

THE 1926 TWO-VALVE UNIDYNE SET.

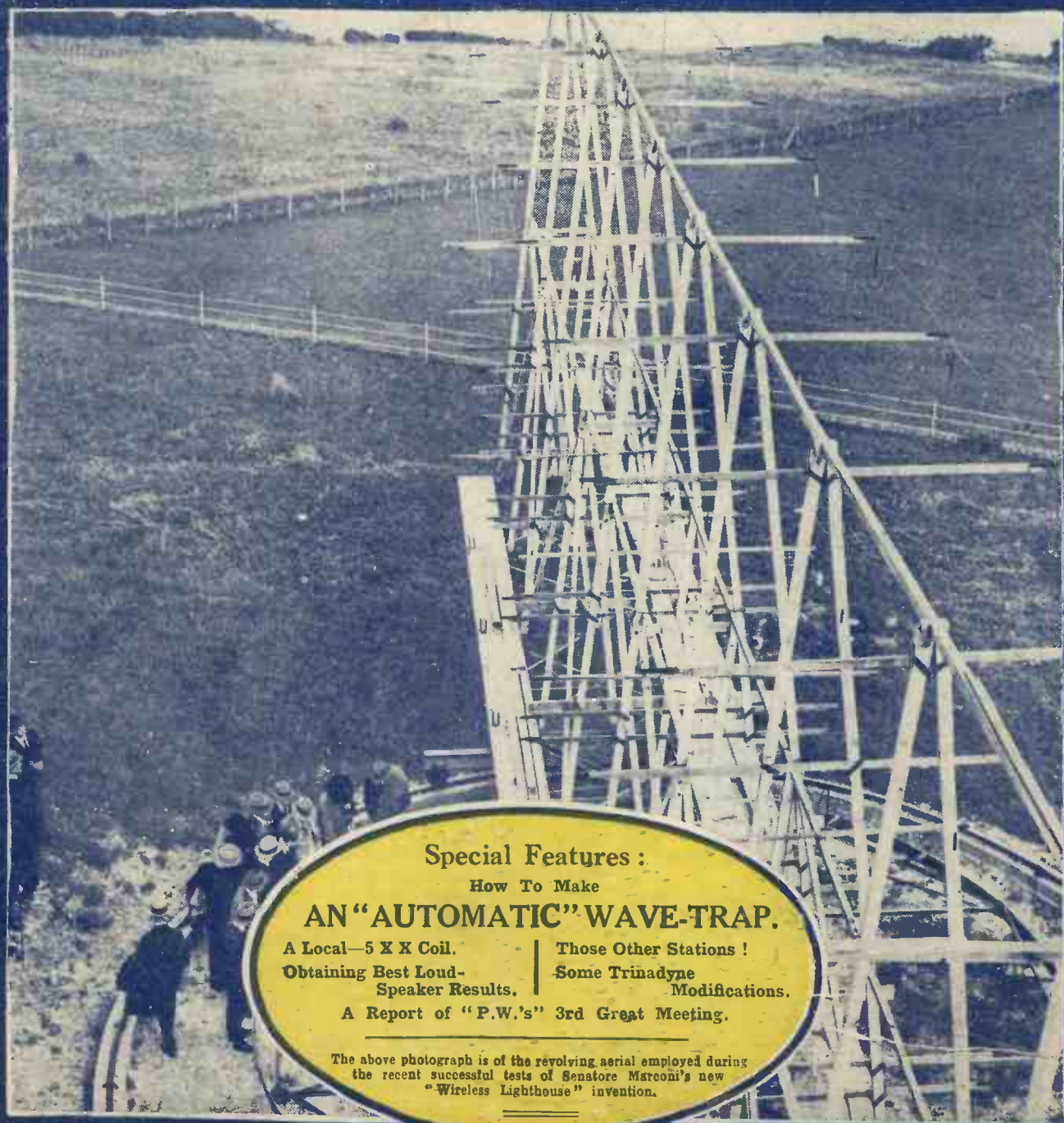
Popular Wireless

Every Thursday
PRICE
3d.

No. 180. Vol. VIII.
November 7th, 1925.

and Wireless Review

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



Special Features :

How To Make

AN "AUTOMATIC" WAVE-TRAP.

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.



Dubilier everywhere

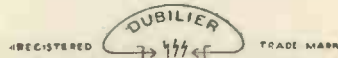
—in the Desert

Grilling days and freezing nights, sudden sandstorms and scorching winds, no wonder Wireless Equipment in the desert has to be so good! That is why you find Standard Dubilier Condensers in all sets that have to stand up to difficult conditions such as this.

Dubilier products include:—Fixed Mica Condensers, Variable Air Condensers, Anode Resistances, Grid Leaks, the Dubrescon Valve Protector, 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.

Whenever any of these products are required, it is always safest to—

Specify Dubilier



Dubilier Anode Resistance. Values up to 100,000 ohms.
5/6

The Varicon Variable Condenser with Vernier, from 17/6



POPPY DAY

WEDNESDAY NOVEMBER 11th 1925



Wireless Men!—remember Nov. 11th.

BLIND to the sights around him—deaf to the sound of the guns—contemptuous of danger—sits the telegraphist. A vital little link in a great chain of communications. Upon his correct deciphering of a message may depend the whole success of a battle.

The ammunition so urgently needed may arrive too late—reinforcements for filling the gaps of the fallen may be diverted to the

wrong sector. In the confusion of battle truly much depends upon the stoical fortitude of the lion-hearted telegraphist.

Wireless men! You have much in common with those gallant wearers of Brown headphones in France, in Gallipoli, in Palestine, in Salonika, in Mesopotamia. Poppy Day affords you an annual opportunity of remembering them and those they left behind. Give generously.



Outwitting Father Time

—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.

Such a record low working temperature means one of the biggest steps forward in the history of the valve. A brilliant contribution to the fascinating quest for the "cold" valve.

The Wuncell functions at only 800°—yet some dull emitters operate at 2000°. And its filament—built up layer upon layer under the Cossor patent process—is practically as stout as that used in a bright emitter.

Allied to the Wuncell filament, of course, are the well proved Cossor principles of construction. A hood-shaped Anode which retains almost

the whole of the electron stream. An arched filament which is not subjected to the strains and stresses which every straight filament must undergo. And a hood-shaped Grid which—by a superb feat of engineering skill—is built up on a stout metal grid band with each turn of the wire secured in three distinct places. Every Wuncell Grid is secured in 35 distinct positions—such rigidity is not obtainable in any other valve. No wonder the Wuncell is acclaimed as the first non-microphonic Dull Emitter!

Remember, long life is only one of the Wuncell features—economy is another. Every Wuncell saves its cost in six months. An accumulator that lasted only one week on a charge with bright emitters would last nearly two months with Wuncell's. See your dealer about these super-economy valves at once and start saving money from to-day.



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

Popular Wireless

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RADIO NOTES AND NEWS.

A Final Farewell—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, giv'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 giv'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

NEXT WEEK

Another Unidyne receiver embodying further improvements will be fully described by the inventors. It will be known as

THE 1926 DX UNIDYNE SET.

An ideal receiver for the reception of really distant broadcasting, it is nevertheless one that is perfectly straightforward both in construction and in operation.

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 359.)

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. Eckersey, 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!

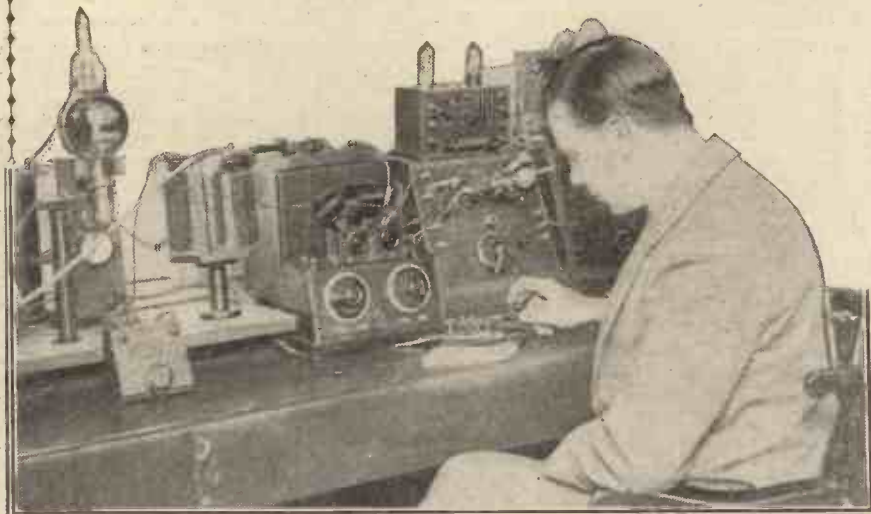
ARIEL.

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 considera-

tion 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-

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.

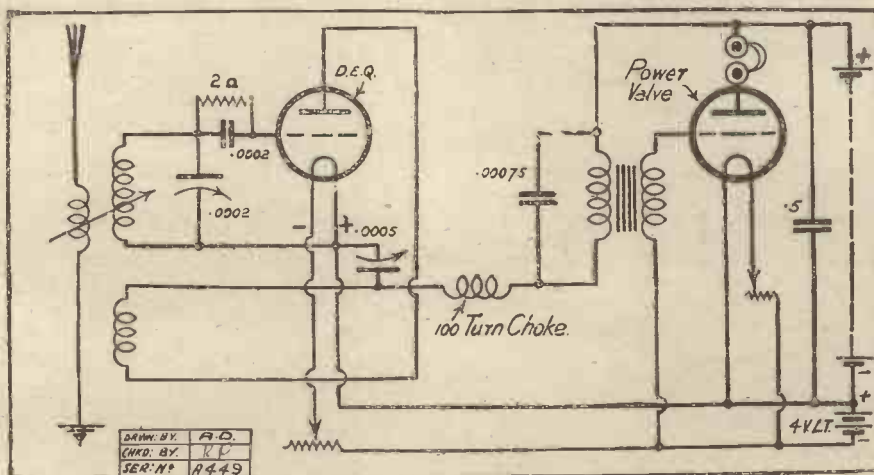


Diagram of the short-wave circuit discussed in the accompanying article.

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

(For the benefit of readers unfamiliar with the D.E.Q. I must mention that it is of the V. 21 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

(Continued on page 562.)

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 wave-length, 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

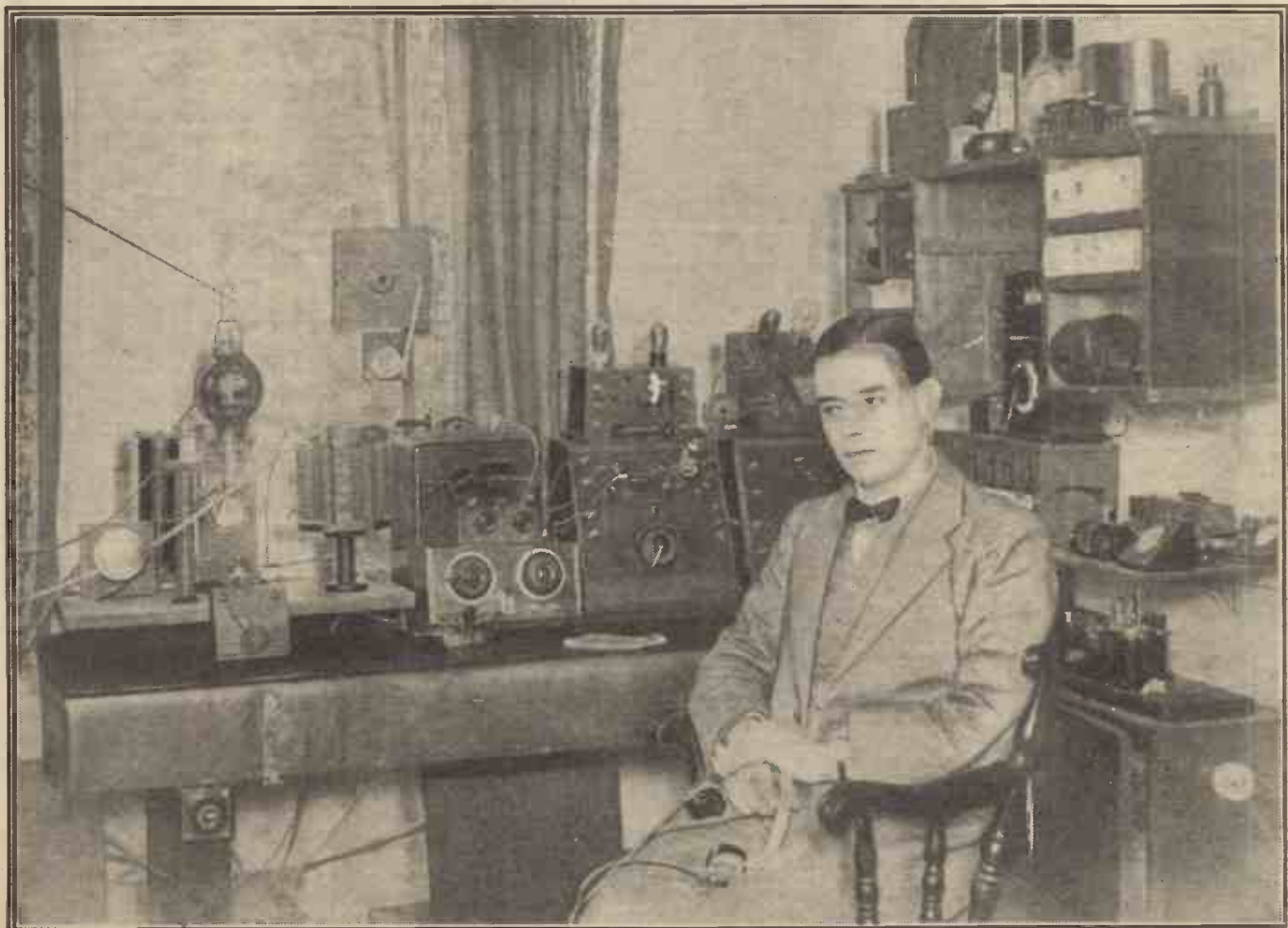
results, covering wave-lengths of from 13 to 40 metres, while a 12-turn grid and 9-turn reaction enable stations working between 25 and 70 metres to be received. A 3-turn grid coil will carry the wave-length down to 8 metres.

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

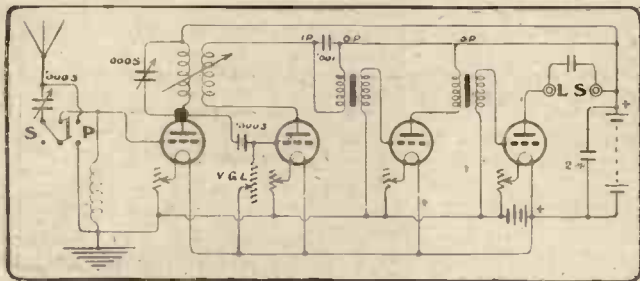
OSWALD J. RANKIN.

"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

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



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

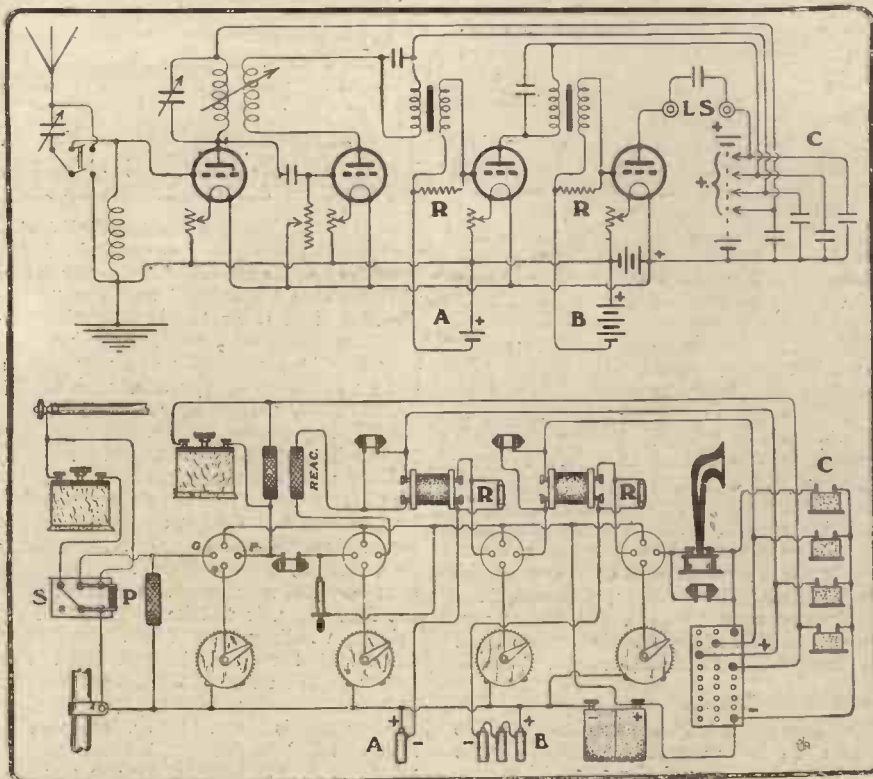
H.F. amplification, valve or crystal detector, and two stages of transformer-coupled L.F. amplification will generally give the best results provided one is capable of effecting the various little modifications outlined below, which constitute essential improvements.

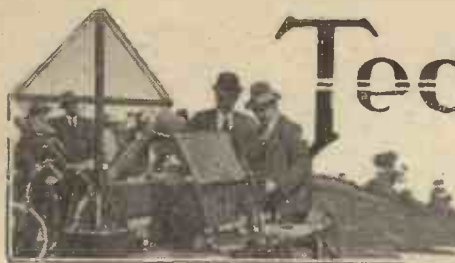
Two Years Ago.

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. amplification 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 0.01 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 queuing 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.

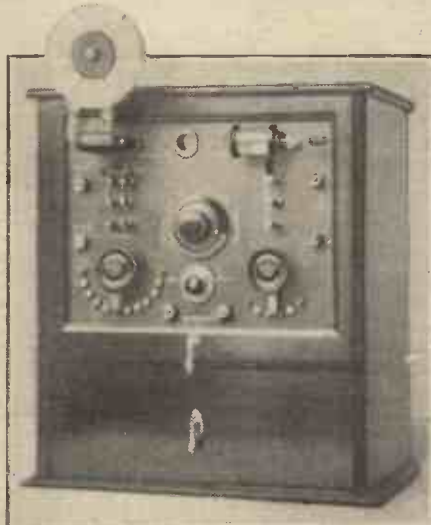
The work should be put in hand early in the new year, in order that the public may have the benefit of the new system by the beginning of 1927. While even the

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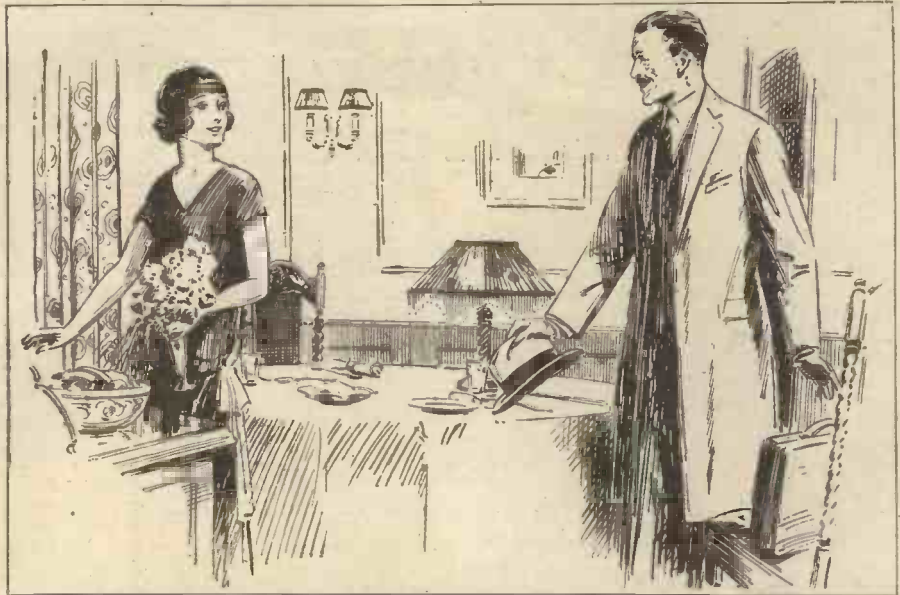
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Readers who would like to call at the Institute are heartily invited to do so. The Consultant will be very pleased to have a talk with them on any matter affecting their personal efficiency, and no fee will be charged for his advice.

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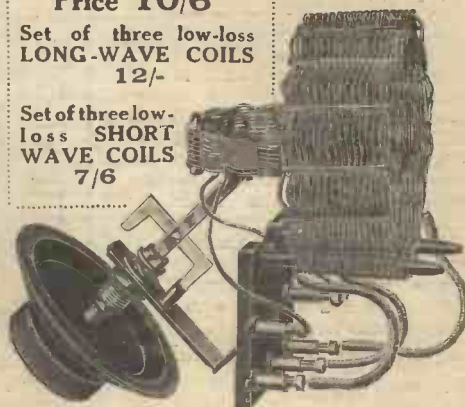
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An 'Automatic' Wave Trap



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, det., L.F., det. 2,

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.

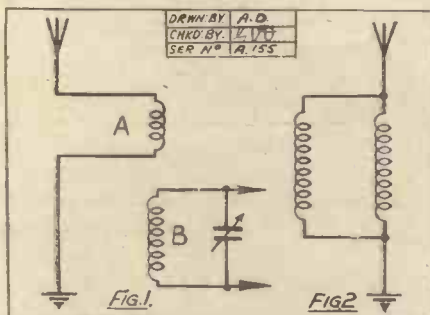
Aperiodic aerial coupling is the primary factor of the "automatic," but not the only one to which it owes its success. Additionally it introduces paralleled inductances, and in this manner brings about a reduction of tuning coil resistance. The effect of reducing grid circuit resistance has already been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

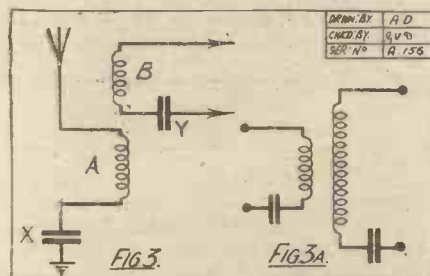
With the model to be described a wave-length range up to about 600 metres is



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.)



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

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.

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.

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 $\frac{1}{2}$ 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

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 "nodial" 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

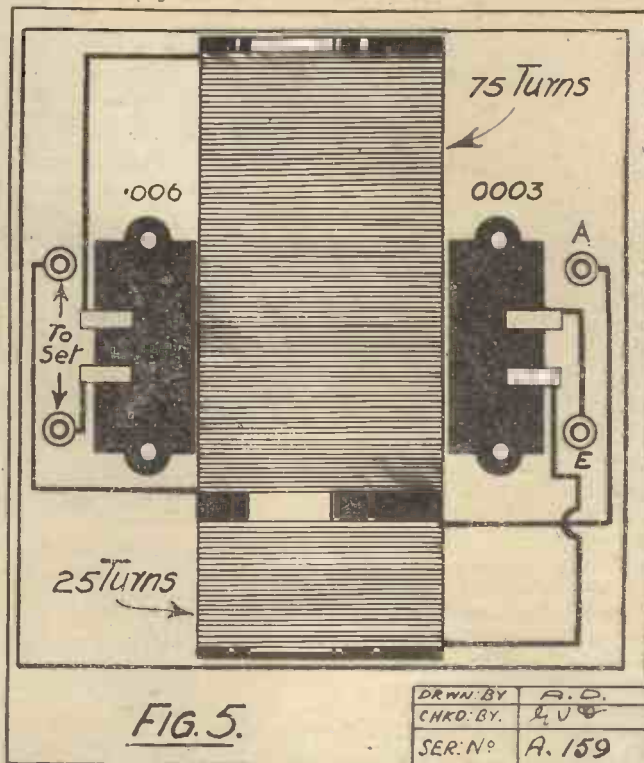
the instrument dealt with in this article should satisfy the requirements of the majority of listeners.

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

"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."

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.

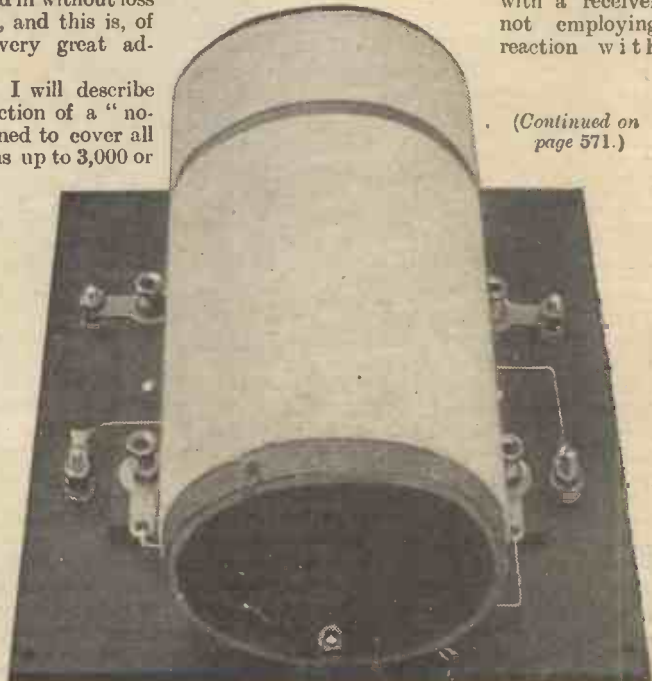
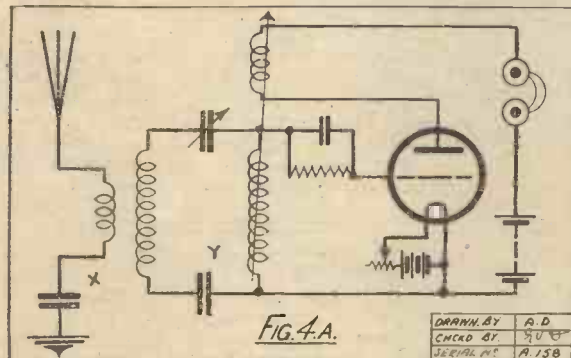


receiver. Where a 35 or 50 turn coil has been in use a 75 may be necessary. When series aerial tuning is used, the same law applies but at a slightly less degree, and a 100 turn coil may be required.

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.)



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.

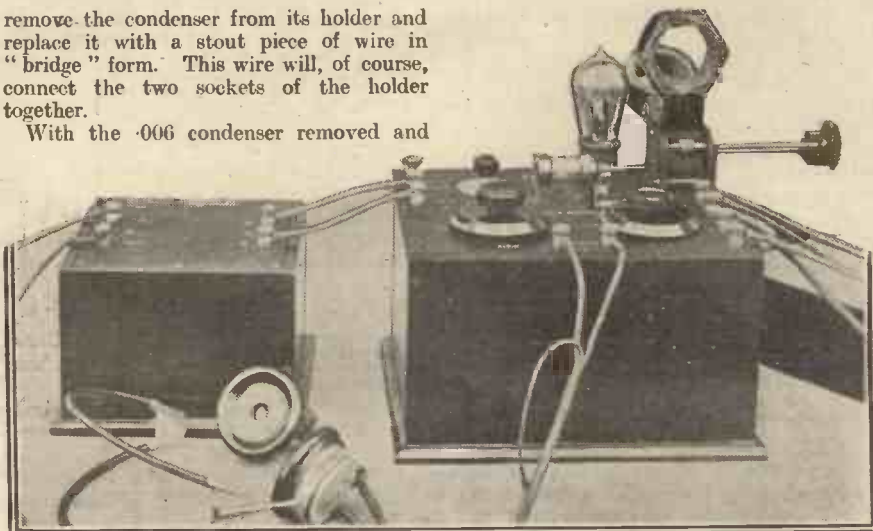
Should one of the various types of tuning units consisting of a tapped solenoid coil be in use, then it should be disconnected by slipping a tiny piece of paper beneath its switch arm. Should the switching arrangement be enclosed and not easily accessible, then it will be necessary to disconnect the 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 "Automatic" Wave-trap connected to an ordinary one-valve and crystal-reflex receiver.

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."

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.

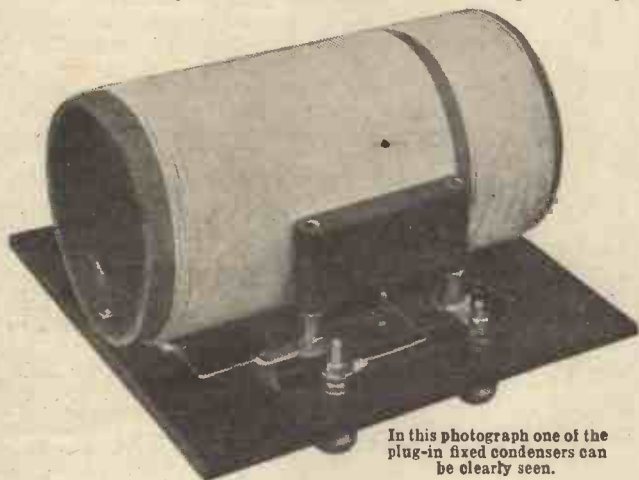
On the Higher Wave-lengths.

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.



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

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.

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

THOSE OTHER STATIONS!

By K. D. ROGERS.

(Assistant Technical Editor.)

A Commentary on Broadcasting Reception Conditions.

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.

Are 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.

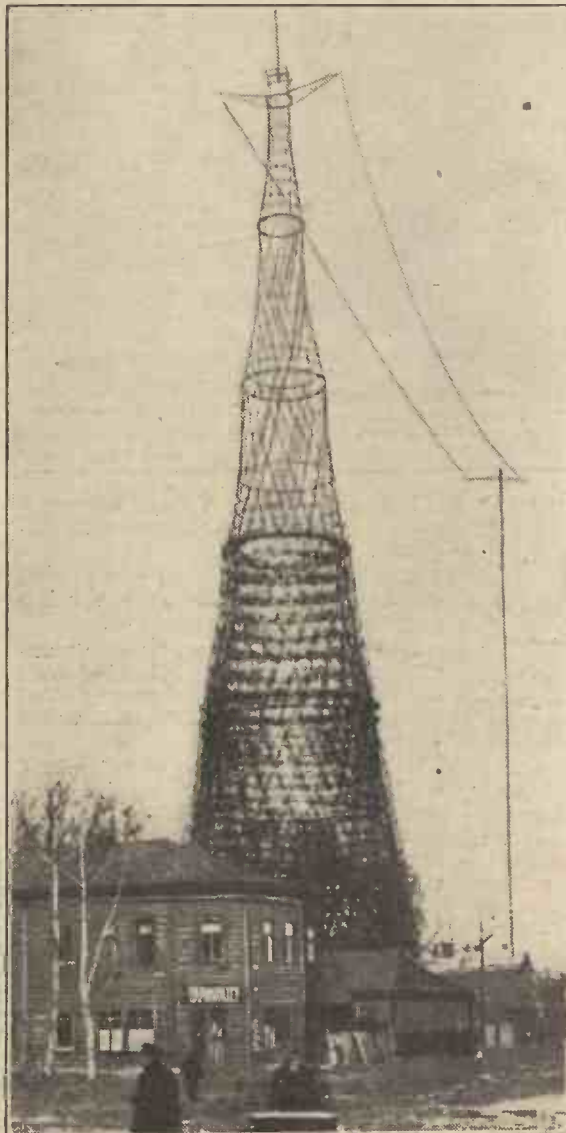
Readers will probably ask why I do not use a more selective tuner and cut out more of the "mush." This *does* have that effect, I admit, but it also cuts off the side-bands of the modulated telephony carrier waves, and the result is distorted music and speech from nearly every station whose broadcasting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



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



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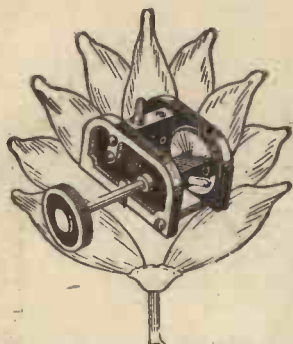
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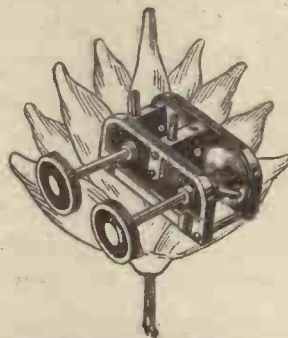
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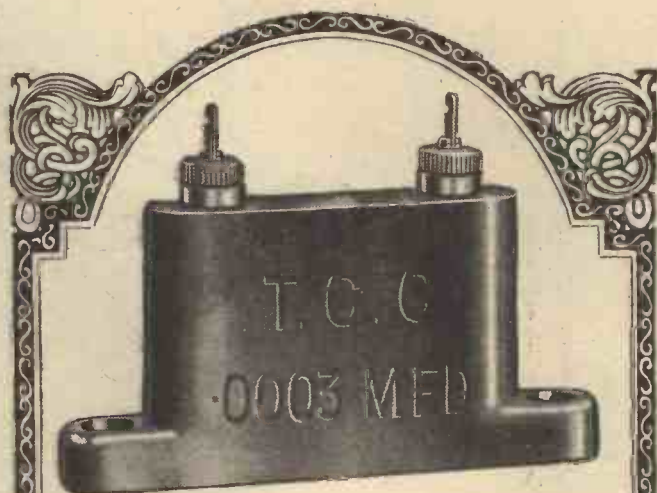
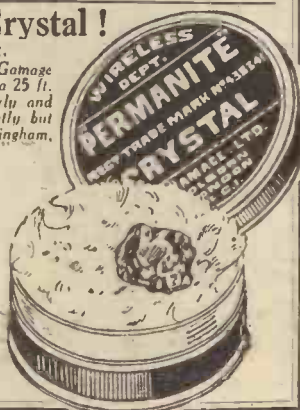
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The Climax Metal-Cooled Rheostats and Potentiometers are metal wound on metal cooling cores. They employ no carbon, no ebonite, no rubber. Except for the bakelite knob and terminal bar they are 100 per cent metal. The Climax Anti-microphonic Valve 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.

The phosphor-bronze contact brush is riveted, thus eliminating the double lock-nut which is a perpetual source of trouble in many rheostats.

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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.

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CLIMAX POPULAR L.F. TRANSFORMER.

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USEFUL NOTES ON DRY CELLS.

FROM A CORRESPONDENT.

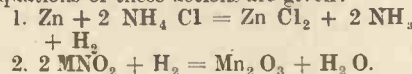
THE dry cell is still holding its own in connection with wireless sets, and will, in all probability, continue to do so, especially for H.T. batteries, for some time to come. They have their troubles, however, and the following notes may prove useful to readers who have experienced some of them.

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. Prac-

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:



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

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.

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.



Part of the aerial system of the Munster station.

tically 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.

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.

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 Hjørring 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 Frankfurt 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 Radiofonica Italiana is shortly to be moved from its present site to a new one near Naples.

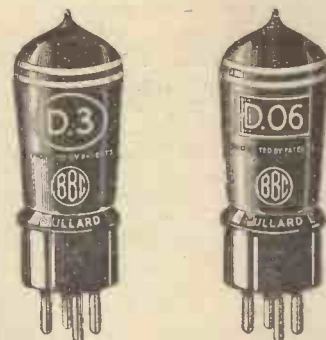
The opportunity will be taken to increase the power of this station, which will also operate on a different wave-length to be announced later.

A Radio College.

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

(Continued on page 608.)

Mullard Double Ring DULL FILAMENT Valves



DOUBLE WHITE RING FOR MASTER DETECTION

Mullard Double White Ring Valves have been specially selected for superior detection. They are made in two types:

Type D.3 for 2-volt accumulators - - - each	14/-
Type D.06 for 2 or 3 dry cells or 4-volt accumulators - - - each	16/6

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Mullard Double Red Ring Valves are designed for real long distance reception. They are made in two types:

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Mullard

THE MASTER VALVE

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"He's alright now"

JUST another of the many broadcasting enthusiasts that do not know the right valve for the right job. They get jumbled with the various makes and types, and after buying several wrong ones, come to me for help. Why don't they come in the beginning? They could get that perfect

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Mullard

THE MASTER VALVE

Ask any dealer for Leaflet V.R. 26, for complete range of Mullard Receiving Valves.

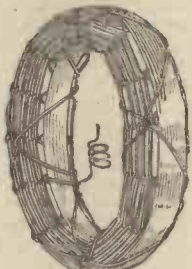


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is the coil you need.

Experts agree that the REFLEX fulfils to a very great extent the requirements of the ideal "low-loss" coil and it is generally accepted as the most successful self-supporting coil ever made. The special winding gives scientifically proportioned air spaces. The use of cardboard, ebonite, shellac, metal, etc. has been dispensed with and whilst the "Reflex" is wonderfully efficient, it is exceptionally low in price.

INSIST ON "REFLEX." No other coil is quite so good.

If unable to obtain please send us name and address of your dealer.



Manufactured under
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Patent No. 168,249

NOTE THE LOW PRICES.

Wave-length with .0005 in parallel (approx.).

No. 25	100—	250	8d.	No. 250	900—	2,500	3/3
No. 35	150—	300	8d.	No. 300	1,200—	3,000	4/3
No. 50	200—	500	9d.	No. 400	1,500—	4,000	5/6
No. 75	300—	750	1/-	No. 500	2,000—	5,000	5/6
No. 100	400—	1,000	1/2	No. 600	2,500—	6,000	6/6
No. 125	500—	1,250	1/6	No. 750	3,000—	8,000	7/6
No. 150	600—	1,500	1/8	No. 1,000	4,000—	10,000	8/6
No. 175	740—	1,750	2/3	No. 1,250	5,000—	15,000	9/6
No. 200	800—	2,000	2/9	No. 1,500	6,000—	18,000	10/6

5 XX Loading for Crystal Sets, 1/6

The NEW "Reflex" Coil Plug is an entirely new Plug, moulded throughout in genuine "Bakelite." It is highly finished, the metal parts being reduced to lowest possible minimum. Used in conjunction with "Reflex" Coils it gives maximum efficiency. **PRICE 1/-** each in attractive yellow cartons. Try this new coil plug to-day!

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it is round.**

Watmel Fixed Condensers are built this way for a very special reason. We discovered that by making them a circular shape we practically eliminated edge loss—an important consideration in condenser efficiency. They simply bristle with other good features too. Mica sheets securely clamped between the plates render it impossible for the capacity to vary, whilst the bakelite case ensures perfect insulation. Fixing is the easiest matter—one central screw only being necessary. For trouble-free condenser efficiency, always use

Watmel

FIXED CONDENSERS

Guaranteed Correct within 5%

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Lancashire and Cheshire representative: Mr. J. B. LEVEE, 23, Hartley St., Levenshulme, Manchester.

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Grid Condenser.

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.0001 } **2/6**
.0002 } each
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Standard
Fixed Condensers:

.002 } **2/6** each
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The **Scientific**
HEADPHONE



Its advantages

Lightness

The Scientific Headphone is extremely light, its total weight being only 8½ oz.

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The headbands are woven, making it possible to be worn for long periods without the slightest discomfort. It is the ideal headphone for ladies' use.

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It is instantly and easily adjustable by a sliding movement without the use of screws.

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It ensures a clarity and strength of tone associated with only the most expensive instruments.

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The Scientific is guaranteed 12 months.

Price

Its price is the remarkable one of 12/6.

No other headphone at such a price combines so many advantages. For your own sake insist on a Scientific.

Sole Wholesale Distributors:

J. C. & W. LORD, Ltd.,
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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 Eekersley, 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:

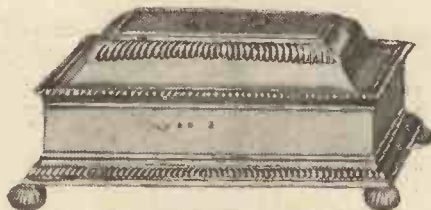
"I feel quite overwhelmed by this surprise which has been put upon me absolutely unexpectedly. If I had known before I should have asked my wife to come as she is in London with me (I expect I shall get it when I go home!), but she said she has already too much of the wireless

and can always hear Captain Eekersley 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.

"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



Senatore Marconi.

(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.

"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 basket, 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?

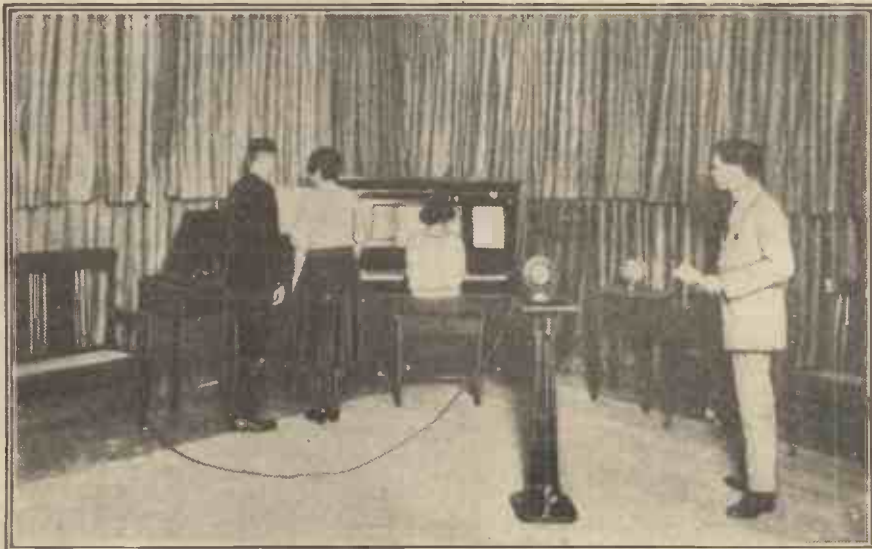
In the first place, if you want distance, you generally need to employ one or more stages of H.F. amplification before the detector will operate efficiently. Then, if you want loud signals, especially to operate a loud speaker, you require one or more stages of L.F. amplification, or "note magnification,"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

LIST OF COMPONENTS.

	£	s.	d.
1 Panel, 13 in. x 6½ in. x ½ 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 (Dublier) ..	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

briefly through the theory of operation of both the detector and L.F. stages of the set.

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

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 fulfils 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.

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

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.)

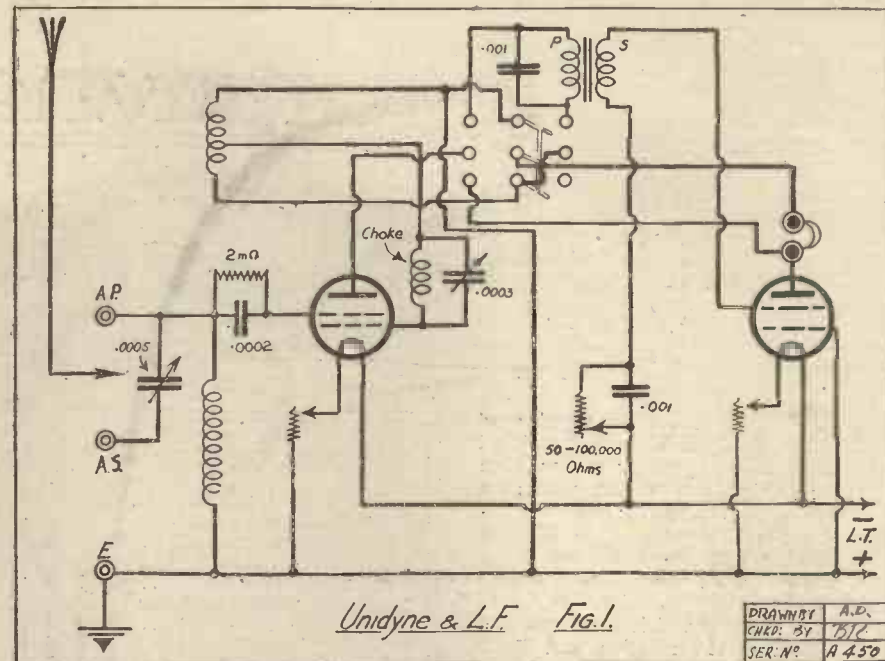
the full negative. This result has the effect of largely nullifying the effect of the inner grid, upsetting the balance of the circuit, and raising the internal resistance of the valve.

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 ter-



minals 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 ½ 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 mount.

ing. The photographs of the interior of the set will make the foregoing clear.

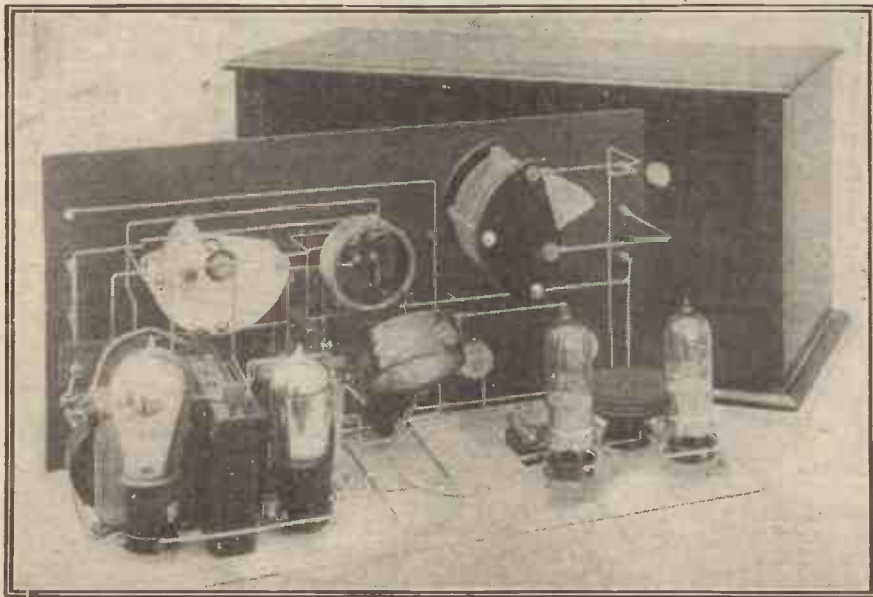
The strips are then drilled to take the ten valve sockets (five for each valve), these being located according to the template on page 588. These sockets should be reversed in position when the second valve holder is being considered so that the filament sockets face each other, the connecting up being 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.

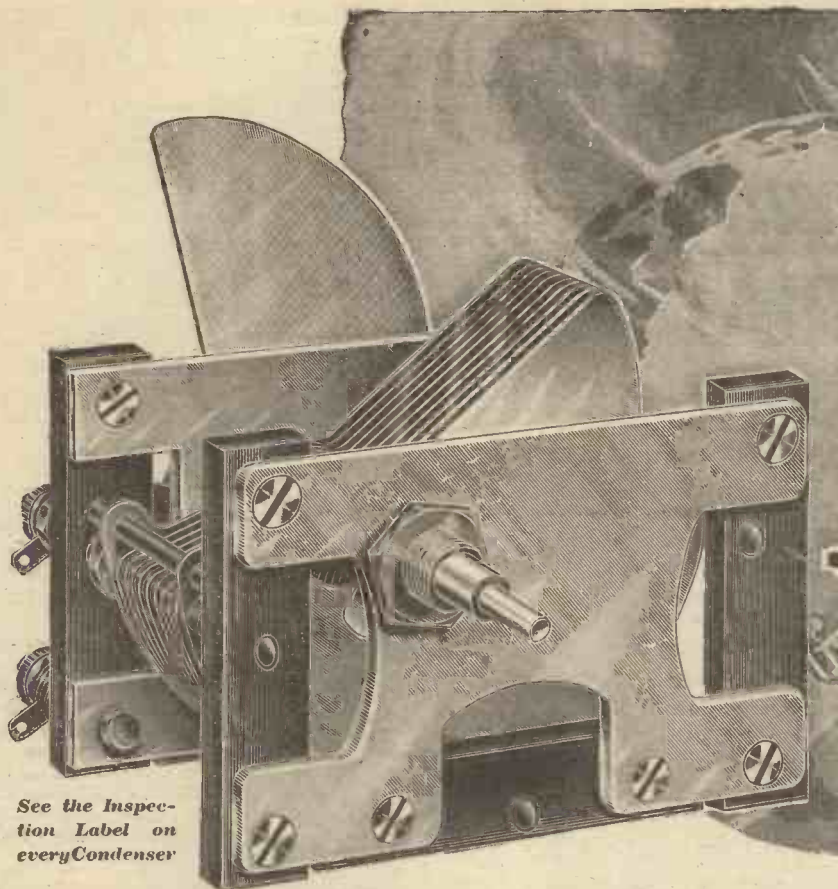
Winding the Choke.

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.)



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.



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0005	9/6	8/-
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35	4/9	280 to 440 metres	
50	5/0	390 " 680 "	
75	5/3	600 " 1,000 "	
For Daventry, etc.			
150	7/1	1,110 to 2,050 metres	
200	8/0	1,450 " 2,300 "	
250	8/9	1,800 " 2,700 "	

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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."

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

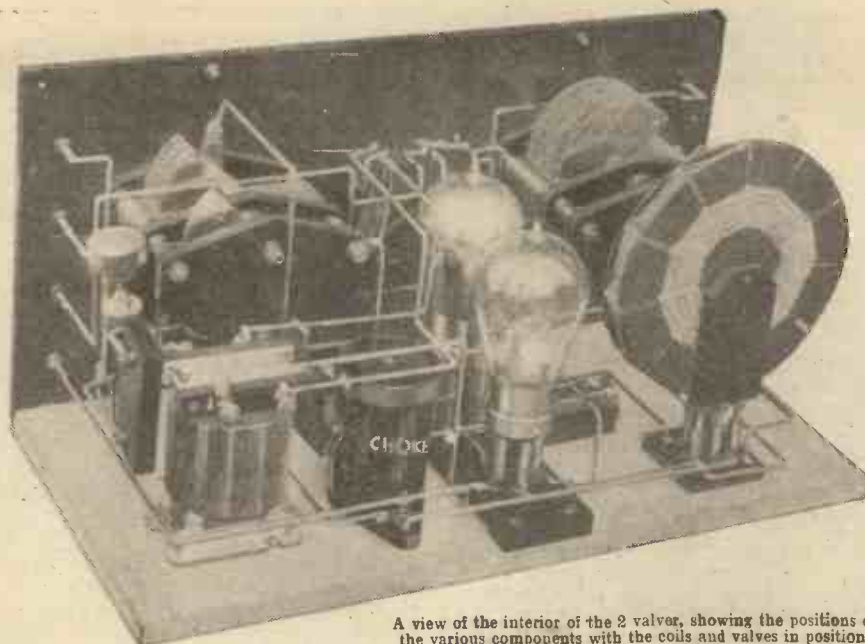
much neater in appearance but is easy to handle and an efficient conductor.

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



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

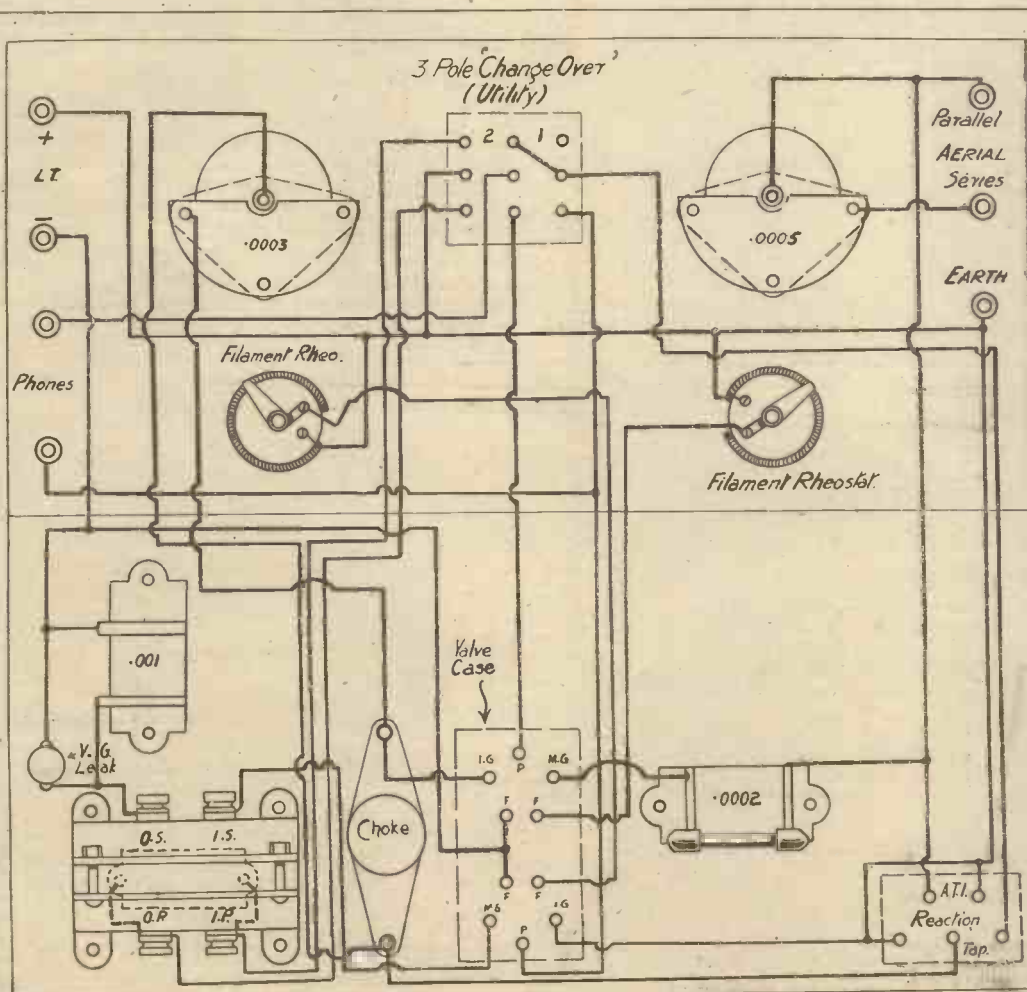


Fig. 2 Wiring Diagram Unidyne & L.F.

DRAWN BY A.D.
CHKD. BY B.R.
SER. NO. A.452

(Continued on page 588.)

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.

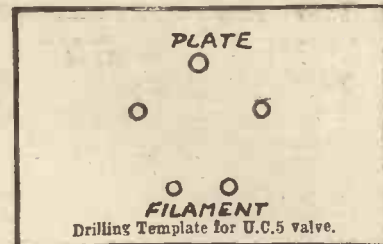
Reaction is obtained by rotating the right-hand ('0003 mfd.) variable condenser spindle towards the *minimum* position, and is stopped by increasing the capacity of this condenser. Very fine control can therefore be obtained, and the set has the added advantage that only two "knobs" have to be operated.

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.

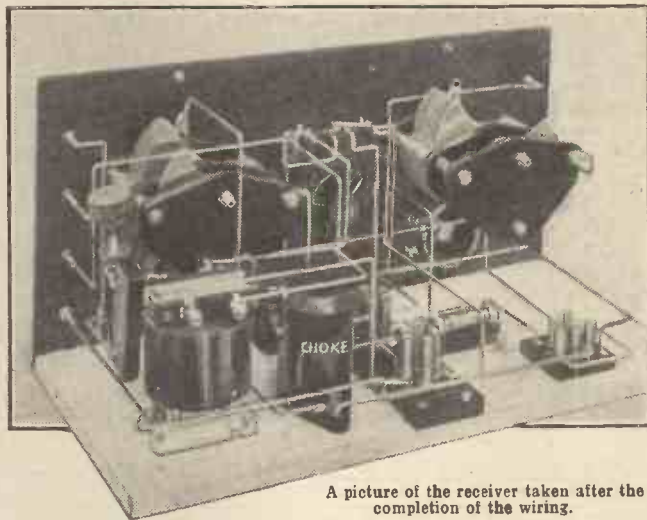
DX Reception.

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



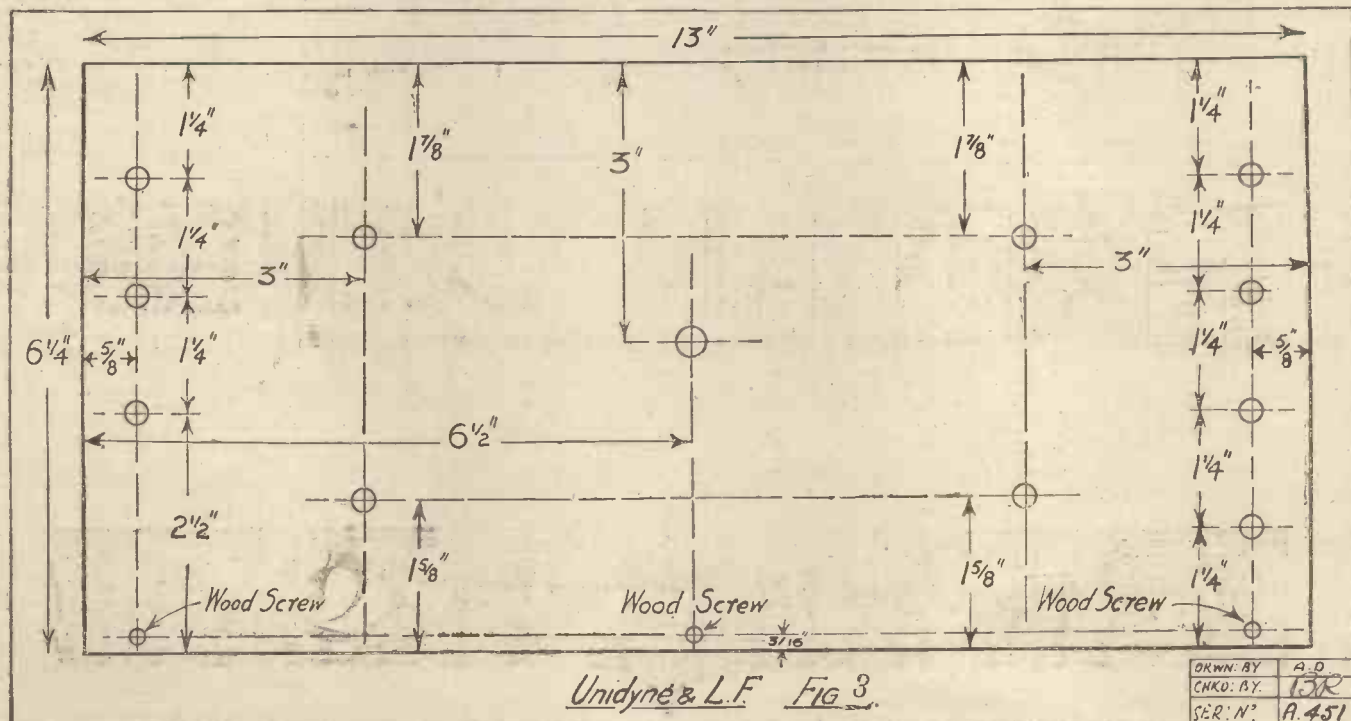
stations need the larger coil unit, and when this is in use the "parallel" position of

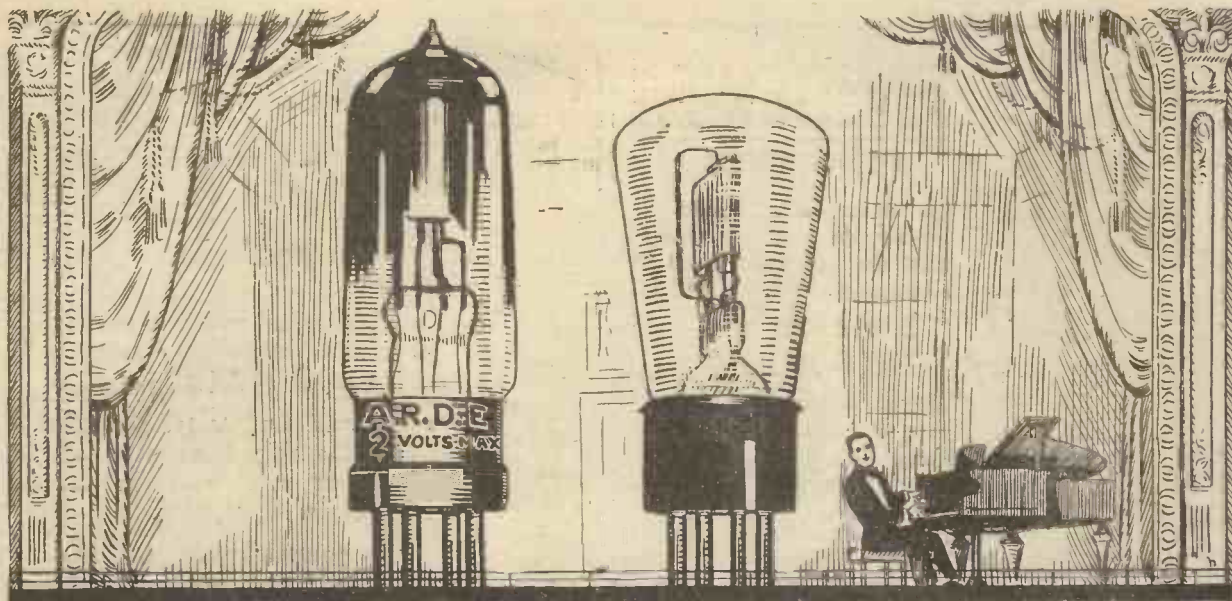


A picture of the receiver taken after the completion of the wiring.

the aerial condenser should be employed.

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.





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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!"

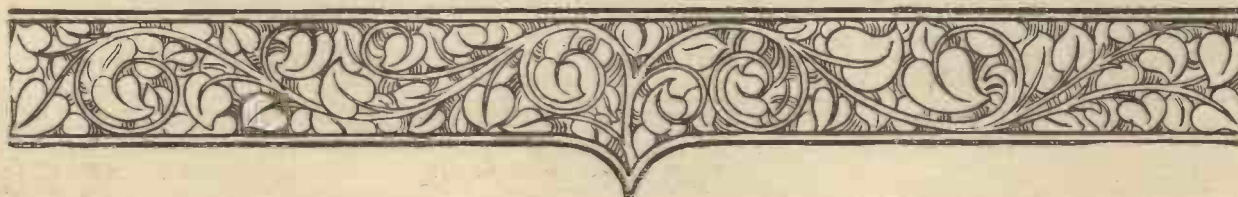
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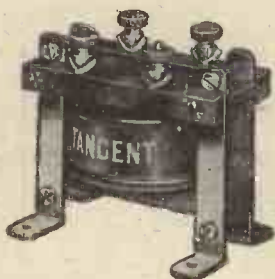
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100 " " - - - 12/6	4 1/2 " Medium - - - 5/6
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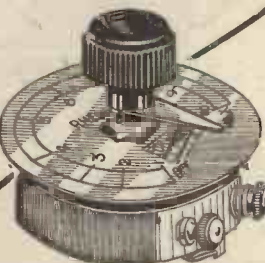
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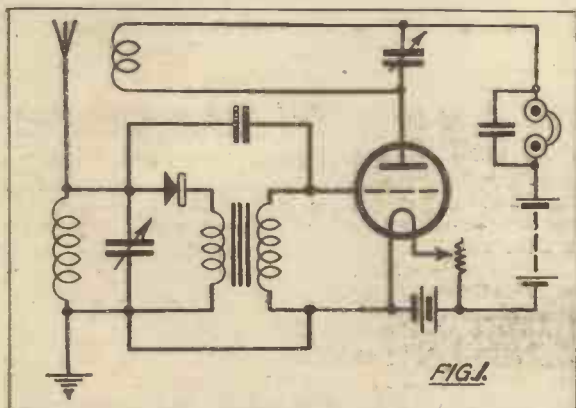
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The lead-in at the Berlin Radio-Aeroplane Harbour.

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.



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.

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P.W. CIRCUIT

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AN EASILY
CONTROLLED
REFLEX RE-
CEIVER

By J. ENGLISH.

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 tapings. 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 "Ultronic" 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.

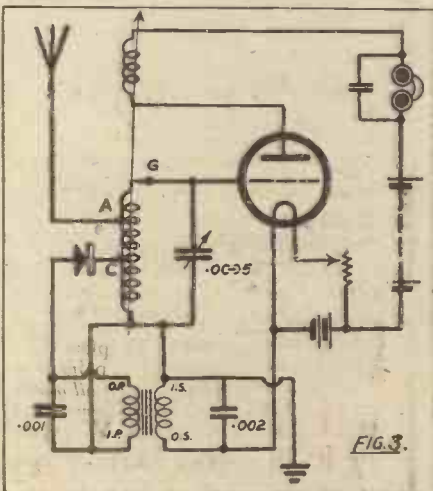
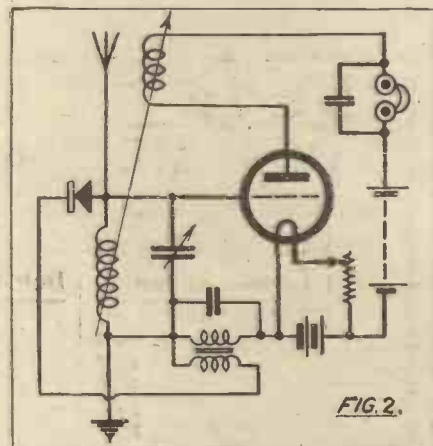
Several variations of this circuit are possible, and it is worth while trying various tapings for aerial, crystal and grid leads. Values that I have found satisfactory, working with a fairly large aerial, are set forth above, the number of turns being counted for each tap from the bottom end of the coil, 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 $3\frac{1}{2}$ 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.)



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-

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.

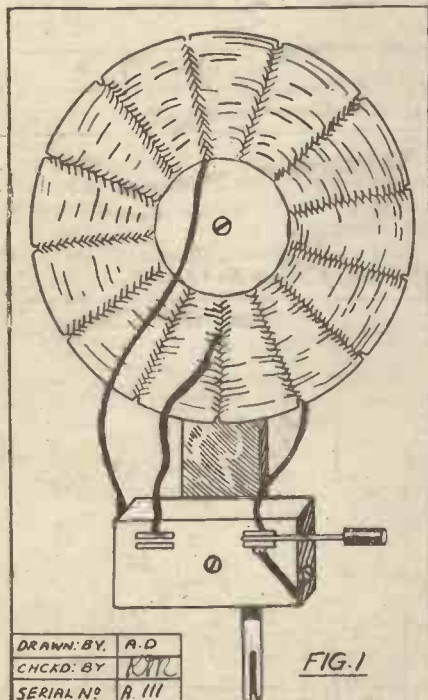
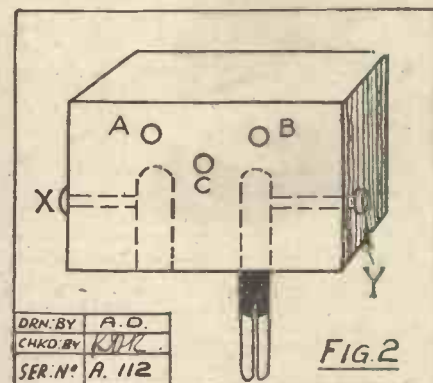
When the switch is opened the whole number of turns is in circuit, and when closed the outer portion is short circuited.

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.



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.

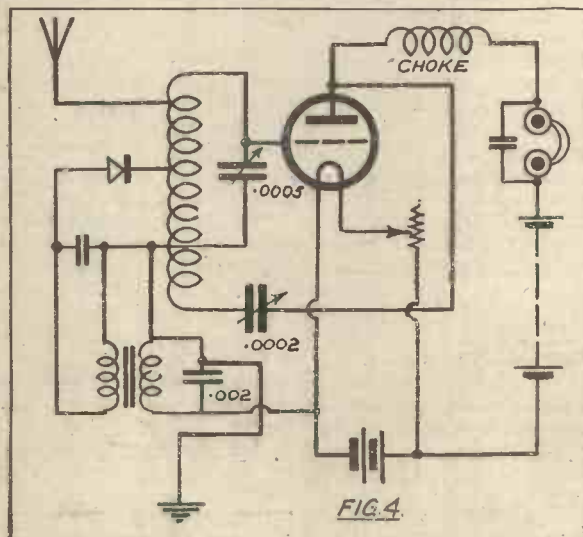
The coil is attached to the plug mount by means of a strip of ebonite about 3/4 in. wide, using screws to pass through the hole

SOME TRINADYNE MODIFICATIONS.

(Continued from page 591.)

secondary can be anything from .002 to .005 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.



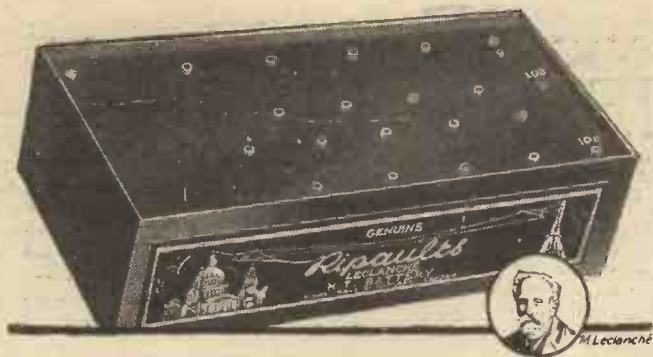
Here reaction is controlled by the small variable condenser C2, and with the correct number of turns in series, wound on the earth end of the coil, a smooth and easily adjustable form of reaction is obtained. The number of turns for each tapping is the same as given above for No. 3, while 15 turns should 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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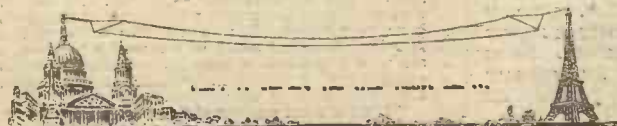
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·0003 mfd. .. 11/6	·001 mfd. .. 17/6

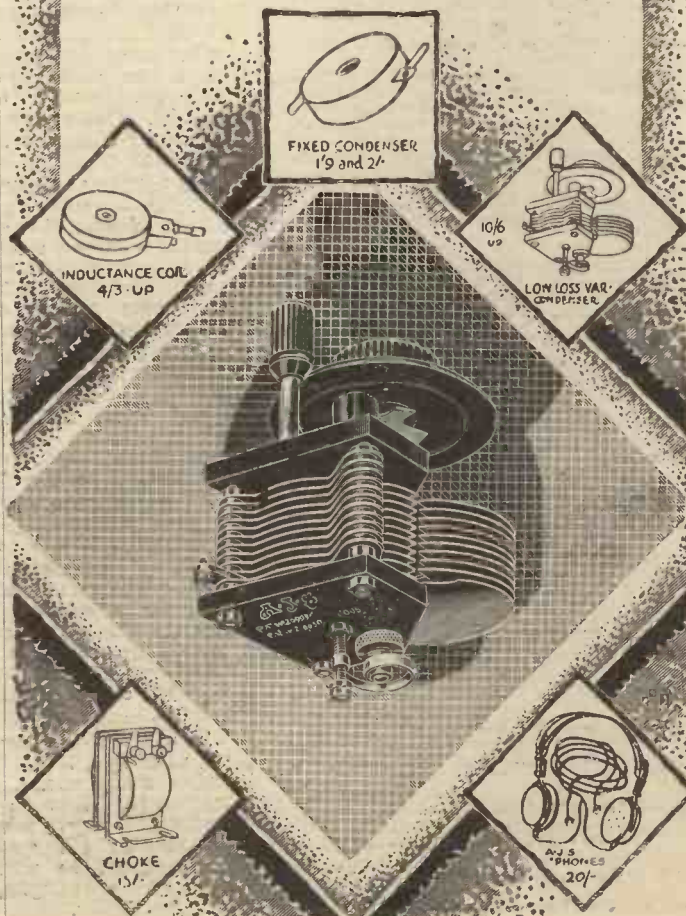
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MORE UNIDYNE OPINIONS

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.
Holmfild, 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, Bentry 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.

Burnley. H. LOWIS.

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.

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 DERRANT.
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. PIPPER.
"Craigmore," Highclere Road,
Bassett, Southampton.

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.

"Broadcasting, 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."*

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.



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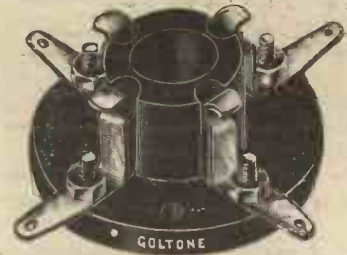
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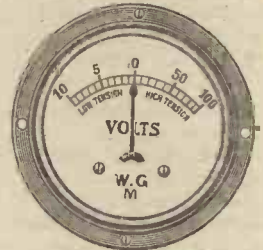
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Flush Type for Panel Mounting.

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"GOLTONE" VARIABLE NEUTRODYNE CONDENSER

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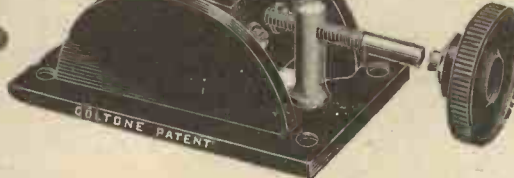
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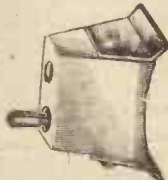
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APPARATUS TESTED.

(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.

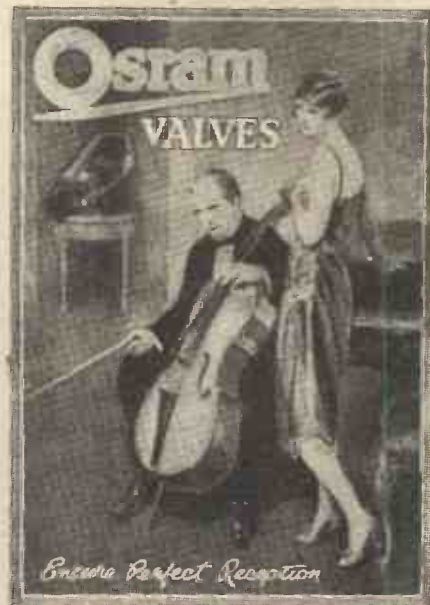
The "Trucon" is certainly "anti-capacity" in character, and will no doubt appeal to those amateurs who incline to the unorthodox.

* * *

"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.



An artistic poster issued by Messrs. The General Electric Co., Ltd.

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This new Crystal Detector, Kathoxyd, is ideal for reflex circuits. It will be found capable of withstanding high potential without the deterioration to which ordinary Crystals are subject.

Kathoxyd consists of a smooth metal plate in a brass mount, which fits your Crystal cup. It is supplied with two contacts—one a ball of zinc iron, for local station use; the other a fine graphite point for long-distance work. Each contact is readily fixed in place of your ordinary cat's-tail whisker.

METAL PLATE KATHOXYD DETECTOR CRYSTAL

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when the Detector will be sent by return post.

1. The "Crystal"—A Metal Plate.

This consists of a brass Holder, in which is mounted the specially prepared Kathoxyd metal plate.

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A zinc, ball-ended rod, held in a spiral spring, is merely dropped at any point on the Kathoxyd plate.

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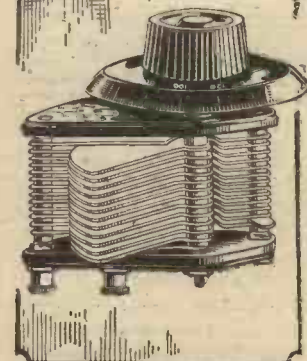
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Includes the following: One Square Law Variable Condenser, .0005 mfd., and one ditto, .0003 mfd. Each with vernier and spiral contact. One 30-ohm Rheostat; one 2-megohm Grid Leak; one .0003 Fixed Condenser; one Unidyne Efficiency Choke; 10 nickel-plated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

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"Red Triangle" Ebonite Panel, 10 x 8 x 3/16th, drilled and tapped.....5/-
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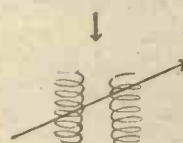
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The Editor desires to direct the attention of his readers to the fact that, as much of the information given in the columns of this paper is of a technical nature and concerns the most recent developments in the Radio world, some of the arrangements 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: Unidyné 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.)

THE HOUSE FOR VALUE IN BRITISH MADE CONDENSERS

All plates made from 22 s.w.g. material. Mounted on Square Spindle.

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Bakelite Ends			Vernier	3/- extra.			6d.
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ENCLOSED DETECTORS, panel mounting
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"SCIENTIFIC" HEADPHONES, high resistance, lightweight 8 1/2 oz.
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2/- Quality for 1/-

The New Test Size
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You can now have this high-grade Crystal at no more than the average price. The quality remains the same; it is only the size that differs. Each piece of this Test Size Sylverex Crystal is fully tested and guaranteed, completely sensitive all over and right through, giving astonishingly clear re-

ception without any tiresome searching for live spots. It differs only in size from the Standard 2/- Sylverex, which is still obtainable. Each box of both the Full Size (2/-) and the Test Size (1/-) Sylverex Crystal contains cat's whisker and directions.

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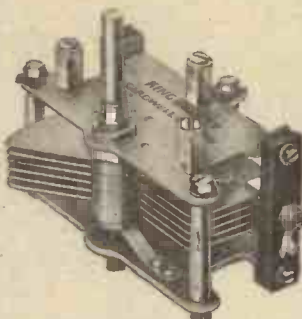
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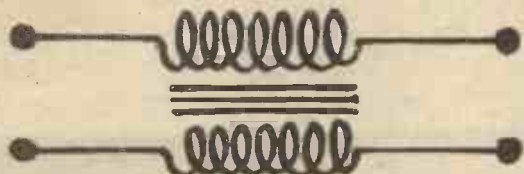


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RADIOTORIAL QUESTIONS AND ANSWERS.

(Continued from page 690.)

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. (Brierley 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. (Croyden).—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 over-run.

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 condensers 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.

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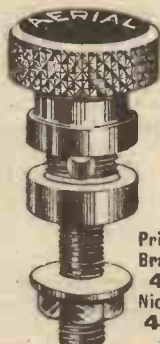
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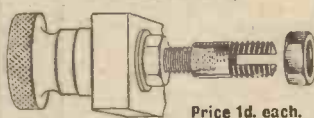
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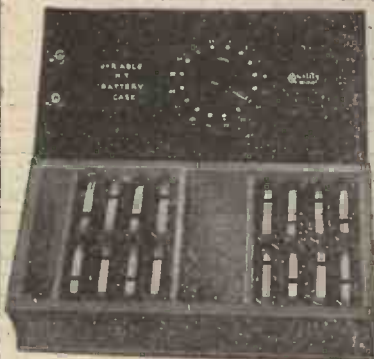
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TECHNICAL NOTES

(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 aërials, 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.)

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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.



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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 considerably 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 *renmier 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.)

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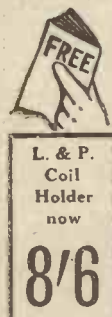
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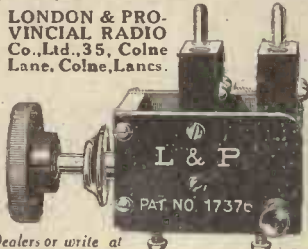


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Permanent Detector, Prov. Patent, in your "P.W." Experimental Set. Contains the "Lion King Combination." Gives the most Power results yet obtained. Micro-meter adjustments for both Crystals. New Locking Device. Tested & Fully Guaranteed.

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Strongly made, size 4 x 3 1/2. Gives powerful flame, removes paint, etc., solders without iron. Simple, safe, economical.

Worth 3/6. Satisfaction guaranteed or money back, 1/6 each, 3 for 4/-, post free. Trade Enquiries Invited.

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F.W. LOWENHARDT'S
TRILLESBORG
TRIVADLER'S

FAMOUS GENUINE
EBONITE
PANELS

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.

Estonia Fixes Wave-length.

It is now announced that, after various trials, the wave-length of the new Reval station, the only one in Estonia, 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, Czechoslovakia, 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.

Accumulators Charged

in your own home with a

TUNGAR BATTERY CHARGER

Simple, Safe and Economical. No moving parts. Requires no attention. No Garage, Owner-driver or Wireless Enthusiast should be without one. Will charge from one to ten 6-12-volt batteries at a time. Deliveries from stock. Descriptive booklet free on application. The Tungar Battery Charger is suitable for use on Alternating Current supply only. Obtainable from your Garage or Electrician.

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BRITISH THOMSON-HOUSTON CO. LTD.

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VALVES POST FREE!

Radiac G.P. 4-volt, 5-amp., 7/- each, post free. Every valve guaranteed, and a free sample non-micro-phonous valve holder given with every valve. Order to-day. This offer may be withdrawn soon. F. DUNDERDALE, LTD., 61, St. Mosley Street, MANCHESTER.

LIBERTY PERMANENT DETECTOR



The Original One-Hole Fixing Detector. 50 per cent. More Efficient. 50 per cent. Lower Price. THE 100 per cent. DETECTOR. Stop Fiddling with Cat's Whiskers.

The "Liberty" Detector gives FIXING. One hole more sensitive reception. Permanently than a cat's whisker gives Temporarily. No hunting for that "special spot" lost by the slightest vibration. The "Liberty" is entirely unaffected by vibration, sensitive all over, and that loud spot cannot be lost.

Refuse Interior Imitations. Insist on seeing name "Liberty". Fully guaranteed. Equally suitable for crystal or crystal with valve amplification.



Radiac Electrical Co., Ltd., Penkett St., London, W.4.

RADIO "CROXSONIA" PANELS

Money back guarantee that each and all Panels are free from surface leakage, Megger test infinity. 8" x 5", 1/2, 7" x 6", 1/3; 9" x 6", 1/7; 10" x 8", 2/1; 11" x 8", 2/3; 10" x 9", 2/4; 12" x 8", 2/6; 11" x 9", 2/7; 12" x 9", 2/10; 12" x 10", 3/4; 14" x 10", 3/5; 14" x 12", 4/-; 7" x 5", 1/- thick. Post Free. Callers, cut any size, & quote by Post, or Phone Clerkenwell 7853. Sample, & prices, post free to the Trade. CROXSONIA CO., 10, South St., MOORGATE, E.C.2.

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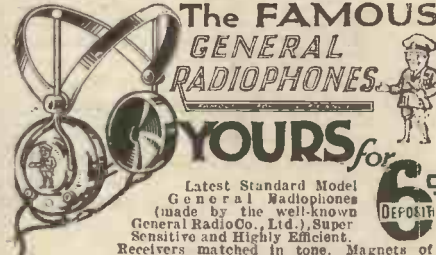
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AMATEURS! Why not write us? We like to hear from you. Trade enquiries always answered. S. MARSDEN-WEBB, 1, Albert Sq., London, S.W.8

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ADJUSTABLE MAGNETS, fine quality. 2-VALVE AMPLIFIER 35/-, 1-VALVE AMPLIFIER 20/-, H.T. BATT. 60-volt 7/-, VALVES 4/3, D.E. '06 9/6, 2-VALVE ALL-STATION SET 24. All on approval.

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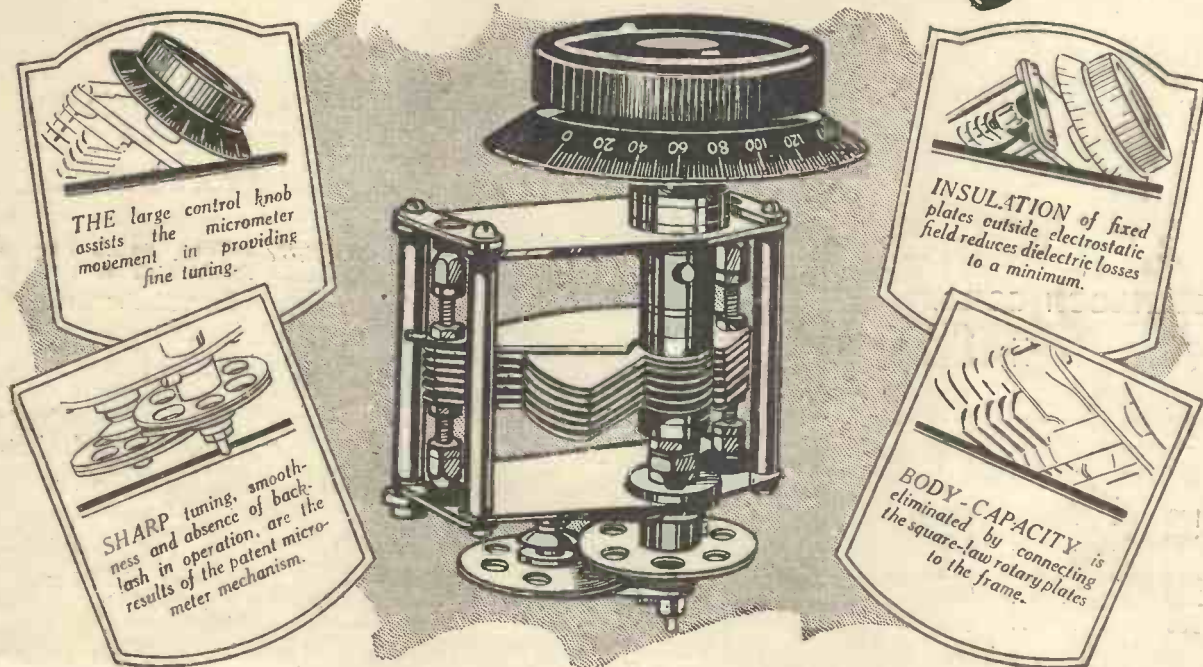


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YOURS for 6/- DEPOSIT

Latest Standard Model General Radiophones (made by the well-known General Radio Co., Ltd.), Super Sensitive and Highly Efficient. Receivers matched in tone. Magnets of highly expensive Cobalt steel. Diaphragms triple tested. Beautifully comfortable, highly finished, weight 7 ozs. Fully guaranteed. Sent on receipt of 6d. deposit. If satisfied, send 2/6 on receipt and balance by instalments of 3/- monthly until only 21/- is paid. Price, full cash with order (or within 7 days of receipt) £1. SIMPSON'S (BRIGHTON), LTD., (Dept. 1623), 94, Queen's Road, Brighton, Sussex.

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:

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LOW LOSS-SLOW MOTION
VARIABLE CONDENSER

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

LISSENIUM

If energy flowed round your circuit without stopping—



LISSENIAGON COILS.

No. 25	4/10
30	4/10
35	4/10
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50	5/-
60	5/4
75	5/4
100	6/9
150	7/7
200	8/5
250	8/9
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YOURS would be an ideal circuit. In laboratory experiments a ring of copper has been taken and brought to the lowest temperature obtainable. Energised at this low temperature it has been found that the current will continue to flow round the ring almost indefinitely.

It will be a long time before this condition exists in your radio receiver, but your tuned circuit can be made extraordinarily efficient by using LISSENIAGON coils. Tune them with the LISSEN MICA VARIABLE CONDENSER and you will have the best tuning combination there is.

The magnetic linkage between LISSENIAGON coils is such that these coils will oscillate readily even though at considerable distance apart. By being able to keep them apart electrostatic effect is eliminated, and the tuning characteristics of each coil are mutually unaffected. There are practically no damping losses to be overcome in these coils, even on the low wave-lengths.

“X” – a mystery letter

WHY are these “X” coils of ours so selective? Why are they so stable and smooth in critical reaction circuits such as the Reinartz? Use them, and you will answer—“Because they are.”

Made at present in four sizes, “X” coil No. 60 covers the broadcasting band of wave-lengths, but in order to obtain the best coil combination for all conditions “X” coils Nos. 50 and 75 are recommended for the lower and higher broadcasting wave-lengths respectively. “X” coil No. 250 covers Daventry and Radio-Paris.

THE EXPERIMENTER USUALLY BUYS THE COMPLETE SET

Readers are invited to ask their dealer for interesting leaflet describing the uses of LISSENIAGON “X” coils or to send direct.

*A copy of the LISSEN TEXT BOOK
will also be sent free to all applying.*

LISSENIAGON COILS and the LISSEN MICA VARIABLE CONDENSER (Price 17/6) make the best tuned circuit there is. The condenser covers all capacities from negligible minimum up to .001 maximum.



LISSENIAGON “X” COILS

No. 50	6/-
60	6/4
75	6/4
250	9/9

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R/R