 'Automatic' Wave Trap," in the current issue of POPULAR WIRELESS, was of special interest.

On the evening of publication, I set about the construction of this trap, as I had the whole of the parts available.

I had a quantity of 20 D.C.C. on hand, and wound the 25-turn coil therewith on a three-inch cardboard tube, and used the remainder in winding the other coil; the wire, however, being insufficient, I completed the coil with about 20 turns of No. 22 D.C.C., and this did not render the coil less efficient, so far as I have been able to discover.

The trap being completed the next day, was tried out on a two-valve set (Det. and L.F.), and with same in circuit I was able to cut out the local station in one degree of the tuning condenser, and receive 2 L O, a feat which I have seldom been able to do otherwise.

I use home-made duolateral coils, and found that one which I have of 55 turns was required for the aerial circuit, in place of the usual 35, and for reaction, 75 was substituted for the usual 100.

With the above combination I am able to tune up to about 400 metres, and intend to construct a somewhat larger coil for the remainder of the broadcast band of wave-lengths. Signal strength is about equal to that without the trap on the local station, and there is much less interference owing to the sharpness of tuning.

Doubtless many of your readers will try out this device, and I shall be interested in any further discoveries which they may make in respect of same.

Yours faithfully,
J. H. COLLINS.

3, Tyisaf Road,
Ystrad, Rhondda.

CLIMATIC CONDITIONS AND DX RECEPTION.

The Editor, POPULAR WIRELESS.

Dear Sir,—Upon making a comparison of the present conditions with those of last year for the same period it is rather interesting to note how very different DX results are. In my own case, referring to my log for October last I find reception of American stations was made at 11.30 p.m. G.M.T. (from K D K A) and 3.30 a.m. on the following morning (from W G Y), but yet neither of these stations have been received this year up to the time of writing. Upon making inquiries I find several other persons are also experiencing this, and like myself are mystified as to the reason.

It has been noticed the wind has for the past two months been in a N.W., N.E., and lately S.E. direction, occasionally veering to S.W. for short periods.

(Continued on page 727.)

CORRESPONDENCE.

(Continued from page 726.)

Last year the wind was mainly S.W. for this period, so it would appear that a S.W. wind has an effect upon atmospheric conditions as presumably we can make reception from U.S. stations when we have a period of S.W. wind.

Perhaps "P.W." has a reader who is more conversant with the subject of meteorology and who can give an explauation why this is so? I am sure there will be many other DX listeners besides myself who would welcome some suggestions.

I have quoted K D K A and W G Y as these are the first to be expected over, but I will add that during August and September I made reception from two stations (one whose call letters are thought to be W B D G and the other probably W P G). This reception varied considerably from week to week and lately the latter station has vanished.

With many thanks to the editor for publishing this letter and with compliments to those who can help a puzzled DX listener.

Yours faithfully,
EDWARD TARPLEE.

"Ivy Dene," 97, Seymour Road,
Gloucester, England.

THE TWO-VALVE "CHITOS."

The Editor, POPULAR WIRELESS.

Dear Sir,—It may interest you to know that on the 12th inst. I received Radiofonka Italiana, Rome, on a loud speaker, using my two-valve "Chitos" receiver. I have used this circuit ever since it was first published.

Last winter, in the North of England, I received several American stations on the one valve. London comes through at excellent strength and purity on the loud speaker. The Savoy bands can be heard all over the house.

I use Wuncell valves with separate H.T. for each (36 volts).

Yours truly,
GEORGE S. DOBSON.

36, Netherfield Gardens,
Barking, Essex.

A PECULIAR EFFECT.

The Editor, POPULAR WIRELESS.

Dear Sir,—I hope you will excuse this trifling result which I discovered with a dull emitter valve.

The valve is a "———" and of the 2 volt ·2 amp. type. Of course the inside is silvered.

Accidentally, however, a lighted candle got beneath the valve, and the heat from the candle had the peculiar effect of removing part of the silvering from the inside of the valve.

I confirmed this result by holding the valve over the candle for about 15 seconds, and it did it again, leaving part of the glass quite clear.

I thought I would let you know as it is rather difficult to see a dull emitter inside a cabinet (through windows) and if the silvering is removed then one could see if the valve was sufficiently bright.

However, I have not noticed any difference in reception whatever, but I have only tried this experiment on the one type of valve.

If this has a weakening effect on the valve I hope you will state if you publish this letter.*

Another thing I would like to mention is the reception of K D K A on 68 metres with this valve only. I use 3 turns on a 4 in. diameter, 7 on the secondary and 12 on the reaction, tuning being made by a ·0002 across the secondary, the A.T.I. being untuned.

The aerial is 24 ft. high one end and 32 the other, and I am badly shielded.

Hoping this may interest some of your readers. I have been one since your paper started. I am only 17 years old. Wishing your paper every success.

Yours faithfully,
J. COFE.

41, Farrant Avenue,
Wood Green, N.22.

* Dr. Roberts, our staff consultant, will discuss this point in a future issue in his Technical Notes columns.
Ed.

SHORT WAVE TELEPHONY.

The Editor, POPULAR WIRELESS.

Dear Sir,—On a recent evening at 7.45 p.m. while using a set designed for 50 to 100 metres (1 valve Reinartz), I picked up a transmission of an amateur calling in French and asking for reports. He gave his name as "Monsieur Vesser." He also gave his profession and town, but I could only get "Fabrique de ——" He was very particular about his name, spelling it out several times, although he did not do this with the name of his town.

Strength was very comfortable with a delicate adjustment of reaction, I should say R5. His gramophone records were quite clear and distinct.

Perhaps you would not mind inserting this in "P.W." in case the report comes to his notice.

Yours very truly.
A. C. BATES.

83, Salmon Lane, Stepney, E.14.

FOREIGN RADIO NEWS.

(*Continued from page 694.*)

and from 6 to 7 p.m. The wave-length is 400 metres, and the power used 500 watts. The call number is O T W.

Sweden's Radio Taxi-Planes.

The Swedish Air Traffic Society is planning to put into service a fleet of "taxi-planes," which the public will be able to hire per hour or per run, just as it hires taxi-cabs. One interesting feature about these air-taxis is that it is proposed to fit them with radio receiving gear, in order that the tedium of flying through the clouds may be relieved by listening to the various stations' musical programmes.

Geneva Changes Wave-length.

The Geneva station, which started with a 1,000 metres wave-length, has found that reception of its programme was interfered with by the Dutch station of Hilversum and the Swiss post of Munchenbuchsee, and has decided to alter its wave-length. Experiments are at present being carried out on 800 metres.

First Radio Show in Portugal.

It is hoped that radio, which has up till now been very backward in Portugal, will receive a fillip through the holding at Coimbra this month of the first radio exhibition ever held in the country. The show is a special section of an exhibition held in connection with the Congress of Electrical Engineers, and it is hoped to make it an annual affair.

Caspian Radio Lighthouses.

The Soviet Government has, it is announced, decided to establish at various dangerous points of the coast of the Caspian Sea, powerful radio signalling stations designed to warn shipping of the coming of storms and to guide them during the fogs that sometimes spread over the great inland sea. During a period of fog, signals on a 1,000 metres wave-length will be emitted every minute, composed of three successive dashes.

New Alpine Station.

The latest Alpine receiving station to be installed at a high altitude is on the moraine of the Padaster Joch, a Tyrolese glacier, at an altitude of over 7,000 feet.

Russian Political Police Radio.

The notorious Russian political police department, the "Tcheka," has just established a radio section. Volunteers have been called for this work from the officials of the force, and after receiving special training they will form a definite and distinct department of the Tcheka, with the duty of keeping in wireless touch with all political police posts throughout Russia.

Special square-ruled paper will be used to transmit the photographs of wanted persons, the drawings being indicated by wirelessing the numbers of the squares through which pass the outlines. It is hoped to replace this in time by some system of television, at which Russian government engineers are working actively.

A Good Guess!

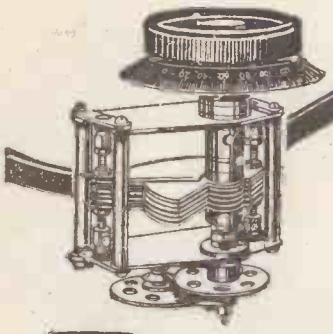
The extraordinary ignorance of radio still obtaining in some quarters is brilliantly instanced by the recent experience of a tourist visiting Paris.

Arrived near the Eiffel Tower, the guide, taking round a party of visitors of many nations, expatiated as usual on the noble proportions of this famous landmark. One of the tourists (it were as well to keep his nationality a secret, but English was his mother tongue) inquired curiously: "What are those cables and lines up there on the top of the tower?"

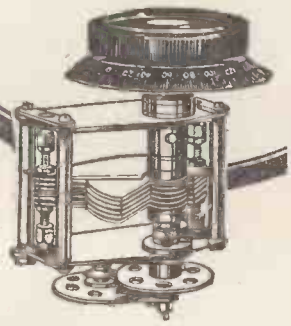
The guide looked up in slight bewilderment, shading his eyes with one hand, while he scratched the back of his head with the other. Then, glibly, having apparently received an inspiration, he retorted:

"Those? Oh, well, you see, the tower has been up a long time, and it is no longer as secure as it was, so they have fixed up these cables to lessen the sagging at the top."

Then they both wondered why some of the party laughed. The Eiffel Tower, of course, is one of the leading French transmitting stations.



More Opinions of Famous Amateurs



Mr. A. Garrett.

Station 5 R B.

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

Captain Percy Baker.

Tewkesbury.

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

Mr. D. McAteer.

Dublin.

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

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

Mr. John Sadler.

President Aberdeen Radio Society.

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

Mr. Louis J. Wood.

Hon. Sec. Halifax Radio Club.

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

Mr. T. McNamera.

Swansea.

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

Mr. Maurice Child.

Director London Telegraph Training College.

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

Mr. J. A. Partridge.

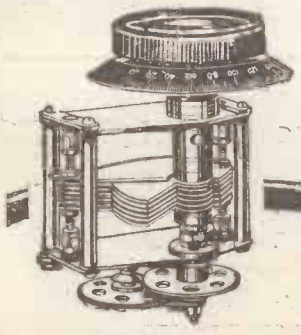
Station G 2 K F.

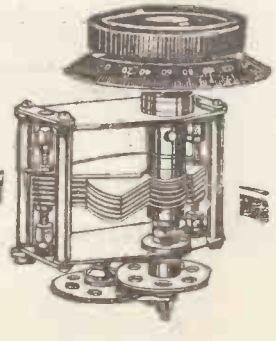
"... the slow-motion device was found to be an ideal arrangement. The entire freedom from backlash and the smoothness of movement were very agreeable. There was a complete absence of ... hand-capacity."

GECOPHONE

LOW LOSS-SLOW MOTION VARIABLE CONDENSER

Sold by all GECOPHONE Service Depots, Wireless Dealers and Stores





Advertisement of the General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.

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R/R

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

"RADIO SOUNDS" COMPETITION RESULTS.

Popular Wireless

and Wireless Review

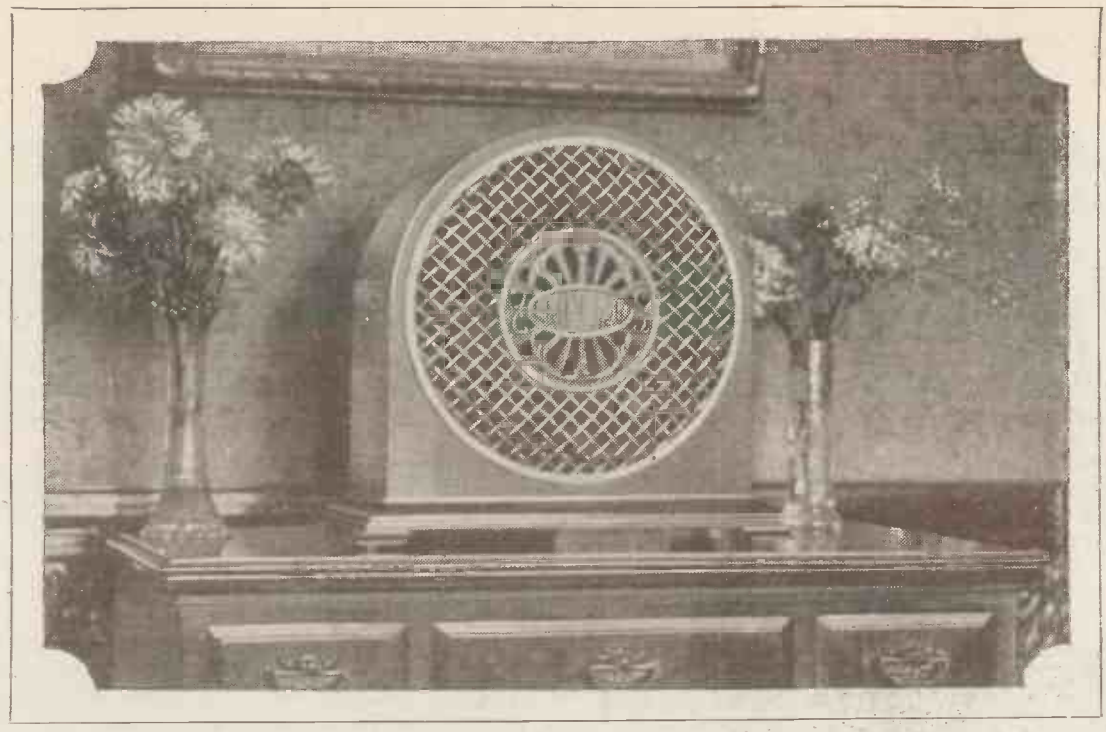
Every Thursday PRICE 3d.

No. 183. Vol. VIII. November 28th, 1925.

Scientific Adviser : SIR OLIVER LODGE, F.R.S., D.Sc.

CONTENTS.

Our cover photograph shows members of the Savoy Orpheans going aboard the huge aeroplane previous to the broadcasting of a concert from the air experiments.



A Revelation in Radio Reproduction

The RADIOLUX AMPLION

represents an outstanding triumph in the art of Loud-Speaker design, being totally different in appearance, in construction and in results.
Louder, clearer, more sensitive and realistic in tone than any contemporary instrument, the RADIOLUX AMPLION is a ***revelation*** in every essential loud-speaker quality. Not only is the spoken word and the song of the vocalist true to life, but instrumental music is almost indistinguishable from the original studio performance.

Outwardly resembling the English bracket clock—in itself a standard to the world—the cabinets possess that beauty of form and superlative finish which denote the ***masterpiece***.

The illustration above depicts Model RS1.M with mahogany cabinet and oxidised silver "grille." Price 8 **Gns.**

The RADIOLUX AMPLION is also available in a smaller size and in metal, oak and de-luxe finish at prices from **£4 15s. 0d.**

Obtainable from AMPLION STOCKISTS, Radio Dealers or Stores.

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ALFRED GRAHAM & CO. (E. A. GRAHAM),
St. Andrew's Works, Crofton Park, London, S.E.4

Telephones: Sydenham 2820-1-2. Telegrams: "Navalhada, Catgreen, London."

Demonstrations gladly given during business hours at the AMPLION Showrooms: 25, Savile Row, London, W.1; 79, High Street, Clapham, S.W.4; 101, St. Vincent Street, Glasgow, and 10, Whitworth Street West, Manchester.

FOR - THE - FIRST - TIME - IN - LOUD - SPEAKER
HISTORY - SCIENCE - AND - ART - GO - HAND - IN - HAND

Ribbons of steel

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

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

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

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

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

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

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

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

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

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

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Popular Wireless

Scientific Adviser: Sir OLIVER LODGE, F.R.S.
Consultants: Dr. J. H. T. ROBERTS, F.Inst.P. J. F. CORRIGAN, M.Sc., A.I.C. C. E. FIELD, B.Sc.

Technical Editor: G. V. DOWDING, Grad.I.E.E.
Assistant Technical Editors: K. D. ROGERS. P. R. BIRD.

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

RADIO NOTES AND NEWS.

Milan Testing—An Interesting Debut—B.B.C's. New Talent—Bill Sykes, Unidyne Enthusiast—Cheap Crystals—Round the World Radio—The New Unidyne.

Milan Testing.

HAVE you heard the new station at Milan, which is now testing? It is probable that a wave-length between 325 and 330 metres will be decided upon for the regular transmissions, which are to start shortly. Technically, the station is built upon lines very similar to 5 I T, and its evening programmes are due to start at 8.30 p.m. In addition, dance music from one of the Milanese hotels is being arranged for during the afternoons, and it is expected that operatic transmissions of exceptional merit will be broadcast when the station has thoroughly settled down to its work.

An Interesting Debut.

"THIS is not 2 L O or 5 N G calling, but trembling Hicks," said Mr. Seymour Hicks, when making his wireless debut before the microphone at Nottingham recently. Listeners had a lively quarter of an hour before Mr. Hicks closed down, and his daughter Betty (who was listening-in) heard a good story which he told against her. It appears that in one part she played, she had to leave him, saying, "Good-bye, father, I'll seek a cosy nook." Instead of this she astonished everybody by proclaiming, "Good-bye, father, I'll seek a nosy cook." I hope that Mr. Seymour Hicks liked his quarter of an hour as much as his audience, and that we shall hear him before the microphone again ere long.

Broadcasting in Fiction.

I HAVE just been reading "Broadcast," a thrilling novel of intrigue in Russia, by John Mackworth. One of the scenes is laid in the studio at 2 L O, and it is rather surprising to find that all sorts of misapprehensions still exist as to the procedure in front of the microphone when an item is being transmitted. For instance, one sentence says the orchestra was leaving the studio, "the players tip-toeing out as though their lives depended on their silence." Most people know that the microphone switch renders such a proceeding quite unnecessary. Nevertheless, "Broadcast" is very well written, with plenty of excitement in the aeroplane flights, which are undertaken by the most attractive German I've met in fiction since the war.

B.B.C.'s New Talent.

THE B.B.C.'s Birthday Week programmes were certainly of a very high order, and listeners everywhere joined in the congratulations showered upon the staff. Those new revues are amongst the very best things the B.B.C. has done, and there was a striking freshness and spontaneity about the microphone humour as exemplified by Mark Lester, Eddie Morris, Donald Calthrop, and Tommy Handley, that promises well for fun in the future.

Fewer But More Powerful Stations.

ONE of the most noteworthy features of the B.B.C. Birthday celebrations was Captain Eckersley's pronouncement that the season 1925-26 will be remembered as the year which saw the B.B.C. breaking up some of their idols, and returning to fewer but more powerful stations. That idea is certainly gaining ground steadily, and even the relay-station audiences — from whom opposition is keenest — admit that such a reorganisation would have many advantages for the average listener.

What is a Birthday?

RATHER an amusing situation has arisen over the Dubilier Co.'s recent advertisement in "P.W.", wherein they expressed hearty good wishes "on the occasion of the fourth birthday of our good friends the B.B.C." Soon after its publication they wrote to the Editor saying, "No doubt many of your readers will have noticed the mistake, for the B.B.C. are only three years old."

This only complicated confusion, for the dictionary definition of "birthday" includes the actual day of birth as well as the anniversaries of it, and reckoned thus this *was* the B.B.C.'s fourth birthday! Anyhow, whatever the wise men decide about that, there is no doubt that a nice little ·001 across the primary is an investment that generally gives many happy returns!

(*Continued on page* 734.)

RESULT OF "RADIO SOUNDS" COMPETITION.

THE FIRST PRIZE OF £250 for the competitor sending in a correct or most nearly correct solution to the twenty "Sounds" which were broadcast on October 16th has been divided between the following two competitors, each of whom submitted a correct solution.

HUGH C. SMITH, 102, North Side, Clapham Common, London, S.W.
P. W. VEAL, 8, Mellitus Street, London, W.12.

* * *

THE SECOND PRIZE OF £100 has been divided among the following six competitors whose solutions came next with one error each.

E. BAKER, Luton Villa, Dunton Green, Sevenoaks.
E. A. GARRETT, 10, Buckland Crescent, Hampstead, London, N.W. 3.
G. STRUAN MARSHALL, 74, The Close, Salisbury.
JOHN C. PIKE, 12, Percy Road, Shepherd's Bush, London, W. 12.
LESLIE C. RAE, 19, Sidney Avenue, Palmers Green, London, N. 13.
H. CHAPLIN-SMITH, 102, North Side, Clapham Common, London, S.W. 4.

The names of Consolation Prize Winners will be published next week.

* * *

RADIO SOUNDS.

THE CORRECT ANSWERS.

1, Horse and carriage; 2, Squirting syphon; 3, Tube lift; 4, Soldiers fixing bayonets; 5, Turnstile; 6, Gun firing and flying shell; 7, Laying table for seven; 8, Telephone call box; 9, Crackling of wood fire; 10, Kiss; 11, Tearing cloth or calico; 12, Cash register; 13, Lighting a cigarette; 14, Walking on shingle beach; 15, Hammering in a nail to hang picture; 16, Mouse caught in a trap; 17, Whitewashing (or distempering); 18, Railway station and milk cans; 19, Stropping a razor; 20, Sewing machine.

NOTES AND NEWS.

(*Continued from page* 733.)

A University of the Air.

LIKE the United States, Canada is to have a University of the Air, in connection with the broadcasting station at Winnipeg. Courses for the benefit of farmers are to be sent out daily, and at stated intervals examinations will be held and diplomas awarded. There are many advantages to the scheme, and it is expected that it will be taken up enthusiastically.

Broadcasting "Down-Under."

IF those recent talks by settlers, diggers, and other Australian workers have lured you into the idea of emigrating to the southern continent, do not forget to take your radio set when you go. There are not so many stations to listen to, but wireless is more than ever a boon away from the cities, in the "outback" regions. Radio components out there are comparatively dear, and, although the licence fee has just been reduced, it still stands at the steep figure of 27s. 6d. per annum. However, you get value for money, for the stations start at 8 a.m. and carry on an excellent all-day programme. (B.B.C., please note!)

Bill Sykes—Unidyne Enthusiast.

A HULL correspondent tells me that burglars recently broke into Doughty's, the wireless dealers there, and took away the stock of K4 Unidyne valves. Burglars have the reputation of generally making for the plate when on their professional visits, but in this instance it appears to have been double grids that attracted them.

Another Radio Raid.

MENTION of a wireless burglary reminds me that there was a rather daring one in London recently, at the works of the Formo Co. Failing to find money, the burglars, in this instance, carried a number of transformers some distance, packed them into the firm's box-tricycle, and rode away, although the firm's name appears in large letters on either side of the carrier!

The empty box-tricycle was found abandoned at Notting Hill, and the police hope to soon have the thieves I.P. (in prison).

New Stockholm Station.

NORTHERN readers ought to find the Stockholm station thumping in soon, for the old transmitter there is being replaced by one of the Marconi type, employing about as much power as a standard B.B.C. main station. Sweden is taking to radio with great relish, and there are already 14 stations there, and lots of keen amateurs. The percentage of listeners to population is higher than in Germany, the latest figure being 110,000 licence-holders; as well as a large number of non-paying guests.

French Morse Interference.

THE complete spoiling of the speech of Mr. J. H. Thomas, M.P., by Morse interference on November 12th was one of the worst instances of the kind that I remember. The transmission appeared to be almost exactly on London's wavelength, and was so powerful that in the neighbourhood of Ilford, where I was listening, nothing whatever could be heard of 2 L O until the jamming ceased. It appeared to emanate from a French ship calling F F B or F B B—I forget which, as I happened to have no pencil with which to make a note—and I should judge that the ship must have been in the river west of Tilbury, or else using a power of at least 1½ kilowatts.

Spoiling a Speech.

UNFORTUNATELY, the B.B.C. decided to "cut" Mr. Thomas's speech at the end, because the programme time had been exceeded, so listeners over a large area heard only the beginning of what promised to be a most interesting speech. It is a great pity that something cannot be done about those French stations—they are bad enough in the London area, and I am sure they must be a severe strain upon the Entente Cordiale as far as south-east coast listeners are concerned.

Radio Society at Newcastle.

THE Newcastle-on-Tyne Radio Society is now holding its meetings every Monday at 7.30 p.m. in the club rooms, 5, Charlotte Street. This society caters for all classes of persons interested in wireless, and is not run solely for the benefit of the more advanced experimenter. The hon. sec. is Mr. N. Hendry (G 6 F G), Hertford House, Sanderson Road, Newcastle, and listeners there are cordially invited to attend a meeting as visitors.

SHORT WAVES.

"With the broadcasting network of to-day not a sound is made but could be conveyed to 10,000,000 listening ears; with the network of to-morrow we shall see the world as one broadcast family."—Capt. Eckersley.

* * *

"Compared with Germany, we have never been a musical people; but the nation is denying itself to buy good gramophones and first-class records, so that music which intrigued it across the ether may be available on demand in the home. This is probably the greatest of the many real achievements of the B.B.C.; never before in history have a small body of commercial men done so much to make a nation musical in so short a time."—A writer in "The New Statesman."

* * *

"Before many years have passed we are sure to have the wireless serial story, and we are sure to have plays acted by wireless with various incidents leading up to exciting passages which are always 'to be continued in our next.'"—Professor A. M. Low, writing in "John Bull."

Cheap Crystals.

WANDERING past a large Woolworth's stores in a London suburb the other day, I was surprised to notice that this enterprising concern has gone into wireless. Crystals were being offered on the usual "tanner-a-time" basis, and with typical Woolworthian generosity, the cat's-whisker was thrown in, too! I haven't tried them yet, but they certainly looked all right.

More Heterodyning.

THE heterodyning problem seems to get worse and worse. Hull listeners are the latest to complain, and the last post brings me more reports from Manchester listeners. Curiously enough, these later Manchester complaints all indicate Madrid as the offender, though previously this station was not mentioned, and everybody blamed Oslo. The truth appears to be that the situation changes from day to day, as the various stations try adding or subtracting a metre to dodge interference. The sooner the Geneva recommendations are enforced the better!

Round-the-World Radio.

YET another record for round-the-world radio has just astonished the students of short-waves. It appears that Washington was calling up Atlanta, 500 miles away, and, failing to get a reply, a station in California butted in to attract Atlanta's attention. In this it was unsuccessful, but a New Zealander who was listening in overheard the attempt and offered to assist, so presently the Antipodes also started to call Atlanta.

A Roundabout Route.

TO all this Atlanta still turned a deaf ear, so one Australian transmitter, in desperation, turned to the Old Country, and asked if anyone in Britain could "raise" Atlanta. A London experimenter offered to take the message from Australia and transmit it to the U.S.A., so this offer was accepted, and the message came via Britain, and was re-transmitted to America, where, after its long journey, it was safely delivered.

First Across the Philippines.

DURING the past week or two reception has been particularly good from all parts of the world. Several records have been created or beaten, one of the best being accredited to Mr. F. A. Mayer, of Wickford, Essex, who succeeded in establishing the first two-way communication between this country and the Philippine Islands. An extraordinary feature of the reception was that signals gradually increased in strength from midday till 3 p.m., after which they began to fade, becoming inaudible at 4 p.m.

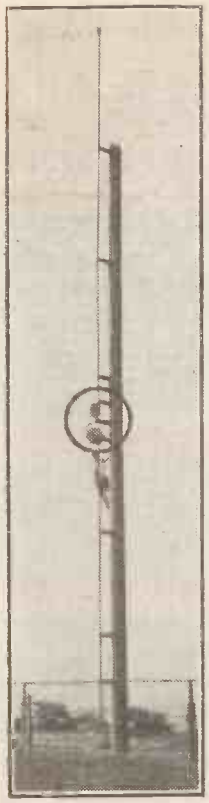
The "P.W." "Ultra" Crystal Set.

SOME time ago I received a letter from a gentleman of 72, who told me that up to the time of writing he believed he had built and tried out every crystal set that had been published in "P.W."! I think this must be a bit of a record, but since then I have often been struck by the fact that many crystal-set users try out new circuits just as painstakingly as the valve-men. One such experimenter informed me recently that "the Ultra Crystal Set is the only one that has given me every satisfaction. It is a credit to 'P.W.,' and if any reader is fed up with his set over poor reception let him build an Ultra, and with a good bit of crystal he will enjoy the programmes without pressing the 'phones hard to his ears." So now you know!

The New Unidyne.

"I HAVE just altered my one-valve Unidyne to your new specification, and must tell you how pleased I am with the results," writes Mr. E. J. Preston, The Cottage, Ambrose Lane, Harpenden. His letter to the inventors continues: "The clear reception and considerable increase in volume, together with the ease of manipulation are very gratifying. The old one was good, but this tops it. I think you are too modest over your achievement. So many people think H.T. is indispensable." I shall be glad to hear from any readers who are getting good DX results with the new circuit, so that further comparisons can be made.

ARIEL.



The oscillating pole at KDKA. Note the tuning coil and aerial ammeter.

THE OSCILLATING POLE.

AN EFFICIENT RADIATOR.

By LLOYD JACQUET (U. 2 O Z).

This interesting article has been written for "P.W." by one of the best known amateurs in the United States of America.

IT would seem that amateurs and engineers the world over have suddenly come to the realisation of the importance of the shorter waves. Marconi and Franklin in England, General Ferrie in France, Conrad in America, have all made their contributions to the young art, and amateurs are continuing to enjoy their lead in the field in which they were the pioneers.

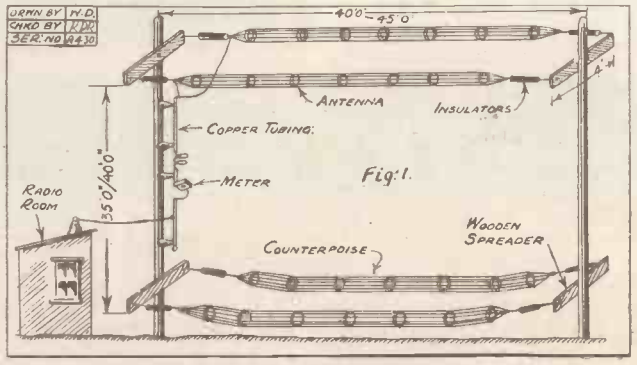
Perhaps the most original work was done by Frank Conrad, of 8 X K, a tireless and well-trained experimenter and engineer located near Pittsburg. Early in his experiments, Conrad set out to design a transmitter that would operate efficiently on short waves, of the order of 50 and 100 metres. This was done, and the question of the right antenna had to be studied. Here is where Conrad showed his originality and genius.

Recognising that one of the most efficient types of radiators was the vertical antenna, a steel mast about 70 feet high was used as the first aerial. This mast was so fastened to the building that its height could be changed by lowering or hoisting it through the roof. In this manner the desired period was secured for "working" the antenna. Due to various conditions, such as the difficulty of keeping the frequency of the system constant, of tuning it, and of preventing leakage, the antenna was temporarily abandoned in favour of a regulation counterpoise and antenna system tuned to the working wave.

Early Experiments.

This radiating system contained some points of interest to the amateur, and it was used for some time with marked success. It was originally designed to work on a wave-length of from 70 to 110 metres. Depending upon the wave chosen, the antenna system was tuned by means of wave meter to the exact frequency on which it was desired to transmit. This could be readily done by means of the inductance in the vertical lead. (See Fig. 1.) The dimensions are shown on the drawing, and the general construction, while not unusual, shows strength and rigidity. There are no unnecessary guys or wires, and the spreaders are fastened directly to the poles. To eliminate swinging conductors, the antenna and counterpoise wires are sprung very taut, and the lead-down is made of copper tubing mounted on insulators along the pole.

There is only one wire that connects this transmitting system to the source of power. In fact, the oscillator is located some distance away from the radiating system. The energy is carried along the single wire, and causes the system to oscillate at the frequency for which it is tuned, or any harmonic thereof. This antenna design is very efficient and rugged.



One of the experimental aerial systems designed by 8 X K.

Work on the first type of antenna—the vertical pole—was not entirely abandoned, however. Following along the lines of the steel mast, a second, but more efficient, pole was designed. As in the first case, rigidity, minimum losses, and practicability were studied and worked into the final device. The entire system now consists merely of a given length of copper tubing, supported by a wooden mast.

Capacity Coupling.

The construction is very simple and inexpensive. The pole is made self-supporting, and, since there is no lateral strain upon it, there is no need for guy wires, with their attendant shortcomings and losses. A short piece of copper tubing horizontally located at the base of the vertical pole serves to increase the capacity of the system.

The entire metallic portion of the radiating system is, of course, well insulated from the wooden pole by means of porcelain insulators. The length of the copper tubing, together with the few turns of the inductance coil, determine the frequency of the system.

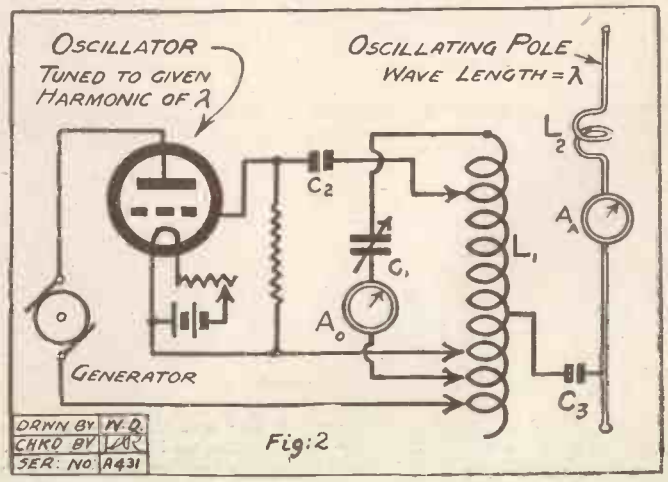
Necessarily, this radiating system must be coupled to the driver, or oscillator. This could be done inductively, but it is found much more practical to do this capacitatively. This coupling condenser is of comparatively small capacity, about ·0001 microfarad maximum, and possibly as low as ·00003 microfarad minimum. In fact, the use of a variable condenser is advised for experimenters, although a fixed condenser of ·000025 was used by Conrad. The condenser should, in any event, be of fine construction, and should be able to withstand high voltages without trouble.

Easily Operated.

The size of the condenser, once determined, need not be altered again, even with a shift of wave-length. It is very useful, however, to change the coupling between the two circuits, and to readjust the degree of coupling so that variations in the system will not affect the radiated wave-lengths in bad weather.

This method of energy transfer has many advantages not possessed by any other method. For instance, the radio room, which cannot often be conveniently located with respect to the antenna, can be placed almost anywhere. Most amateurs have little choice in this matter, but with the capacitative coupling either cellar or the back parlour can be used as the "den"

(*Continued on page* 736.)



THE OSCILLATING POLE.

(Continued from page 735)

with the assurance that maximum results can be obtained with the radiating system on the roof, or in the yard. Since only one lead, which carries comparatively little current, is used, the insulation problem is solved. As the antenna may be located some distance away, it can be free and clear of obstacles in its field. Finally, it is easy to install and operate.

The Hartley Circuit.

The coupling lead is located along the oscillating system at a place which is at a nodal point. After a little practice, this can be done without difficulty. It is said that Conrad can locate this point with unerring accuracy every time. A little experiment will tell you exactly where it is. It is not a critical adjustment.

The oscillator, or driver, is nothing more than the familiar Hartley circuit (Fig. 2). It is adjusted first, and carefully tuned to the wave which has been selected for working, and to which the oscillating pole has been previously regulated. Then the coupling lead to the antenna is connected to the primary coil at a high voltage point, which can be found experimentally. First attempts may cause the driver to stop oscillating. This is an indication that the coupling is too tight. Change the coupling point along the primary, and the capacity of the coupling condenser, until conditions are normal.

Two ammeters, one of them located in the radiating system and the other in the driver, show what is going on in the circuits. Ao will read low when Aa reads high, thus giving an indication of the amount of energy that is being absorbed by the radiating circuit. The variable condenser used in the driver circuit should be able to withstand high voltages and considerable current.

Many Advantages.

An advantage of this type of antenna is its possibilities in the field of harmonic operation. For instance, it would be necessary, ordinarily, to have quite a high oscillating system to transmit on a wave of 100 metres—a pole 300 feet high for an antenna of this period. By constructing a system which will have a fundamental of, say, 20 metres, and which would be approximately 60 feet high, it is possible to transmit on 100 metres by exciting it at five times its fundamental, or 100. Similarly, waves of 40, 60, and 80 metres can be radiated without the necessity of changing the radiating system. The tuning is done with the driver.

In fact, on the very low waves this type of radiator becomes very efficient and desirable. Because of its peculiar construction, it becomes possible to use reflecting screens, and achieve directional transmission. Without a doubt the vertical oscillating pole has proved itself, and experimenters should be quick to appreciate its advantages. It is well worth trying, and the writer advises all amateurs interested in short-wave transmission to give it their attention.

CRYSTALS USED IN BROADCASTING.

RADIO engineers recognise that the principal source of interference with clear reception to-day is the station that is off its recognised wave-length. How to ward against this has been a problem under consideration for some time, and it has now been solved by means of a special crystal called the "piezo-crystal," which has been tried for many months now at the K D K A station in America, and which the Westinghouse Electric Company has now decided to install on all its broadcasting stations.

Many people do not realise how easy it is for a station to slip off its regular wave-length. The stations are separated by as little as ten kilocycles, and must be kept very close to their assigned frequency if they are not to encroach on the wave-band assigned to another station. If a broadcasting set at 300 metres, for instance, should be 1 per cent. off its proper wave-length, it would in most cases just overlap on to the next station.

Accurate Frequency Control.

Very often such a variation is occasioned by a variation in power. Any moisture in the shape of rain or snow clinging to the antennæ wires will cause them to sag and produce a similar result.

The new device is a piece of a certain kind of quartz cut and ground to the desired shape and size, and placed in a specially designed transmitter circuit. This quartz, or "piezo-crystal," will oscillate if electrical energy is properly applied to it. The frequency, or number of times per second, at which the crystal oscillates, is in the radio-frequency field.

The experimenting engineers learned that the frequency of any given piece was remarkably constant, and that the only way to change it was to change the size and shape of the crystal. They also discovered that if the crystal was placed in a transmitting circuit, broadly tuned to the same frequency or wave-length as the crystal, the piece of mineral would hold the transmitting set constantly in its own exact frequency.

This piezo-crystal should not be confused with the common crystal used on a receiving set, as the receiving set crystal does not oscillate.

Erecting one of the aerials at the new Rugby Station. Note the huge insulators and heavy aerial wire.

FURTHER EXPERIMENTS WITH THE "THREE-ELECTRODE" CRYSTAL DETECTOR.

By G. V. DOWDING, Grad. I.E.E.
(*Technical Editor.*)

Mr. Dowding recently outlined some novel crystal experiments, which aroused considerable interest; this article deals with some further and eminently practical developments

ALTHOUGH I have already described my "three-electrode" crystal detector in "P.W.," for the benefit of those who may have missed the description I will repeat the essential details. Instead of an ordinary cat's-whisker and crystal, the three-electrode detector employs a cat's-whisker so arranged that it makes contact with the crystal in its centre. It is bent sharply, and connections are taken from each of its two ends. Thus there are two cat's-whisker terminals and one crystal terminal.

Testing a Theory.

The original device employed a stationary crystal and an adjustable cat's-whisker, but to facilitate construction the cat's-whisker can be stationary and the crystal made to be the adjustable element.

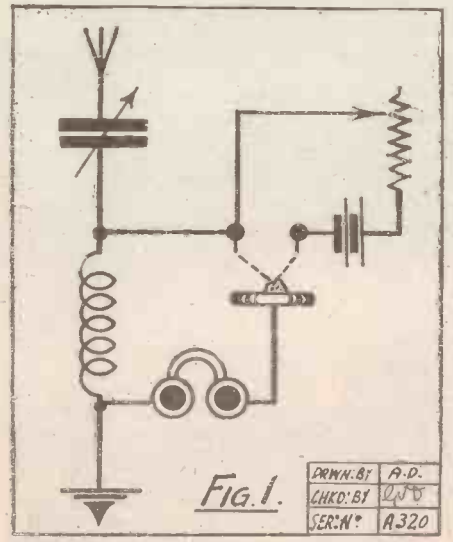


FIG. 1.

The detector was designed for the purpose of discovering whether thermal effects caused "rectification," but, as was shown in my previous article, nothing very conclusive resulted from the initial experiments. However, there are a number of further experiments to record, some of which are not only interesting, but of a definitely promising nature. They indicate a sphere of usefulness for the three-electrode crystal detector the value of which has not yet been fully estimated.

Subsequent to those experiments already described, it was decided that it would be worth while observing the behaviour of the detector under conditions of locally applied and generated heat.

The circuit given in Fig. 1 was therefore arranged. Basically, it is a straightforward crystal circuit, but, as will be seen, the cat's-whisker was placed in series with a battery and a variable resistance. A 4-volt accumulator and a 0-500 ohm resistance were used. Of the cat's-whiskers tried, one was of 32-gauge hard brass wire arranged in a "V" form, with its "arms" spiralled and its point flattened slightly and sharpened. This proved to be the most suitable.

By means of the variable resistance a direct current of a controllably variable nature could be passed through the cat's-whisker, and upon the strength of this would directly depend the degree of heat to which the cat's-whisker was heated.

Tuning-in was first of all carried out in the usual manner with the battery totally disconnected (a switch, not shown in the diagram, was introduced to facilitate this), and when the greatest reading on the micro-ammeter obtained (a micro-ammeter replaced the 'phones, so that accurate observations could be taken), the battery was switched in with the resistance set at approximately 300 ohms.

Peculiar Results.

Some 13 milli-amps. were then passing through the cat's-whisker, and the strength of the rectified current dropped from a previous 21 micro-amps. to 19. Reducing the variable resistance to 200 ohms, and thus bringing the cat's-whisker current up to some 20 milli-amps., caused an *increase* of rectified current from 19 to 22 micro-amps. A re-setting of the mechanical adjustment of the detector brought it up to 23 micro-amps., so that, so far, a gain of 2 micro-amps. was registered.

Readers will appreciate the fact that a difference of an odd micro-amp. or so would not be particularly noticeable on 'phones.

Finally, an adjustment was reached which produced 24 micro-amps. rectified current, and switching the battery off caused a drop to 16! On switching the battery on again immediately afterwards only 19 micro-amps. were recorded! But the original 24 could be regained after further mechanical and electrical adjustments. A reversal of battery connections did not appear to affect results.

I inferred from the foregoing that neither heat nor incidentally applied potential was playing any direct part in the curious variations recorded, and my opinion was, and is—although I put it forward in all humility—that this was what happened.

A Probable Explanation.

An expansion and contraction of the cat's-whisker naturally followed the variations of current passing through it, and this was due, of course, to the varying heat generated. Although this expansion and contraction was quite small, it acted as a "vernier" *mechanical* adjustment to the detector. Anyway, it seems to me that this is a most probable explanation, and I was prepared to accept it as such, even although it meant that I had run into another *cul-de-sac*.

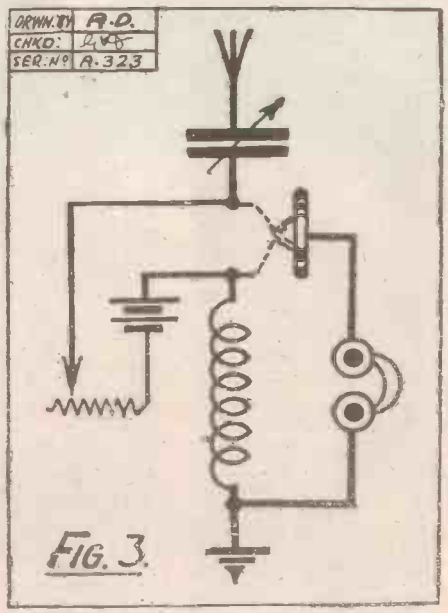


FIG. 3.

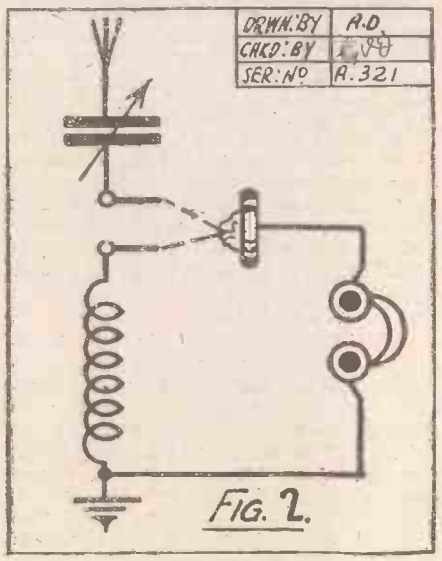


FIG. 2.

Trying Something New.

A delay of a few weeks followed, owing to the diversion of my activities into another direction—not unconnected with Unidyne circuits! Eventually, however, I again unearthed the three-electrode crystal detector.

This time I decided to strike out into another direction. The circuit given in Fig. 2 was the result.

Here it was hoped that, even supposing rectification was not due solely to thermal

(*Continued on page* 738.)

FURTHER EXPERIMENTS WITH THE "THREE-ELECTRODE" CRYSTAL DETECTOR.

(*Continued from page 737.*)

effects, a certain amount of energy could be generated in that manner and added to the energy due to whatever form of action really does take place. Inasmuch as in this circuit (Fig. 2) *every bit* of oscillating current in the aerial circuit passes right by the point of contact between the cat's-whisker and the crystal, it is reasonable to suppose that optimum use is, in the circumstances, being made of all the available energy. I do not think I can be far wrong if I state that as a fact.

Striking Stability

The results obtained with circuit Fig. 2 were distinctly gratifying. A condition of stability resulted far exceeding that of any other detector I have ever tested. To use the words of a well-known radio engineer who has tested it, "You can hit it with a hammer and not lose strength."

But, more curiously still, selectivity was markedly increased, and, so far, I am rather at a loss to understand why this gain should be registered.

Stronger signals were invariably obtained, but these are not always particularly noticeable in 'phones, although, of course, the micro-ammeter gives definite and visible proof. However, in point of stability and selectivity—particularly the former—the three-electrode detector used as per Fig. 2 really is a noteworthy improvement over standard types.

The striking stability referred to as "hammer-proof" was, it is distinctly interesting to note, observed even when that sensitive, but usually most unstable, mineral galena was employed. Many kinds of crystal were tried in the detector, and many kinds and gauges of wire, and it was noticed that results varied as in standard practice in point of sensitivity.

Excellent results were obtained with the various proprietary crystals, but a hard brass wire cat's-whisker was as good as anything tested, irrespective of the mineral used. As indicated previously, the latter's degree of efficiency obtaining in standard circuits was repeated in the three-electrode hook-up.

As was only to be expected when the "three-electrode" was applied to valve-crystal (reflex) arrangements, the stability factor proved to be of very great importance. I anticipate that I will be able to employ the device in an original manner in such circuits; as readers will realise, it opens new fields for investigation.

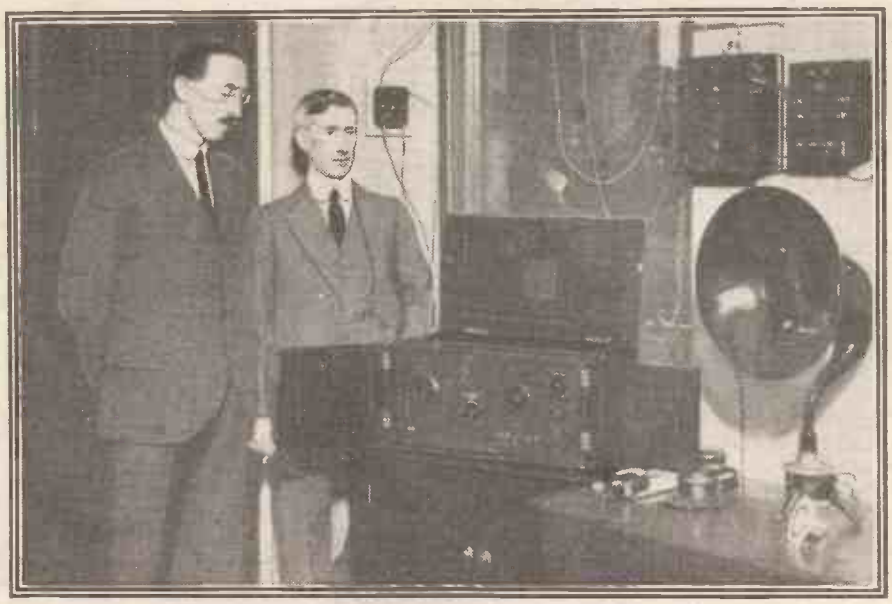
Although Mr. J. F. Corrigan, M.Sc., who is, as readers know, one of the foremost radio crystal authorities, has not yet been able to investigate the system closely, he gives it as his opinion that it is probable that some form of "double rectification" takes place. This seems the most likely explanation, although whether it is double rectification due to two dissimilar effects or not, I am not at the present moment prepared to say.

In fact, I do not mind admitting that, so far, I am no nearer to the proving or disproving of any one of the several theories concerning crystal rectification than I was before the evolution of the "three-electrode" system. However, I feel I have accomplished something worth while.

Battery No Advantage

An obvious variation of Fig. 2 is Fig. 3, which shows a similar circuit with the addition of a battery and variable resistance. Almost identical results were obtained, relatively speaking, as were given by Fig. 1, so that it would appear that there is no practical advantage in employing the extra apparatus in the described manner, although I trust it will be agreed that the observations are sufficiently interesting to include in this article.

Finally, I would like to record my thanks for the assistance given me in the three-electrode crystal detector research work by Mr. R. P. Rogers. He has spent an enormous amount of time in the inorganic laboratories of one of the famous universities testing the action of metals and alloys, and even small thermo-couples as cat's-whiskers for the three-electrode, and the data accumulated will prove of inestimable value.



The four-valve Burndept equipment installed in the Dumfries and Galloway Royal Infirmary for the benefit of the patients.

LENGTHENING THE LOUD-SPEAKER LEADS.

"HOW can I work a loud speaker in another room without causing the set to howl?" This question presents itself to nearly everybody at some time or another, and many have given up the problem in disgust when they found that as soon as the long lead was connected up, the set started to howl its head off. The trouble is especially liable to occur with a reflex set, or anything in the nature of a super-circuit, but even in these cases it can generally be cured.

Sometimes the self-capacity of the extension leads is sufficient to cause the trouble, and if twisted flex has been employed, it is worth while disconnecting this and trying the effect of separate spaced wires for the "go" and "return" leads. Also try the effect of spacing the leads away from walls or floors, which, by reducing the capacity to earth, may prove effective.

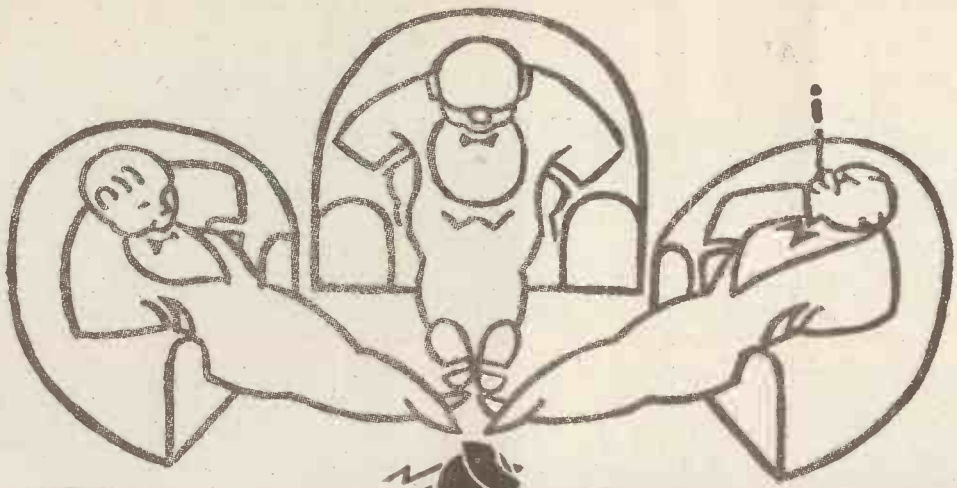
Using a Transformer

In the case of a dual circuit, especially one of the tuned anode type, more drastic treatment is generally required. Consideration of the circuit of such a receiver shows that the telephone terminals are right in the main H.F. lead, so that naturally any big load here is bound to affect the operation of the set. The obvious way out of the difficulty in such a case is to separate the H.F. currents from the L.F. component by using an iron-cored transformer to transfer the latter into a separate circuit; for a low-resistance loud speaker a step-down transformer having a ratio of about 10 to 1 can be employed effectively, whilst for a high-resistance loud speaker of 2,000 ohms or more a 1 to 1 ratio transformer is required. In either case the primary of the transformer will probably need to be shunted by a small fixed condenser to by-pass the H.F. currents effectively.

One method of getting over the trouble without the use of a transformer is to use a choke circuit, such as is now commonly employed for protecting the windings of loud speakers from the passage of heavy current. In this case an L.F. choke (an old Ford coil, or the good winding of a broken-down L.F. transformer will generally do) should be connected across the output of the set.

The long extension leads are taken from the ends of this choke, and in one of the leads a large fixed condenser is connected in series with the loud speaker. The value of this condenser should be half a microfarad or more, and the arrangement is generally very effective.

OURSELVES — AND THE ELECTRICAL IMPULSE



Brandes

"That radio contrivance of yours, Smith; it talks very naturally. The fellow holding forth on what to plant in the garden might well be in this room."

"Ah yes! It's a Brandes; an old friend of mine. Always did sound clearly and well. Thank Heaven the fellow is not in the room, anyhow. It too easily reminds me that my wife will probably lend her moral support to my doing some gardening on Sunday morning."

"Yes, but why is it so appreciably better than most? I had dinner with Brown-Jones last week. His port is excellent, but his radio is excruciating; I wanted to throw things."

"Well, these Brandes fellows claim that they build their instruments from an expert knowledge of radio acoustics."

"I don't know what radio acoustics is from Adam."

"My dear Jackson, of course you don't. Neither do I, technically."

"Well, tell me what you know about it."

"You perhaps know that acoustics is the science of sound?"

"Well, ye-es!"

"Right! Radio acoustics is the science of transforming the electrical impulse into audible sound."

"Do you mean that the electrical impulse is the electrical energy which carries the transmitted power from the studio to the receiver?"

"Precisely!"

"And that the Brandes instrument is constructed with the correct scientific elements for a most able transformation into audible sound?"

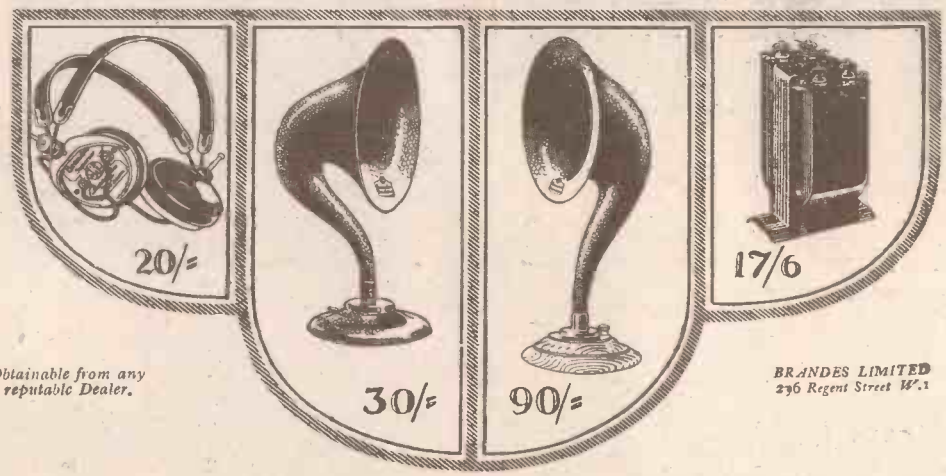
"As you say, dear fellow! Brandes are thoughtful radio builders and seventeen year's intimate association with the electrical impulse must have given them a lift above the others."

"Well, that youngster of mine is pestering me for a loud-speaker—I'll see that it's a Brandes."

"I should! You have heard mine—ah! the Savoy Bands coming through. Don't give John any more whisky. He'll probably want us to fox-trot with him."

"No sir! On the contrary, I am thinking of investing in a Brandes."

MATCHED TONE HEADPHONES — THE TABLE-TALKER — THE BRANDOLA — AUDIO TRANSFORMER



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Service Advertising

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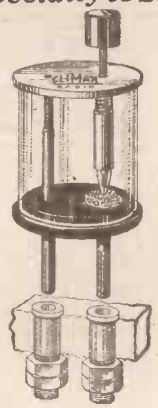
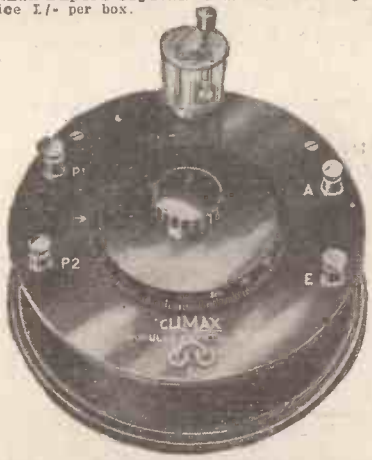
"Made Specially to Stay Put."



That is the great difference between the Climax Popular Plug-in Detector and the ordinary Detector. IT DOES STAY PUT. You see it all hinges on the special catwhisker—The Climax Auto-micrometer Catwhisker. (Prov. Pat. No. 21001/25). The trouble with crystal sets in the past has been the difficulty to find a sensitive spot on the crystal and to keep it when found. The crystal has usually had the blame, but the seat of the trouble has really been the type of catwhisker employed. The Climax Auto-micrometer Catwhisker is undoubtedly the common-sense solution of crystal setting difficulties. The unique design based on the stylographic pen point automatically ensures that essential delicate micrometer pressure. In addition an independent pressure is maintained between the catwhisker container and the crystal surface which automatically ensures complete stability.

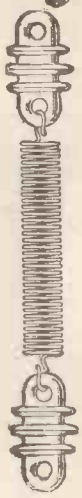
Climax Popular Plug-in Detector, fitted with Climax Auto-micrometer Catwhisker and Climax Superb Crystal, complete, ready for use.
Price 3/6, complete with sockets.
Climax Auto-Micrometer Catwhisker (Prov. Pat. No. 21001/25). Fits all standard Detectors.
Price 1/-.
Climax Superb Crystal. Guaranteed *natural* galena. **Price 1/-** per box.



CLIMAX POPULAR CRYSTAL SET
A perfectly finished set, remarkable for its high efficiency tuning system and fitted with the Climax Auto-micrometer Catwhisker. The tuning system, which is by specially designed "D" shaped variometer gives remarkably close coupling, wide wave-length variation, fine tuning and good selectivity. Long wave tuning is accomplished by an adjustable plug-in coil giving unusually close tuning.
CLIMAX POPULAR CRYSTAL SET, complete with Climax Popular Plug-in Detector, the Auto-Micrometer Catwhisker and Climax Superb Crystal. Wave-length range 300–500 metres. **Price 12/6** Daventry adjustable loading coil, extra 3/6

MAKE SURE IT'S CLIMAX

Christopher Columbus
found a better earth



It took him an awful long time and cost a fortune. But that was four hundred years ago. To-day Climax offers a Better Earth for 5/-. It can be installed in five minutes and it provides equally wonderful results. Follow Columbus and get yourself a better earth To-day.

THE CLIMAX RADIO EARTH.—(Prov. Pat. 17653).—The low-loss direct tubular earth. Far better than the old-fashioned water-pipe or gas-pipe earth. The latest pattern is provided with projecting flanges which break up the earth around the tube, thereby preventing any rocking of the tube in the ground. The projections on the surface of the tube provide water-courses which make for perfect electrical contact. Fit this well-proven improvement to your wireless set to-day, and learn the importance of a perfect earth. Ready for use. Easily fitted. Maximum efficiency. Length approx. 30 ins. **Price 5/-.**
Climax Insulated Low-Loss Earth Lead, 20 ft. **Price 1/8.**

The CLIMAX INSULATED SHOCK ABSORBER SET—for aerial insulation de luxe. One pair of Climax Insulators linked with a Climax Shock Absorber spring at each end of a single span wire, means perfect insulation, while the aerial wire is relieved from sudden strains due to mast sway or halyard rope shrinkage.
Each Climax Insulator (Reg. Design No. 708718) will stand four times the flash-over voltage of the ordinary insulator, while it has far less capacity to earth.
It will stand a direct pull of hundreds of pounds. It is entirely non-hygroscopic. It cannot absorb moisture even if fractured. IT INSULATES PERFECTLY DURING RAINFALL. It is self-cleaning on all surfaces.
One Climax Insulated Shock Absorber Set comprising four Climax Low-Loss Insulators and two Climax Shock Absorber Springs. Price 3/- per box.
Climax Low-Loss Insulators. Boxed Separately. Price per pair 1/-.
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Climax Lightning Arrester. Made on the multi-gap quenched spark system. **Price 7/6** complete, ready to fix.

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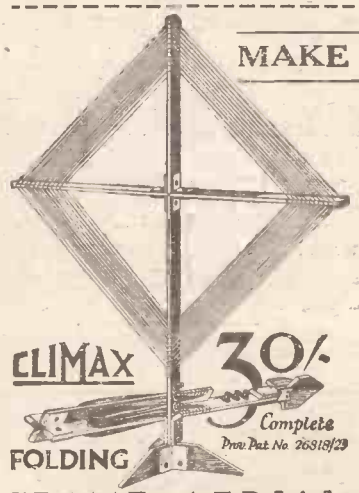

UNDOUBTEDLY THE BEST FRAME AERIAL—AND IT FOLDS

Constructed on an ingenious mechanical system by which it may be opened or folded in a few seconds. The wire folds into a frame or opens out to its final form without the least trouble. The winding is arranged in two flat coils which are mechanically and electrically balanced. They combine the advantages of the pancake type of winding with the solenoid type. A centre tapping is provided for use with various special circuits.
This frame aerial is very attractive in appearance, extremely efficient in operation, remarkably simple in construction, and is very easily folded into a conveniently portable form. The stand also folds. It is offered at a particularly attractive price.

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Showrooms: 257, HIGH HOLBORN, LONDON, W.C.1. *Telephone:* Holborn 2538.

The "P.W.D." Crystal Set

Here is a novel and inexpensive Crystal Set, designed, built, and described by

G. V. DOWDING, Grad.I.E.E.

(Technical Editor "P.W.")

THE special feature of the "P.W." "D" set is the method of winding the coils, which, as will be seen from the photographs, consist of two windings upon each former. Each of the windings is D-shaped, and they are so arranged that the "front" of the D faces the centre of the complete coil. This method of winding results in an extremely compact coil, and enables the receiver to be contained in a case measuring only about 2 in. from top to bottom. Two coils are needed to form a variometer covering the wave-length of the main and relay B.B.C. stations, each coil consisting of two of the D windings.

Before describing the construction of the coils, it will not be out of place to consider the circuit and the components used. The former is one of the simplest possible arrangements for a crystal receiver, consisting merely of a variometer connected between the aerial and earth. Across the variometer the crystal detector and telephones are wired together in series.

Referring to the list of components given on this page, it will be seen that the whole receiver should not cost more than 10s. or so, a great deal depending upon the price paid for the crystal detector and upon the class of case in which the receiver will be contained. In the original receiver an ebonite panel was used. Any type of crystal detector can be mounted upon this, the one shown in the photographs having been made up from a set of parts such as can be obtained from any dealer for a shilling or so.

The Variometer.

The only parts of the variometer which need be purchased are the knob and dial, and about 2 in. of 2 B.A. rod, together with locknuts and a $\frac{3}{8}$ in. brass bush with collar, drilled to take 2 B.A. (In case the constructor happens to have an old variable condenser in his junk box, it is perhaps worth mentioning that the whole of this bush can usually be obtained from the moving-vane-end of such a component.) The variometer itself consists of two flat cardboard discs carrying the four D windings. One of these discs is fixed to the panel permanently, and the other is placed close to it and rotated by means of the control knob and the dial, which are mounted upon the brass spindle passing through a hole in the centre of the fixed coil.

The method of winding the coils will now be described in detail. The first step is to cut out two formers from a piece of stout cardboard. The exact dimensions of these

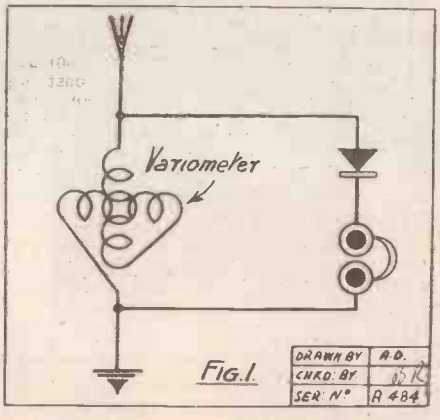


FIG. 1.

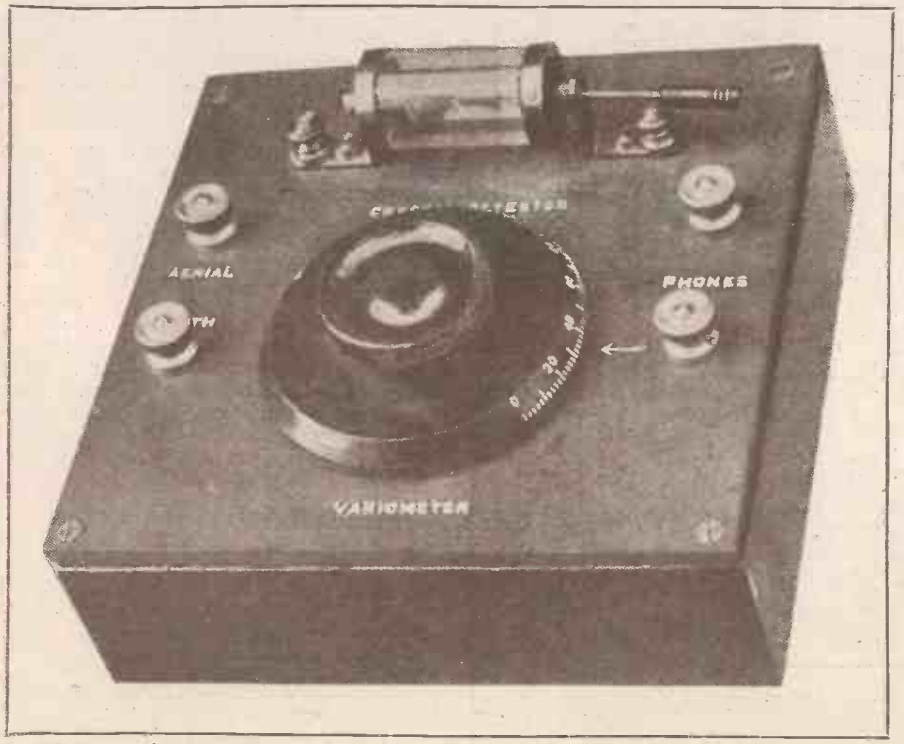
are given in Fig. 2, and it is important that this shape should be adhered to. When the slots have been cut in the former, at the points indicated in the diagram, the winding is commenced by fixing the end of the wire through one or two holes near the centre of the former. Draw the wire tight, and pass it across the front of the former and down into the first slot. From the first slot it is passed to the second, as indicated by the dotted lines which show the wire's position behind the cardboard, and at the second slot it emerges and crosses the front

LIST OF COMPONENTS.

1 Panel, 6 in. x 6 in. x $\frac{3}{16}$ in., with box 2 in. high	4	6
1 Panel-mounting crystal detector	1	6
1 Knob and dial; $\frac{3}{8}$ brass bush, with collar; 2 in. of 2 B.A. rod; spring washer, and 4 locknuts	1	6
$\frac{1}{4}$ lb. 26 S.W.G. D.C.C. Wire	1	3
Terminals, transfers, etc.	1	0

of the former to the third slot and so on. Emerging again at the fourth slot, it is passed down the fifth slot, and then (behind the former) up to the first slot again, thus forming the first turn of a D winding. From 25 to 30 of these turns are completed in this way, and then the winding of the right-hand D is commenced.

(Continued on page 744.)

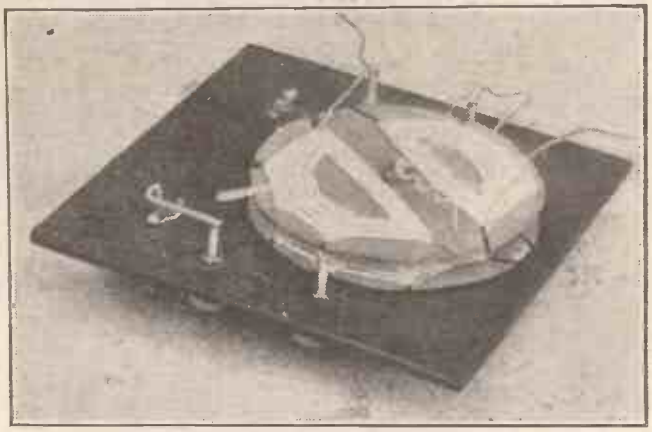


This view of the complete set shows that a very shallow and compact case can be employed.

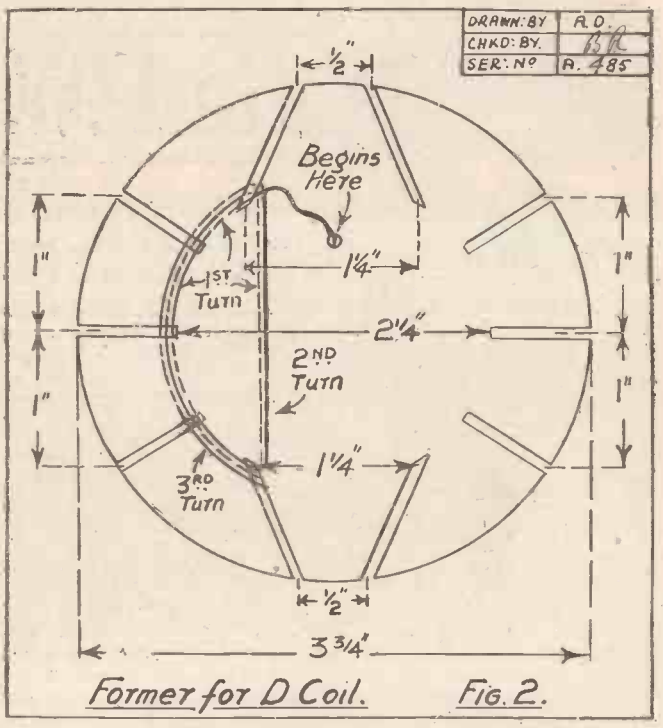
THE "P.W." "D" CRYSTAL SET.

(Continued from page 743.)

From the completed left-hand winding, the wire is crossed over the former to the opposite slot and the first turn of the at the top). Carry it across the former to the first slot on the right-hand side, and thence on to the second slot on the right-hand side, threading through each slot in turn and returning to the starting point to complete



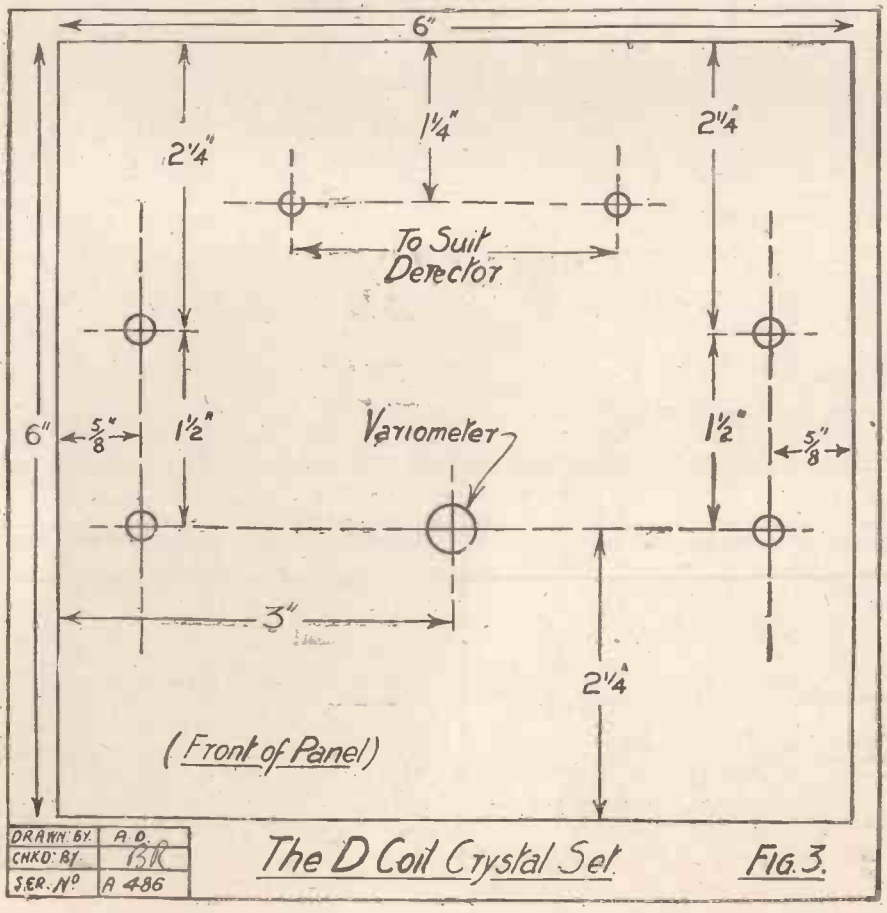
The method of "stopping" the rotating coil can be seen above, which shows the set before completion of the wiring.



Former for D Coil. FIG. 2.

right-hand D is laid on in the *opposite* direction to the turns in the left-hand D. To make this clearer, refer to Fig. 2, and assume that the left-hand D has been completed and the wire is emerging at the first slot (on the left-hand side of the coil the first right-hand D by the same method as employed for the left-hand winding. It is important to notice, however, that the direction of the windings are opposite in the two D's. That is to say, whilst on the left-hand D the wire is taken round in an *anti-clockwise* direction, the right-hand D is wound in a *clockwise* direction.

When the two D's have been completed, the winding is finished off by threading through a small hole in the former and the coil is laid aside. The construction of the second coil is carried out in exactly the same way, making a total of four D's for the complete variometer.



The D Coil Crystal Set. FIG. 3.

Size of the Coils.

Regarding the number of turns upon the coils, this will depend upon the wave-lengths of the station from which it is desired to receive. If this wave-length is between 500 metres and 370 metres, 30 turns should be wound upon each D. For the four D's this will make a total of 120 turns, which, with an average aerial, will cover any of the B.B.C. stations broadcasting on the higher band of wave-lengths, up to 500 metres. If, however, the desired station transmits upon a wave-length anywhere between 280 and about 450 metres, only 25 turns will be needed upon each D, making a total of 100 turns for the two coils. It will be seen that there is a considerable overlap between the extremities which these number of turns will cover, so that almost any aerial or earth will be allowed for if the number of turns is based upon the foregoing figures. After the winding of the coils is completed, they are assembled in the form of a variometer; but this operation can be postponed until the rest of the set is ready.

Drilling the Panel.

When the panel is ready for drilling, this operation should be carried out in accordance with the diagram of the panel lay-out which appears on this page. Apart from the holes at the corners for fixing screws, only 7 holes are needed in the panel, and all the necessary dimensions for these are given in the diagram. After the panel has been drilled, the terminals and crystal

(Continued on page 745.)

THE "P.W." "D" CRYSTAL SET.

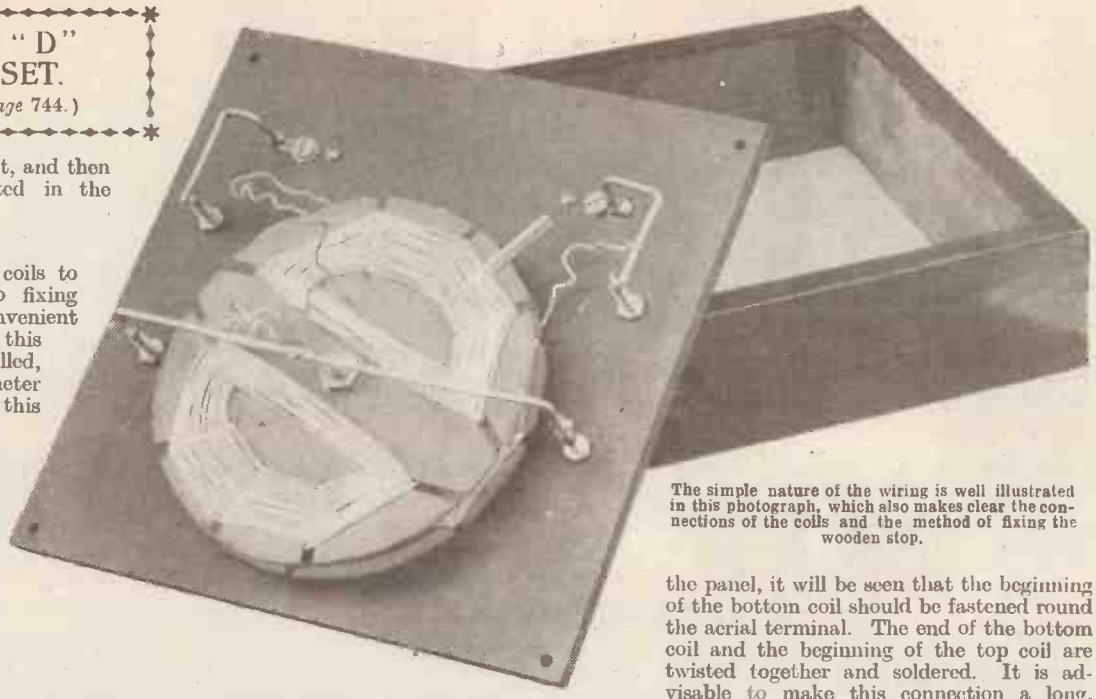
(*Continued from page 744.*)

detector are secured upon it, and then the variometer is mounted in the following manner:

Mounting the Coils

First secure one of the coils to the panel by one or two fixing screws or any other convenient method. In the centre of this former a hole must be drilled, through which the variometer spindle can pass. On this spindle the locknut, dial, and knob are secured. Push the spindle through from the front of the panel, and thread over it a spring washer and a locknut at the back of the panel. When the tension of the spring washer has been adjusted from the back, the moving coil is also placed in position on the spindle. It is a good plan to protect each side of the soft cardboard former with some form of washer, such as flat rings of thin ebonite or brass washers. After the coil and its washers are in place, two more locknuts are threaded on to the spindle from the back and tightened up. At this stage, the height of the moving coil should be adjusted relative to the fixed coil, so that it will just clear the fixed coil when it is rotated by means of the knob.

Having fixed the moving coil firmly upon the spindle, it can now be connected up in accordance with the diagram on this page. Looking down at the back of the panel, it will be seen that the beginning of the bottom coil should be fastened round the aerial terminal. The end of the bottom coil and the beginning of the top coil are twisted together and soldered. It is advisable to make this connection a long, springy one, as every time the knob is rotated this connection is stretched out, and, unless plenty of slack spring is left, it will in time be broken. The remaining winding (the end of the top coil) is now joined to a lead which connects the earth terminal with the lower 'phone terminal.



The simple nature of the wiring is well illustrated in this photograph, which also makes clear the connections of the coils and the method of fixing the wooden stop.

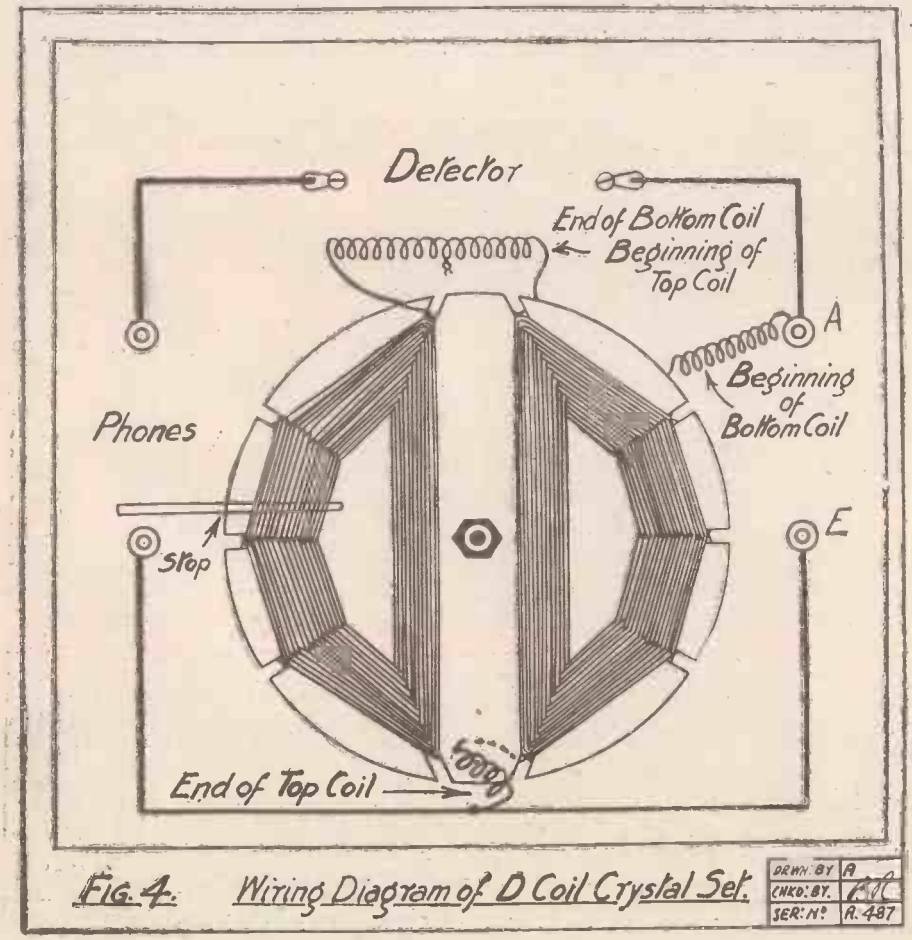


FIG. 4. Wiring Diagram of D Coil Crystal Set.

A Simple Coil Stop

The upper 'phone terminal is connected to the left-hand side of the detector, and the remaining detector terminal is connected to the aerial and the beginning of the bottom coil. This completes the wiring, but, before the receiver is finished off, it is necessary to make some sort of stop which will prevent the moving coil from being twisted round and round, and so breaking the connections. There are many ways in which this can be done, and a very easy method is that shown in the photographs, which consists of a match pushed underneath the windings of the coil and projecting out so as to just touch the neighbouring terminals. If placed as shown in the wiring diagram, it will permit the moving coil to rotate for 180° before the stop has moved away from the lower 'phone terminal, round past the detector, to the earth terminal. Alternatively, one of the partitions between two neighbouring slots on the coil might have been left projecting, so that it could itself act as a stop; but the exact method of limiting the movement can safely be left to the constructor who will easily decide which method suits him best.

As in all crystal sets the connections should, if possible, be soldered, as this is the only really satisfactory contact.

SUPER INDUCTANCE COILS.

GIANT APPARATUS FOR RUGBY.

AMONG the features of the Government's great radio station at Rugby is a cable of novel construction which forms part of a variable inductance in the high-power frequency circuits for wireless communication from this Government station, which is the largest in the world.

Generally speaking, the cable may be compared with the single wire which is wound into a coil for tuning, and which is familiar even to the wireless tyro.

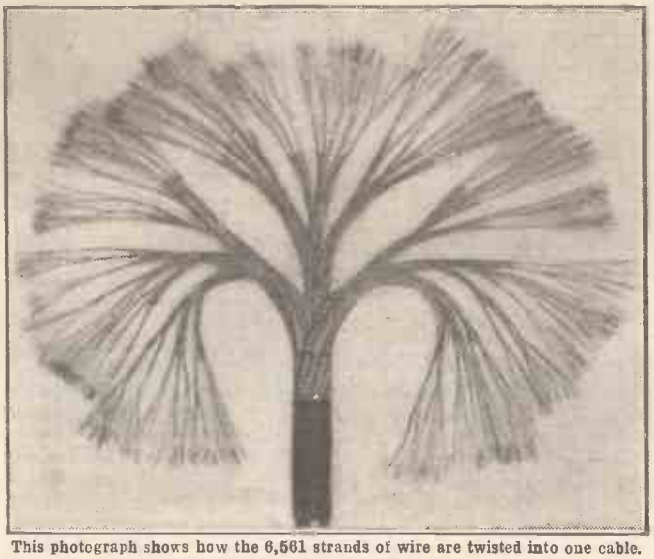
The cable in these giant inductance coils contains 6,561 wires, each separately insulated with enamel, and connected together at each end, forming what is, to all intents and purposes, one conductor—i.e., all the wires are in parallel.

6,561 Strand Cable.

The reason for the separate insulation of each fine wire in the conductor lies in the fact that alternating current tends to pass along the surface of a wire, as was pointed out by Lord Kelvin thirty-five years ago.

This "skin" effect, as it was called, is negligible with such low frequencies as are used for ordinary electrical transmission, but it becomes of importance when the frequency reaches many thousands per second, as it does in wireless transmission.

In the construction of this cable the insulated wire is first covered with a layer of cotton to protect the enamel. Three wires are twisted together, forming a unit. Three of these units are twisted again, and the operation is repeated until 81 wires are reached, when these wires are covered with a coat of silk, to give further protection. Three of these are twisted again, and the operation repeated until the cable contains 6,561 wires.



This photograph shows how the 6,561 strands of wire are twisted into one cable.

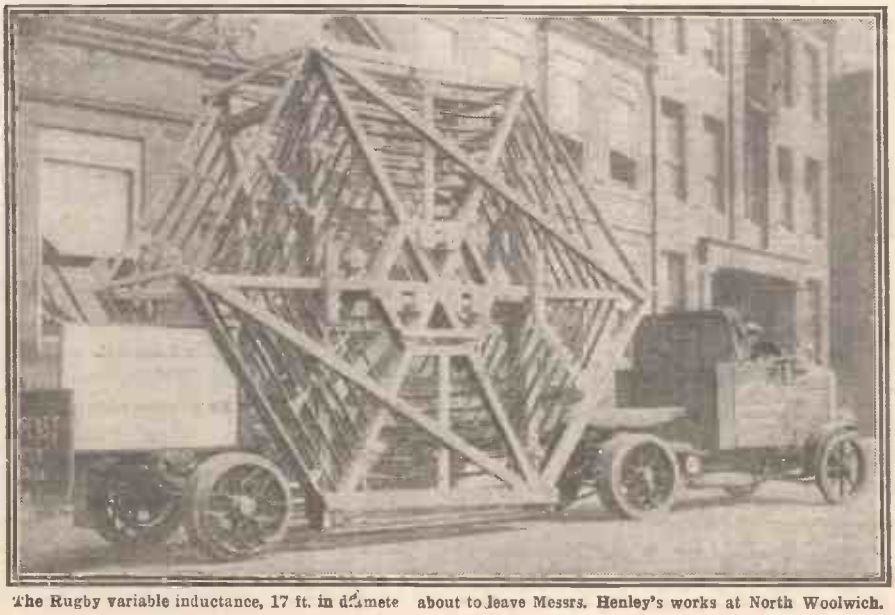
Gigantic "Spider-web" Coils.

The accompanying photograph of the cable, showing the wires spread out fan-wise, gives a clear idea of the construction.

The cable was constructed in accordance with the design and specifications of the British Post Office Engineering Department by Messrs. W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.1. The manufacture presented several unique features, which involved the design and construction of special plant and machinery.

The "spiders" shown in our photograph are really the complete inductance coils, the wooden framework being the former for the conductor. As they are 17 ft. in diameter transport by rail was out of the question, and they were transported on special lorries from the manufacturers' works at North Woolwich to Rugby. The route had to be specially selected and surveyed to avoid the possibility of trouble with bridges, etc.

In all, nine of these huge tuning coils are used at Rugby.



The Rugby variable inductance, 17 ft. in diameter about to leave Messrs. Henley's works at North Woolwich.

Original Theories Proved.

After many years the theories of Lord Kelvin and Oliver Heaviside have thus found application in a branch of electrical development of which they were not cognisant at the time. Further, the theory and formula evolved by Lord Kelvin mathematically for frequencies of about 100 per second were experimentally proved to be correct, 25 years later, up to frequencies as high as 5,000 per second. As we have said, the frequencies used in wireless transmission are very much higher than this.

DIELECTRIC LOSSES.

IF any material is used between the plates of a condenser, and the condenser is employed in a high-frequency circuit, losses will occur in the condenser, known as dielectric losses. These dielectric losses would be very small in a vacuum, that is, if there were nothing at all between the plates; and the losses are also extremely small if a gas is between the plates, such as air—so small, in fact, that it is usual to assume that the presence of air between the plates makes no difference.

Waste of Energy.

But if a solid substance such as paper, celluloid, or mica is introduced between the plates, the losses become appreciable. This is owing to the fact that every time a difference of potential is set up between the plates, a state of strain is created in the material between—the dielectric, as it is called—and when the potential disappears, or is reversed, the state of strain is relieved or again set up, and so on. This all represents waste of energy, and is equivalent to the introduction of wasteful resistance in the circuit.

Avoid Insulated Wire.

Now when a wire or other conductor is carrying electric current, the conductor is surrounded by a static field, and so acts as one "plate" of a condenser, the other "plate" being all the surrounding objects. If the wire is bare, the dielectric is air; but if the wire is covered with thick insulation, this acts as dielectric, and so increases the losses when the wire is carrying high-frequency current.

It is for this kind of reason that the constructor is advised to avoid too much insulation on H.F. wires.

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

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

Inductance Coils

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

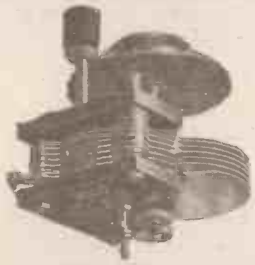
All coils have the same dimensions, 3¼ inches in diameter.

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

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

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

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



A.J.S. VARIABLE CONDENSER

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

·0002 mfd. 10/6 ·0005 mfd. 12/6
·0003 mfd. 11/6 ·001 mfd. 17/6

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

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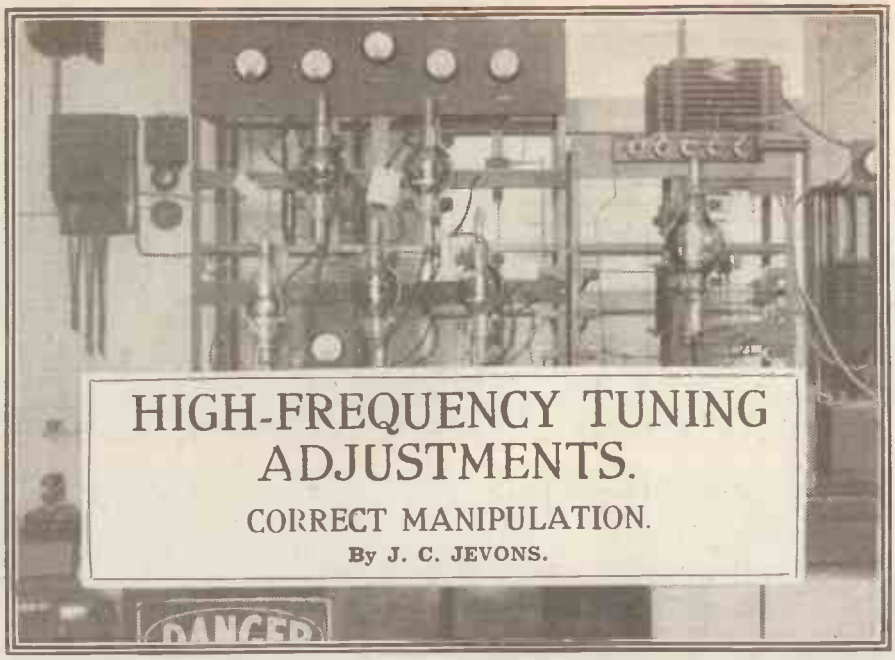


HIGH-FREQUENCY TUNING ADJUSTMENTS.

CORRECT MANIPULATION.

By J. C. JEVONS.

WITH the introduction of one H.F. stage of amplification, the business of tuning-in begins to demand close attention. With more than one stage it creates problems which involve the use of balanced-bridge methods, or neutrodyning, or super-heterodyning, or some other polysyllabic remedy outside the scope of the present article.

The ordinary owner of a multivalve receiver would naturally prefer to be able to manipulate as many stages of H.F. amplification as are necessary to cut out the local station, and take his pick of distant programmes, with the same ease with which he got 2 L O in his salad days on a crystal receiver.

Unfortunately, the fool-proof, single-knob, multi-valve set is not yet available in this country, although manufacturers are undoubtedly trying their best to reach that ideal. In America, where conditions demand high power and selectivity, generally coupled with the use of a frame aerial, a special feature is made of the multi-valve set with simplified or uni-control tuning.

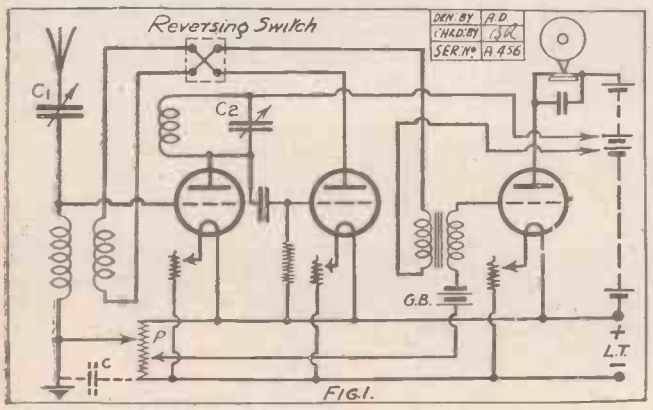


FIG. 1.

Taking the case of a standard set, such as that shown in Fig. 1, comprising one H.F. stage followed by a detector and an L.F. amplifier, there are one or two simple points that must not be overlooked if it is hoped to get the best out of the set.

Potentiometer Control.

In the first place, provision should be made for controlling the fixed grid potentials both of the H.F. and the L.F. valves. If the detector valve is fitted with the usual grid condenser and leak, the provision of grid bias is unnecessary.

A potentiometer winding P of 300 ohms of high-resistance wire shunted across the poles of the L.T. battery, as shown, will provide sufficient control for the grid of the H.F. valve. From the point of view of selectivity alone, it is desirable to have as large a negative bias as possible on the grid of this valve. If, however, the set tends to oscillate too easily, it can readily be stabilised by moving the grid tapping towards the positive end of the potentiometer.

By making the grid more positive in this way, some of the signal voltage built up across the input circuit is allowed to escape in the form of grid current. The H.F. voltages in the plate circuit are correspondingly lessened, and the electrostatic back-coupling across the internal electrodes is thus brought below the point of self oscillation.

Unfortunately, the presence of grid current causes the receiver to become less selective, so that the final position of the tapping on P is chosen so as to give a reasonable compromise between stability on the one hand and selectivity on the other. The potentiometer should preferably be shunted by a by-pass condenser C, as shown in dotted lines.

If the L.F. stage is a power amplifier a separate dry-cell battery G B of at least two or three units should be inserted in the grid lead, in order to prevent the amplified voltages applied across the L.F. transformer from sweeping past the straight-line part of the characteristic curve, and so causing distortion in the loud speaker. In order to allow for a further fine adjustment of this bias, the grid lead should be taken to a separate slider on the potentiometer P, as shown.

The next point to be considered is the best value of high-tension to apply to the plate of each valve. If a special H.F. type valve is used for the first stage, in combination with a "soft" detector, and a power amplifier for L.F. amplification, it is absolutely fatal to good reproduction to attempt to work all three stages from the same tapping on the H.T. battery. Even if "general purpose" valves are used for all three stages, improved results will be obtained by providing a separate H.T. tapping for each, as shown.

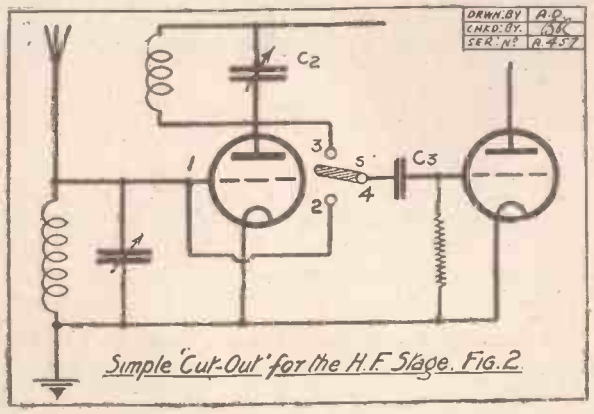
For a "general purpose" valve the best H.T. voltage for the H.F. amplifier will be somewhere between 48 and 60; for the detector between 24 and 36 will be sufficient; whilst for the L.F. amplifier use the highest voltage available. The special G.B. battery becomes essential when a power amplifier is used in the third stage, in which case the H.T. voltage may be anything from 180–300 volts. These figures are approximations. The best values in each case can only be found by actual test, but separate tappings to the H.T. battery should in all cases be provided, as shown.

Handling the Receiver.

The actual method of tuning-in with the high-frequency stage in circuit is, of course, perfectly well known by everybody. One sets the aerial condenser C1 to a given value and then brings the tuned anode condenser C2 slowly into step, until either the signal or a "click" is heard in the 'phones. In the latter case one shifts one of the condensers hurriedly, to prevent neighbourly complaints, and tries again. It is all amazingly simple in theory, and frequently extraordinarily futile in practice, particularly when one is demonstrating before an admiring friend.

A very sound plan in these circumstances is to tune in first on the detector valve alone. If the set is not provided with means

(*Continued on page 750*)



Simple "Cut-Out" for the H.F. Stage. FIG. 2.

HIGH FREQUENCY TUNING ADJUSTMENTS.

(*Continued from page 749.*)

for cutting out the H.F. stage at will, it ought to be. A simple way to remedy this defect is shown in Fig. 2. The connection from the anode condenser C2 to the grid condenser C3 of the detector valve is broken, as shown at 3, 4, and an extra lead, 1, is connected at any point 1 on the grid input and brought to point 2. A simple throw-over switch S can then be utilised to cut the H.F. valve in and out as desired.

An "Idle Passenger."

A simpler expedient is merely to switch off the filament current supply to the H.F. valve. The capacity existing between the grid and plate electrodes of that valve will then be found sufficient to conduct the aerial voltages directly on to the grid of the second or detector valve. This is not, however, so satisfactory in practice as the cut-out switch. Incidentally, another good reason why one should always be able to cut out the H.F. stage is that this valve rarely does any useful work when receiving broadcast within a range of 20–25 miles. Under these conditions it is merely an idle passenger wasting good filament juice.

As soon as the signal has been picked up on the detector alone, this at once gives the approximate setting of the aerial condenser, and there is then no difficulty in bringing the anode condenser into step, and making the final small adjustments on both condensers to produce maximum signal strength without distortion.

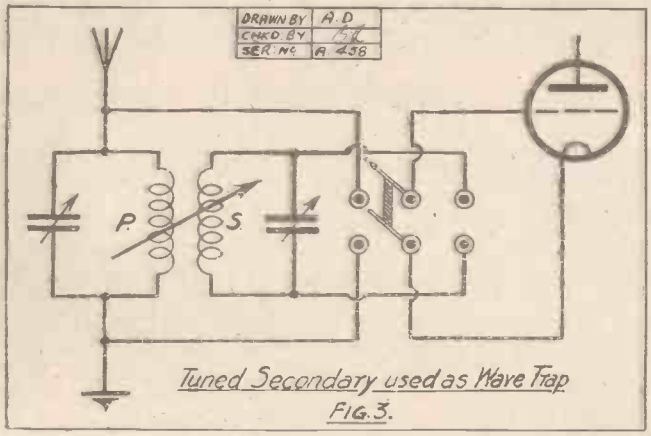
Reaction Reversal Necessary.

There is one point, however, that must be mentioned in this connection. When using the detector valve alone (if this is back-coupled to the aerial circuit, as shown in Fig. 1) the reaction leads must be reversed as the H.F. stage is switched off, and their original position restored as it is switched in again. The introduction or removal of a valve stage in between the aerial and the source of reaction, as in the present instance, alters the phase relation of the back-coupling by 180°, so that the reaction coil must be adjusted accordingly. For this reason a simple reversing switch should be inserted in the reaction leads as indicated in Fig. 1, so that the necessary change can be readily effected.

Both the switches mentioned above can easily be added to an existing set at the cost of a few pence and half an hour's work, and they will be found to be well worth while (1) from the point of view of saving the filament juice usually wasted in keeping the H.F. stage in operation when picking up local broadcast, and (2) from the point of view of being able to tune in rapidly when using the H.F. amplifier for distant work.

Novel Wavetrap Arrangement.

Where a set is provided with a tune stand-by switch, the secondary circuit can often be used more effectively as a wave-trap than for the purpose for which it is primarily intended. For instance, when the switch is on the "stand-by" position, i.e. on the left-hand studs in Fig. 3, if the secondary coil is swung close up to the primary or aerial coil, the secondary coil and condenser obviously form a closed circuit, tightly coupled to the aerial.



Tuned Secondary used as Wave Trap

FIG. 3.

This arrangement is equivalent to the well-known absorption type of wave-trap, and disturbing signals can then be cut out, or considerably weakened, by tuning the trap circuit to the interfering frequency.

Quite Straightforward.

The use of H.F. is really quite a straightforward business; straightforward, that is, if certain rules are borne in mind. H.F. is not, unfortunately, capable of providing such a definite evidence of its efficiency as is L.F. amplification. We know the latter is O.K. when it is capable of magnifying signals with reasonable purity up to a reasonable volume.

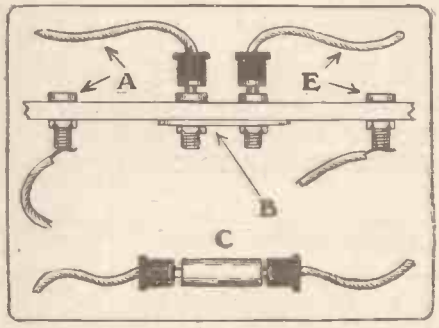
In the case of H.F. amplification there is no practical check on effectiveness in the case of the local station; as a matter of fact, for this purpose it is, as mentioned previously, an "idle passenger." Therefore, inasmuch as it is peculiar to "DX" tuning adjustments are all important.

At distances over 20 to 30 miles a rough idea of the efficiency of the H.F. valve can be obtained by switching it out and tuning into maximum signal strength on the detector and switching in the H.F. valve and comparing the two signal strengths. The addition of H.F. should mean an increase of at least 25 per cent. and possibly more, dependent on the distance of the station used for the test.

EARTHING THE AERIAL

By OSWALD J. RANKIN.

EVEN the most simple home-made crystal receiver should be provided with some practical and reliable means of joining the aerial lead-in to the earth lead when the set is not in use. The mere twisting of the ends of the leads together, a very common practice amongst beginners, is simply asking for trouble, for the inefficient contact thus formed is a veritable spark-gap which, in the event of a heavy atmospheric discharge, might easily cause damage to surrounding



objects as well as to the receiver itself. In this all-important matter one cannot do better than adopt the "safety first" policy and install a really efficient switching device for earthing the aerial.

The Best Method.

The fact that H.F. currents leap over metallic contacts in close proximity to each other immediately condemns the plug and jack, the key switch, or other similar device. Such undesirable effects are often encountered when using the "midget" type of knife switch, although a well-designed knife switch, with well-spaced blades and contacts is usually quite satisfactory, but, in the writer's opinion, the very best arrangement of all is the simple and inexpensive plug-and-socket system, where plugs are connected to the aerial and earth leads and made to engage sockets mounted on the receiver panel in the manner outlined in the accompanying sketch. Four sockets, preferably of the flush type, are mounted on the panel as shown, the usual circuit connections being made to the two outer sockets marked A and E (aerial and earth), and the two inner sockets being short-circuited by means of a stout brass or copper link, B, so that when the plugs are inserted, as shown, the aerial is in direct contact with earth and entirely disconnected from the receiver circuit.

Still More Direct.

If desired, the connection may be made still more direct by substituting the two linked panel sockets with a stout brass sleeve, as shown at C, which, with the two leads, is suspended in any desired position and separated from the receiver altogether.

In this case the plugs, or the leads, should be provided with simple clips for attaching same to the window frame or wall, otherwise the weight of the leads will have a tendency to draw the plugs from the ends of the sleeve. The plugs should be made to fit very tightly into the sockets or the sleeve.

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E.P.S. 143

BROADCAST NOTES.

By O. H. M.

Retaining Unified Control—The Birthday Festival—An Excuse for Stunts—The Telepathy Experiment—Technical Facilities—The Heterodyne Nuisance.

ALTHOUGH the Government Broadcasting Committee has only just commenced its formal meetings, a good deal of the preliminary work is already complete, and I am in a position to state with some measure of assurance that the outline of its conclusions is now fairly clear. The probability is that the present licence of the B.B.C. will be extended for another temporary period of two years. During this extension, the constitution will remain practically the same as at present, the only exception being that its news facilities will be considerably enlarged and in consequence the present agreement about news will be amended.

During the period of extension the permanent regime of broadcasting will be brought into being. This, I believe, will follow the lines of a national trust, such as the governing body of the British Museum or the Electricity Commissioners.

So far as the actual work and conduct of the broadcasting services are concerned, listeners will notice no appreciable change. The policy and tradition founded and now being consolidated by the B.B.C. will be strengthened, developed and perpetuated under the permanent regime. One thing is absolutely certain, and that is that unified control will be retained, but with certain wholesome checks to autocratic tendencies.

The Birthday Festival.

The B.B.C. birthday festival week has come and gone. It fully lived up to expectations. There never was such a galaxy of stars or such a series of successful broadcasts, and it is comforting to note that there was no great falling off in standard after the festival week.

Thus, while it is naturally impossible to maintain quite the same standard it is none the less true that the festival week has lifted the whole average of the British programmes, and has established a new criterion for broadcasting. Much useful experience was gained. Not the least valuable point in this connection was the folly of employing theatre and music-hall stars, except in an appropriate setting.

I am already looking forward to the next festival week, which is promised during Christmas. But there is a Radio Revel in between on December 15th, and if all the expectations of the B.B.C. materialise, this should be an overwhelming success.

More Stunts Needed.

I am interested to see the revival in the controversy about stunts. There is an awakening of interest in this side of broadcasting. The wiseacres and the highbrows are gravely concerned. These pundits admit there was an excuse for stunts during the early days of broadcasting, but they claim that this excuse has now disappeared, and that the thing to aim at is a steady rational day-to-day standard, unbroken by sordid publicity expedients. In this the highbrows are consistent. In most matters of commonsense judgment they are wrong. Their consistency in error is magnificent. Broadcasting without stunts would decline. This is an age of stunts. A popular newspaper that abandoned stunts would soon cease to be a popular newspaper. We may deplore the emotionalism and the craving for novelty and excitement that are characteristic of our time, but we must admit their existence. If broadcasting is to prosper we must have stunts and more stunts. We must levy a severe tax on the imaginative reserves of our broadcasters.

Mass Telepathy.

I think it was a grave pity that the element of ridicule crept into the mass telepathy experiments the B.B.C. organised the other day. It was obviously not meant to be the serious experiment which it should have been. Mass telepathy is a subject of engrossing scientific interest and one which merits the serious attention of such an organisation as the B.B.C. I sincerely hope that the Savoy Hill people will retrieve their mistake by setting out to organise a really serious experiment in mass telepathy.

Mr. Alan Cobham, the famous airman, broadcasting from 2 L O.

I suggest that this should be done under the auspices of some organisation such as the Psychic Research Society or alternatively under the personal supervision of an eminent authority, such as Sir A. Conan Doyle or Sir Oliver Lodge. Nor is there any time to waste in setting about this. I know quite several regular listeners who have abandoned the habit because of this slip-up by the B.B.C.

The idea of having eminent Fleet Street personalities to broadcast the News Bulletins now and then seems to me to be an excellent innovation. There are risks in the running comment, but then there are always risks in anything connected with broadcasting particularly if it is of exceptional interest. Lord Riddell, Sir Alfred Robbins, Mr. R. D. Blumenfeld and Mr. Hugh-Jones, who have already broadcast a General News Bulletin, have each made a striking personality contribution to the microphone. The trouble with broadcast news bulletins in the ordinary way is that they are inclined to become mechanical. An occasional interpolation of the kind we have been having is all to the good.

Five Studios at 2 L O.

The broadcast serial drama is definitely being developed. Several are in hand, and the first serial thriller is scheduled S.B. from 2 L O on December 7th, 9th, and 11th. It is curious to note how the broadcast programmes tend to follow magazine lines.

There will soon be five studios working at Savoy Hill. The result of this should be a real final solution of the programme gaps problem. It is symptomatic of the rapid advance of the new art that even before they are in commission at least one of the new studios is out of date.

Technical Facilities.

Now that technical facilities and studio accommodation are so much improved the new B.B.C. programme organisation will have an opportunity of showing its best form. From what I have heard about it in well-informed quarters there is certainly no lack of ideas or of the journalistic mind. In fact, there is a superabundance of brain waves. But not enough appear to be getting across, which goes to suggest that it is to the executive side that attention should now be directed. Unified control is as sound a principle in programme building as it is from the viewpoint of public policy on broadcasting. I do not envy Mr. Reith his herculean task, but I back him to win every time.

The Heterodyne Nuisance.

Heterodyning by various continental stations still appears to be troubling the British stations, and only recently a very bad instance of interference with 2 L O occurred.

Practically the whole of the evening programme was spoiled by a constant whistle or whine, ever changing in pitch, while occasionally this whine would resolve itself into indistinguishable speech or very badly distorted music. I do not know who the offender was, but I for one am looking forward to the day when the decisions of the people at Geneva are enforced, for with the steadily increasing number of European stations the interference problem is becoming really serious. Something will have to be done fairly soon, for not only does this heterodyning upset valve enthusiasts, but it spoils even the crystal users' enjoyment.

Technical Notes

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

IT is a common complaint with regard to valves exhausted by means of the new, or comparatively new, process, which produces a silvering upon the inner surface of the bulb, that it is difficult if not impossible, to tell whether the filament is being run at the correct temperature, owing to the fact that the filament, in many cases, can scarcely be seen at all. Many readers have asked, from time to time, whether there is any simple way of getting over this difficulty.

The "silvering" is produced by the deposition of the volatilised metal, usually magnesium, which is employed during the final stages of the exhaustion process, for the purpose of obtaining the necessary vacuum. It is commonly known as a "getter." The precise manner in which it acts is not properly understood, but it is probable that it acts partly in the same manner as a Langmuir vapour-pump, and partly as an absorber of the residual air and other gases.

At the last stage of the exhaustion, when the pumps have already removed the air down to a pressure of perhaps a small fraction of a millimetre of mercury, the getter is flashed (by processes which differ with different manufacturers, and which I cannot enter into here, as they are in many cases in the nature of trade secrets), and the resulting metal vapour drives out the remaining air before it finally condenses, or "sublimes" as it is called, upon the glass bulb. It is believed that it also absorbs some of the gas into itself in the act of subliming; but, as I have said, the exact details of the mechanism of the action are not properly understood.

The net result upon the bulb, so far as the user of the valve is concerned, is that it is rendered partially opaque, and the electrodes often cannot be discerned through the deposit. In the case of a dull-emitter valve, it is sometimes impossible to know whether the filament is burning at the right temperature, or whether it only appears to be glowing at a dull-red heat owing to the partial opacity of the deposit.

Making a "Window."

One correspondent recently suggested a simple and ingenious method of overcoming the trouble. Since the metal has been deposited as the result of condensation, he suggests driving it off again, by the application of heat to a certain limited portion of the glass. This may be done by applying a methylated spirit lamp to a spot on the glass for a few seconds, or until it is found that a space has been cleared. The heat revolatilises the metal at that part, and drives it off again, to condense at some other part. In this way a small "window" is created through which the filament may be examined. Of course, the spot should be selected in relation to the filament, in such a way that the necessary view may be obtained when the "window" has been made.

It is hardly necessary to say that the process must be carried out with extreme caution, as there is danger, in the first place, of cracking the glass, if too hot a flame is applied, or if it is applied too suddenly, and in the second place, if the glass is made unnecessarily hot, gas may be released from it which may not afterwards be taken up, and this will have the effect of "softening" the valve. Thirdly, of course, if the heat is much too great, the glass may actually be softened, with the result that it will cave inwards under the atmospheric pressure. But this is not likely to happen, as the glass would have to be made somewhere near a dull red heat.

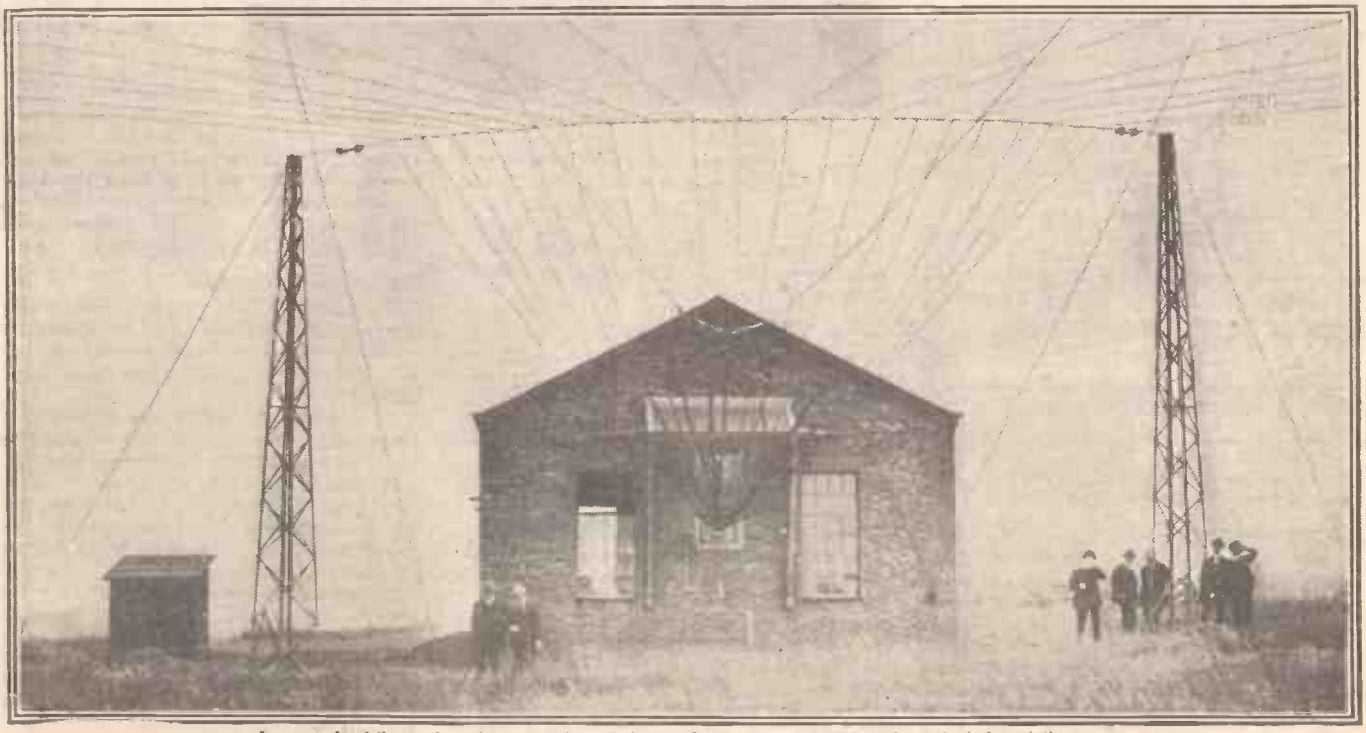
Novel Crystal Receiver.

A new crystal receiver of unusual and interesting design has lately been put on the market by the Baltic Co., of Stockholm. By a novel design, the space occupied by the receiver is much economised. Instead of the tuning coil and the other parts of the set being spaced out separately, the coil is made of such a size that the other parts may be accommodated within it. The coil is wound upon a square "former," and is of the low-loss variety. Outwardly, the set looks simply like a rather large, square coil, the "former" constructed of the upper and lower panels, and four supporting pillars of ebonite at the four corners, around which the turns of the tuning coil are wound, the rest of the set being, as already mentioned, located within this coil.

An Interesting Device.

Another interesting component is a new type of terminal made by the London Metal Warehouses, Ltd., specially adapted for attaching the busbar within the set without the use of solder. The inner extremity of the terminal is slotted with a

(*Continued on page* 783.)



An example of the method of counterpoise erection employed at some of the continental wireless stations.

HINTS ON THE 1926 UNIDYNE.

A RESUMÉ OF H.T.-LESS TECHNIQUE.

By G. V. DOWDING and K. D. ROGERS.
(*Inventors of the "Unidyne."*)

WE do not want readers of "P.W." to gain the impression that the Unidyne is a tricky business—it is no thing of the sort; the motive behind this article is a desire to register 100 per cent success. After all, the Unidyne is absolutely a "P.W." affair, and naturally it is up to every one of us on the technical staff to do everything possible to gain the above desired end. Concerning other circuits and systems the amateur can refer to many different books on his bookshelf, but apart from brief commendatory comments such as those which appear in books by Sir Oliver Lodge, Capt. P. P. Eckersley, several American writers and others, Unidyne information is almost peculiar to "P.W."—a fact of which we are proud in view of the popularity of the system.

As readers will have noticed by the hundreds of Unidyne letters published during the last year or so, a considerable number of constructors have achieved extraordinarily successful results, and in South Africa, where most H.T. batteries lead precarious lives, and where the leading wireless organ, "Radio," is a stout Unidyne supporter, it has been more than enthusiastically received, and with it, radio DX records are broken with gratifying frequency. Nevertheless, now and then initial failures are reported. That they invariably "make good" is not the point; we aim at 100 per cent initial *successes*.

Question of Components.

Where there is trouble we are almost certain, judging from experience, that it is generally due to what we prefer to regard as excessive optimism, although some might call it carelessness. There is certainly no H.T. to worry about, but there is still H.F. However rapidly and unsystematically a Unidyne is "hooked up," there being no H.T. to wander around L.T. preserves, the first "try out" is never a moment of chilling suspense. But all the rules in respect of clean connections, efficient wiring, etc., must be carried out with all the care bestowed upon H.T. sets. Remember—forgive us if we put it crudely—there is no H.T. to help the poor H.F. currents along carelessly arranged paths.

Not only with Unidynes but with H.T. sets as well, a great deal of harm is unconsciously caused by lucky people who broadcast news of successes achieved with rag-and-bone hook-ups. We say lucky advisably, because we know only too well how many an amateur who has spent hours on the assembly of a first-class piece of work has failed owing to just one little "dry joint," or some other tiny little discrepancy that has crept in. These things will happen even in the best of regulated workshops.

Then there is the question of components. If a piece of apparatus of a certain design or value is specified it is decidedly risky to attempt to make a piece of cheap junk of doubtful antecedents serve in its place. It could be *tried* but not *relied* upon. We have an example directly in mind. A constructor built a 1926 one-valve Unidyne. Results were not up to expectations. He had had on hand a basket coil of 50 turns tapped at the 25th turn, and used it for the reaction which should be a coil of 40 turns tapped at the 24th. He presumed that that slight divergence from the "written word" would not affect the operation of the circuit. Did he but know how long it took us to arrive at the correct design, and could he have followed our experiments he would have realised what a difference such a variation can make—but he didn't and couldn't, so we cannot blame him if he fails to understand the importance of such details. After all, wireless is our job as well as our hobby and that particular reader in question probably knows as much about some other subject as we do about wireless in general and Unidynes in particular!

A few of the generators used at the great new Rugby station.

Oscillation Control.

Now, in connection with the 1926 One-Valve Unidyne, quite a number of constructors have written to us who have obtained good results but are puzzled about the reaction control. "It is very flat," wrote one. It is! and that is a very great advantage.

With an ordinary H.T. set, one can pop in and out of oscillation with a very small movement of the reaction control. With the 1926 Unidyne method almost the whole sweep of a condenser dial divides the "approach" and the "ultimate." Gliding into oscillation is truly possible, and no precarious balance between the tuning condenser and the reaction control marks the final stage of adjustment. The tuning adjustment is sharp—sharper than in most cases—and the nice broad sweep of reaction control can be handled like a real control, and not like an apothecaries' balance.

Confusing the Grids.

Far from being a fault, "flatness," in this instance, is a distinctly desirable factor.

Whenever two similar things are introduced into a wireless circuit there are always a number of people who will persist in reversing their order, and so with the two grids in the four-electrode valve employed in the Unidyne. Admittedly, these grids can be very confusing. "Inner grid is on left looking down on holder with filaments at bottom" is clear enough when the words are carefully read, but of course, the inner grid can be on the *right* looking at the holder from the *under side* of the panel (when a flat panel set is being built). Such little points want careful attention, but we can assure readers who have mixed up those grid connections that they have erred in good company!

Quite a number of constructors are almost abjectly apologetic to our Queries Editor when faults such as the foregoing are pointed out to them in connection with their diagrams and sets, but they have no

(*Continued on page* 756).

CHOOSING A LOUD SPEAKER AND SELECTING A SET.

From A CORRESPONDENT.

A GREAT many listeners who decide to buy a loud speaker very often give the matter no great thought, and simply purchase one of the many types that take their fancy, providing it looks all right, costs somewhere about the amount they are prepared to pay, and will give a reasonably good volume of sound. Possibly they have heard that that particular type is "quite good," and they may have heard it on a friend's set; but generally that is as far as the business of "choosing" goes.

In reality there is very little choice about the matter, for it is impossible to *choose* a loud speaker without hearing it up against others of the same and different types. Appearance should have very little weight as to the final choice, and quality of reproduction and price should be the main considerations. The latter need not be stressed very much here, for there are so many of all types at both moderate and high prices, and so the chief consideration should be the quality of the music and speech the loud speaker is capable of delivering. Therefore the horn and hornless types should be heard together, and a true comparison made. After this several of those of the chosen *type* should be listened to, and the best one be the final choice.

Might Be Set Distortion.

The listener should be careful, however, that the loud speaker he chooses will be O.K. on his *own* set. Very often, in exhibition rooms, a huge set is employed having all the refinements necessary for loud and pure reproduction. At other times—in local dealers' shops more often than not—the set used is of the poorest, and so the loud speakers are not given a chance of showing what they really can do.

If it is impossible to take the loud speaker home for test on the actual set it will be used with, then close inquiries as to the set upon which it was demonstrated should be made, and deductions as to what is likely to happen at home.

Finally the listener should remember that to give pure reproduction the loud speaker should be provided with a pure *input*, and if the reader is ever disappointed with his loud speaker, let him search his *set* for distortion faults before he discards what *may* be—though it is not always blameless—only the innocent *reproducer* of distortion and not the manufacturer of it.

Selecting A Set.

THIS is the time of the year when you are probably considering what kind of a set you will buy, whether you will have one to bring in distant stations—a DX set as it is called—or whether you will plump for loudness on the local stations: whether you want noise or quality; whether headphones will suit your purpose, and whether the question of price is all important. The various considerations which will arise in your mind will no doubt fall into the following classes: Quality of reception; sensitivity of receiver, that is, distance; selectivity, that is, ability to pick out stations from one another; Appearance of receiver and cabinet design; cost of set; operation; simple or otherwise; running and upkeep costs.

All these points require to be carefully thought out. If it is a question primarily of first cost, then you had better go for a one or two valve set, preferably detector and one low-frequency amplifier. Of course, if cost is really a very serious question, you had better go in for a crystal set. With a good aerial and good headphones, you should get excellent results with a crystal set on the local station.

If you want to go for distant stations, one H.F. valve is highly desirable, and for good all-round reception, one H.F. valve, detector and one L.F. valve make an excellent combination.

"Straight" Circuits Advised.

For foreign stations, it usually becomes necessary to add an extra H.F. valve, although, with many special circuits, great distances can sometimes be obtained with remarkably little valve equipment. Speaking generally, however, a "straight" set is more convenient for the beginner to handle and makes for more reliable results.

As for batteries, you will no doubt start with a dry battery for the high-tension, but it is much better to use an accumulator for the low-tension than a dry battery, as the latter are so soon exhausted and require total replacement.

A short-wave receiver constructed by Mr. D. T. Silcock, 67, Woodcote Grove Road, Coulsdon, Surrey.

HINTS ON THE 1926 UNIDYNE.

(*Continued from page* 755.)

cause to be; if everybody was a radio expert there would be no need for a Queries Dept. to assist "P.W." readers—for that matter there would be a much thinner "P.W."

Other potential pitfalls in the 1926 Unidyne, but ones that so far, at least, seem to have been commendably avoided, are the five point connection to the tuning unit consisting of the tightly coupled reaction and aerial coils, and the position of the reaction coil tapping in relation to the direction of the windings of the two coils. Close attention should be paid to the description of these details in the article, if success is to be assured.

Important Items.

The choke, too, is a most important item in the circuit. It is an H.F. choke, and must be of reasonably low capacity. For this reason it was advised that it should be wound not as cotton is wound upon a cotton reel, but in the form of separated bunches in layers separated by paper. The bunches need not necessarily consist each of an exactly similar number of turns, and the layers need not consist of exactly similar numbers of bunches but the 500 necessary turns should be broken up into at least eight or so bunches, and into at least three layers separated by paper. It might be mentioned in passing that almost any form of plug-in coil can be used for the choke so long as it consists of 500 turns. Basket, spiderweb, honeycomb, or even cylindrical coils should be used.

Talking about capacity, the transformer used in the Det. L.F. two-valve Unidyne must be fairly low in this respect, more especially in the 1926 Unidyne two-valver. It is here that the R.I., the Silvertown, and the Sullivan score above many others. Would that there were more low capacity L.F. transformers on the market, for then we would be nearer that 100 per cent mentioned at the beginning of this article, for if a constructor has a transformer on hand he naturally tries to use it in the new set he is building. If he would *try* and not *rely*——!

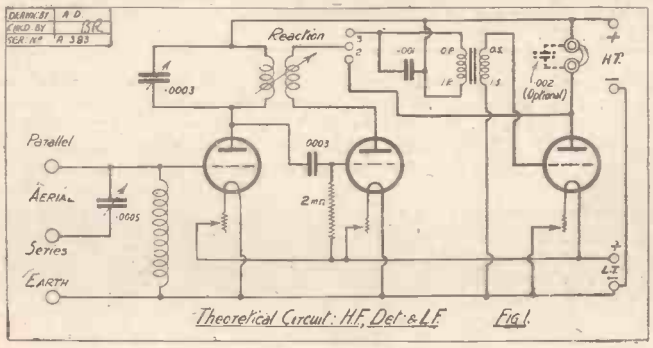
A Straight 3 Valver

The Set Designed and Described by
K. D. ROGERS
(Assistant Technical Editor).
Constructional Work by
G. V. COLLE & H. MEADOWS.
(Technical Staff).

THIS receiver has been designed owing to the great demand expressed by readers for an economical set which is capable of giving loud-speaker reproduction from the local station and a fair range of reception on telephones.

The best circuit that will fulfil these conditions is one which makes use of three valves, employed respectively as H.F. amplifier, detector, and L.F. amplifier, and the diagram in Fig. 1 shows the circuit employed for the construction of the Straight Three-Valver.

The word "straight" is used advisedly to denote that no reflex arrangements or any peculiarities are included in the set; each valve is used to form one single duty, and the components are so arranged that it can do so with full efficiency.



Theoretical Circuit: H.F. Det: & L.F. Fig. 1.

General Design.

A study of Fig. 1 will show that the tuned anode method of coupling between the H.F. and the detector valves is employed while reaction is carried out by coupling the usual reaction coil in the plate circuit of the detector valve to the anode coil in the plate circuit of the H.F. valve.

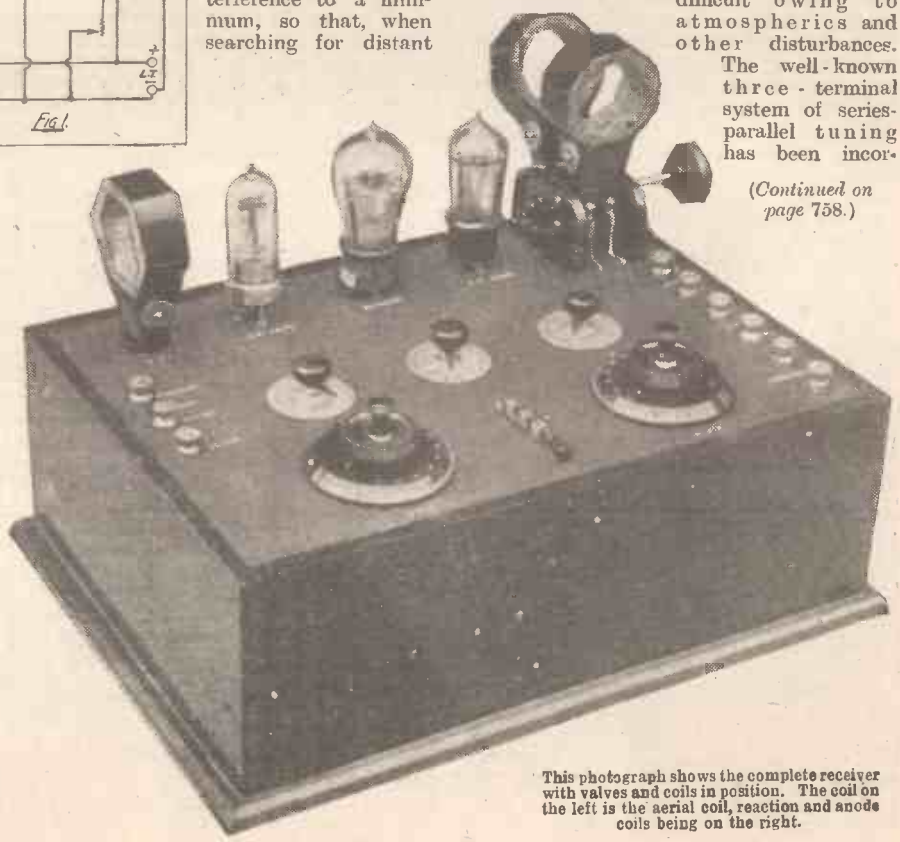
This, contrary to some people's ideas, does not totally eliminate any risk of causing interference to other listeners by the excessive use of reaction, but it does assist in cutting down such interference to a minimum, so that, when searching for distant stations, providing the reaction control is used as carefully as possible, the interference will be of a very weak character, and probably only heard by near-by listeners. This does not mean to say that anyone using this receiver is bound to cause interference, but is merely to point out that interference caused by the misuse of action is not so great as it would have been had reaction on the aerial been employed. Furthermore, the use of reaction coupled to the tuned anode assists very greatly in increasing the selectivity of the receiver, and it is, in our opinion, not one whit less efficient than when carried out direct upon the aerial coil.

For those who desire to use the set for telephone work only, a switch is incorporated which enables them to cut out the L.F. amplifier. This is very useful when the fine tuning of a fairly strong station is required, or when the reception of distant stations is rendered difficult owing to atmospherics and other disturbances. The well-known three-terminal system of series-parallel tuning has been incor-

(Continued on page 758.)

LIST OF COMPONENTS.

	£	s.	d.
1 Panel, 14 in. x 10 in. (Peto-Scott), with cabinet, 5 in. deep		19	8
1 Ferranti L.F. transformer ..		17	6
1 ·0005 variable condenser (Peto-Scott) (with vernier)		10	6
1 ·0003 variable condenser		9	3
1 Lotus 2-coil holder		7	0
1 Single coil holder		1	6
3 Precision rheostats		9	0
12 Valve sockets (Peto-Scott) ..		1	6
1 Dubilier grid condenser and leak, ·0003—2 mfd.		5	0
1 Dubilier series connector		0	6
1 Nesthill S.P.D.T. switch		1	6
9 W.O. Terminals		1	1½
1 Sangamo ·001 fixed condenser ..		2	6
Wire, screws, transfers, etc. ..		3	0



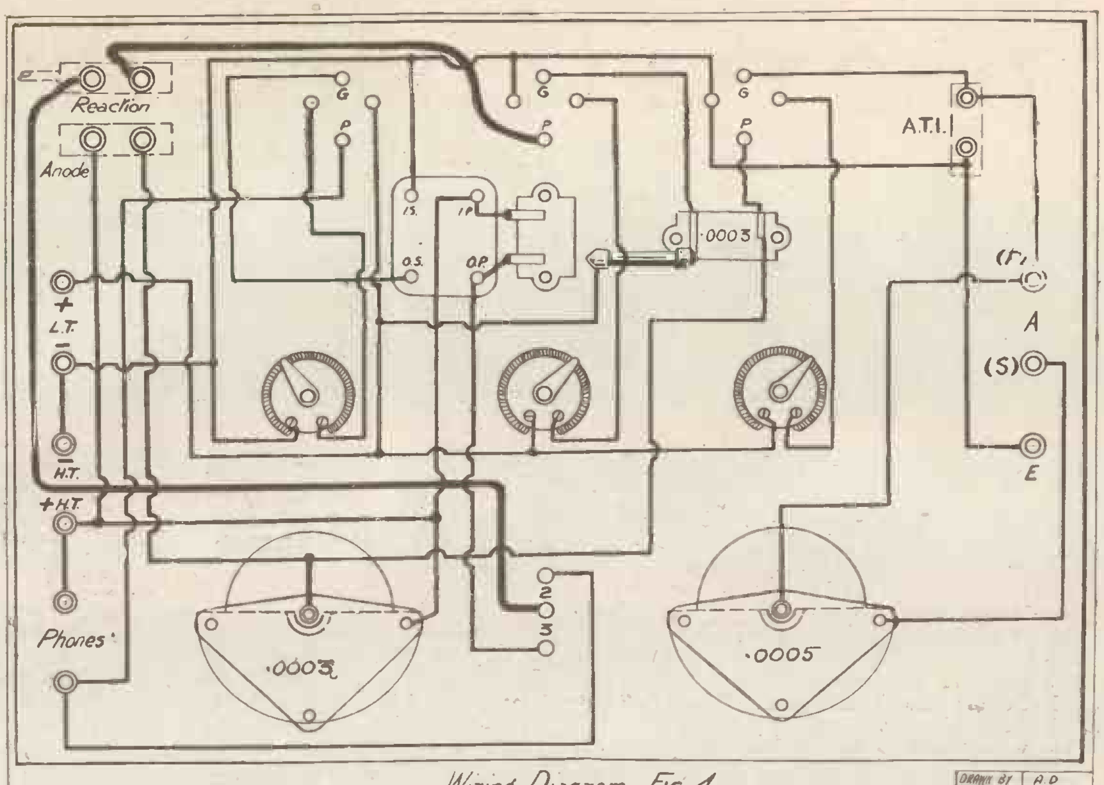
This photograph shows the complete receiver with valves and coils in position. The coil on the left is the aerial coil, reaction and anode coils being on the right.

A STRAIGHT 3-VALVER.

Continued from page 757.)

porated, but, for the benefit of those who are unfamiliar with this system, it would be best to run over the operations necessary to change the aerial condenser from the series to parallel positions, or vice versa.

It will be seen in Fig. 1 that, instead of the usual two connections or terminals provided for the aerial and earth, an extra one is included, and a study of the photographs showing the top of the panel will make it clear that two terminals (the top two) are used for the aerial connections, and are marked "parallel" and "series" respectively, while the earth is taken to the bottom terminal. Fig. 1 shows that the variable condenser is placed between the two aerial terminals, so that it can be seen that if the aerial is taken to the centre terminal (series) the impulses will have to pass through the condenser before they reach the grid of the valve and the tuning coil. The earth is, of course, connected to the earth terminal. On the other hand, if the aerial lead-in is connected to the parallel terminal and the series terminal is short-circuited by a piece of wire to the earth terminal, then the variable condenser is automatically thrown across the tuning coil, and we have a parallel tuning arrangement.



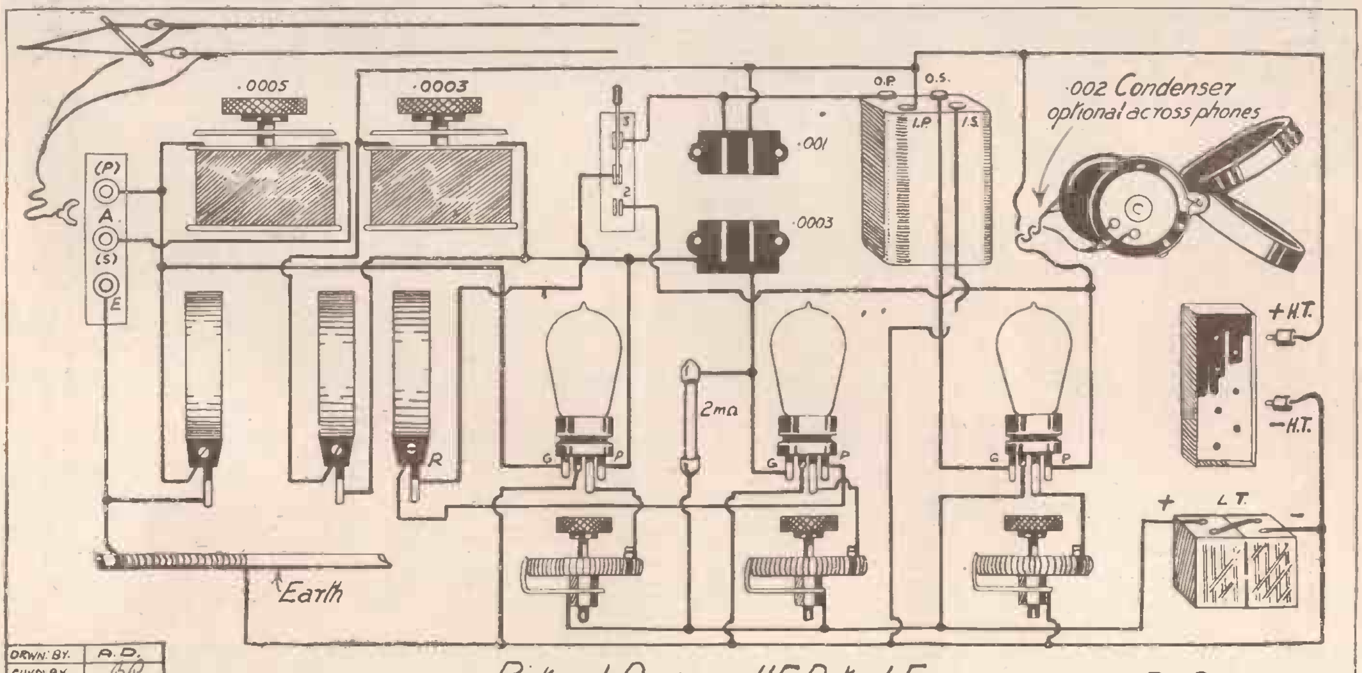
Wiring Diagram. Fig. 4.

Components Required.

A flat panel has been chosen for the construction of the three-valve set, as it is considered that this will greatly simplify the mounting and wiring of the receiver, while the lay-out has been arranged so that the handling of the set is made as simple as possible. The actual construction presents no difficulties, and, providing reliable components are used, there is no reason why constructors should not obtain every satisfaction from the receiver.

A full list of components will be found on page 757, and it is advised that constructors use the same make as is stated in the list,

(*Continued on page 763.*)



Pictorial Diagram: H.F., Det., & L.F. FIG. 2

3000 TESTS OF CLEARTRON

Types C.T. 08, C.T. 15
(Also makers of American type C.T. 199) at
12/6
Full technical data on request.

America's foremost valve made in Britain's newest factory.

Types C.T.25, C.T.25.B.
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15/-
Full technical data on request.

—and finally not 2,977 but "3,000 fully satisfied" because the 23 valves reported defective were instantly replaced without cost or question. Every Cleartron must satisfy its own purchaser. The judgment of the actual user is never questioned. Buy Cleartron and be certain of complete valve satisfaction.

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"I think it only right I should tell you how extraordinarily pleased I am with the valves I purchased from you."

Manchester.

"I have to-day tested your Cleartron valve and must congratulate you on its super-excellence. It has a clarity and fulness of tone, the equal of which I have never before heard."

Manufacturers of Heterodyne Receivers.

"We are using for our demonstrations, solely Cleartron valves, standardised, and are specifying same in all sets we are selling."

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"Cleartron valves are much better than any valves I have tried previously. They are clearer and give a much greater volume of sound."

From "Manchester Evening Chronicle," October 5th, 1925.

"I used in my tests one of the new Cleartron Valves, C.T.25, which works well from the usual six-volt accumulator and 70 volts on the plate. It will oscillate at a much lower plate voltage: in fact this valve oscillates more readily than any valve I have used."

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All Cleartron Valves are Dull Emitters.

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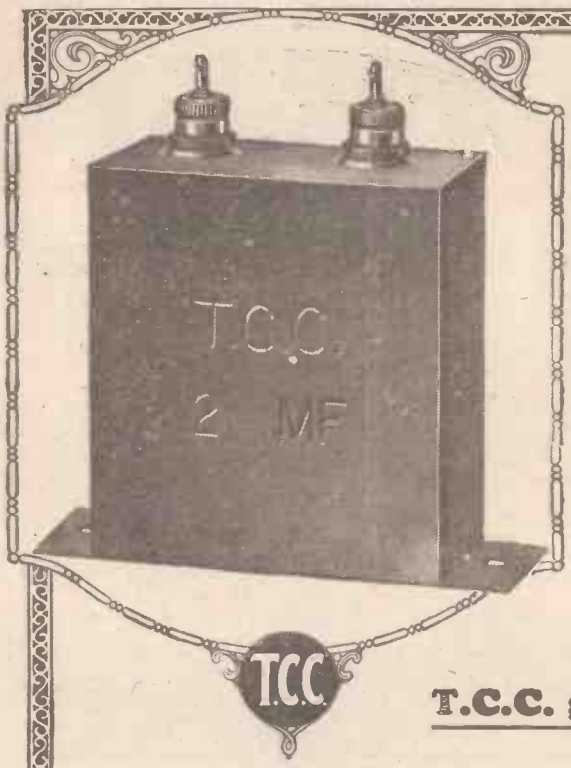

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THE new T.C.C. Mansbridge Condenser—the famous Condenser in the green metal case preferred by radio technicians for its accuracy and constancy—is now fitted with Duplex (patent applied for) terminals. Soldering is optional. If you want to use a quick "hook up" for experimental work you can use the milled heads, and obtain perfect electrical contact. The top of every T.C.C. Mansbridge is now all-metal and is, of course, quite impervious to the heat of the soldering iron or the action of the atmosphere.

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Advertisement of Telegraph Condenser Co. Ltd., Kew, Surrey. *Gilbert Ad. 4054.*

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RADION G.P.a 4-v. Bright Valve only 7/-

A user writes: "I am really amazed at the result; they are the best valves I have yet come across. Let me thank you for executing my order so quickly, and when I require any more valves I will certainly send to Radions, Ltd."

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Send for our booklet; it describes valves, repair service, and gives useful hints. It's free. Write to-day.

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Just think of the advantages of the many and varied applications of the Newey Snap Terminals. You can have all the 'phones your set will stand from two terminals only.

There is no unscrewing of nuts and twisting of wires round the screw; just press the connector to the stud and the connection is complete and perfect. You can switch over from 'phones to loud speaker at a moment's notice. Battery connections are perfectly simple, and for experimental circuit work the Newey Snap Terminals will save the constructor precious hours.

Get the Newey Snap Terminals for your set to-day and you will soon find out the extent of their utility.

Experimental Sets (in brass) .. 2/-
Experimental Sets (nickel-plated) 2/6

Leaflet (P.W.) gives complete information. Ask your nearest dealer. If you have any difficulty write direct.

Newey SNAP TERMINALS

Wholesale Distributors:
PETTIGREW & MERRIMAN (1925), Ltd., 122-124, Tooley St., London, S.E.1.
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New Unidyne Sets

The 1926 1-Valve Unidyne

Complete Kit of Parts

Includes the following: One Square Law Variable Condenser, ·0005 mfds., and one ditto, ·0003 mfds. Each with vernier and spiral contact. One 30-ohm Rheostat; one 2-megohm Grid Leak; one ·0003 Fixed Condenser; one Unidyne Efficiency Choke; 10 nickel-plated Valve Sockets; 7 Mark III plated Terminals; one plated Shorting-bar. All components tested by us and fully guaranteed. **41/-**

Extra if required:

"Red Triangle" Ebonite Panel, 10 x 8 x 3/16th, drilled and tapped	5/-
Engraving extra	1/6
Polished Cabinet to fit	8/6
Coil Unit for B.B.C. wave-lengths (comprising aerial and reaction coils mounted on duplex plug-in base	4/6
Interchangeable Daventry Coils, similar to above	5/6

The Set of the Season!

—the "Popular Wireless" 2-Valve Continental

NO need to spend a lot of money on a ready-built receiver when you can build the splendid "Popular Wireless" 2-Valve Continental Set shown above for just over £3. This is a wonderful Set for long-distance reception. Now that valves have been reduced in price no one can say that a Valve Receiver is costly to build or expensive to run.

This splendid Set is only one of many shown in the Pilot Manual (post free 3d.). Send for your copy to-day, and see what you save when you build your own set.

SPECIAL NOTE: When a complete Set of Parts is purchased with panel a Royalty of 12/6 per valve holder is payable to the Marconi Company and must be remitted with order.

Complete kit of components

68/-

Send for List

The 1926 2-Valve Unidyne

("Popular Wireless," Nov. 7th.)

The Component Parts required for this Receiver are as follows:—

1 Peto-Scott Square Law Condenser, ·0005, with Vernier and Spiral contact	11 6
1 Peto-Scott Square Law Condenser, ·0003, with Vernier and Spiral contact	10 3
1 Utility Switch	6 0
2 "C.H. Precision" Rheostats, 30 ohms	6 0
1 Dubilier Fixed Condenser with clips, ·0003	2 6
1 Dubilier Grid Leak, 2 megohms	2 6
2 Peto-Scott Fixed Condensers, ·001 mfd.	3 0
1 Bretwood Variable Anode Resistance	3 0
1 "R.I." Transformer	1 5 0
1 Coil Socket Unit Holder	1 3
2 5-pin Valve Holders	3 0
1 Unidyne "Efficiency" Choke	10 0
7 Mark III Terminals	1 2
Square tinned copper wire, screws, etc.	1 6
	£4 6 8

1 "Red Triangle" Ebonite panel, 13 x 6½ x 3/16th, drilled and tapped	6 0
Engraving extra	2 6
1 Polished Mahogany Cabinet, with baseboard	1 1 0
Extra if Required: Coil Unit for B.B.C. wave-lengths, comprising aerial, and reaction coils mounted on duplex plug-in base	4 6
Interchangeable Daventry Coils, similar to above	5 6

PETO-SCOTT Co., Ltd. (Sole Unidyne Licensees).

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P.S. 4040

If Ebonite were transparent

you could see for yourself the ingenious internal construction of the Watmel Variable Grid Leak —and appreciate why it means the most efficient operation.

A glance at the sectional drawing will show how the pressure on the resistance elements may be accurately adjusted, thus permitting smooth and critical variation to be accomplished at will.

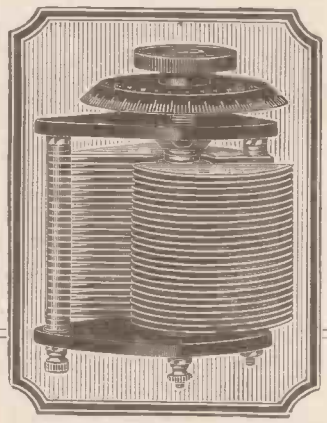
When you consider that, allied to these constructional refinements, the Watmel is continuously variable, dust and damp proof, and constant in any temperature, you cannot doubt that it will get the best from your detector valve.

GRID LEAK (*Black Knob*). **ANODE RESISTANCE** (*Red Knob*).
·5 to 5 megohms, 2/6. 50,000 to 100,000 ohms, 3/6.
10,000 to 50,000 ohms (*Green Knob*), 3/6.

See this name on **WatMel** every instrument.

The Watmel Wireless Co., Ltd., 332a, Goswell Road, London, E.C.1. Telephone: 7990 Clerkenwell.

Lancashire and Cheshire Representative: Mr. J. B. Levee, 23, Hartley St., Levenshulme, MANCHESTER.



On Ultra Short Waves

SQUARE LAW.

·001	9/6	·00025	6/9
·00075	9/-	·0002	5/6
·0005	8/-	·0001	5/3
·0003	6/9	Vernier	4/6

STANDARD.

·001	8/6	·00025	5/9
·00075	8/-	·0002	5/-
·0005	7/-	·0001	4/9
·0003	5/9	Vernier	4/-

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·0005	12/6	·0003	11/3
·001	14/-	·00025	11/-

Post: One, 6d.; Two, 9d.; Three 1/2.

It is a well-known fact that when working with the very high frequencies involved in working with the ultra short waves, apparatus must be strictly low loss. High losses such as are found in many types of variable air condensers may easily prevent any ultra short-wave receiver from oscillating. Such a condition makes efficient reception practically impossible.

Low losses are essential in ultra short-wave work. These low losses not only ensure the efficient operation of ultra short-wave receivers, but also make certain that on the higher wave-lengths signals are reproduced without loss.

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(*First Floor*)
Telephone:— GERRARD 7414

Barclays 1256

A STRAIGHT 3-VALVER.

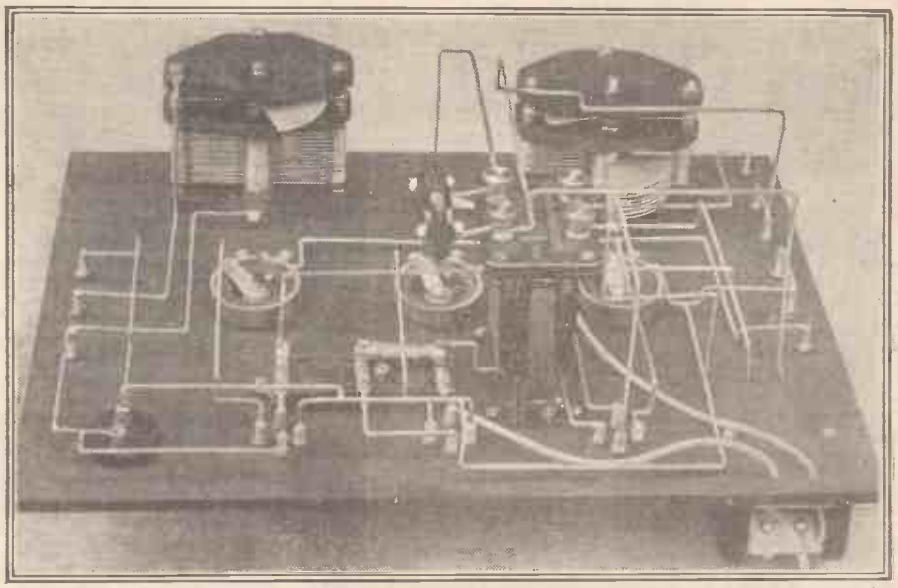
(*Continued from page 758.*)

POINT-TO-POINT CONNECTIONS.

Parallel aerial terminal to moving plates of aerial condenser, one side of A.T.I. and grid of 1st valve. Series terminal to fixed plates of aerial condenser, earth terminal to other side of A.T.I., also to L.T. —, which is connected to I.S. of L.F. transformer, one side of L.F. rheostat, direct to filaments of H.F. and detector valves, also to H.T. —. The remaining L.F. rheostat terminal is connected to one filament socket of L.F. valve, the other socket being connected to L.T. +, which is also taken to the H.F. and detector rheostats, and through the rheostats to filaments. The remaining L.T. + connection is to the free end of the grid leak.

The plate of the 1st valve goes to one side of grid condenser, moving plates of ·0003 condenser, through anode coil, to fixed plates of ·0003 condenser, I.P. of transformer, and H.T. +. The other side of grid condenser is connected to grid leak and grid of 2nd valve.

Plate of 2nd valve to reaction coil, the other reaction coil connection going to centre contact of S.P.D.T. switch, the top contact goes to one 'phone terminal and to plate of 3rd valve, the other 'phone terminal to H.T. +, and bottom contact of switch to O.P. of transformer, across the primary of which is connected a ·001 mfd. fixed condenser, and O.S. of transformer goes to grid of 3rd valve.



An under-panel view of the Straight 3-Valver showing the disposition of components and method of wiring.

in order that there should be no difficulties regarding the drilling of the panel and the spacing of the components. Other makes of components can be used (provided they are of reliable manufacture), and, in this event, the panel drilling diagram given in Fig. 3 will no longer hold good in every case, and the construction of the receiver will be correspondingly more difficult. Whatever components are used, however, the transformers and the grid leak and condenser must be thoroughly reliable, while care must be taken that in the case of the variable condensers no slack connections between the moving vanes and the external wiring can eventuate. The panel should be 14 in. x 10 in. x ¼ in. thick, and the constructor is advised to purchase both this and the case at the same dealer's, because this will do away with the necessity of trimming up the edges of the panel in order to make them fit the case. This latter, by the way, should not be less than five inches in depth.

The panel-drilling diagram is given in Fig. 3, and will be found to be all that is required for the mounting of the components given in the list. Sharp metal-working drills should be employed for making the holes in the panel, an ordinary twist drill or hand brace being used. It may be found that the latter will not hold a drill large enough to make the holes for the variable condensers, and, in this event, as large a hole as possible should be made, and then reamed out to the correct size. The rest of the construction will present no difficulties, and when the components have been mounted the wiring should be carried out.

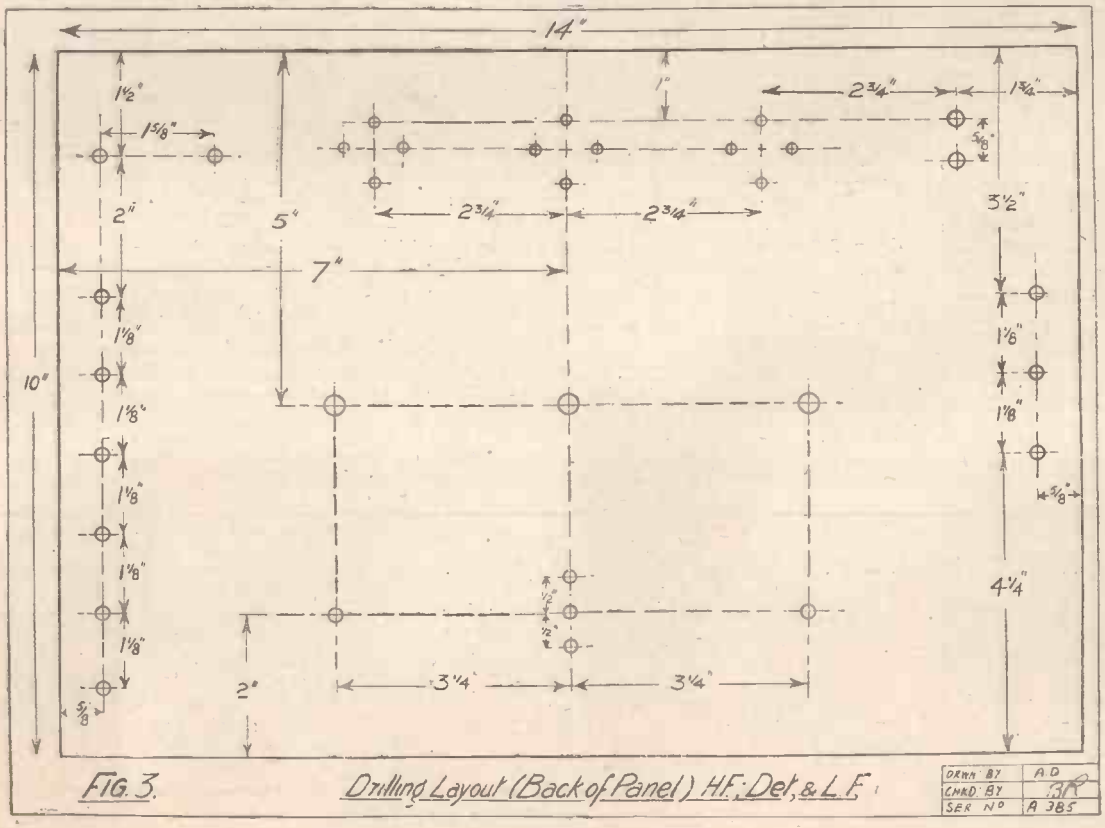


FIG. 3. Drilling Layout (Back of Panel) H.F. Det. & L.F.

Wiring Up.

Square section tinned copper wire of about 16 gauge should be used for this, firm soldered connections being made at all points except at the transformer and filament resistances, where special terminals are provided. A study of the photographs and the wiring diagram will show that the grid leak is not placed in parallel with the grid condenser, but is connected between the grid end of the condenser and L.T. positive. If, as recommended, a Dubilier condenser and leak are employed, the special grid leak connector supplied by the makers at an extra cost of sixpence should be used, so that there is no need to solder the wire to the grid leak itself, as such a procedure might impair its efficiency.

On the completion of the wiring all the con-

(*Continued on page 782.*)

CURRENT TOPICS.

By THE EDITOR.

The B.B.C.'s Third Birthday—The Post Office and Licence Money—The "Rectalloy" Articles.

A FEW days ago the B.B.C. celebrated its third anniversary. A succinct summary of its activities was published in "The New Statesman," and we quote the following, an extract, because it is about as near the truth as any critic of the B.B.C. is likely to get.

"During its brief existence it has achieved a variety of miracles, some of them comic and others substantial. It has grafted a new jargon on to our mother tongue—wherever men foregather, youth, and very possibly age, will be heard prating of "nought nought nought five condensers," and similar mysterics. It has caused many of our most picturesque hamlets to bristle with masts as if they were seaports.

". . . The B.B.C. experts probably exaggerate the value of their more serious endeavours. Their potted science, history, and economics may conceivably light eternal fires in a bosom here and there, and embark some eager mind on a course of genuine study; but we fancy that most of their auditors switch off the valves when an educational item is announced. The case of music, however, is far different . . . others who could only appreciate a lively fox trot are yielding themselves to the troubling harmonics of the great masters . . ."

And so on.

The Proof of Success.

But whatever the critics have to say the salient fact is that the B.B.C. have been successful. We all have our individual likes and dislikes when we listen to the broadcast programmes: some of us may still, with obstinacy worthy of a better cause, regard the B.B.C. as a monopoly, the thought of which outrages the political and moral feelings of many sober citizens; we may still grumble at this or that station because we can't hear it on a crystal set, or because it relays 2 L O far too often; and we all of us, at one time or another, have vowed violence on the various "talkers" who have, from time to time, bored us to extinction.

And yet the B.B.C. flourishes: the proof of its success is the fact that it is successful. America admits we have the best organised broadcasting service in the world—and for America to admit that is Something.

We do not propose to recapitulate the history of the B.B.C., their early struggles, their failures, their outstanding triumphs. We refrain from a long eulogy because our readers are better acquainted with the work of the B.B.C. than most people, because it has been our aim to record with some precision the advances and retreats made by the B.B.C. since its inception.

In our opinion the B.B.C. may be likened to a ship navigating perilous and uncharted seas. On the bridge is the captain, watchful, skilful, and full of enthusiasm and love for his task and his craft.

The captain of the B.B.C., Mr. J. C. W. Reith, and his crew, are entitled to adorn themselves with laurel wreaths. They have not yet finished the voyage (and breakers, in the shape of the Government committee, are ahead), but their many admirers are sure they will, and with great and continued success as in the past. We wish them that, at any rate.

* * *

"Tons of Money."

In a recent issue we announced that the number of wireless licences now issued by the Post Office exceeds 1,500,000.

A simple arithmetical effort reveals the interesting fact that, with the cost of a licence put down at 10/-, of which 7/6 goes to the B.B.C. and 2/6 to the Post Office, the B.B.C.'s revenue from licences is more then £562,500 per annum, while the Post Office finds itself £187,500 a year the richer.

There is no reason to suppose that the licence figure will stop at 1,500,000, or at 2,000,000, or at—well, writing noughts is fatiguing and beside the point. The question is, will the Post Office continue to draw 2/6 on every licence taken out by listeners, despite the licence figure soaring over the two million mark?

The figures quoted above indicate that the Post Office is drawing a tidy sum of money every year from the licence fees paid by listeners. What is being done with the money? Should it not be expended in an attempt to track down "pirates"?

In any case, the Postmaster-General might justifiably reduce the cost of the listener's licence, and we hope the Broadcasting Committee will give the licence question very careful consideration. In our opinion the time has come when the licence fee should be reduced to 7/6.

After all, there are many people in this country who don't mind paying 7/6 for a dog licence, but who object to paying 10/- for a wireless licence. If the latter was reduced to 7/6 we might possibly see more aerials and fewer dogs. Or more of both. The result will probably be sanguinary.

* * *

We have received a very large number of inquiries in connection with the articles on "Rectalloy," recently published in our columns.

In view of a good deal of misapprehension which seems to exist with regard to these articles, we would explain that, in the first place, the articles by Mr. Harland were published with a view to announcing certain successful experiments carried out by the author.

We wish to make it clear that, in the first place, the sale of "Rectalloy" did not concern us; it was, naturally, a matter for the author to decide whether he wished to market his invention.

Mr. Harland has now made arrangements to place "Rectalloy" on the market.

"Rectalloy."

The manufacture of "Rectalloy" and "Rectalloy" chargers does not concern us; we published Mr. Harland's articles as a matter of interest to experimenters, and, owing to that interest, further articles on chargers of all descriptions will appear in POPULAR WIRELESS in the near future.

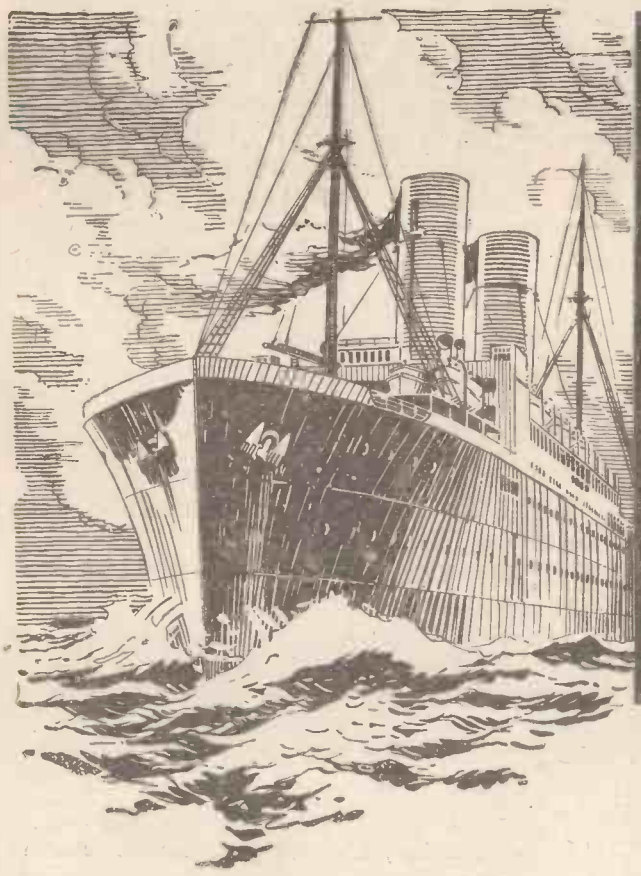
In the meantime, we would ask our readers to realise that we cannot act as agents, and so recommend to them firms which may take up the manufacture of "Rectalloy"; we can only urge readers to carefully note the advertisements appearing in this and other wireless journals.

Canadians listening to the anniversary programme transmitted from C.N.R.A.

The New "Rectalloy."

During the last week members of the technical staff have been experimenting with various metals for use in rectifiers—including "Rectalloy," platinum, tungsten, tantalum, and other metals. The original "Rectalloy" electrodes we received for test acted very well and, in fact, better than tungsten and platinum, but not so well as tantalum.

Mr. Harland's attention was drawn to this (his original "Rectalloy" electrodes being made of rare metals coated in a special way, and the nature of which the author does not wish to divulge), and in view of this the original "Rectalloy" will not be put on the market, but it has been superseded by specially prepared tantalum. This, we believe, is now being sold under the original name of "Rectalloy." Its performance in rectifiers we can vouch for.



SUPREMACY

Unequalled for perfection of design and workmanship, the Supremacy of the R.I. Transformer has never really been challenged.

25/-

And yet there is no mystery about the design of the R.I. Transformer. It is simply a question of an iron circuit of ample area, correct ratio of the number of turns of both primary and secondary, and last and most important the **subdivision of the windings into sections to reduce the self-capacity to a minimum.**

Before the present model was adopted, every possible type of transformer was made and tested under the most searching conditions. The present design was selected as giving the most consistent and best results with the various valves on the market, the final confirmation of our selection being decided by musical critics with no knowledge of electrical design. No better proof of the wisdom of the final choice can be cited than the popularity of this transformer, considerably over half-a-million being now in use.

Our latest model has proved so successful that many attempts have been made to emulate the almost perfect transformer—the R.I. Transformer—which still retains its original form and is considered by all users as *the* type which gives the most natural reproduction of speech and music it has so far been possible to obtain.

Amongst the many thousands who read this advertisement will be found a large number of actual users of the "R.I." and they will endorse this claim. Do not be put off; if you want perfect reproduction, insist on having an "R.I."

Write for the new R.I. blue and gold Catalogue free on application.

RI LTD

When buying R.I. Transformers see that they are contained in the R.I. standard sealed boxes.

THE MARK OF BETTER RADIO

Advt. R.I. Ltd., 12, Hyde St., New Oxford St., London. W.C.1. P.C.11.

Mr. Marcuse operating one of his short wave sets at 2 N M.

2 N M CALLING.

THE HERTZ AERIAL.

By GERALD MARCUSE.

This exclusive article—Mr. Marcuse only contributes to "P.W."—will be of great interest to the ever-growing band of amateur transmitters in this and other countries.

AS there seems to be considerable controversy as to the best and most efficient antenna to be used on short wave-lengths for the transmissions of C.W. and telephony, I propose this week to deal with the Hertz antenna, which is the one I have finally adopted after testing out every type of aerial.

It is an ideal aerial to use when one has height available, and would prove a great advantage to anyone who wished to transmit from the top of any high building.

This form of aerial has been used for some considerable time by high-power stations, and lends itself to endless interesting experimentation.

It naturally has disadvantages where one is screened and tied for room, but has proved itself in my case a great advantage, especially in use with a master oscillator circuit.

It also has the great advantage of sparing the room which would otherwise be utilised by the counterpoise, but you may say that it ties you down to one, or, at the most, two wave-lengths, though one can certainly get half a metre either side, which, on these frequencies, is quite sufficient to avoid QRM.

A Simple Aerial.

The coupling of the antenna to the set is extremely simple, and can be done in two ways (see Fig. 1). Further, there are no series condensers needed, excepting when the length of the H.F. feeder tunes to somewhere around the working wave-length, though this, unfortunately, is the case in my station, but this difficulty can easily be got over with no loss of efficiency by the addition of a series condenser in the feeder.

The length of the lead-in makes no material difference to the efficiency of the transmitter, but the aerial should be erected free from all screening, and there is no necessity to consider the length of lead-in, as is the case with an aerial tuned to a harmonic.

As in this country we suffer at times from gales, we have an advantage in this type of aerial, because any swinging does not produce variations in the wave-lengths of the transmitter.

In constructing this aerial, take a single enamelled wire, say 14 gauge, 22½ metres in length. The RF feeder is connected at a quarter of the length; this, at any rate, I have found to be the best position. For instance, a wire 22½ metres, fed for 45-metre transmission, will oscillate as shown in Fig. 1, and one concludes that half the Hertz aerial acts as aerial and the other half as counterpoise. It is logical to conclude that the losses in this radiating system are very low, seeing that we are able to raise the whole of the radiating system above all earthed bodies.

Any transmitting circuit can be adapted to this type of antenna, such as Colpits, Hartley, reversed feed back or straight circuit, and master oscillator.

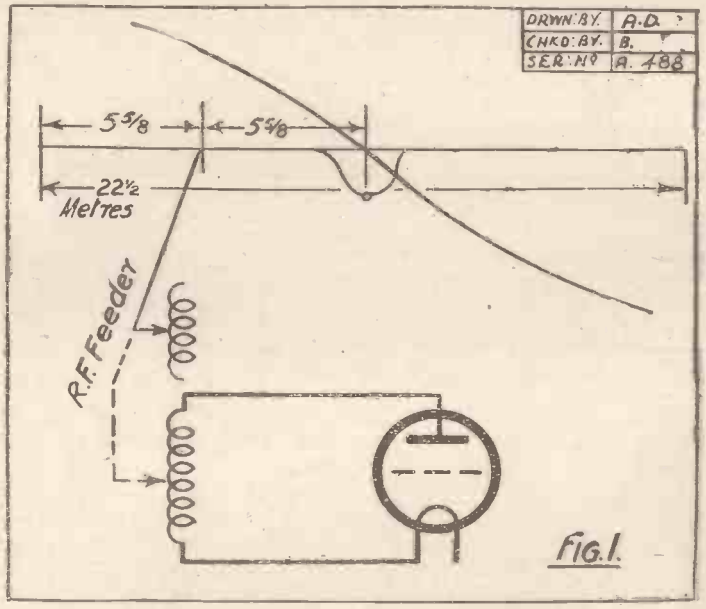


FIG. 1.

This aerial can be fed on to the set in various ways, either by tapping in on to your existing aerial coil, taking the earth or counterpoise lead off, and varying the coil for the maximum efficiency, or you can tap on to the plate coil.

Tapping the Feeder.

The best position seems to be, say, two turns above the negative or lowest potential side of the plate inductance, when the antenna is in resonance with the transmitter, and energy will be absorbed through the coil and feeder.

Care is needed, though, for if the feeder wire tunes to the wave-length or harmonic one may be getting a good indication in the aerial ammeter, but the note will be bad, and one may put the whole circuit out of resonance. One can always measure the feeder, and if its wave-length is near that of the main antenna, a series condenser should be placed in the feeder.

A Resonance Indicator.

One may also find that the antenna oscillates at, say, 46, or even 47 metres, if its proximity to an earthed object is unavoidable. In this case a piece of the main antenna should be cut off, but only an inch or so, taking care to readjust the nodal point.

It will be seen in Fig. 1 that there is a node at the centre, and if one takes a tap, say, 3 inches each side of this node, there will be a considerable voltage drop, so an ordinary 4-volt flashlight bulb should be connected across these two points, and it will light up when the aerial is in resonance.

Again I say one must not be misled by a high reading in the aerial ammeter, because one gets a large aerial indication when the RF feeder is radiating on its own; I am speaking from experience, as I have been misled in this way. This aerial will work just as well on 22½ metres, so is very convenient for the two wave-lengths allotted to British amateurs, but when one wants to use wave-lengths from, say, 20 to 50, one cannot use a better aerial than a single wire 100 feet long. Here again, however, one needs an earth or counterpoise.

All my latest records have been achieved on the Hertz aerial, and whilst testing recently to Canadian I A R, he told me that on speech he could hear me take my breath at every inhalation.

(*Continued on page* 782.)

Traders and manufacturers are invited to submit wireless sets and component parts to the "P.W." Technical Dept. for test. All tests are carried out with strict impartiality in the "P.W." Test Room under the supervision of the Technical Editor, and the general reader is asked to note that this weekly article is also intended to provide a reliable and unbiased guide as to what to buy and what to avoid.—EDITOR.

MESSRS. Burndept, Ltd., have sent us a number of their latest types of filament resistances. They are practically all metal in construction, one-hole panel mounting, and provided with polished bakelite pointer knobs and scaled aluminium plates. The complete range of these rheostats, with prices, is as follows :

Power rheostat, 2 ohms, 3 amps., suitable for large multi-valve sets, as Master-Rheostat, and for small transmitting valves, 5s. ; Standard Single-Valve Rheostat, 7 ohms, 1½ amps., suitable for general use, 5-volt power valves, two 310 valves (4-v. acc.), etc., 5s. ; Medium Rheostat, 15 ohms, 1 amp., suitable for one 310 valve (4-v. acc.), one 512 valve (6-v. acc.), two 306 valves (4½-v. cells), 5s. ; H.R. Rheostat, 30 ohms, 0·5 amps., suitable for all 3-volt dry battery valves (4½-v. cells), etc., 5s. ; Dual Rheostat, 5-30 ohms, suitable for a 306 or 310 valve with dry battery and bright or power valve with accumulator. The original Dual Rheostat, 6s. ; Super-Dual Rheostat, 10-60 ohms, a new Universal Rheostat with which can be operated "any valve from any battery" (up to 6 volts), 7s. 6d.

The centenary numbers refer, of course, to the now well-known Burndept valves.

It will be noticed that the current carrying capacities of the various types are given. This is, in our opinion, a very commendable practice, more especially when as in the case of the Burndept rheostats such are distinctly conservative. As a matter of fact, not the slightest sign of heating was apparent, even when the above figures were exceeded. We can fully recommend these Burndept products to all constructors desirous of rheostats capable of standing up to real hard work. and which have good front-of-panel appearance.

From the same company we also received a standard potentiometer (250 ohms, 0·1 amp. which retails at the modest price of 6s. Similar in construction to the new rheostats described above, it operates smoothly, yet with a definite contact, throughout the whole range of its adjustment.

The stated resistances of all the above Burndept components were found on a bridge test to be substantially accurate, which, considering that they are all machine wound, was hardly surprising !

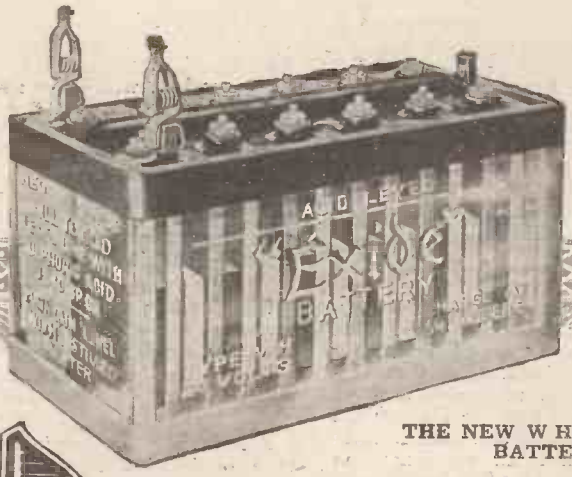
* * *

The Enterprise Manufacturing Co., Ltd., Electric House, Grape Street, London, W.C.2, have sent us several samples of their new L.F. transformers. They are neat little components in appearance, are not shrouded, but have enclosed laminated cores. Four brass terminals are provided for connecting purposes. Several ratios are available, including 5 and 2·7 to 1, at a standard price of 12s. 6d. Considering their size and cheapness, results obtained during tests were very good ; better, we consider, than several others we have examined whose prices were higher. If the Enterprise L.F. transformers have not the low capacity of some, have not quite sufficient primary impedance, etc., to give quite a "straight line," they are, nevertheless, quite useful little articles at a useful price.

* * *

A filament control of novel design has been produced by the L.E.S. people. It

(*Continued on page* 770.)



THE NEW W H TYPE H.T. BATTERY.

Exide

The Long-Life Battery

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

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

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

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

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

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

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

1 Valve		OR		2 Valves		3 Valves	
1 DTG (2 Volts) 36 hrs.	5/-	1 DFG (2 Volts) 125 hrs.	10/-	1 HZ 2 (2 Volts) 75 hrs.	17/6	1 HZ 2 (2 Volts) 43 hrs.	17/6

·06 amp. Dull Emitter (Marconi-Osram "D.E.3," B.T.H. "B.5," Ediswan "A.R.'06," Mullard "D.'06"):

1 Valve		2 Valves		OR		3 Valves		OR	
2 DTG (4 Volts) 290 hrs.	10/-	2 DTG (4 Volts) 106 hrs.	10/-	2 DFG (4 volts) 320 hrs.	20/-	2 DTG (4 Volts) 60 hrs.	10/-	2 DFG (4 Volts) 190 hrs.	20/-

W H High-Tension Battery, supplied in 24-volt units, sealed in moulded glass container.

TECHNICAL DATA.

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

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

NORMAL CHARGE CURRENT.—¼ Ampere.

DIMENSIONS.—4⅞ in. W x 8⅝ in. L over glass container x 5¼ in. H, over lead terminals x 6¾ in. H over take-offs.

WEIGHT.—15½ lbs. including acid.

QUANTITY OF "ACCUMULATOR" SULPHURIC ACID, 1·240 specific gravity.—1½ pints per 24-volt battery.

PRICE 24-Volt W H Battery including 2 connecting clips but excluding acid **35/-**

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

BIRMINGHAM: 58, Dale End. *Central, 7629/30.*

BRISTOL: 22, Victoria Street. *'Phone: 6460.*

THE Chloride ELECTRICAL STORAGE COMPANY LIMITED.

CLIFTON JUNCTION, Near Manchester.
LONDON: 219-229, Shaftesbury Avenue, W.C.2.
Telephone: Regent 8070.

MANCHESTER: 1, Bridge Street. *Central 2075/6.*

GLASGOW: 40-44, Tureen Street. *'Phone: 985 Bridgeton.*

APPARATUS TESTED.

(*Continued from page 768.*)

comprises an L.E.S. filament control with an adjustable wire resistance fitted externally. This resistance acts in conjunction with the compression movement and allows a safety minimum to be arranged. The component is well made and operates efficiently. It is very reasonably priced at 5/-.

From the L.E.S. we also received a back-of-panel mounting two-way coil holder. Its adjustment is rotational and it is provided with a dial similar to that of a condenser. A vernier movement is fitted and this controls the distance between the coils within a limit of over half an inch. Both adjustments are smooth and regular and no "backlash" is present. The coil holder is well made and should stand up well to hard and continuous usage. It is retailed at 7/6, at which price it should be well received by discriminating constructors.

* * *

In an article describing "A Long Range Two-Valver," which appeared in our issue of November 14th, the following statement was made in respect of the well-known "Lotus" coil holder.

"Unfortunately, these coil holders are not at present available with long handles making them suitable for baseboard mounting. . . ."

This might have been true when the article was written; anyway, it is certain long-handled "Lotus" coil holders had not been brought to our notice up to that time; but since then we have had a number sent us. They are well up to the usual high standard which has made "Lotus" coil holders so popular, and we are using several in receivers which are shortly to be described in "P.W."

We trust Messrs. Garnett, Whiteley will forgive us for the above misstatement, which was made in all good faith, and not with any intention of reflecting upon the efficiency of their latest products.

* * *

The heading of the third table in the recent report of the new R.I. Reactive Anode Unit which appeared in these pages should have been MAXIMUM and not MINIMUM with a ·00025 mfd. condenser.

* * *

A lock switch similar in principle to the type of ignition lock switch frequently provided on American motor-cars, has been produced for use on wireless receivers by Messrs. A. F. Bulgin & Co., 9, 10, 11, Cursitor Street, Chancery Lane, London, E.C.4. It is a neat little fitment, well made, and carries out its duties in quite a straightforward manner. A little key, reminiscent of a Yale, is provided, and can, of course, be left in position until the switch is required to act as a "lock." One pictures the frantic endeavours of an untechnical household endeavouring to silence a raucous loud speaker, the "operator" having left the set *locked on!* But happily the device is so designed that the key cannot be removed when the switch is in the "on" position. This switch, known as the "Decko" lock-switch, retails at 2s. 9d., extra keys 4d. each.

Two advertisements in our last issue contained small printer's errors. The address of M. Bobin, agent for F. A. R. L.F. transformers (page 710) was given as 12 instead of 21, Warwick Lane, London, E.C.4.

The price of the 35 ft. steel "Laker" mast advertised by Messrs. J. and J. Laker Co., Engineers, Beckenham, Kent (page 722), was erroneously stated as being 52/-; it should have been 52/6.

One of the very artistic radio posters recently issued.

NO CONDENSER

of the "Mansbridge" type is a genuine product of the Mansbridge Condenser Co. Ltd.—unless the words MANSBRIDGE CONDENSER are plainly embossed on the metal case. The colour of the case is maroon. Guaranteed by the Dubilier Condenser Co. (1925) Ltd. who are the sole concessionaires.

REGISTERED DUBILIER TRADE MARK

Specify Mansbridge

PRICE & CAPACITY:

Capacity	Price	Capacity	Price	Capacity	Price
0·02–0·05 mfd.	2/6	0·25 mfd. ..	3/-	0·50 mfd. ..	3/6
0·10 „	2/6	0·30 „ ..	3/-	1·00 „ ..	4/-
0·20 „	2/8	0·40 „ ..	3/3	2·00 „ ..	5/-

DUBILIER
CONDENSER CO (1925) LTD

ADVERTISEMENT OF THE DUBILIER CONDENSER CO. (1925) LTD., DUCON WORKS, NORTH ACTON, LONDON W.3. TELEPHONE—CHISWICK 2241-2-3.

E.P.S. 3.

School-days taught You *vaguely* of the Genius M. Leclanché . . . To-day discretion singles out Ripaults,

Leclanché Batteries

TO every grown man who buys Ripaults Batteries is revealed with striking vividness the great genius of M. Leclanché—the intellect behind every genuine Ripaults master production.

20 volts	Price each	4/6
36 volts	„ „	7/6
60 volts	„ „	12/6
108 volts	„ „	21/-

If your local dealer is unable to supply Ripaults Leclanché Batteries apply direct to us, giving his name and address.

RIPAULTS LIMITED,
King's Road, St. Pancras, London, N.W.1.
Telephone: NORTH 4374 (4 lines).

RADIOTORIAL

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

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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.*

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 wireless 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.*

TECHNICAL QUERIES.

Letters should be addressed to:
Technical Query Dept.,
"Popular Wireless,"
The Fleetway House,
Farringdon Street,
London, E.C. 4.

They should be written on one side of the paper only, and MUST be accompanied by a stamped addressed envelope.

Queries should be asked in the form of numbered questions: (1), (2), (3), etc., but may be accompanied by a short letter giving any necessary additional particulars as briefly as possible.

For every question asked a fee of 6d. should be enclosed. A copy of the numbered questions should be kept, so that the replies may be given under the numbers. (It is not possible to reproduce the question in the answer.)

IMPORTANT.—If a wiring diagram, panel lay-out or point-to-point wiring is required an additional fee of 1/- must be enclosed.

Wiring diagrams of commercial apparatus, such as sets of any particular manufacture, etc., cannot be supplied. Such particulars can only be obtained from the makers.

Readers may submit their own diagrams, etc., for correction or for criticism. The fee is 1/- per diagram, and these should be large, and as clear as possible.

No questions can be answered by 'phone.

Remittances should be in the form of Postal Orders.

Questions and Answers

H.F. AMPLIFIER FOR CRYSTAL.

R. M. J. (Paignton, Devon).—What are the connections for adding an H.F. valve to my existing crystal set? Is it necessary to alter the crystal set in any way?

If the following connections are made, there will be no necessity to alter any of the connections in your existing crystal set, as the inductance included in it can remain to act as a tuned anode coil as this method of coupling the H.F. to the crystal is

(*Continued on page* 774.)

The All-Important Variable Condenser

And the Prestige behind the "Polar"

Not all variable condensers can be judged by appearance and price alone. It is unlikely that the condensers produced by any but long-established Radio Engineers *can* be fully efficient.

It is, further, unlikely that nondescript, cheaply-assembled condensers will carry anything like the UNCONDITIONAL written GUARANTEE enclosed with every "Polar" Condenser. It is a guarantee against original defects, as well as against breakdown or the development of faults in ordinary use—for a period of ONE YEAR.

All constructors of Radio Sets have an appreciation of quality in *appearance*, as well as of quality in *performance*; yet not all are equally able to indulge in the *expensive* class of components. For this reason we have introduced the "Polar" Junior Condenser, at a price of 5/6 for all capacities—putting a product of high quality (backed by a great reputation) within the reach of all.

Buy the products of well-known Firms—disregard any may-be biased recommendations of "cheap" components—and depend upon the Manufacturers to "see you through."

"The Polar" Junior Condenser.

5/6

All Capacities.

Possesses all the characteristics of the well-known Polar "Straight-line-Frequency" condenser. Gives a straight line of frequencies, with an approximately even movement of dial in relation to change of wavelength. Low minimum self-Capacity; one-hole fixing; 350 degrees dial; perfectly screened; remarkably compact; occupying minimum space behind panel.

The 'Polar' Cam-Vernier Variable Condenser.

Compensated square-law design of vanes; this means that the Condenser functions in the square-law manner, *not on the bench*, but *on your set*. Its shape of vanes compensates for the inherent self-capacity of your coils and aerial, with the result that the figures on the dial indicate definite wavelengths. You can recognise the Cam-Vernier Variable Condenser, if by nothing else, by the specially engraved dial which *commences* at "26"—recognising that no aerial tuning system can have a zero capacity. It embodies the well-known Cam-Vernier device, giving 10 degrees of Vernier movement in any position; and *the vernier readings register on the dial.*

Prices:

·0003 - - -	10/6
·0005 - - -	11/6
·001 - - -	12/6

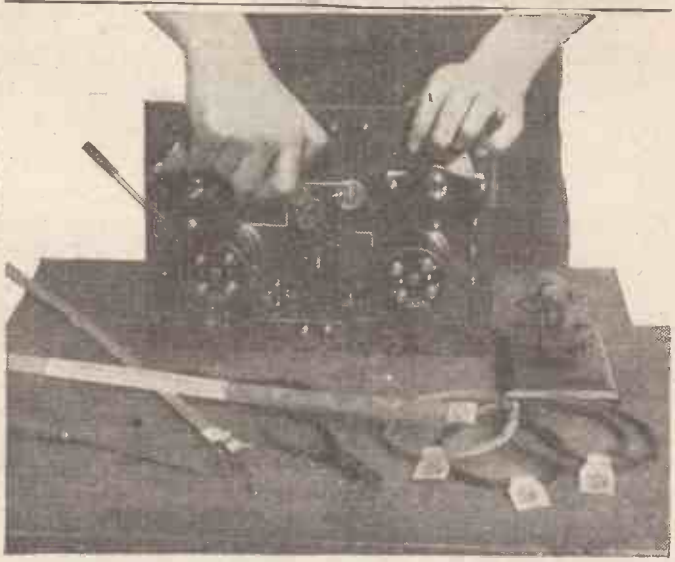
Polar Components for Sound Design

Sold by all reputable Radio Dealers. Ask your Dealer, or write to us, for the Polar Condenser Booklet.

Radio Communication Co., Ltd., 34-35, Norfolk Street, Strand, London, W.C.2.

E.W.8

Next time you wire a set —use GLAZITE!



The more complicated the circuit, the more important it is to use

GLAZITE

BRITISH MADE REGD.

COLOURED CONNECTING WIRE
Red, Yellow, Blue, Black.

10 ft. Coils 1/2 *Per Coil* 18 s.w.g.

2 ft. lengths *Per Packet 4 Assorted Colours* **1/-** 16 s.w.g.

Supplied by all Radio Dealers — *Write for Descriptive leaflet.*

All genuine Glazite bears this mark. Insist on seeing it.

Our mark is a guarantee of quality.

THE LONDON ELECTRIC WIRE CO. AND SMITHS LTD.

(Makers of Electric Wire for over forty years).

Playhouse Yard, Golden Lane, London, E.C.1

Telegrams: Electric, London Telephone: Clerkenwell 1388, 1389, 1390, 1391

JUDD.

RADIOTORIAL QUESTIONS & ANSWERS.

(*Continued from page 772.*)

to be used. Connect aerial to one end of A.T.I. and other end to earth—or slider to earth if a solenoid coil with slider is to be used. A variable condenser is connected across the A.T.I. if a plug-in coil is utilised. The aerial also goes to grid of valve, while the plate goes to the aerial terminal of crystal set. The earth terminal of crystal receiver should go to H.T. +, and H.T. — be taken to earth, as also are one of the filaments and L.T. —. The remaining filament is connected through the rheostat to L.T. + The 'phones remain in their old position on the crystal set. It may be found necessary to connect a small fixed condenser across A. and E. of crystal set to load up the coil before it will act as an anode coil.

DX RECEPTION.

J. W. of Blackley, Manchester, discusses the article, "Those Other Stations," published in our issue of November 7th, and suggests the remarks about DX reception are too caustic.

The article is question was intended as guidance to those *listeners*, as distinct from *amateurs*, who expected to be able to tune in DX stations and enjoy them from a purely "broadcast programme" point of view. We agree that from an amateur point of view the hobby of DX reception is extremely interesting and that is why we frequently publish DX receivers, but it must not be forgotten that in the case of the amateur the joy of reception is not in anyway marred by any little distortion, or jamming from the stations. He aims at getting a station and on hearing it has reached achievement. As a matter of fact, we believe Mr. Rogers has more to say upon reception conditions in the near future when he discusses both local and DX reception from the amateur's point of view, as well as from that of the man who wants pure entertainment and a good programme.

LOADING COILS.

R. F. (Henley-on-Thames).—When loading coils are added in both circuits to increase the wave-length, should coils of similar size be placed in both circuits, or should the secondary circuit have larger coils than the aerial circuit? I notice that instructions for making secondary coils generally give them as being much larger than the coil on the primary of the same set.

The coils should be loaded at a similar rate, and if the inductance of one circuit is increased by a No. 50 coil the other circuit will need a similar coil to bring it into tune.

The reason that the original primary and secondary coils are of different dimensions should be apparent if it is remembered that the aerial itself is connected to the aerial coil, and therefore a smaller coil in the aerial circuit will be required in order to give the same wave-length as the secondary circuit, which has no aerial.

Once the circuits have been brought into tune in this way equal loading will keep them fairly closely in tune with each other.

FILLING HOLES IN EBONITE.

"CONSTRUCTOR" (Southend-on-Sea).—Can small holes in a panel be filled so as to hide them?

Black sealing-wax is quite effective, or the very handy preparation known as "Chatterton's Compound." The best plan of all is to file down an ebonite rod to the same size as the hole and then drive it in to make a tight fit. Saw it off close to the panel surface and then file down until smooth. The surface can afterwards be polished.

DIAGRAMS OF VARIOUS KINDS.

G. C. (Stamford Hill, London, N.).—What is the difference between a "pictorial" diagram and a "practical" diagram, and why is it that several kinds of diagram are necessary even for the same circuit?

The pictorial diagram shows sketches of the various components as they appear before being mounted upon the panel, and by means of the connecting lines it shows how the various parts are joined together in the circuit. Even a novice can read this kind of diagram and gain a clear idea of how the parts stand in relation to one another.

The "practical" diagram, which appears in constructional articles, shows the connections of a specific set: very often it shows how the actual wires are placed, but generally its most important function is to indicate how the components at the back of the panel are spaced, and how the wiring is actually carried out in the set under construction.

The theoretical diagram does not show either the components themselves or a view of the back of the panel, but it uses symbols to illustrate the various parts employed. It gives at a glance the path of the current flowing in the set, and to an experienced eye it conveys the essentials far more rapidly than either of the other kind of diagrams.

PARALLEL AERIALS.

J. H. P. (Cranbrook Park, Ilford).—My neighbour's aerial is parallel to my own and we share the same mast. When my three-valve set is tuned to the local station his signals are greatly increased, apparently by interaction, but he is unable to tune out and listen to other stations. How can this effect be lessened?

To reduce interaction, the aerials should run at right angles instead of parallel and reaction should not be used on either aerial or secondary circuit. Where aerials are separated only by a few feet it is impossible to avoid a certain amount of interaction between them.

THE UNIDYNE QUERIES.

SPECIAL NOTICE:

Owing to the very heavy demands upon the Technical Staff, it is regretted that the recent offer of free replies to Unidyne Queries must now be withdrawn. Commencing forthwith all such queries must be forwarded in accordance with the Rules of the Technical Queries Dept., as set out under the heading "Radiotorial."

RADIO AS A CAREER.

"AERIAL" (Somerset) writes:—"A young man very interested in wireless would like to know how to set about taking up Radio as a career. Where, and to whom, should he apply? He is a skilled constructor and has evolved a circuit of his own which is very successful.

(*Continued from page 776.*)

RADIOTORIAL QUESTIONS AND ANSWERS.

(Continued from page 774.)

We are afraid that there are very large numbers of people in a similar position to the one outlined. There are several different types of wireless careers now available, the chief being Wireless Operator in the Mercantile Marine, Wireless Operator in the Navy, Army, etc., or Wireless Salesman or Factory Hand. The two last-named are the classes from which manufacturers generally recruit their staff, for there is no royal road to promotion *via* examinations or degrees, and the practical man who knows the business thoroughly is often of greater use to a manufacturer than a man with higher theoretical qualifications.

Similarly the head positions of the great wireless companies are largely recruited from the ranks of operators, and there is opportunity for advancement in the wireless branches of the Services.

In the case of employment by manufacturers, the best method of approaching prospective employers is by direct application to the firm concerned. Particulars of the wireless opportunities in H.M. Forces can be obtained through the usual recruiting channels, whilst the conditions of employment in the Mercantile Marine can be obtained from the Wireless Companies or Shipowners. In the latter instance the candidate may also obtain free information from "The Association of Wireless Telegraphists," Lennox House, Norfolk Street, Strand, W.C.2.

H.F. AND L.F. AMPLIFICATION.

E. A. W. (Eton).—How does resistance-coupled low-frequency amplification compare with transformer-coupled ?

In general practice a transformer-coupled low-frequency amplifier will be found to give more amplification than a resistance-coupled one, although this latter form of coupling is not quite so liable to distortion as is the transformer method. If expense is no object, however, three stages of resistance-coupled amplification, which will be found to give about the same volume as two stages with transformers, will give a noticeable improvement over this latter form as regards purity of tone.

AERIAL RISKS.

"NERVOUS" (St. Leonards-on-Sea).—Is there any danger from an aerial being struck by lightning; or would a lightning conductor on the mast prevent this ?

The aerial itself forms a lightning conductor, and is therefore actually a safeguard *if it is directly earthed*. The down-lead should go to earth in a straight line without entering the house, and this can easily be arranged with an outdoor switch (which connects up the instruments when desired, but is normally "shorting" between aerial and earth leads). In these circumstances a lightning conductor on the mast is hardly necessary, but, of course, it can be erected if desired.

REACTION.

F. P. E. (Merton Park, London, S.W.19).—Are there more ways than one of employing reaction, and if so, how do they differ ?

The best methods of employing reaction are to couple a coil inserted in the anode circuit of a valve (usually the detector) to a coil either in the grid circuit of the same valve or the aerial itself. Another method is to connect a variable condenser between plate and grid or aerial, and pass the energy through in a static instead of electro-magnetic form. A variation of this static form is to tune the plate circuit of the reacting valve so that reaction takes place via the capacity between the electrodes of the valve itself. The first-named method is usually the more efficient.

RESISTANCE-CAPACITY-COUPLING VALVES.

J. W. (Hornsey).—Is there a valve designed specially for resistance-capacity coupling which will work from a comparatively low H.T. voltage, and if so, what is its voltage factor ?

The D.E. 5B (Osram) valve is specially suitable for resistance-capacity amplification, and its voltage factor (M) is 20. Other characteristics of this valve are:—Filament volts, 5—6; filament current, 0·25 amp.; anode volts, 20—120; impedance (R) 30,000 ohms; mutual conductance (M/R), 670; grid bias for L.F. amplification, 1½ volts.

A CRYSTAL SET FAULT.

F. S. (Fleet).—Can you explain the reason for a complete stoppage of signals on my crystal set at about the same time nearly every night, although previous to this stoppage signals are coming through perfectly ?

Quite possibly this is due to a faulty crystal, but this is rather improbable, because the trouble comes at the same time always. It looks as if a powerful receiver is being used in the immediate neighbourhood, and no care is being taken to prevent it energising the aerial. The only thing to do is to try and find out who the offender is, and carry out experiments with him until it can be definitely discovered how he is causing the trouble—probably innocently.

SIMULTANEOUS BROADCASTING.

A. B. C. (Torquay).—When the B.B.C stations are simultaneously broadcasting, does one receive the *sum* of the transmissions, or only the one station, as in a usual separate programme transmission ?

Each of the stations, although all are transmitting the same programme, is using its own particular wave-length, as is the case when it is broadcasting its own individual programme, so that one only actually hears only the station to which one's receiver is tuned.

REACTION AND VARIOMETERS.

M. O. D. (Sheffield).—I have a two-valve set (H.F. and detector), which is transformer coupled and tuned by a variometer. It is very non-selective and I am unable to get reaction. Would it be advisable to dispense with the H.F. transformer and use tuned anode, and shall I be able to couple a reaction coil to this or should I dispense with the variometer ?

Variometers as a whole are not very satisfactory, as they tend to give flat tuning. The variometer should be substituted for a plug-in coil and across this should be joined a variable condenser, ·0005. A reaction coil should then be joined in series with the plate circuit of the detector valve, and coupled to the aerial coil, the two coils being mounted in a two-way coil holder.

This gives you reaction direct on to the aerial, and allows you to retain the present H.F. transformer, thus avoiding more interference with the wiring than is necessary.

Correspondence

Letters from readers discussing interesting and topical wireless events or recording unusual experiences are always welcomed, but it must be clearly understood that the publication of such does in no way indicate that we associate ourselves with the views expressed by our correspondents, and we cannot accept any responsibility for information given.—Editor.

A "CHITOS" THREE-VALVE SET.

The Editor, POPULAR WIRELESS.

Dear Sir,—With reference to the "Chitos" set which you published recently in "P.W." I have had your "Chitos" set made up to 3 valves, L.F. and power valve last stage, using Ediswan valves (dull emitters), and it is everything that you claim it to be, but with reference to a question which you published in "P.W." asking could this set operate a loud speaker, you replied that the set was not suitable for loud-speaker work, but having made up this 3-valve set I find that it is everything desired for L.-S. work. Sixteen stations have been received at good loud-speaker strength, using "Baby Sterling" loud speaker.

I think I can claim that this is indeed a record.

My very best wishes to your paper, also to the inventor, for such a wonderful circuit.

Yours sincerely,
H. W. HORTON.

8, Nethergate, Upper Gornal,
Nr. Dudley, Worcestershire.

NEUTRODYNE EXPERIENCES.

The Editor, POPULAR WIRELESS.

Dear Sir,—I have read with great interest the article on neutrodyne circuits published recently in POPULAR WIRELESS, but my experience with apparatus of this type has led me to rather different conclusions.

First, as regards ease of handling, when a neutrodyne set is properly neutralised it is as easy to tune as any super-het. As regards selectivity, I am less than two miles and a half from 2 L O, but on a 60 ft. "T" aerial 2 L O is inaudible when listening to Bournemouth.

I am inclined to criticise the design of H.F. transformer recommended by the author of the article. I fear that the coupling of the primary and secondary windings is too tight and that the well-known tuning hump may be the result.

I am quite unable to understand the suggested arrangement of the H.F. transformer to avoid magnetic coupling. When placed in the relative positions shown in the photograph, this coupling will be nearer the maximum than the minimum. It may be that the transformers are so connected that their magnetic fields are reversed. In this case, it is conceivable that the magnetic coupling may act as a stabilising factor by negative reaction. This is, however, a departure from the neutrodyne principle, which relies on the balancing of the stray capacities to prevent oscillation.

I would strongly advise anyone intending to build a neutrodyne set with 2 H.F. stages to follow American standard design as far as the H.F. stages are concerned. This does not mean necessarily using American components, as any good condenser will do and the H.F. transformers present no difficulty.

The one difficulty, using English valves and valve holders, is correct neutralisation. I have found it necessary to try various types of condensers for this purpose, as some have too small a maximum value, and others too large a minimum. The correct size depends upon the circuit used, upon the position of the balancing tapping, upon the type of valve and the type of valve holder. Sometimes a condenser with a large maximum value like the Polar micrometer condenser will be found correct, but it is equally likely that a condenser of very small minimum capacity like the original American neutrodyne or the microhm vernier condenser will be found none too small.

Yours faithfully,
HUGH LEDWARD.

6, King's House, King's Road, S.W. 10.

A SUCCESSFUL REFLEX SET.

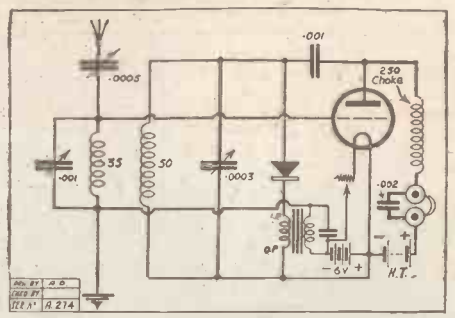
The Editor, POPULAR WIRELESS.

Dear Sir,—The enclosed diagram is a one-valve and crystal reflex set, which I have constructed and which I find gives excellent results. I can effectively cut out 5 I T, only about two miles away, for practically every other B.B.C. main station (with the exceptions of Aberdeen and Dublin) and Nottingham and Stoke-on-Trent relay stations. All these stations come in at a comfortable earphone strength. Chelmsford and Radiola can be separated effectually, and Brussels and a German station about a few metres different wave-length, besides Hamburg, Le Petit-Parisien and Madrid have been heard, the latter not for a few weeks now.

I am using a combination of zincite and bornite in an old R.I. permanent detector, and get even better results, than previously, using the "R.I." as manufactured.

I have coupled the 250-turn choke coil in a three-way coil holder, and I find that in some way it improves reception on weak signals.

Using large coils 250 and 300, I find that there is two or three large Morse stations which I never have been able to recognise.



If any of your readers would like to have particulars of this set, I would be pleased to furnish same, as I have derived much help from some of your correspondents' letters and remarks, and am always willing to reciprocate. I have made four of these sets and each one has functioned perfectly in several districts near Birmingham and up to 19 miles away, and my friends are pleased with the result.

Yours faithfully,
W. T. KING.

32, Clent Road,
Handsworth Birmingham.

REFLEX OR STRAIGHT?

The Editor, POPULAR WIRELESS.

Dear Sir,—May I make a few comments on Mr. Boothroyd's letter on "Reflex Circuits versus Straight Circuits" in "P.W." No. 176.

Mr. Boothroyd, quite truly, says that we are aiming at efficiency combined with economy in receiver design, but I do not consider that either of these objects is attained in the usual single-valve and crystal reflex, and my own experiments show that the straight single-valver with magnetic reaction and low-loss design is far superior to the reflex.

Theoretically, of course, a single-valve reflex ought to give the results of a three-valve straight circuit, but in practice this is very wide of the mark.

Experiment proves that the range of the straight single-valver is unlimited if carefully handled, but this cannot be said of any one-valve reflex. Perhaps "reflex" fans will argue that the reflex will operate a loud speaker whereas the straight single-valve will not, but this is not the case, as I can do so quite well up to twenty-five miles. So I think that argument will not bear weight.

He goes on to say that the reflex may be made quite stable, but I have yet to see one with the perfectly smooth reaction control associated with the straight circuit of good design, and this is the chief factor in long distance reception.

As argument in favour of the reflex, Mr. Boothroyd mentions that he can switch over from the reflex to the straight, the reflex proving superior. Surely, this is no test since it introduces many sources of loss and complications which cannot be compensated for in the tests.

Yours sincerely,
F. PRESTON, 2 B J O.

2, Bright Street, Haworth Brow, nr. Keighley.

THE FOUR-VALVE L.S. SET.

The Editor, POPULAR WIRELESS.

Dear Sir,—May I take this opportunity of thanking "P.W." and Mr. K. D. Rogers for the excellent 4-valve loud-speaker set of your March last paper. I have tried out some eighteen hook-ups from your valuable paper, especially those by Mr. Dowding or Mr. Rogers, as I know it to be worth trying out before either gentleman put their names to it. The present set, with separate H.T. to all valves and ·5 megohm resistances on transformers, is superb in purity of tone, whilst I can receive any B.B.C. station on loud speaker (Brown H.2) at will. Foreign stations I can get with equally good results. Madrid can be heard all over the house. This on an inferior aerial not more than 20 ft. high, closed in all round. Dynamo No. 1 within 10 yd., dynamo No. 2 within 15 yd., dynamo No. 3 within 30 yd. Interference from these so loud as to nearly cut out nearest station, Hull. Wishing your paper the success it richly deserves.

Yours faithfully,
H. DONNER.

P.S.—Have tried the old Unidyne, but owing to the above interferences, not with any success; yet, when taken to another aerial, results were equal to any 1-valve using H.T.

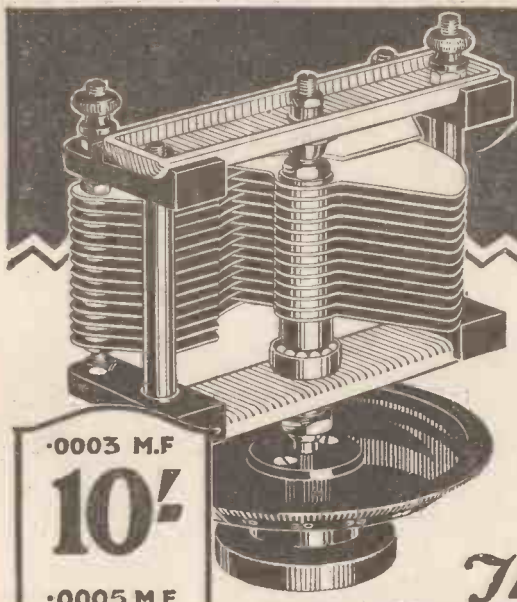
41, Upgate, Louth, Lincs.

THE "MARCUSE" SHORT-WAVE SET.

The Editor, POPULAR WIRELESS.

Dear Sir,—With reference to the "Marcuse Short-Wave Receiver," described in "P.W." No. 178, it may interest you to learn that I have made up this set, and recently tried it out. As a trial I employed a Mullard Ora valve, and for the choke a 75 Igranic coil (which I had by me). The

(*Continued on page* 780.)



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gives months of regular, unfailing supply and can be re-charged at a negligible cost. It comes to you dry, but charged, you fill it with dilute acid and it works for months. Our 60-volt accumulator is equal to an 80-volt dry battery or more—Get one now.

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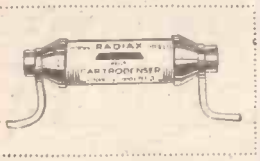

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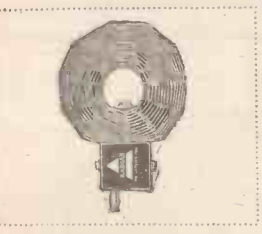

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·0003	.. ..	1/7	·0025, with 2-meg.		
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These coils consist of wire and air, no shellac, wax, or celluloid, yet they are marvellously strong.

25	.. 1/6	75	.. 2/3	200	.. 4/3		
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50	.. 2/-	150	.. 3/-	300	.. 5/3		

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PORTSMOUTH

CORRESPONDENCE.

(*Continued from page 778.*)

set oscillated very nicely, and, although I am no expert at Morse reading, I almost immediately tuned in a station calling "ABC de WQO." This was between 11.36 and 11.55 p.m. A little later I tuned in "WIZ" and "WIL." Tuning was, of course, very critical, even when using extension handles (I have fitted low-loss condensers) but the strength of signals was remarkably strong and clear. I found signals could be heard quite clearly without any aerial merely using an earth alone.

May I take this opportunity of congratulating you on the excellence of your publication. I may say I have every copy since No. 1 in my possession, and its steady improvement in every way is very marked. You have struck the right note in introducing the short-wave articles.

Wishing "P.W." continued success,

Yours truly,
T. A. ISERBYT.

"Lynmouth,"
18, Broughton Road,
Thornton Heath, Surrey.

LOUD-SPEAKER EXTENSIONS.

The Editor, POPULAR WIRELESS.

Dear Sir,—Although I have been a constant and fairly close reader of your paper, I have no recollection of seeing the following suggestion referred to in your journal. It is, of course, not claimed that the idea is "new" or "original" but it may be of practicable utility to many of your readers and it is sent to you for consideration and concerns the utilisation of the house electric bell circuit system for extension of wireless to other rooms.

In order to avoid separate wiring for the purpose of extending wireless reception to rooms other than those in which the set is permanently placed this may be easily accomplished by connecting the 'phone terminals of the "set" to the "Bell Push" of the Electric Bell Circuit. This is done by drilling two holes in the cover of the bell push immediately opposite the terminals to which the bell wires are connected and inserting a plug so as to make contact with those (two) terminals. Each bell push in the room or rooms to which extension is required should be similarly treated, the "'phones" or "further extension cord for use in room only" being plugged in. It is necessary to disconnect the Bell Circuit Battery during the period the extension is in use.

Yours faithfully,
H. C. MICHELL.

20, Farquharson Road.
Croydon.

THE "CHITOS" CIRCUIT.

The Editor, POPULAR WIRELESS.

Dear Sir,—It may interest readers to hear the results I have obtained with various sets that have been constructed from "P.W."

The "Chitos" set gives very good results here. I have managed to get 2 L O very loud on 'phones. Birmingham at good strength. Bournemouth good. Daventry good strength, especially on morning concerts. Radio-Paris, fair. Brussels, fair. The chief thing is to cut out 2 L O, but this is managed by very careful adjustment; a wave-trap will help.

I have also built the Armstrong regenerative set, and the "Auto" one-valve set. This latter I consider the best set for a loud speaker. In fact, your article in the current issue, "The Best One-valve Loud-speaker Set," has various circuits that I have tried, but the "Auto" beats them. It works a loud speaker with good volume, and equals the "Chitos" for selectiveness.

I wish your valuable paper every success, and I always enjoy your various articles and circuits, which are so interesting.

Yours faithfully,
H. S. BRACEY.

Factory Square, Streatham, S.W.16.

THE TRINADYNE CIRCUIT.

The Editor, POPULAR WIRELESS.

Dear Sir,—Having given the above-mentioned circuit a thorough test, I think you may be interested to know my experiences with it.

I am strongly of the opinion that this circuit should be made more widely known and should take its place with other well-known "straight" circuits. It is eminently a "straight" circuit, based on a commonsense principle, and is simple in conception, in operation, and in wiring.

I have tabulated below the outstanding merits of the Trinadyne in comparison with the more well-known circuits:

1. For a near-by station the set can be operated as a perfectly orthodox crystal L.F. receiver, with no switching or alteration in any respect, simply by refraining from the use of reaction.

2. For more distant stations reaction can be used very efficiently, which practically has the effect of preceding the crystal with an H.F. valve.

3. The leaky-grid method of detection with its inevitable distortion is wholly eliminated, and the purity of crystal rectification is a marked feature of the circuit.

(*Continued on page 781.*)

CORRESPONDENCE.

(*Continued from page 780.*)

4. It is extremely stable in operation, in marked contrast to the reflex type of circuit, and every valve used is functioning at its highest efficiency—i.e. as an amplifier.

I find that this circuit, consisting of crystal and two valves (Trinadyne and 1 L.F.) will bring in Daventry (without reaction) and London (with reaction) at good loud-speaker strength some 35 miles N.W. of the latter station. I have also received on the loud speaker several Continental stations quite audibly within a radius of ten feet of the instrument. These results are distinctly better than can be obtained on a straight 0–v–1 circuit, both in volume and clarity.

I would strongly urge you to include the Trinadyne circuit in one of your constructional articles for the benefit of the large number of your readers who may not have the experience or inclination to "hook-up" their own sets from a circuit diagram.

My sole reason in writing is that I think this circuit is too good to keep to oneself. It would be exceedingly interesting to hear the views of other amateurs who may try it out—may I also suggest that it would be a fitting subject for a "P.W." test report in a future edition of your valuable paper?

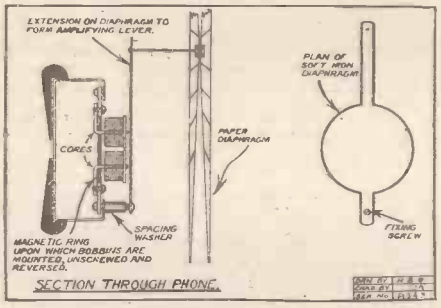
Yours faithfully,
S. E. CRYER.

Halton, Bucks.

PAPER DIAPHRAGM LOUD SPEAKERS.

The Editor, POPULAR WIRELESS.

Dear Sir,—I have been experimenting in the construction of a loud speaker of the pleated paper diaphragm variety and I came across a little dodge which may be of some use to your readers. It lies in the connection between the 'phone diaphragm and the paper one. As can be seen from the accompanying sketches it consists of an adaption of the lever principle of magnification as an oblong piece of soft iron is used instead of the customary round diaphragm.



The one difficulty seems to be the adjustments of the magnets and is best overcome by using that type of 'phone in which the magnets and terminals, etc., are mounted upon a separate ring, which can be unscrewed and reversed; that is, placed so that bobbins project out of the back of the 'phone.

I think that the sketches are self-explanatory and I may only add that I found this very successful, the volume of sound being increased by about fifty per cent.

Hoping that this may be of some use to you.

I beg to remain, yours truly,
F. D. BLAKE.

45, Sprules Road,
Brockley, S.E.4.

UNIDYNE RESULTS.

The Editor, POPULAR WIRELESS.

Dear Sir,—I have read in POPULAR WIRELESS several accounts of good reception on "Unidyne" sets, and I thought I would write and tell you of my experience with a one-valve Unidyne and an ordinary L.F. valve.

The L.F. was a "hook-up" on an old box, and under no circumstances gave an amplification of more than twice the original signal strength!

During the last two weeks of last April the following stations were received: London, Chelmsford, Radiola and Le Petit Parisien at moderate loud speaker strength.

Birmingham, Cardiff, Manchester, Newcastle, Bournemouth, Glasgow, Belfast, Aberdeen and Breslau at good 'phone strength: and Sheffield, Edinburgh, Leeds, Bradford, Madrid, and several other unknown stations at moderate to bad 'phone strength.

I would also like to congratulate you on the wonderful selectivity of the set. With a .0005 mfd. variable condenser in series I could separate Cardiff, Bournemouth, London and Manchester with the greatest ease, and these results were got at Chatham, which is only 32 miles from London, from which there was no interference.

Wishing "P.W." the best of luck,
I remain, Yours truly,
S. FALLOON.

Priory House, Dover College.

2 N M CALLING.

(*Continued from page* 767.)

It is evident that certain wave-lengths travel best by day and others by night, and whether it will ultimately be possible to find a wave-length suitable under both conditions, it is difficult to make any definite statement at the moment. These experiments of which I am speaking have been carried out with low power, in the neighbourhood of 500 watts, but on certain favourable mornings signals have been received from New Zealand and Australia, and give readable strength when using the input of 3½ watts, which is equal to that consumed by an ordinary pocket flash-lamp.

One salient feature of these high frequencies is the effect the sun's rays have on signal strength, and also it has been noticed when clouds have been low, near or over the transmitting or the receiving station, considerable fading has taken place, and observations have been made on nights when it has been practically impossible to get any signals through at all between, say, Australia and England.

High Speed Fading.

There is one point which must be mentioned here in connection with C.W. and telephony transmissions: that is what has been termed as high-speed fading, and this has the effect of not only distorting telephony, but also distorting modulated or continuous waves, and although perfectly audible and undistorted speech and C.W. waves have been emitted from the transmitting station, yet at a distance of, say, 3,000 miles, the telephony appears distorted and the modulated waves rough, while at distances of, say, 12,000 miles, the telephony and modulated waves have been perfectly free from distortion. It appears to be essential, in order to obtain the best results on short-wave transmissions from 50 metres down to 20, that either one of the stations must be in darkness, but, on the other hand, the best results with the Antipodes have been obtained in brilliant sunshine at both the transmitting and receiving stations, which tends to prove that signals travel through the dark belt.

There is still a lot of ground to be covered and room for further experiments for some considerable time to come before we can prove any theory on the vagaries of short-wave transmissions.

A STRAIGHT 3-VALVER.

(*Continued from page* 763.)

nections must be checked over by the point-to-point list of connections given on page 763, and then the panel and wires cleaned up so as to remove any traces of flux or loose beads of solder.

The set is now ready for testing. The choice of valves must be left to the constructor, though it is advisable that he choose them according to the tasks they have to perform. For instance, he should use an H.F. valve in the first stages of the receiver and a valve designed for L.F. amplification in the last stage, while a good general purpose valve will act excellently as a detector. The filament voltage of the

(*Continued on page* 783.)

A STRAIGHT 3-VALVER.

(Continued from page 782.)

valves must be chosen to suit the constructor's own convenience, while a 72-volt H.T. battery should be all that is required for both long-range reception and local loud-speaker work. The coils recommended are a 50 in the reaction position, 75 for anode, and a 50 or 75 in the aerial socket. The size of this latter will depend upon the stations the listener requires to receive and upon the size of his aerial. He should, therefore, try both the 75 and the 50 as his aerial coil, and also both parallel and series tuning, in order to find out which suits his own local conditions best. The coils given above are, of course, for the reception of broadcast wave-lengths, excluding 5 X X. For this latter larger coils will be required, a 150 or 200 aerial coil, a 250 anode, and a 150 reaction probably being the most suitable.

TECHNICAL NOTES.

(Continued from page 754.)

slanting slot, and is threaded and fitted with a nut. The end of the busbar to be joined to it is laid in the slot (having been first passed through the loose nut), and the nut is then placed in position and pulled up. As it progresses, it drives the busbar against the slanting slot, until it finally comes home with a tight grip.

A New Potentiometer.

The importance of grid bias has several times been mentioned in these Notes, as well as elsewhere in this Journal, and it is interesting to note that a new device has now appeared on the market, in the shape of a grid bias potentiometer, which is designed to enable the operator to secure the correct value of the grid bias for best working of the set. In the ordinary way, it is usual to try different numbers of cells, or indeed, to put in some conventional number more or less by guesswork, such as a 4½-volt battery or a 9-volt battery, and hope for the best. The new potentiometer has a resistance value of about 30,000 ohms, and may be disconnected from the grid battery when the set is not in use. The resistance is sufficiently high to ensure that no damage is done to the battery. A moving contact permits any desired bias voltage to be applied to the grid between the limits afforded by the battery. This appears to be a very useful component, as there is no doubt that, especially with certain types of circuit, the grid bias adjustment is a critical matter, and one which makes all the difference to the purity of reception, as well as to the high tension current. The makers of the device mentioned are the Igranic Co.

Patent Arrangements.

A reciprocal arrangement has been entered into between the United States navy and the Pacent Electric Co., whereby radio patents controlled by each may be shared by the other. The navy gives rights on the basic radio-frequency circuit, the reflex circuit, and radio patents seized from the Germans during the war, and receives, on the other hand, the right to use the radio plug, rheostats and potentiometers patented by the Pacent Co.

FOREIGN RADIO NEWS

From Our Own Correspondent.

Developments in Russia.

THE Soviet Government has decided to construct near Moscow a new and very powerful station, to be known as the "Oktiabrshaia," or October-post. This will be used solely for telegraphic communications. The Chabolorka station near Moscow is to be reconstructed and enlarged, and will be reserved for broadcasting and telephony.

The well-known station at Nijni Novgorod is being supplied with a Government radio and short-wave laboratory. Recent experiments from this station led to messages on wave-lengths of 83, 102 and 104 metres being picked up clearly in Chili and on the west coast of the United States.

A new type of transmitter invented by Messrs. Bontsh and Tatarinoff, gave remarkable results, short-wave messages being received distinctly in various parts of Europe, Asia and Africa, including Cape Town and the Dutch East Indies.

Professor Bontsh is devoting his whole time to radio research work, and has invented a new valve transmitter of 100 kw., which is being fitted to the new station of Oktiabrshaia.

Radio Activity in Denmark.

The extension of radio in Denmark during the last few months is remarkable. Although the area of the country is so small, there are no less than six stations in working order and one under construction.

They are, with their respective wave-lengths: Lyngby, 2,400 m.; Copenhagen, 308 m.; Hammeren, 1,900 m.; Ryvang, 1,150 m.; Odensee, 950 m.; Hjörring, 1,205 m.; and Viborg under way.

Radio in Spanish Morocco.

A broadcasting station is to be erected in Spanish Morocco, near Ceuta. The enterprise is the work of a company which has been just formed under the name of Union Radio Ceuta. The station, which will be known as Radio-Ceuta, will use 250 watts.

Spanish System to be Recognised.

The Spanish broadcasting system is giving rise to a good deal of dissatisfaction. One or two of the stations are exceedingly good, one indeed ranking among the half a dozen best in Europe; but the larger number have no effective existence at all save on paper.

It is now proposed to put the whole system on a new footing and to co-ordinate the efforts of the various interested companies. Twenty-one stations are mooted, and are expected to be in working order within two years. They will use from 4 to 8 kw.

Warsaw Suspends Broadcasting.

The Polish station at Warsaw has suspended broadcasting till the spring. When it reopens it will have been entirely overhauled, and will use considerably greater power.

Sweden's Many Licences.

The growth of radio in Sweden is eloquently indicated by the following official statistics of the number of licences granted up to the various dates of the past year: January 1st, 39,801; July 1st, 99,082; November 1st, 102,507.

League of Nation's Radio.

The newly formed Institute for Intellectual Co-operation, inaugurated here under the auspices of the League of Nations, is apparently fully alive to the importance of radio.

In the course of a chat about the Institute broadcast by Radio-Paris stations, M. Luchaire, the Director of the Institute, announced that, starting this month, there would be issued daily by that station a news bulletin covering every department of activity of the League of Nations.

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