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POPULAR WIRELESS

No. 175 Vol. VIII.
October 3rd, 1925.

and *Wireless Review*

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

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THE "P.W." RADIO SOUNDS COMPETITION



"P.W.'s"
3rd GREAT WIRELESS MEETING
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 (See page 308.)

❖

The operating room of a wireless station situated on the 28th floor of a New York skyscraper is shown in the above photograph. The station belongs to the Independent Wireless Telegraph Co.



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Because we value our reputation, and because we take a genuine pride in our manufactures apart from their function as profit-makers, we are always exerting ourselves to the utmost to maintain the high standard that it has always been our aim to achieve. For this reason, therefore, the two words—"Specify Dubilier"—are buttressed by all the moral weight and all the material resources of the world's largest Condenser Manufacturing Firm. A Dubilier Guarantee is a genuine guarantee, and a Dubilier Product is the best of its kind.

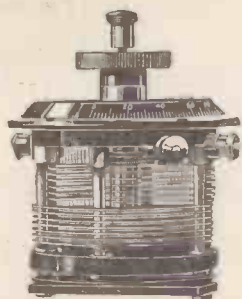
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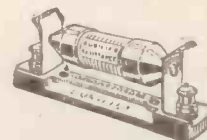
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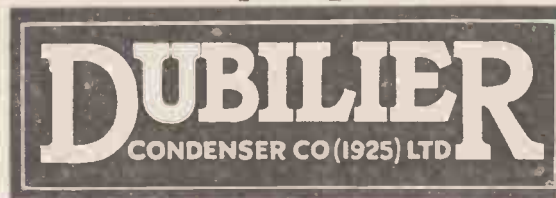
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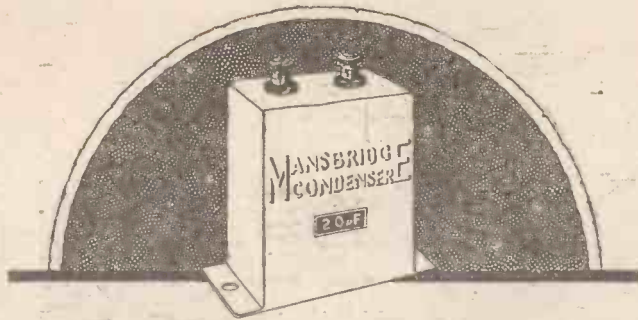
extreme thinness actuated by a vibrating reed. The slightest movement of the reed is transmitted to the diaphragm and converted into audible sounds. The ordinary small Loud Speaker, however, uses a flat diaphragm of iron. The diaphragm must be made substantial in order to give it the necessary springiness to vibrate. The smaller the diaphragm the less resilient it will become—and the more power it will require to actuate it.

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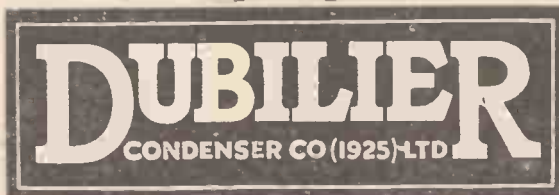
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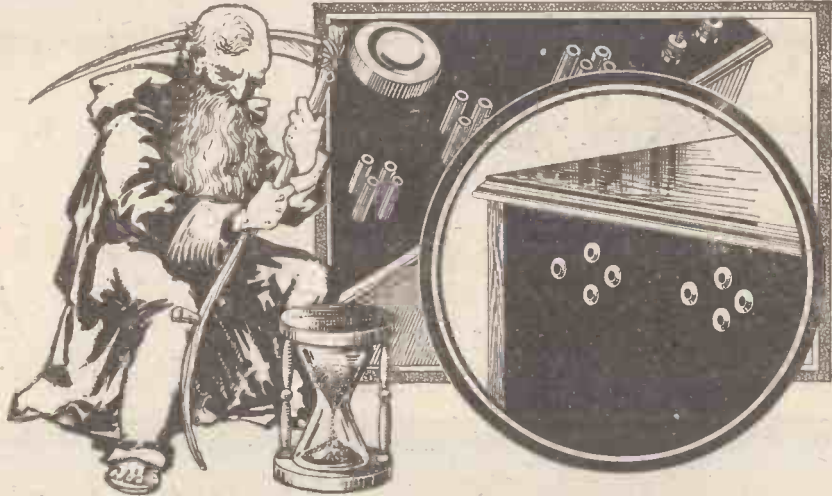
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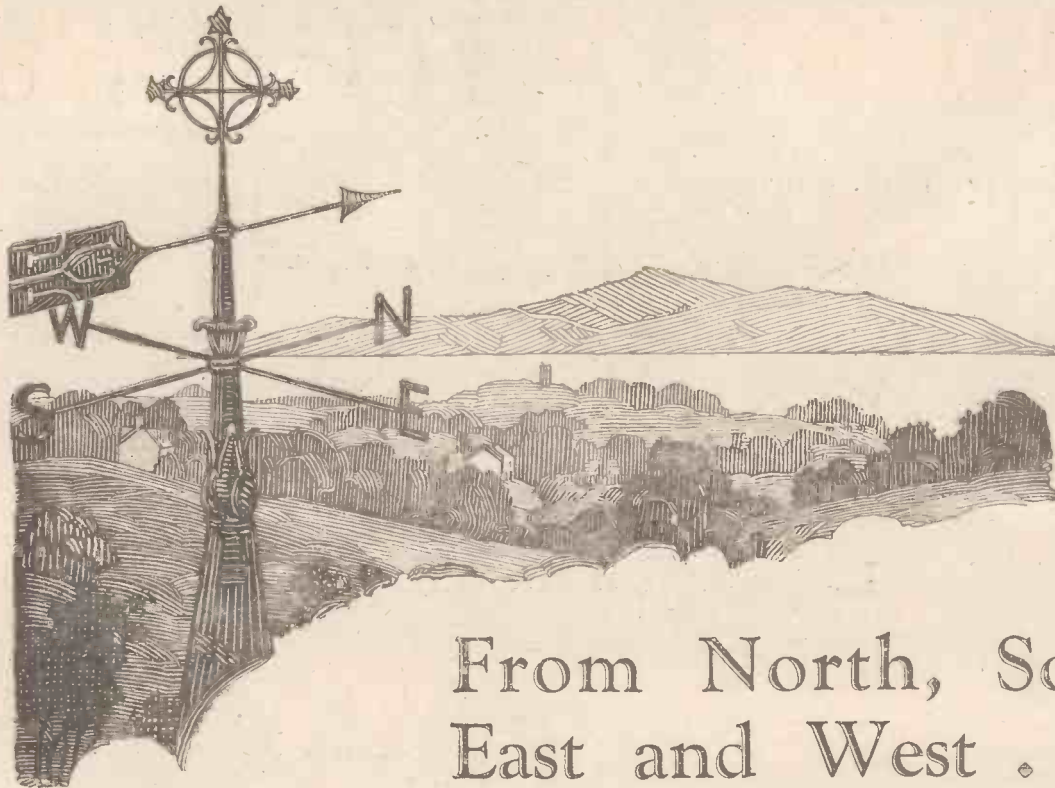
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The Wuncell Dull Emitter

Types W.R.1 and W.R.2 for use with either 2-volt, 4-volt, or 6-volt accumulator at will. Each Valve incorporates a special resistance in base which can be cut out when not required. If your Set uses bright emitters this Valve will enable you to change over to Wuncells, one by one, without altering a single connection. Normal voltage (with resistance out of circuit), 18. Filament consumption, .3 amp. Price: W.R.1 (for Detector or L.F.), 16/- W.R.2 (for H.F. amplification), 16/-

FROM North, South, East and West come minute oscillations from distant Broadcasting Stations. Sometimes your Set is too weak to detect them—but all the time they are impinging on your aerial. With oscillations that have travelled many hundreds—perhaps thousands—of miles you cannot afford to take risks. An inefficient Valve may give tolerably good results on local stations but long-distance reception will soon prove its real weakness.

Just as the Cossor P.2—the bright emitter with the red top—was the first Valve ever to be designed specially for long-distance reception, so the Wuncell W.2 is the Dull Emitter which has amazed experimenters by its abnormal sensitiveness to weak signals.

Hitherto Dull Emitters had always been accepted as being inferior in

efficiency to bright emitters. But users—tired of spending several shillings a week on accumulator recharging—were quite prepared to sacrifice some degree of efficiency in order to obtain economy in current consumption.

Cossor is now definitely proving that the Wuncell—owing to its special filament built up layer upon layer—is not only wonderfully economical in upkeep, and not only possesses an exceptionally long life but actually rivals in sensitivity the famous P.1 and P.2. This is indeed a triumph in Valve manufacture.

Your dealer can supply you free with interesting literature on the Wuncell, proving to you how it will save its cost in four months, and go on saving money for you all through its long life.

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RADIO NOTES AND NEWS.

The Geneva Shuffle—Black Listeners—One-Valve Record—Closing 5 X X—
 Another Wonderful Winter—D X Records—The New Beam Station.

Russian Stations.

I THINK some of the Russian stations have increased their power recently, for I have had several reports of reception during the past week or two. Whilst none of my correspondents have been positive about the Soviet broadcasting, several have picked up authentic Russian messages in Morse. One Swansea reader—whose aerial by the way, is only 18 ft. high—tuned in the Nijni Novgorod experimental station on 45 metres, using a straight two-valve set (Det. and L.F.).

An Unbeaten Record ?

MOST of the other reports refer to long-wave Russian broadcasting, but mention of the Nijni Novgorod station reminds me that the feat of another "P.W." reader—to which I referred some months ago—is still unbeaten. This enthusiast actually tuned in the Soviet station when using a straight crystal detector, followed by a valve amplifier !

The Geneva Shuffle.

WILL the Geneva wave-length shuffle spoil reception from Radio-Toulouse ? It seems impossible that this station will not be charged with interference with other stations' concerts, for it has been coming over with tremendous vigour, and it now appears to be one of the best foreign stations heard in this country. Amongst others, it has recently surprised a Sheffield reader, who tuned it in at such strength that he mistook it for the local station !

A Surprise.

HE was using an Ultra-Audion, followed by 2 L.F. stages, and not being particularly interested in the item he first tuned in, he started to read a book, thinking he was receiving the Sheffield programme. To his astonishment, a few minutes afterwards the announcer shouted across the room that he was speaking from

Radio-Toulouse. It certainly must have seemed weird to sit in Sheffield and hear an unknown Frenchman shout : "Allo, Monsieur !" at you, mustn't it ?

The New "Beam" Station.

THE new "beam" station at Bridgewater, which is being built for short-wave communication between this country and Canada and South Africa, is now rapidly approaching completion. Of

Staff Vacancies.

THE Editor asks me to inform the applicants for recent vacancies upon the "P.W." staff, that owing to the enormous number of letters received, it is impossible to reply to them individually. Each application has, however, received due consideration, and a record is being kept of suitable candidates, so that they may be all communicated with in the event of further vacancies occurring in the near future.

One-Valve Record.

WHAT is the record number of stations received upon a one-valve set ? Whatever it may be I think it must be held by a "P.W." reader, for some of the sets described in this journal fairly scoop in the distant stations. Just recently the Chitos circuit seem to have been excelling itself, and hundreds of readers can get twenty or more stations with it, many of them on aerials that even their owners are thoroughly ashamed of. One Teddington reader thinks he heard R D W (Moscow) amongst others. Have any other one-valvers picked up this station ?

5 I T's Signals.

EVERY day now it seems easier to tune in, as the evenings get darker and darker. But all the improvements noticeable is not due to the season, for small modifications are continually being tried out in the endeavour to improve transmission. Birmingham, for instance, surprised me recently by signals much stronger than normal, but I find this is due to a new transmitter at that station. Other listeners at a distance who have noticed a marked alteration in 5 I T's signals, might like to drop the station director a line, as reports upon the new arrangement will doubtless assist the engineers there.

(Continued on page 270.)

"RADIO SOUNDS."

(In co-operation with the B.B.C.)

"P.W.'s" GREAT COMPETITION. AN "S.B." NOVELTY ON OCTOBER 16th.

ON Friday evening, October 16th, "Popular Wireless," in co-operation with the B.B.C., will broadcast from all stations, with the exception of 5 X X, a competition of interest to all amateurs and listeners.

"POPULAR WIRELESS" is offering large money prizes in connection with this competition. There is no entrance fee, and every listener has an equal chance of winning a valuable prize.

FULL DETAILS WILL BE FOUND ON PAGE 328 AND IN THE EDITOR'S ARTICLE "CURRENT TOPICS."

the ten great masts, each 287 feet high, seven have been erected already. Unlike the aerial system of an ordinary transmitting station, each mast has a cross-arm at the top, 90 ft. in length. The weight of a mast is approximately 50 tons.

"Black Listeners."

HOW will the Postmaster-General deal with Black Listeners ? This latter is a German title given to those who listen without a licence, and it seems to be a happy description of the delinquents. I believe that over in Germany one purchases the radio-licence at the door from the postman, and this individual also keeps an eye out for aerials whilst on his round.

Has our Postmaster-General any such scheme up his sleeve, and if so will it result in a handsome addition to the revenue ?

NOTES AND NEWS.

(Continued from page 269.)

An Old Controversy.

ONE rather unexpected effect of the London Wireless Exhibition (which was recently held in the Royal Albert Hall) was to revive the old controversy about who invented wireless. I think Mr. Marconi started it all again when he said the first wireless message was a "glad-eye," given by a cavè-girl to one of our scantily-clad forefathers whom she fancied would make a good home-constructor!

But Mr. Marconi's modesty in ascribing the invention to such a hoary, hairy source will never disguise his own brilliant share in the work.

In a Nutshell.

IT is now being slowly realised that no single man can claim the credit of inventing wireless. "The Electrician" put the case clearly in a recent issue in the following words: "The fact is that wireless telegraphy did not spring like Pallas Athene out of the brain of Mr. Marconi or anyone else, but was the culmination of a long series of endeavours made by numerous people working in different fields." And the last sentence of "The Electrician's" summing-up is so arresting, and will be so interesting to readers of "P.W.," that I have "re-transmitted" it upon the Short Waves (See Col. 2).

Closing 5 X X.

AS might have been expected, the War Office proposal to close 5 X X during the Army Manœuvres (because the Daventry transmissions would interfere with army wireless), caused a good deal of sarcastic comments amongst listeners—and the Press. One writer in the "Evening News," commenting upon the situation, said: "What the wireless men want to know now is 'Why don't the War Office have Salisbury Plain mown as well, and put a roof over it in case it rains?'" But I fancy that there must have been a reason for the request which has not transpired, for it is all too patent that to be effective the ordinary tests must be carried out during an ether-full of jamming.

Crystal Users.

CAPTAIN ECKERSLEY brought up an interesting point in his lecture to the British Association, in reference to the popularity of crystal sets. He is reported as having said that when the B.B.C. first started something like 50 per cent of listeners had crystal-sets; later the number had risen to 65 per cent, and to-day something like 85 per cent had crystal sets. According to that there are only about 210,000 valve users in this country—at least that number seem to write to me every year, grumbling about the wicked cost of re-charging accumulators, and threatening to give up "P.W." unless I do something about it!

DX Records Again.

ALREADY this season I am being notified of some extraordinarily good long-distance reception. Writing from 37, Mysore Road, Clapham Common, Mr. S. Brasier says: "While listening on a two-valve set (O—v—1) during the Inter-

SHORT WAVES.

"Correctly speaking, no one person can be said to have invented wireless telegraphy—Lodge can perhaps claim that more than anyone else—for its development is the result of the work of numerous scientists."—"The Electrician."

"Mr. Marconi carries his fame modestly."—"Glasgow Herald."

"To say that wireless as now practised is an actual disaster is no doubt an assertion that needs much qualifying. That it is exercising a disastrous effect on some aspects of the music-trade cannot be denied."—A Writer in the "Musical Times."

national wave-length tests, I tuned in the South African station, Johannesburg. Signals were fairly strong, but fading was very pronounced. The announcer stated that the power used was 500 watts. I think this is a fair performance for 2 valves, and even when the L.F. valve was switched out signals could still be heard."

Another Wonderful Winter?

BY the same mail comes a letter from a Swadlineote reader, Mr. O. Cowley, who reports, "I received F 8 Q Q on Sept. 1st (the first day of operation from Indo-China), and again on Sept. 4th. The wave-length on both occasions was about 30 metres (set not yet calibrated)". The set used by Mr. Cowley is a Reinartz with indoor aerial and 2-valve L.F. amplifier; and although this reception has not yet been confirmed it seems to me that there is no doubt the radio season is fairly here again, and we are in for a wonderful wireless winter.

Dr. Johnson's Brilliant Friend.

NOT long ago I turned out of Fleet Street into the quiet precincts of the Temple, and strolling under the trees, noticed the tomb of Oliver Goldsmith, Dr. Johnson's brilliant friend.



CAPTAIN ECKERSLEY ON THE MOORS.
How the Chief Engineer spent his holidays.

To-night, from their studio near by, the B.B.C. will broadcast Goldsmith's sparkling comedy, "She Stoops to Conquer," which was a great success in the London of long ago; and I can't help wondering if—somewhere between the Temple and the Heavenside Layer—the author and his friend will be listening-in. What a broadcaster the Doctor would have been!

A Good Collection.

I CONSTRUCTED my set 12 months since and on one valve alone I received from time to time 24 stations on it, including all our main stations (except Cardiff)," says Mr. T. B. Mayer, writing from 29, Neville Street, Earlestown, Lancs. He goes on to say that on the two valves he has picked up 37 stations, with others not identified, and many amateurs.

What kind of a set is it? Well, Mr. Mayer thinks it is the last-word-in-tone-and-distance set, but its official description is the 1-2 Valve Unidyne (Det. and L.F.).

Hard to Beat.

THE letter from which I have quoted above was not addressed to me, as a matter of fact, but it is part of a lengthy and careful report which Mr. Mayer prepared and sent to the B.B.C. in connection with the special wave-length tests organised at Geneva.

I haven't the faintest idea as to how many hundreds of reports were received by the B.B.C. upon the night in question, but I am pretty sure there were not many like that one! Some of the H.T. wallahs who believe in plenty on the plate have a long way to go before they beat Mr. Mayer's record of 23 different stations in 3½ hours.

The Explorer's Verdict.

A PART from the success of the short-wave radio equipment which Mac-Millan took with him on his Polar expedition, other explorers have found the value of this new method of wireless communication. The Australian Inland Mission which is traversing the interior of that continent have been getting excellent results, using a vertical rod 19 ft. high for an aerial, with a one-wire counterpoise. The transmitter is only using a five-watt valve, but 8 A C, the call-sign allotted to the explorers, has been picked up hundreds of miles away upon 20 metres.

From Sunny Spain.

HERE is a letter which the B.B.C. received recently from a Barcelona listener. It speaks for itself.

"I receive every nights your perfects and pures emissions and I am very delected . . . Wich is the tittle of the valse wick the day before yesterday, at 11 and ¼ of the night was executed by the band of the Savoy Hotel? The last number had been a shimmy, the number before was another valse, and the other, the one wish tittle I ask you because I am very interested on it and I will buy it on gramophone disc."

Overheard at a Bookstall.

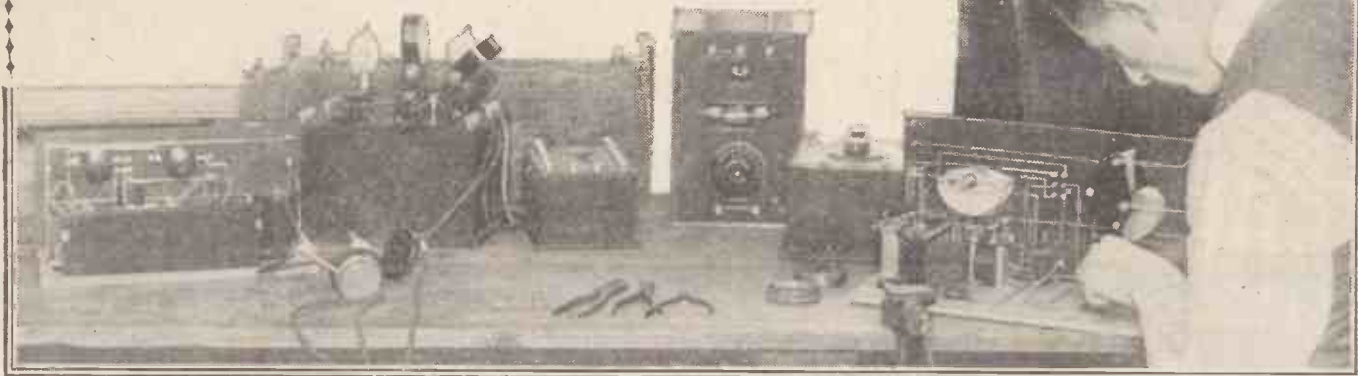
"POPULAR WIRELESS, please."
"Sorry—sold the last. Er—this do instead?"

"Sorry—bought the last!"

ARIEL.

POWER VALVES AND HOW TO USE THEM.

By R. H. WATSON.



ONE of the greatest boons given to the amateur by modern progress in valve design is the small power valve, a

Now what is a power valve, and what exactly does it do? An examination of the curves shown in Fig. 1 will help us to

understand the most important points about it. The first curve A is that of a typical general purpose valve. The useful portion of this curve for note magnification purposes is that which lies between X and Y. We cannot take the working point much above Y, where the grid is two volts negative, or grid current may start to flow with the result that distortion may occur owing to its damping effect on the upper halves of waves. Nor can we allow it to fall below X, or four volts negative, for if we do we shall be getting on to the lower bend and again distortion will follow. We must set the grid of this valve then at three volts negative by means of a biasing potential; that is, its working point must be at Z, and this will mean that the valve can deal faithfully only with those waves whose crests and troughs have a value not exceeding one volt positive or negative. This valve then could not deliver a large volume of undistorted sound from the loud speaker.

Curve B is that of a valve designed specially for low-frequency work, but still not a power amplifier. Here, by adjusting the negative bias to about five volts, we can make use of a much longer portion of the curve. This valve with the working point at Z will amplify without distortion impulses with crest and trough values of three volts. It would, therefore, operate a small loud speaker or give excellent service immediately after the rectifying valve.

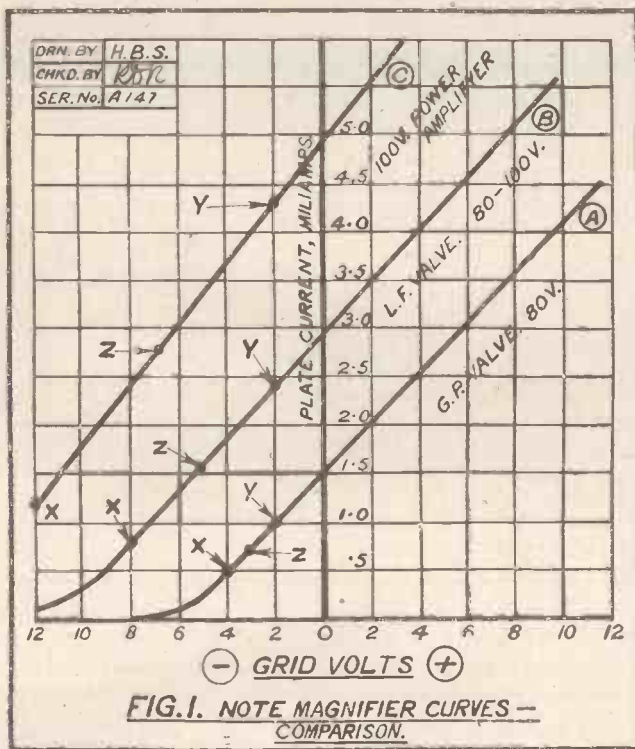
Two Important Points.

The last curve C illustrates the action of a power valve. Here, by using a negative grid bias of seven volts, we bring the working point to Z and the "safe" portion of the curve is a long one. Signals amplified so greatly that there is a swing of five volts above or below the normal working point will not produce distortion.

The power amplifier then is a valve specially designed to deal with large oscillations. Hence it is suitable for use in the last stage of a set intended to give loud signals without distortion.

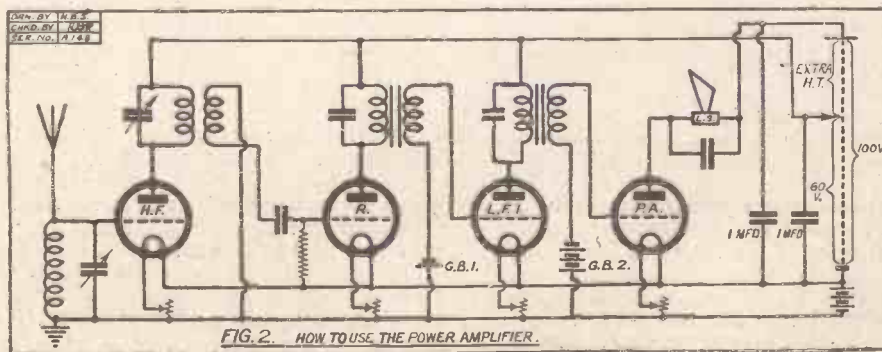
The main things to remember when using the power valve are two. First of all, it requires a high voltage upon its plate in order to give the best results. Most small power amplifiers are designed to work with a plate voltage of about 100. If a lower

(Continued on page 272.)



number of types of which are available for his use at reasonable prices. Not very long ago one could safely say that ninety-nine per cent of amateur reception was done with the help of general purpose valves, for the few specialised types which then existed were expensive and not easy to obtain.

To-day we have a large variety of valves designed for high- or for low-frequency amplification which are sold at the same prices as those of the "maid-of-all-work" kind. Some makers recommend their high-frequency valves for use as rectifiers, others their low frequency; but so far no one has produced a valve intended solely for rectification at a popular price. This is bound to come in time.



POWER VALVES AND HOW TO USE THEM.

(Continued from page 271.)

voltage is used the useful portion of the curve will be reduced and there will be a tendency to distortion owing to the flow of grid current. Fig. 2 shows how the set should be arranged to make the power amplifier do its best. The high-frequency valve, the rectifier and the first note magnifier may have a common high-tension positive lead tapped off at from 50 to 70 volts according to the nature of the valves. The power amplifier should have a positive high-tension lead of its own so that a potential of 100 volts may be applied to its plate. Both portions of the high-tension battery should be shunted by large condensers as shown in the diagram.

Protecting the Loud Speaker.

The second point is that sufficient negative grid bias must be used. The power valve's grid battery is seen marked G.B. in the diagram. It may take the form of small cells such as those used for flashlamp refills. For the best results the first note magnifier should also have its grid battery. It should be noted that besides avoiding distortion by bringing the working point well away from the grid current area the use of a biasing battery greatly lengthens the life of the high-tension unit by cutting down the current taken from it to the lowest possible limits.

Some readers may wonder whether it is safe to use a plate voltage as high as 100 with high resistance telephones or loud speakers. Instruments of good quality will carry the current which this voltage entails without much risk, but there is really no

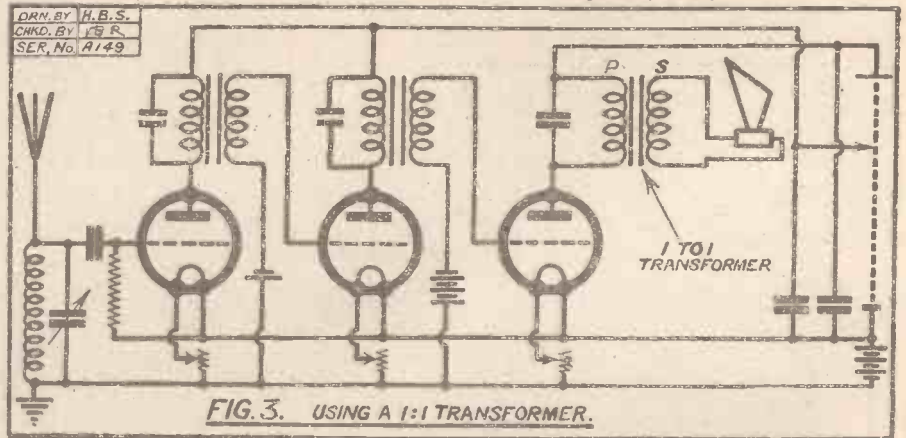


FIG. 3. USING A 1:1 TRANSFORMER.

well for this purpose. The loud speaker is connected up as shown with a two microfarad condenser between it and the plate. A choke coil bars the passage of oscillating currents but has only a negligible effect upon direct; a condenser on the other hand stops direct current but allows alternating currents to pass. In the circuit seen in

Fig. 4 the steady current from the plate is prevented by the condenser from passing through the loud speaker, but finds no opposition to its passage to the battery through the choke coil. On the other hand the oscillations due to modulation are kept back by the choke and pass by way of the condenser through the loud speaker.

AN ANTI-SULPHATING ACCUMULATOR.

By J. F. CORRIGAN., M.Sc., A.I.C.
(Staff Consultant, "Popular Wireless.")

IN view of the accumulator curse under which every valve user suffers, it will be of interest to the reader to have an account set before him of a new and almost foolproof type of accumulator, the details of which have just been made public.

The new accumulator is the invention of a M. Féry, a French scientist, and before making the details of his discovery public, the inventor appears to have given his new type of accumulator a very thorough and extensive series of tests.

In order to grasp the lines upon which M. Féry has worked in the

production of his new type of accumulator cell, it will be necessary for us to run over the theoretical causes which are generally considered to underly the production of sulphating in the accumulator.

"Natural" Sulphating.

It is well-known, of course, that the very simplest accumulator consists of two lead plates into one of which is incorporated a paste of metallic lead, and into the other a paste of lead peroxide together, of course, with some suitable binding and hardening material. The plates are immersed in dilute sulphuric acid.

Now, when the cell is discharged, a chemical reaction takes place, and the lead peroxide is converted into lead sulphate.

The accumulator "naturally" sulphates, as it were. But the lead sulphate, which is formed during the ordinary process of discharge of the accumulator, is different from the sulphate which is formed accidentally, or as a result of misuse of the cell.

The naturally-formed sulphate can be converted back again into the peroxide and metallic lead by the process of charging the cell. The accidental sulphate, however, cannot undergo this reverse change. It is a highly insoluble substance, and it is a non-conductor. Consequently, when it is formed on the plates of the accumulator it acts as an insulator and clogs up the cell.

Cells Will Not Sulphate.

M. Féry showed that the insoluble sulphate was always produced on the accumulator-plates through the agency of oxygen or some oxidising agent.

The oxygen may come from the peroxide on the plate of the accumulator, from the air, or from the acid solution.

M. Féry now claims to have got over this difficulty by placing the negative plate of the accumulator at the bottom of a deep glass cell, the remaining plate being placed in a porous pot above it, and surrounded by the electrolyte which penetrates it and reaches the bottom negative plate.

The accumulator of M. Féry has been put to practical tests, during the course of which it has been found to retain its charge, with very little loss, over a period of two years. Moreover, the cell, after being allowed to remain in a completely run-down condition for two years, was recharged, and found to be in excellent condition in every way.

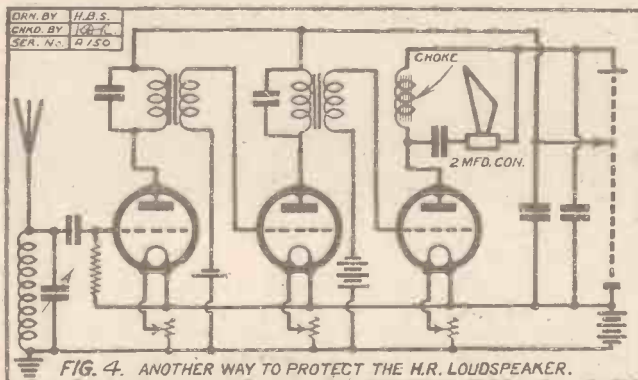


FIG. 4. ANOTHER WAY TO PROTECT THE H.R. LOUDSPEAKER.

reason why the steady current should be passed through their windings at all; the steady current serves no useful purpose in the loud speaker, whose diaphragm is actuated only by variations due to modulation. There are two ways of protecting a high-resistance loud speaker when a high plate voltage is in use. The first of these is seen in Fig. 3. Here a 1:1 telephone transformer is used. The steady current from the battery passes through its primary, but only the variations due to modulation are transferred via the secondary to the loud-speaker windings. The second method is seen in Fig. 4. Between the high-tension positive lead and the plate of the power valve is placed an iron-cored choke coil—the secondary of an old transformer will do very



The "P.W." 2 Valve Ultra

IT has long since been recognised that auto-coupled aerial and grid circuits have distinct advantages over the direct or even loose-coupled tuners. These advantages may vary with different types of aeriels, being more noticeable with some than with others, while on a few aeriels the use of auto-coupling is sometimes a disadvantage.

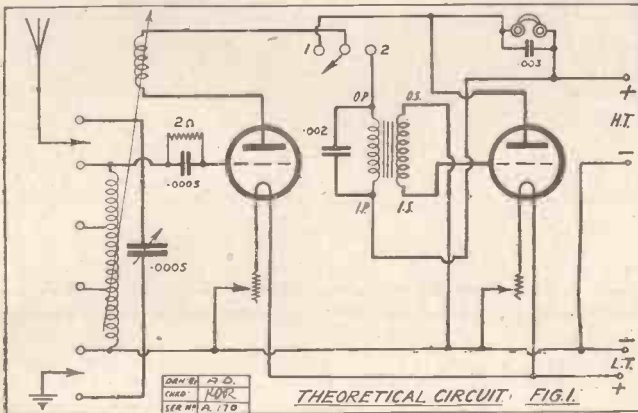
The receiver here described aims at using as nearly as possible the ideal method of

The Set Designed and Described by
G. V. DOWDING, Grad.I.E.E.
(Technical Editor.)

Constructional Work by
G. V. COLLE and J. R. WHEATLEY
(Technical Staff.)

This Set has been built and tested in the "P.W." Laboratory and is guaranteed by "Popular Wireless"—EDITOR

six terminals on the left hand side of the panel; no alterations in the interior of the set are needed. The constructor will probably be able to work out the various circuits for himself, but a few of the most useful are given in Fig. 5, where it will be noticed that the terminals have been arranged in as simple a form as possible, so that a mental picture of what is actually happening inside the receiver is obtained while connections are being altered.



tuning for all conditions. Thus it enables either auto-coupling or ordinary tuning to be carried out, together with either a series or parallel aerial condenser without complicating the set to any further extent than the addition of four terminals.

In order to reap the full benefit from the variation of circuits provided, an Igranic "Ultronic" coil is used, and with this coil and the aid of the six terminals on the left of the panel over 50 different tuning circuits are available.

The secret of the success of the "Ultronic" coil is due to the fact that auto-coupling is employed in such a way as to obtain what

may best be described as symmetrical "end" effects. An increase of signal strength over that obtained by the ordinary coil is one result, and sharper tuning another, while if the coil is used as shown in the receiver under consideration, the auto-coupling principle may be varied so that optimum efficiency is maintained under all conditions.

The coil is of the plug-in variety, for it loses

some of its efficiency above 1,000 metres, and for the reception of 5XX and high-wave stations it is advisable to remove it and replace it by an ordinary plug-in coil of the required inductance.

In order to obtain the various circuits available in this receiver it is only necessary to vary the connections between the

The Components Required.

The variable condenser is taken to Nos. 1 and 6 (outside terminals) and is thus quite separate until joined up by outside connections. The other four terminals correspond with the top, 1st and 2nd tapping, and bottom of the coil respectively, reading downwards from 2 to 5.

The construction of the set should present no difficulty even to a beginner, and any doubt as to connections will be



A view beneath the panel showing all the terminals and components mounted and everything ready for wiring up.

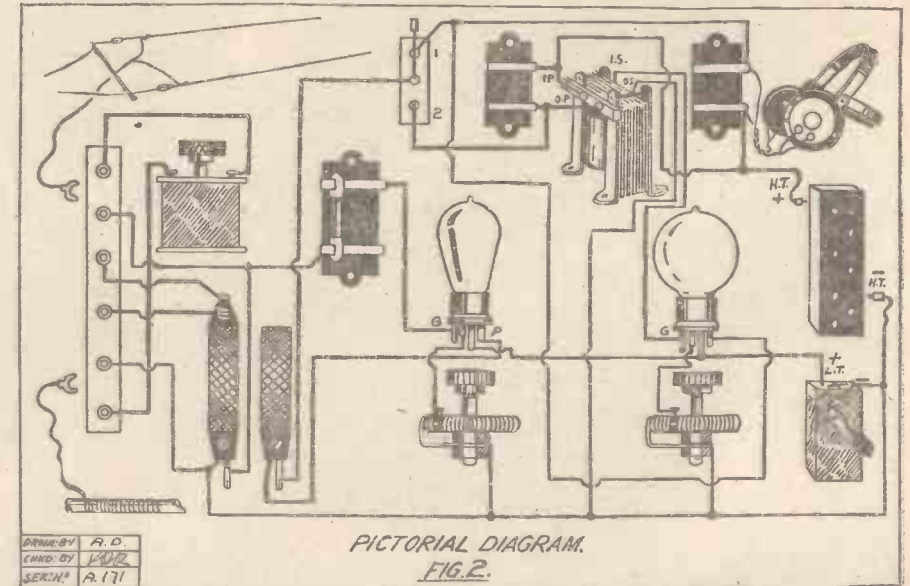
cleared up by examining Fig. 2. The parts (Continued on page 274.)

**THE "P.W."
2-VALVE ULTRA.**
(Continued from page 273.)

required, together with approximate costs, are given below:

1 panel and case to fit, 10 in. by 8 in. by 1/4 in. (cabinet 4 in. deep)	s. d.
1 .0005 variable condenser and vernier (Peto-Scott)	13 6
1 two-way coil holder with long handle (Peto-Scott)	10 6
1 "Ultrynic" coil (Igranic)	5 6
1 100-turn reaction coil (any good make, such as Igranic)	9 0
1 L.F. transformer (R.I. Ltd.)	6 3
1 S.P.D.T. switch (Nesthill)	1 5 0
14 W.O. terminals	1 6
2 filament rheostats (Precision)	1 9
8 valve legs (Countersunk type) (Peto-Scott)	6 0
1 .0003 fixed condenser and grid leak (Dubilier)	1 0
1 .002 fixed condenser (Dubilier)	5 0
1 .003 fixed condenser (Dubilier)	3 0
1 .003 fixed condenser (Dubilier)	3 0

The constructor will find that the panel and case can be purchased complete from the firm mentioned, though the case may be obtained separately and any wireless dealer will cut a panel roughly to size. In this event, however, the constructor will probably find that he has to file down the panel edges in order to make them fit the cabinet. This is often a rather tedious undertaking, and the constructor is advised to buy the panel and cabinet together so that a proper fit is ensured. Either a specially polished panel or a matt one should be used,



the cheaper polished types being avoided because of the poor insulation that is so often a "feature" of the lower grades of ebonite.

The Wiring Connections.

The drilling diagram, Fig. 3, shows the position and sizes of the holes that have to be made, and this section of the construction should be carried out next, after which the panel should be screwed to the baseboard and the components mounted.

Wiring is carried out with the 18 gauge square tinned copper wire and all connec-

tions should be soldered if possible, care being taken to remove any flux that may be left after this operation. "Killed spirits" should not be used, as it tends to cause corrosion at the joints and eventually loosen the contacts and cause many of those mysterious faults that give rise to noisy reception.

The diagram given in Fig. 4 shows the connections as made in the set photographed, but a point-to-point description is given below to act as an additional check and for those to whom the following of diagrams proves a little difficult.

Point-to-Point Connections.

One filament valve leg of each valve holder to one side of filament rheostat. Other side of each rheostat joined together and taken to the - L.T. terminal and - H.T. terminal. Inside "E" terminal and O.S. of L.F. transformer to - L.T. lead.

The other filament valve legs of each valve holder joined together and taken to the + L.T. terminal.

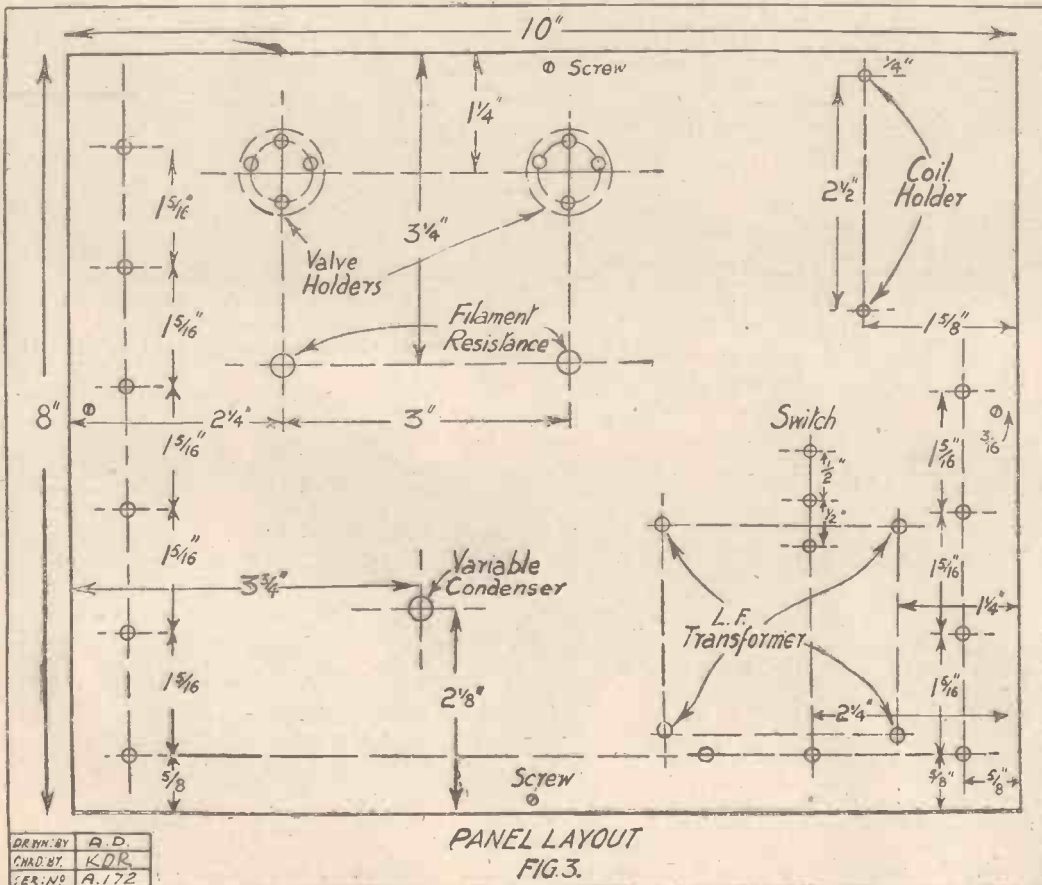
Grid leg of the first valve holder to one side of grid leak and condenser. Other side of grid leak and condenser to inside "A" terminal. Outside "A" terminal to moving vanes of the .0005 variable condenser. Fixed vanes of same condenser to outside "E" terminal.

Flexes are joined to the "aerial" and "earth" terminals and are connected to the terminals on the "Ultrynic" coil. Plate leg of first valve holder to plug side of moving coil holder.

Socket side of moving coil holder to centre of the S.P.D.T. switch.

Plug side of fixed coil holder to - L.T. lead. Socket

(Continued on page 275.)



**THE "P.W."
2-VALVE ULTRA.**
(Continued from page 274.)

side of fixed coil holder to inside "A" terminal lead.

Grid leg of second valve holder to I.S. of L.F. transformer.

O.P. of L.F. transformer to top contact of the S.P.D.T. switch.

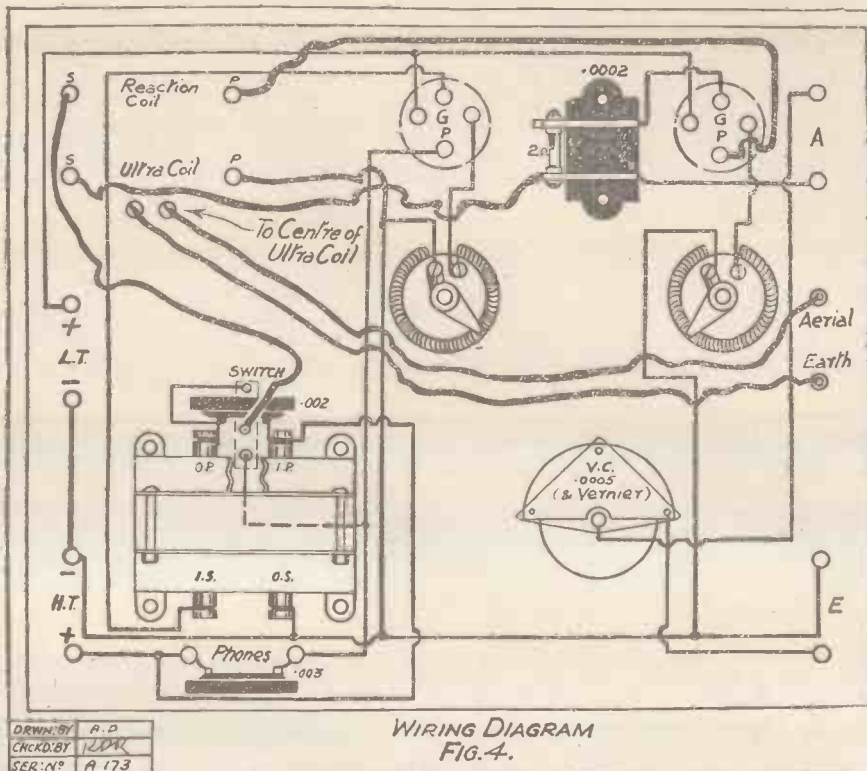
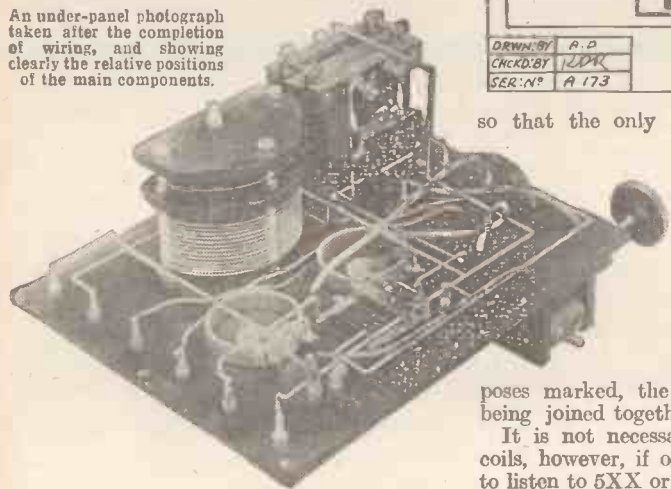
Plate leg of second valve holder to bottom contact of the S.P.D.T. switch and to one 'phone terminal. Other 'phone terminal to the + H.T. terminal. A .002 fixed condenser is connected across the primary of the L.F. transformer and a .003 fixed condenser across the 'phone terminals.

Aerial and Earth Terminals.

As in all receivers, the importance of good, clean connections cannot be over-emphasised, and it is advisable to solder all joints, or at any rate to make sure that no connections can work loose.

As regards the operation of the set, it will be seen that a switch is provided for cutting out the L.F. valve, if desired,

An under-panel photograph taken after the completion of wiring, and showing clearly the relative positions of the main components.



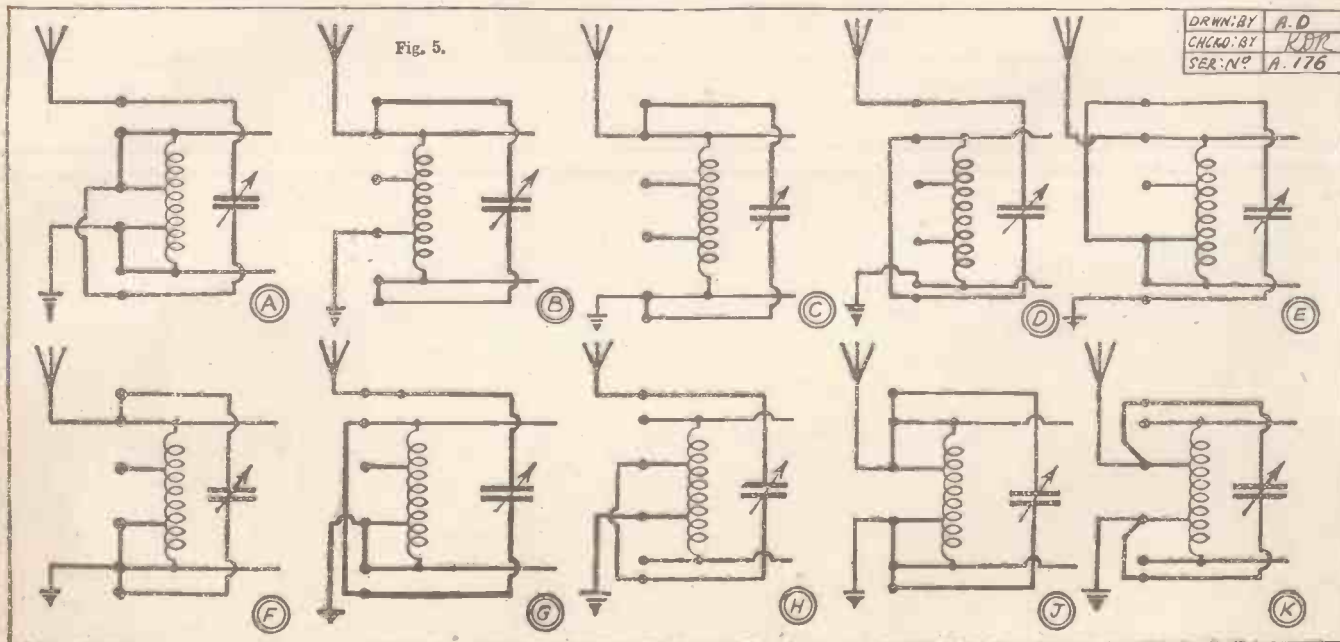
so that the only points that needs any explanation are the various aerial and earth connections.

It will be noticed that the two centre terminals have been marked "aerial," and "earth." With an "Ultrynic" coil in use these are employed for the purposes marked, the top and bottom pairs being joined together.

It is not necessary to use "Ultrynic" coils, however, if one desires, for instance, to listen to 5XX or any station not covered

by the "Ultrynic," or if the constructor decides to forego the advantages of auto-coupling, and in this event the aerial goes to the bottom (A) terminal (second from the top), and the earth lead goes to top (E) terminal (second from the bottom). The top (A) is still left connected to second (A) and bottom (E) to top (E). This leaves the condenser in circuit and completes the tuning system (see Fig. 5). This terminal arrangement also gives 60 turns "straight," if an "Ultrynic" coil is used, the total windings being in operation and the two tappings being ignored.

To the uninitiated in wireless this complication of terminals may seem a
(Continued on page 276.)



AN ACCUMULATOR CHARGING UNIT.

UNLESS fitted with a baffling plate of celluloid immediately under the filling cup, accumulators when gassing freely—as they should do if charging is carried to the correct stage—emit a fine spray which settles in the form of an impalpable film on the lid of the accumulator, and is difficult completely to remove.

The expedient of smearing the top and terminals with vaseline, while protecting the latter, is unsightly and messy, and the writer has found the following dodge to obviate the difficulty admirably.

A rubber or cork plug is obtained to fit each vent hole of the accumulator in place of the usual celluloid plugs which, having only small holes in them, do not afford sufficient ventilation during the gassing period.

These plugs are bored through their centres, and a piece of glass or ebonite tubing, about 3 or 4 inches long, is inserted.

THE "P.W." 2-VALVE ULTRA.

(Continued from page 275.)

little too abstruse, so before giving any further details of how to "ring the changes" on the circuit, it may be just as well to give brief directions of how the set should be used for ordinary broadcast reception.

Reaction, etc., is, of course, carried out as usual, and it is only in the terminal arrangements that the receiver differs from the ordinary one or two-valve set.

Using an Igranite "Ultrynic" coil, for the reception of broadcasting between 300 and 600 metres, the two top terminals (A)

The top of this being so high above the surface of the electrolyte does not permit spray to emerge, whilst the bore, which should be about 3-16 in. diameter, allows the free passage of the occluded gases.

If cork plugs are used they should first be soaked in hot wax. The plugs are, of course, replaced by the ordinary celluloid

ones after the cells are charged and retained for use during charging only.



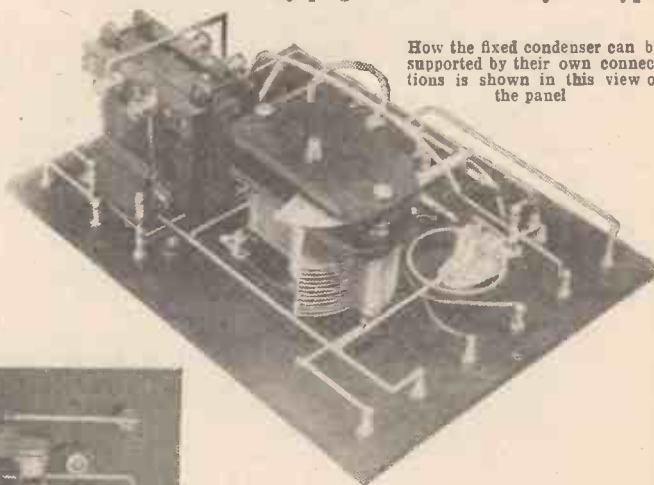
Capt. Twelvrees testing a B.T.H. portable "super-het." on a motor run to the North

are connected together and the two bottom ones (B) are also joined, the aerial and earth going to the terminals marked for that purpose. "In the moving coil holder—reaction—a 50-75-turn coil of any good make can be employed.

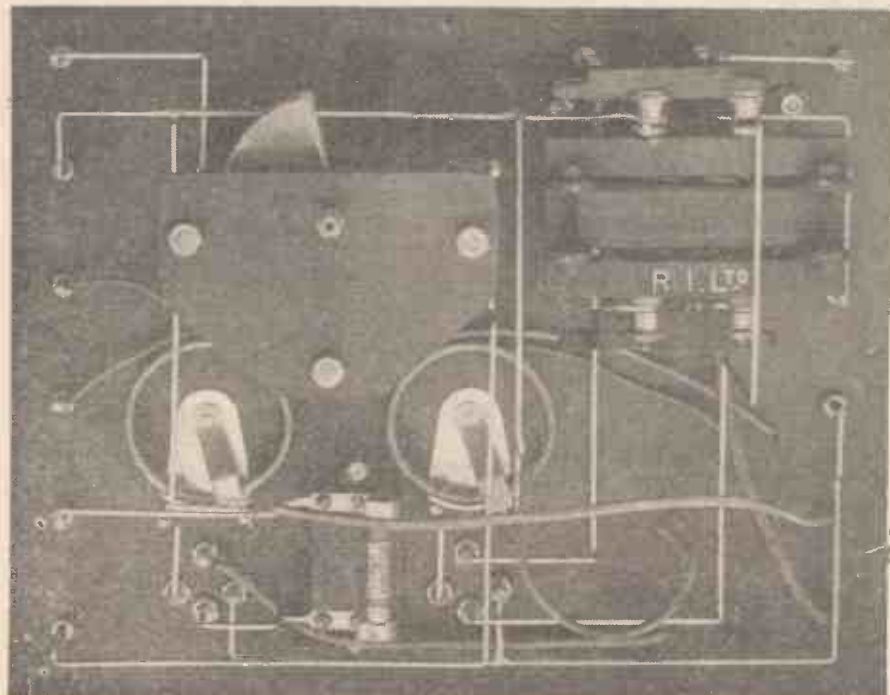
For Daventry the "Ultrynic" coil is disconnected and removed, and an ordinary plug-in coil of about 200 turns is inserted in the socket.

The reaction coil should also be sub-

stituted by a larger coil of about 150 turns. The aerial connections will be the same as for any plug-in coil—not "Ultrynic" type.



How the fixed condenser can be supported by their own connections is shown in this view of the panel



Neat lay-out of components facilitates wiring, as this photograph clearly shows.

Now let us consider some of the circuit variations possible with the six terminals on the left-hand side of the panel. For series condenser tuning, either ordinary coil or "Ultrynic," 60 turns, connect as per Fig. 5, letter (D), for "Ultrynic" 60 turns or ordinary coil and parallel tuning connect as per (C).

Using the "Ultrynic" coil (F) gives parallel tuning of 40 turns, (A) 20 turns series for short waves, and (J) 20 for relay stations on small aerials. (K) "Ultra" gives good results with primary tuning on 320-380 metre range, while (B) gives 40 turns auto-coupled. (G) will enable 40 turns to be used with aerial series tuning.

It will also be noted that the variable condenser can be used in series with the earth lead, sometimes a beneficial arrangement and well worth trying, and for the benefit of those who wish to test this position (Concluded on page 326.)

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This is the second of a series of short articles for practical experimenters, by OSWALD J. RANKIN.

THE panels to be described in this and the following article may of course be duplicated as many times as desired, according to requirements. Each panel is arranged to serve one or more definite purposes, and it will be seen that, although very little space is wasted, no single panel is unduly complicated. The variometer panel shown in Fig. 6 measures 6 in. by 3 in., the hole for the spindle being drilled accurately central so that an ordinary 3 in. dial may be



Fig. 6.

fitted. This dial effectively hides the four fixing bolts, and thus adds to the appearance of the panel.

Variometer Panel Connections.

A loading-coil plug with switching device is fitted to the lower portion of the panel, the arrangement of this being shown in the diagram, Fig. 7, where it will be seen that the panel terminals marked "variometer" are connected one to the instrument and the other to a wander-plug, so that when the plug engages the socket S1 which is joined to the other side of the instrument and to one side of the coil socket, and marked "off" in Fig. 6, the variometer only is in use;

and when engaging the socket S2 (marked "on" in Fig. 6) the coil socket is brought in series with the variometer, and thus any mounted coil may be plugged into the coil socket when it is desired to load the variometer.

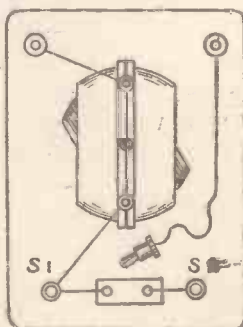


Fig. 7.

show how the two- and three-coil holders are mounted on 6 in. by 3 in. panels, the former being also fitted with a Burndept crystal detector or with any other small and equally useful component which happens to fill the available space.

All connections to terminals are made under the panels, stout copper bus bar being used for wiring and good soldered joints made wherever possible. With the aid of a pair of fine round-nosed pliers, however, many efficient joints can be made by looping the connecting wires at the ends and clamping same very tightly, between two washers previously cleaned with emery



Fig. 8.

connections from the fixed (centre) socket are made with ordinary bus bar.

The variable condenser panels are 6 in. long by 3 1/2 in. wide, these being also fitted with duplicate coil sockets to take coils

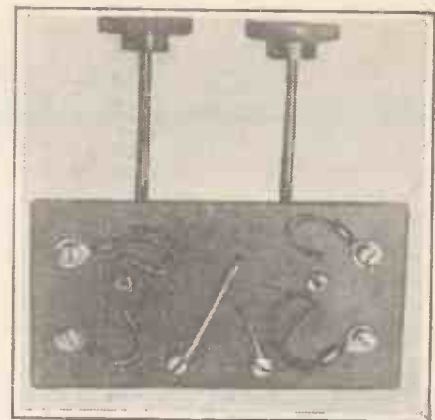


Fig. 10.

with standard mounts or home-made coils with valve pin mounts, and provided with separate terminals so that a loading coil can be used at any time without altering the under-panel connections. If a tuned anode coil is fitted to the socket, then, of course, it is only necessary to connect the condenser and coil terminals in parallel on the face of the panel. Front and back views of the panel are shown in Figs. 11 and 12. It is as well to make up three of these panels and fit them with .0005 mfd. condensers, preferably with vernier attachments, but two will suffice if one's ambitions are confined to certain limits.

Wherever possible switching arrangements are carried out by means of plugs and sockets, this system being considered far more efficient than any other, besides being very simple, neat, and convenient. Figs. 13 and 14 show respectively (Continued on page 280.)



Fig. 11.

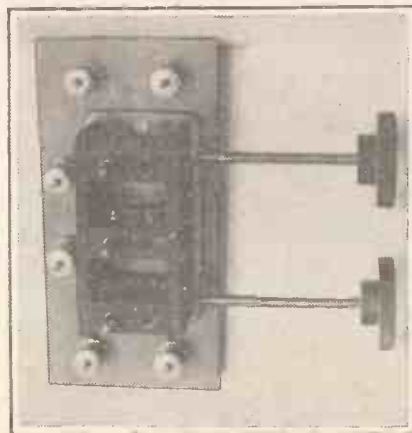


Fig. 9.

cloth, under the terminal nuts. This method is only permissible when using good stout bus bar and strong nuts. Fig. 10 represents a back view of the three-coil holder panel, and shows how the short flexible leads from the moving sockets are first soldered to spade terminals and then clamped under the terminal screws. The

Figs. 8 and 9

AN EXPERIMENTAL SYSTEM.

(Continued from page 279.)

front and back views of a very useful switch panel designed to switch the A.T.C. either in series or parallel with the A.T.I., and also

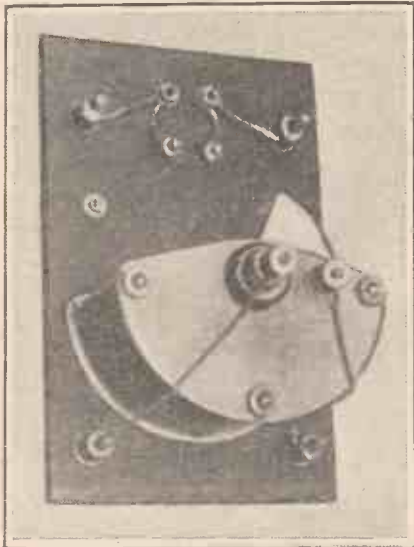


Fig. 12.

to reverse the connections of a reaction coil or to effect the reversing or changing over of other circuit leads in a most convenient manner.



Fig. 13.

1 and 3 respectively the condenser is in series with the coil; when engaging sockets

2 and 4 the condenser is in parallel, and with P1 in socket 1 and P2 in socket 4 then the condenser is switched out of circuit altogether, the aerial and earth leads being connected to the terminals marked A and E. All sockets and terminals should be



Fig. 14.

labelled with ordinary panel transfers, and it is as well to also mark the two settings as shown in Fig. 13.

Rapid Changes Over.

The simple reversing switch should be understood at a glance. If a reaction coil is connected across the two lower terminals, and the upper terminals, carrying the plugs, and the upper terminals, carrying the plugs, are connected to the plate of the rectifying valve and one 'phone terminal, in place of the usual coil connections, the direction of the coil winding can, in effect, be quickly reversed by simply changing over the plugs. That to be able to do this is particularly useful and sometimes essential when trying out new circuits all amateurs and experimenters will admit. There is practically no limit to the number of different changes which can be easily and quickly effected by means of plugs and sockets, and in the next article it is proposed to describe further examples embodied in the design of other panels.

(To be continued.)

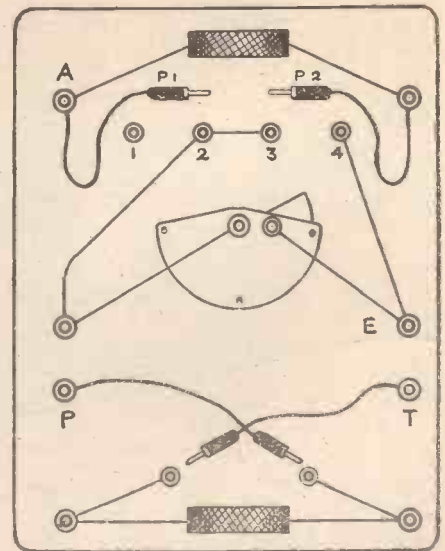
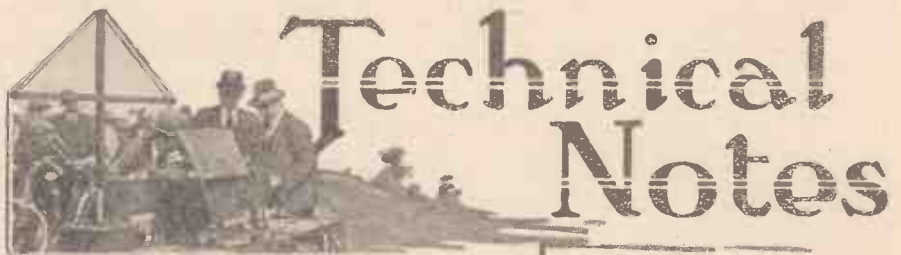


Fig. 15.



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

IN the States the "barretter" is coming again into extensive use, many manufacturers of complete sets installing it as standard. The barretter is made in various models, but in principle it consists of a resistance wire—often of iron—enclosed in a small glass tube containing hydrogen. The wire is made of a metal which has a large resistance variation with temperature, so that small variations of current are accompanied by comparatively large variations of resistance. In this way the resistance of the barretter acts as a "ballast" and tends to compensate for variations in the applied voltage.

Barretters are in some ways very convenient, but, of course, no large variation or adjustment of current is possible by their use. There is nothing to prevent a barretter being used in series with a filament rheostat, the latter for coarse adjustment and the barretter to compensate for small variations in the battery voltage there- after.

A New Valve.

Some little time ago mention was made in this journal of a newly-developed valve, in which a kind of concave "mirror" was used behind the filament to fulfil the functions ordinarily exercised by the grid. A valve of this kind is now on the French market, and is stated to give excellent results. It is operated by one dry cell for the filament heating, and works well both as detector and amplifier. The valve is easier to make than the conventional type and has certain advantages in regard to the inter-electrode capacity, which is very small.

It is understood that valves of this kind

will soon make their appearance on the English market at a very low price.

A Listener's Ideal.

It has always been one of the aims of set manufacturers to turn out a set which would bring in the various wave-lengths according to a dial, which could be adjusted before the set left the factory; such a set would represent the last word in simplicity for the listener. One of the chief difficulties, of course, is the variation introduced by different aerials connected to the set, and there are other variable factors as the reader will readily understand. However, even these can largely be compensated for by means of a very simple adjustment which may be made by the user of the set, the various stations being then approximately indicated on the tuning dial.

An American manufacturer has so far succeeded in this respect that he has placed on the market a "no dial" set, which is provided with a rather large tuning dial on which the various U.S. stations are indicated by their actual call-signs. All you have to do is to turn the dial until the pointer is opposite to the station you want, and the set does the rest.

Not a "No Dial" Set.

Whether there are any further adjustments to be made from time to time I cannot say, as I have not examined one of the sets, but it seems very probable that things will not really be quite so simple as all that. Incidentally, the set is not a "no dial" but a "one dial" set.

(Continued on page 323.)



2 N M CALLING!

NOTES ON SHORT WAVE WORK.

By **GERALD MARCUSE.**

We publish below the second of a series of fortnightly articles by one of the most famous of British amateurs. Mr. Marcuse will contribute articles only to this journal. His third article will be published in our next issue but one.—THE EDITOR.

FOLLOWING on my introductory article—we amateurs eventually came down to the 100-metre wave-length, which proved highly successful for long-distance communication. Some of the commercial stations did some very useful short-wave work, realising that (after the amateurs had shown the way!) useful results could be obtained on these wave-lengths.

On the 90-100-metre band, "DX" work was started in earnest, and great hopes were expressed with regard to round-the-world transmissions. The first experiments were naturally conducted on C.W. Morse, as one of the greatest difficulties experienced by us was to get a pure, steady wave. Owing to the high frequencies of these waves, it was necessary to reduce losses to a minimum, and also to tune each circuit into resonance, etc.

Without going into details, it is interesting to note that every known circuit was tried out, and I am not sure which circuit proved the most efficient as we all had our own particular "pets," best adapted to our own topographical conditions. It seems strange to note here that (and we have proved this several times) you may be able to get your set going perfectly at your own station and yet, when you take it to another locality and apply exactly the same "lay-out," nothing happens. This applies to receiving as well as transmitting.

Valves Need Re-designing.

One special item of interest we noted on reducing wave-lengths, was that the input to anodes of valves is higher as we reduced and the output less, and yet signals seemed to go farther in consequence of the reduction in wave-length.

I believe I am right in saying that in the past valves have been designed for wave-lengths over 1,000 metres to give a certain dissipation at certain inputs, but our best thanks are due to Messrs. The Marconi Osram Valve Co., Ltd., and Messrs. The Mullard Radio Valve Co., Ltd., for their great assistance given to us in the way of designing suitable valves for short-wave working, which has made it possible for us to go ahead, and they have shown their generosity in loaning amateurs valves for their experiments.

Very curious happenings have been experienced with valves, and one of the greatest

surprises I have had since experimenting on short-waves was when the glass supports for the plate leads of one valve I used simply melted, and released the vacuum. I found it necessary to make valves of much stronger construction, and also construct a special grid seal. In this way it will be realised how the amateur experimenter has been of great assistance to the valve manufacturers, supplying them with data and the results of their experiments, which have proved extremely useful.

The Earthing System.

Another important point is the construction of earthing and aerial systems, to which special attention has had to be paid. When reducing wave-lengths from 440 metres we found that an ordinary earthing system

IMPORTANT ANNOUNCEMENT.

In next week's "P.W." we shall publish the first of a series of articles by another famous British amateur, Mr. E. J. Simmonds, whose call sign, 2 O D, is known to all.

Like Mr. Marcuse, Mr. Simmonds will contribute ONLY to "Popular Wireless" throughout the winter. Thus, "P.W." readers will have the exclusive benefit of the valuable articles written by Britain's leading amateur experimenters.

had too high a resistance, and so the counterpoise, or earthing screen, system was adopted. Of course, in the latter case topographical conditions have to be considered; but the ideal counterpoise is one which extends directly underneath the aerial system, preferably slightly longer than the aerial itself. In my particular case, I found that a fan-shaped counterpoise of twelve wires extending a few feet beyond the antenna was the best. Particular care was taken to insulate well in order to prevent losses.

I experienced some difficulty with a change of frequency of the C.W. note, and for a long time I could not locate this trouble. But eventually I found that this only occurred in windy weather, and located the trouble in the halyard touching the mast, which is made of steel.

I have heard various suggestions made that, on 40 metres, better results have been obtained by using a good earthing system over the counterpoise but I have not yet tried this idea in practice, as yet.

Personally, I have discarded both earth and counterpoise, and use what is known as a Hertz aerial, with a radio-frequency feeder; but I shall deal with this more fully in another article, when I intend to describe my own station in some detail.

Success of Vertical Aerial.

You will realise that the design of a suitable aerial is also very important for these short waves, and as yet I don't think it has been definitely established whether it is best to work below the fundamental of an aerial, or to use a short aerial. In my own particular case, I have tried most kinds of aeriels, and although with a short aerial I could get "plenty of amps." into it, signals did not travel. Whereas, when I used my old 90-metre aerial on the 3rd harmonic, with a low input and consequently low output, my signals seemed to travel well.

Mr. Maclurcan, the Australian amateur, 2 C M, has been conducting experiments with a vertical steel pipe as an aerial, and his signals certainly seem to come over well.

There is a further important point in selecting the type of transmitter on short waves for long-distance work. For instance, in countries such as Mexico, South America, the Antipodes, and the American continent, they are troubled there with interference such as we do not know, and that is "power-line" leaks. It must be understood that in these countries power and lighting current is transmitted for long distances, often at 30,000 volts, by overhead standards, for 50 to 100 miles and more, and although no leaks are apparent one certainly hears them! Also, atmospheric disturbances at times make it quite impossible to hear anything but local stations, and I have noticed that it is only about one morning in three that one does not get the usual sign "Q R N bad." So one has to decide to use a C.W. note that penetrates these interferences, and curiously enough the absolutely pure C.W. does not seem to be favoured. The rectified and partly smoothed note gets there the best.

Pure Note Difficult to Read.

Raw A.C., such as most French and European stations use, is unsuitable, owing to the similarity of the tone to atmospherics.

I once received a very curious report from a Chilian amateur when working on 90 metres, to the effect that he received my signals, but owing to the unusual purity of my note it was difficult to read! I have never yet quite understood this.

One of the most important things for an amateur interested in long-distance reception to remember is to accustom himself to

(Continued on page 282.)

2 N M CALLING.

(Continued from page 281).

reading weak signals. I have had commercial operators at my station who agreed that they could not get used to reading such elusive signals. We know that we do get a considerable amount of fading, and also, those of us who have sometimes tried to read WEP and WAP have agreed that, at times, they are impossible to read owing to the type of C.W. note and method of sending used. These latter are the Macmillan Expedition ships.

No Atmospherics.

One point must not be overlooked and that is that most of these distant amateur experimental stations are not using more than 250 watts at the most, and I think that the results we have had on the 40 metre band have exceeded our wildest dreams. For instance, last season, on 90 metres, we had to cease long-distance tests owing to signals fading out in May and June, whereas this year we have been able to maintain communication with the outside world throughout the whole summer.

And one surprising item of interest is that we have been practically free from atmospherics on this side all through, and often when it is almost impossible to receive distant stations (even on broadcasting wave-lengths) we have been practically undisturbed on 50 metres and below. I have even noticed during a thunderstorm, when communicating with an Australian amateur in Melbourne, that except for the lightning flashes, no electrical interference was experienced. I admit that this was a risky attempt, but I was anxious to ascertain what the effect would be.

Some Peculiar Effects.

With regard to the 20-metre band of wave-lengths, I am afraid that this wave-length is still somewhat "in the dark." It seems to be very erratic, and although some good work was done by British amateurs with daylight communication in the summer months, there is still plenty of room for experiment.

One characteristic of this wave is that it is practically impossible to hear stations within the range of 400 miles, and although several stations in England were working on 23 metres, I could, in some instances, not hear them at all.

They were heard well in Copenhagen, and the only explanation of this is that these

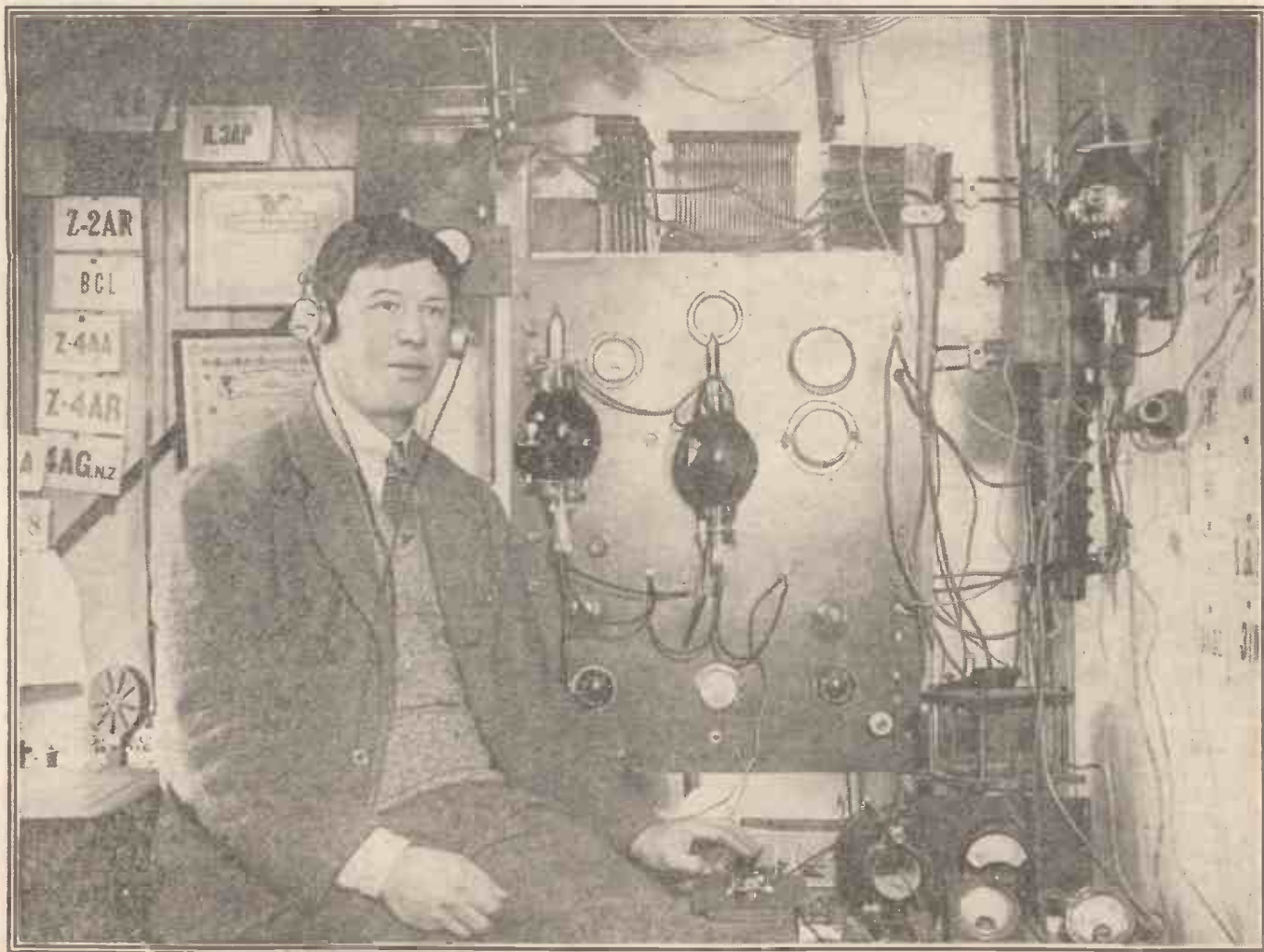
waves radiate vertically and reflect off the Heaviside layer. Curiously enough, signals from the United States of America seem to travel across to England during the whole of the 24 hours, as stations on the Pacific coast could be heard here at midnight and yet we could never establish two-way communication.

Good H.F. Chokes Necessary.

In concluding this article I would like to add that it is very important to use suitable and efficient high-frequency chokes in all circuits, and the best and most efficient way is to wind spaced one turn on a lamp-glass. Use an H.F. choke in your grid circuit in series with the grid leak, and be sure and place same at right angles to your inductances in the main part of your circuits.

Don't be alarmed at your high input and small output relatively to higher waves. This is usually the case. Also, don't be misled by no reading in the aerial ammeter. See that you draw more plate current when your aerial coil is coupled to your closed circuit. On low power it is a good plan to key in your aerial.

[Another interesting article by Mr. Marcuse will be published in a fortnight's time—in "P.W." No. 176, dated week ending October 17th.]



Mr. Gerald Marcuse at work at his station, 2 N M, at Caterham. The photograph shows one of the valve panels and the master oscillator used for C.W. transmission.



"THIS is W G Y, of the General Electric, Schenectady, New York. You have just heard—"

To DX fans, real ones, the above is quite a familiar announcement, and there are mighty few among those who have received America several times who do not include W G Y in their logs. Before leaving England my log contained record of reception from three U.S. stations, all back in '23 too (way back in the 'nineties sort of idea). These included W M A F, K D K A, and W G Y. The latter used to come through about five

W G Y is a station every listener has heard of, even if he has not actually heard the station's transmissions. This article is the result of a special visit to the station by Mr. L. W. Corbett, our New York representative.

centre, on the left, is the piano, and on the right a small table at which the announcer sits and on which is a microphone. There are two other microphones on pedestals which are used for orchestral items and singers, etc. These microphones are of interesting design, a stage of L.F. amplification actually being included within the instruments themselves.

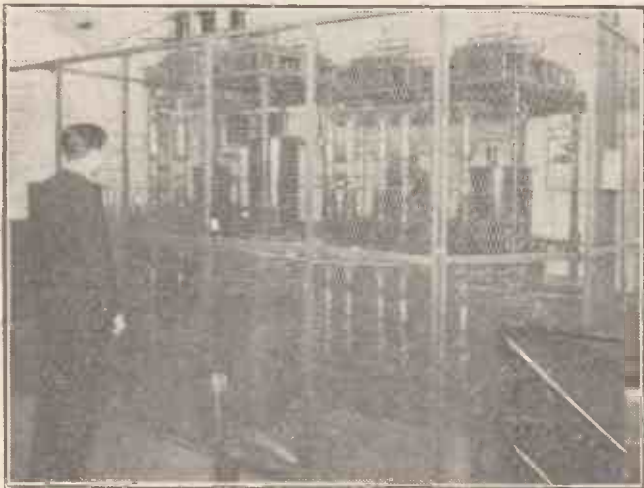
The practice of having the studio on the ground floor, while unusual in England, does not seem to be so in America, and in fact, I have visited a studio situated below ground level. The windows of the W G Y studio face on to the private property of the General Electric Co. But as a rule, little noise comes into the studio if the windows are left open, although now and again the shouts

are all more or less the same, except in minor details, but some people like—I certainly do—to be able to sit back in their chairs and, while listening-in, to visualise exactly the position of each artiste partaking in the programme. Many will disagree on this point. It is so much more satisfactory to imagine that the silver tones of one dulcet-throated soprano are emanating, not from the uninteresting studio, but perhaps from some sylvan glen, they will say. In that case why not picture to oneself, during the rendition of the "Blue Danube," that the symphony orchestra obliging, is, at the time of the playing, floating down this river on a large raft. And how our geography would suffer in the case of two stations jamming, for who has ever heard of the "Blue Danube" flowing through a "Persian Market." All of which is rather beside the point, but it gives me an excuse to describe the studio of W G Y.

Manufacturing "Noises."

At the time of my visit, the director of the famous W G Y Players was in the act of testing out various pieces of apparatus required to provide the incidental noises for a forthcoming play. In this particular play two people are stranded in a collapsed mine with water dripping upon them from the above. An explosion takes place, which echoes through the mine. An ordinary bath, it was found by experiment, gave the best broadcasting sound for the dripping water, while the echo effect was obtained by having the explosion take place some way up the passage outside the studio. It is interesting

(Continued on page 284.)



The Kenotron rectifier, by means of which "stepped up" A.C. is converted into D.C. for transmitting purposes.

or six times louder than the others, and for all I know, does so still.

Maybe, the old order changeth, but what I am sure of is the fact that W G Y is still getting piles of letters from European listeners, reporting reception of part of, or in many cases the whole of, the programme. Don't take me too literally, for, of course, during the summer months one of the postmen is pensioned off, but to the end of the last radio season W G Y was still holding its own.

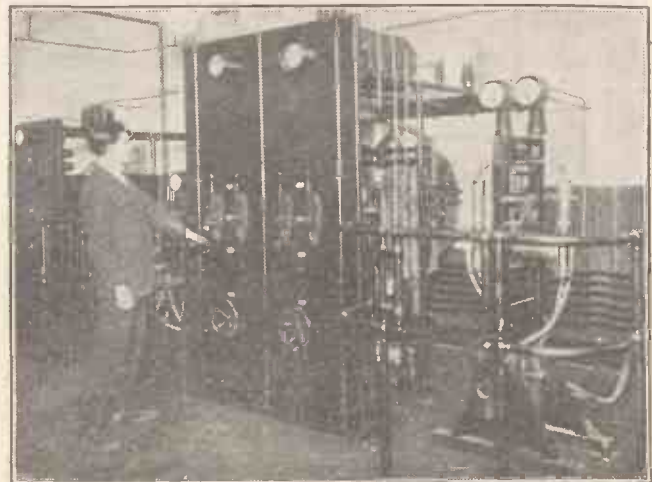
Ground Floor Studios.

The two studios of W G Y, one large and one small, are situated, together with the control room, on the ground floor of a six-floor building on River Road, where the six million odd square feet of the General Electric Co.'s enormous plant begin. Between the two studios is the control-room.

To one end of the studio, the end nearest to the control-room, is a large pipe organ which is often heard by W G Y's listeners, while at the opposite end is a divan. To the

from baseball players playing on a field some hundred yards away are picked up by the microphone, and it is necessary to close the windows, or read the riot act. The studio is padded in the usual manner, and some form of wallpaper covers the padding to make B.C.A.'s as happy as possible. B.C.A., I hope readers will understand, is meant to stand for "broadcast artistes." I don't see why it shouldn't if B.C.L. stands for "broadcast listener."

A description of a studio is naturally uninteresting, for they



The "Standby" transmitter, showing the modulating and oscillating panels.

A VISIT TO W G Y.

(Continued from page 283.)

to note that the special play "Danger," written by an Englishman, Richard Hughes, specially for broadcasting, was recently given by the W G Y Players.

The sound waves impinged upon the microphone, after passing through the amplifier within the instrument and an additional amplifier in the control room, are carried by land-line to the transmitting apparatus in the power-house about a quarter of a mile away, and are here amplified by two 150-watt valves in parallel. Thence through the modulator system, the H.F. power amplifier, Hartley oscillator, the Tank panel, etc., to the transmitting aerial. There is, as is the case with most of the larger American stations, a complete duplicate transmitter which can be utilised at only a few seconds notice.

An Unfortunate Coincidence.

"How often do you have a breakdown?" I asked the engineer-in-charge.

"This can best be answered by stating that last year, for a total of 1,600 hours on the air, we were only off for 36 minutes, due to a fault with the transmitter," he replied.



The original experimental transmitting equipment used in the early days of W G Y.

Hardly had the words escaped his lips when we were thrown into comparative darkness, and the filament of every valve became cold. A glance at his meters informed the engineer that the source of power was cut off and that there was no fault with the transmitter. A telephone call confirmed this. It was fifteen minutes before

the station was able to resume broadcasting, as there is only one source of power at W G Y. As a matter of fact, the whole night's broadcasting from W G Y on this particular night was a fiasco, for a particularly heavy electrical storm had caused the Washington land-line to be put out of commission, and W G Y was relying on Washington for an hour's dance music.

The N.Y. Philharmonic Orchestra was also scheduled to give an out-of-doors concert which W G Y was to give also, but the rain delayed this for about an hour. It all ended up by the staff of W J Z providing a very excellent impromptu concert of vocal and piano items, the programme being relayed to W G Y. So even the best of the American stations have their set-backs even as do the B.B.C.'s stations.

A Special "S.O.S." Transmitter.

The outside power supply as received by W G Y consists of 250 volts D.C., and as 12,000 volts is required for the plates of the transmitting, some method of stepping-up this 250 volts had to be devised. A transformer cannot be used to step up D.C. current, so this is the way it is done. The 250 volts D.C. current drives a motor; the motor drives a dynamo; the dynamo supplies three phase A.C. current, and the A.C. is then stepped up to the required value, also rectified by the Kenotron rectifier.

Included in the apparatus is a 600-metre transmitter and receiver. It is a regulation of the U.S. Government that all U.S. broadcasting stations within two or three hundred miles of the coast have such a transmitter, and the engineers have to listen-in for three minutes out of every fifteen for S.O.S. calls. If any such calls are heard they are required to go off the air immediately (this refers to broadcasting), and to repeat the S.O.S. call with their 600-metre I.C.W. transmitter.

The power employed by W G Y is in the neighbourhood of 2,000 watts.

When W G Y first went on the air it was intended to be more or less a development station, where apparatus and so forth might be tested for the other two General Electric stations, K O A and K G O, but now there is, of course, a permanent transmitter in operation.



Workmen busy at work on one of the huge transformers to be employed at W J Z, an American station that is to use the immense power of 50 kw.

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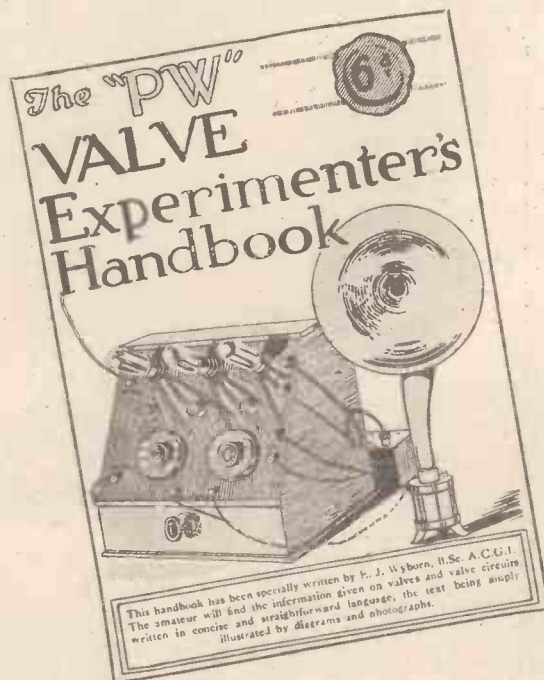
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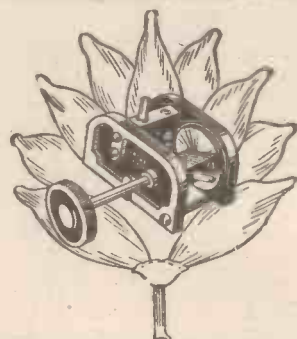
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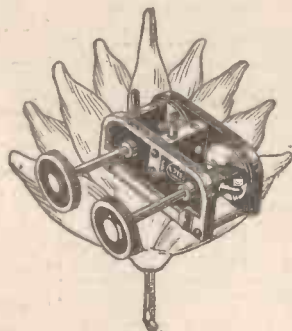


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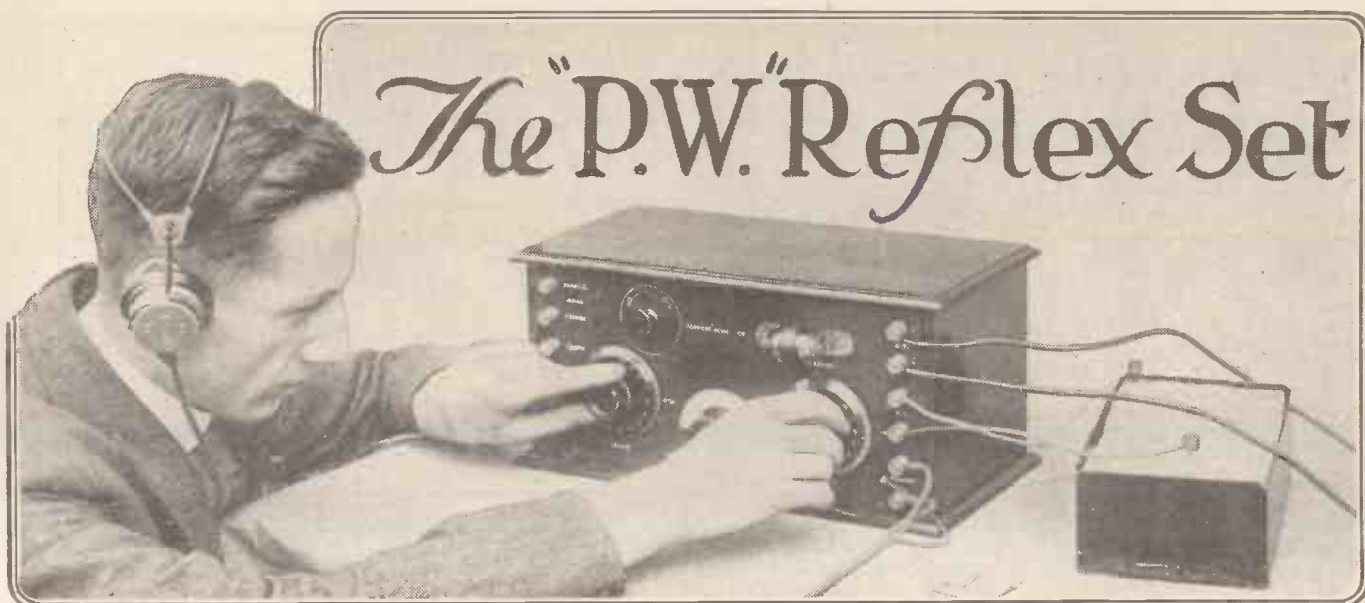
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Compared with an ordinary one-valve set results are noticeably more powerful, but, as will be seen from the photographs, the set

A ONE VALVE REFLEX SET.

Designed and Described by
K. D. ROGERS.
(Assistant Technical Editor).

Constructed by **G. V. COLLE.**
(Technical Staff).

ing condensers are necessary, one for aerial and the other for anode circuit tuning. The lay-out has been symmetrically arranged to facilitate tuning. Left and right hands may be employed simultaneously on the condenser dials and the reaction control is centrally situated.

Concerning the Components.

In order to make the set as easy as possible to tune, a "gravity" detector instead of the ordinary cat's-whisker type of detector has been employed. The latter type is, however, quite suitable for use in this circuit. The terminals on the right-hand side of the panel are self-explanatory, but, in passing, it may be said that there is plenty of room in the case for the components, so that the constructor is not absolutely limited to the particular types which are employed in the original set, although for larger components it might be necessary to rearrange the lay-out. It will be seen that an anti-microphonic valve-holder is employed. This is a refinement well worth while, as it completely obviates those jarring noises that so frequently spoil reception when the valve is rigidly mounted in the set.

The containing case is of the type employing an upright panel and baseboard, and its hinged lid enables the valves or coils to be changed, whilst keeping the interior of the receiver completely free from dust. If the components to be used conform in size with those given in the list on page 291.

(Continued on page 290.)



The complete receiver presents a neat and business-like appearance.

itself is larger and involves two tuning controls.

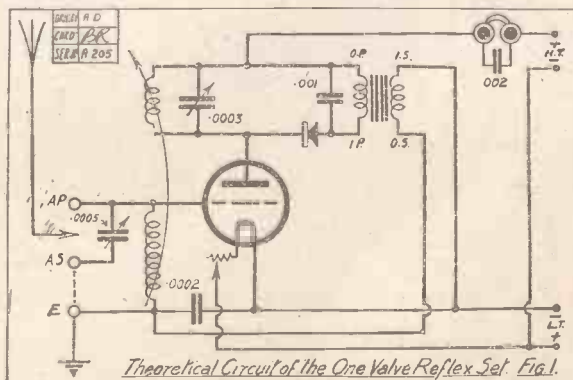
B.B.C. station, from the lowest wave-lengths up to 5 X X (1,600 metres), can be tuned-in under suitable conditions. Either bright or dull emitter valves can be used, and the receiver is fairly easy to operate.



A back-of-panel view taken after the main components had been mounted, but before any wiring was carried out.

Referring to the photographs on this page, it will be seen that the well-known double aerial terminal system is employed. By this means the aerial tuning condenser can be arranged either in series or parallel with the aerial coil, and thus the receiver is suitable for reception on either long-wave or short-wave broadcasting. The use of plug-in coils enables a very wide range to be covered, and, with a set of suitable coils, any B.B.C. station, from the lowest wave-lengths up to 5 X X (1,600 metres), can be tuned-in under suitable conditions. Either bright or dull emitter valves can be used, and the receiver is fairly easy to operate.

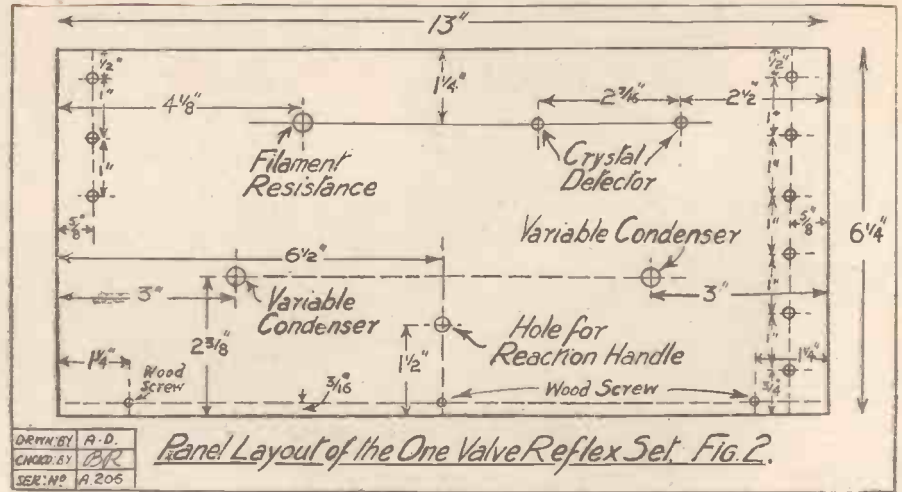
From the list of components given in another column it will be seen that two tun-



THE "P.W." ONE-VALVE REFLEX SET.
(Continued from page 289.)

the drilling of the panel may be carried out from the dimensions shown in Fig. 2. Similarly, the baseboard may be laid out, as shown in the photographs, and, even with larger components, it will probably be possible to conform more or less to these positions. (See Fig. 3.)

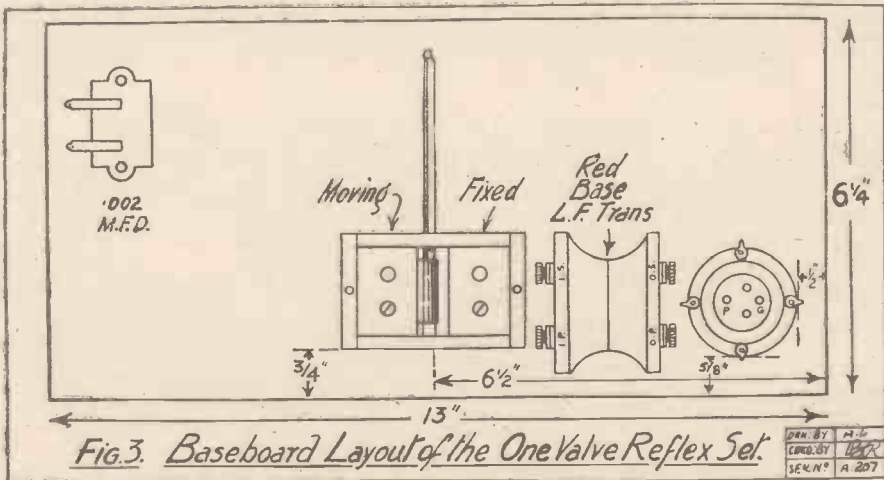
Having assembled the components and placed them in position on the panel and baseboard, care should be taken that none of the moving parts is restricted in action. The largest coils that will be used should be plugged in the coil holder, the valve mounted in its holder and the condenser vanes opened to make sure that there is plenty of room. Then the final mounting of the parts can be done and the set prepared for wiring. The terminals should be



filed ready for soldering and wiring carried out in accordance with the list of point-to-point connections.

COMPONENTS REQUIRED.

1 panel 13 in. by 6 1/4 in. by 1/4 in. (Peto-Scott) ..	1	5	9
1 cabinet with baseboard			
1 filament rheostat (Lissen) (Lissenstat Major) ..	7	6	
9 terminals W.O. type ..	1	2	
1 valve holder (anti-phonetic) (Magnum) ..	5	0	
1 .0005 variable condenser (Peto-Scott)	6	6	
1 .0003 " " (Ormond)	5	6	
1 L.F. transformer (Max. amp., red base) (Peto-Scott) ..	10	6	
1 .0002 fixed condenser (Lissen)	2	0	
1 .001 " " ..	2	6	
1 .002 " " (Dubilier)	3	0	
1 2-way coil holder (Peto-Scott) (friction drive, long handle) ..	5	6	
1 crystal detector (Eureka) ..	6	6	
Wire, screws, transfers, etc. ..	2	6	

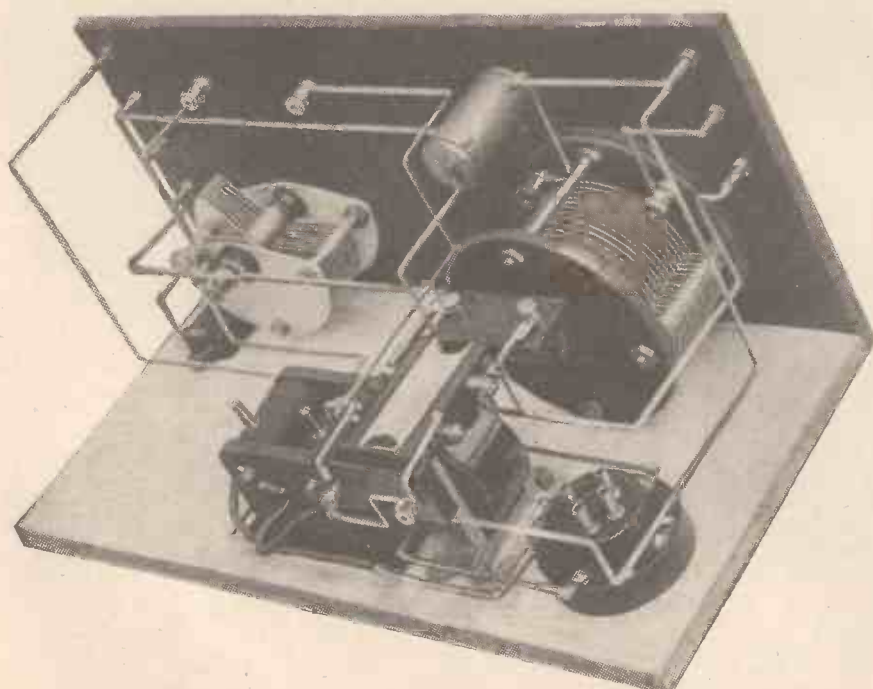


Owing to the fact that components vary in size and shape, no attempt is made in the list of point-to-point connections to give the actual order in which the wires are taken from point to point. The constructor will find that the best plan is to draw a sketch of the back of his panel and fill in the connections to be made. How the actual wiring was carried out can be seen from the photograph on this page, which can be compared with the wiring diagram, Fig. 4.

Wiring-up the Set.

No. 18 square section tinned copper wire was employed for the connections. The leads to the anode coil are flexible ones, to facilitate a change-over of connections, if required, owing to different makes of coils. If, when connected up, the set does not oscillate, these leads to the anode coil should be reversed, as unless they are connected in the correct position relative to the aerial coil, the reaction effect will tend to oppose instead of to assist reception. From the photographs it will be seen that the fixed condensers have been supported across the L.F. transformer terminals by means of the stiff wires employed for connections. This was merely done for convenience, and, if desired, the condensers could be placed on the top of the transformer or beside it on the baseboard.

Another point worthy of mention is that variable condensers employing a vernier would undoubtedly assist in the reception of



▲ Photograph of the one-valve reflex set after the completion of the wiring. Note the space left for the anode coil to swing out away from the aerial coil.

(Continued on page 291.)

THE "P.W." ONE-VALVE REFLEX SET.

(Continued from page 290.)

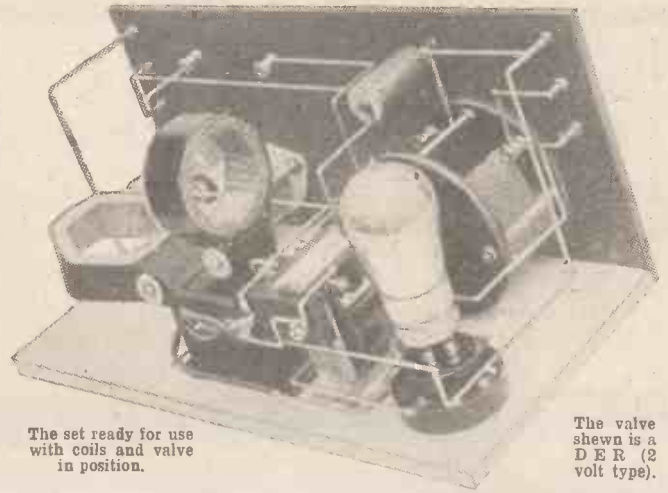
long-distance signals. They are not, however, essential to the operation of the set, and in addition to loud results from the local station, very good long distance results can be obtained with the components shown.

After the connections have been completed and checked, the set should be carefully cleaned and tested out. About 80 or

90 volts H.T. is required for most valves in order to get the best results when used in a reflex circuit.

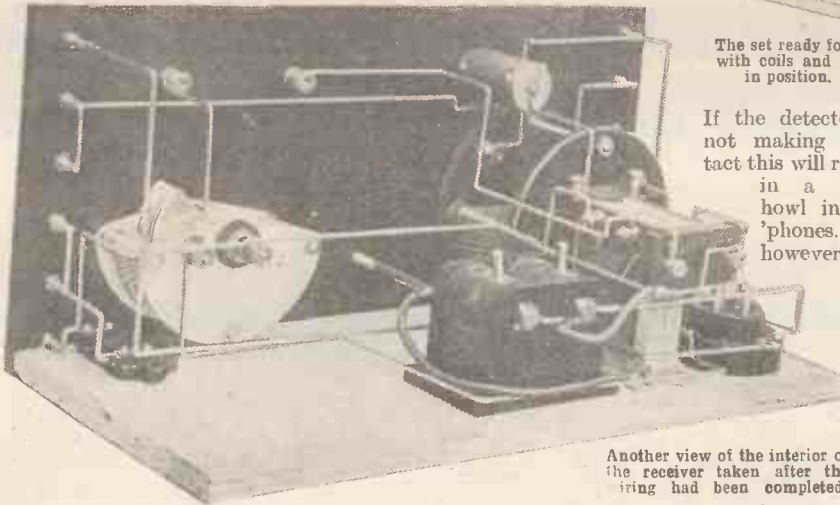
The Eureka crystal detector is completely enclosed, but it can be tested for operation as follows:

Connect up the set in the ordinary way with normal H.T. and L.T., etc., and then remove the anode coil from the coil holder.



The set ready for use with coils and valve in position.

The valve shown is a DER (2 volt type).



Another view of the interior of the receiver taken after the wiring had been completed.

If the detector is not making contact this will result in a loud howl in the 'phones. If, however, the

crystal is correctly in circuit, the removal of the anode coil will not cause the set to howl. For short-wave working, the aerial should be in the series position, and either a 50 or 75 turn aerial coil should be used. For 5 X X the aerial leads should be taken to the parallel terminal. Then a short external lead is connected between the series and earth terminals, in order to complete the circuit. Tuning will be found to be a matter of skill and experience. Having rotated the aerial condenser until a weak signal is received, strengthen by tuning the anode condenser. If the set breaks into oscillation loosen the reaction coupling, and readjust the condensers until both are accurately tuned. For long distance work final control of the filament is a valuable asset, and the crystal detector may also be found rather critical in its adjustment, for good reception of weak signals.

Point-to-Point Connections.

One filament leg of the valve holder to one side of the filament rheostat. Other side of the filament rheostat to the + L.T. and - H.T. terminals.

- L.T. terminal to the other filament leg of the valve holder.

Aerial parallel terminal to the fixed vanes of the .0005 variable condenser, to the grid leg of the valve holder, and to the plug side of the fixed coil holder.

Aerial series terminal to the moving vanes of the .0005 variable condenser.

Earth terminal to O.S. of the L.F. transformer, and to socket side of the fixed coil holder.

I.S. of the L.F. transformer to the - L.T. lead.

A .0002 mfd. fixed condenser is then connected across the secondary of the L.F. transformer (this condenser is essential).

Plate leg of the valve holder to socket side of the moving coil holder (flexible wire), to the fixed vanes of the .0003 variable condenser, and to one side of the Eureka crystal detector.

Other side of the crystal detector to I.P. of the L.F. transformer.

O.P. of the L.F. transformer to the plug side of the moving coil holder (flexible wire), to the moving vanes of the .0003 variable condenser and to one 'phone terminal. Other 'phone terminal to the + H.T. terminal.

A .001 fixed condenser is connected across the primary of the L.F. transformer, and a .002 fixed condenser across the 'phone terminals.

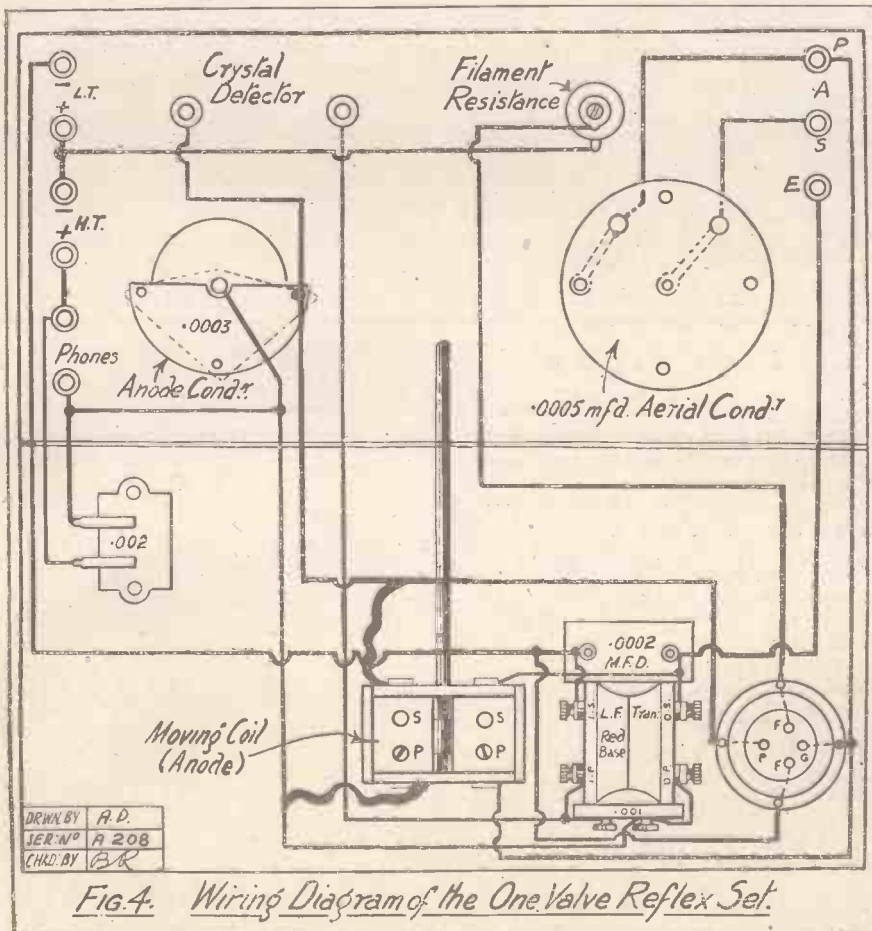


FIG. 4. Wiring Diagram of the One Valve Reflex Set.

THE CAUSE OF CRYSTAL RECTIFICATION.

By J. F. CORRIGAN, M.Sc., A.I.C.
(Staff Consultant "Popular Wireless.")

PART II.

CONTINUING our résumé of the various theories which have been brought forward in order to explain the crystal's action, let us now turn our attention to those theories which may be said to be electro-chemical in nature.

One of the old theories which, in the early days of wireless science, was put forward to explain the action of the coherer as a detector of Hertzian waves, stated as a general line of argument that upon any metallic surface a minute film of air is formed, and this air is "absorbed" in the surface skin of the metal. According to the old coherer theory, it was this absorbed film of gas which, acting as a partial dielectric, caused the metallic fragments of the coherer to provide a current-conducting path when acted upon by a train of Hertzian waves.

Now a very similar theory to this has been applied to crystal rectification. On this theory it is assumed that there is present in the surface films at the point of crystal contact a quantity of *absorbed* air or gas, and it is owing to the peculiarities in the conductivity of this surface layer that the rectifying effect of the crystal is set up.

Four Important "Laws."

Other experimenters have considered that every rectifying mineral or crystal must possess within its mass molecules of oxygen, sulphur, or allied elements. These form what is known as a "solid solution," that is to say, a solid is dissolved in a solid, instead of a solid in a liquid, as is more usually the case. According to this electro-chemical theory, when an H.F. current is applied to the rectifying contact, a sort of ionisation of the dissolved molecules is set up. This results in an electro-motive force being produced at the point of contact which tends to oppose the electron flow in the other direction, but which assists it in the other, thus giving rise to the phenomenon of unilateral conductivity.

In its fundamentals, therefore, this electro-chemical, or electrolytic, theory of crystal rectification may be said to comprise an attempt to follow up and to elaborate the early unilateral conductivity theory.

Thermal theories of crystal rectification may really be divided into two main classes, to wit, those which deal with differences in temperature—and, therefore, of resistance—at the point of contact, and those which ascribe the rectification effect to the production of minute thermo-electric currents at the contact.

However, before considering these theories, let us make quite sure of the meaning of several well-known electrical principles or "effects" which must enter into our discussion.

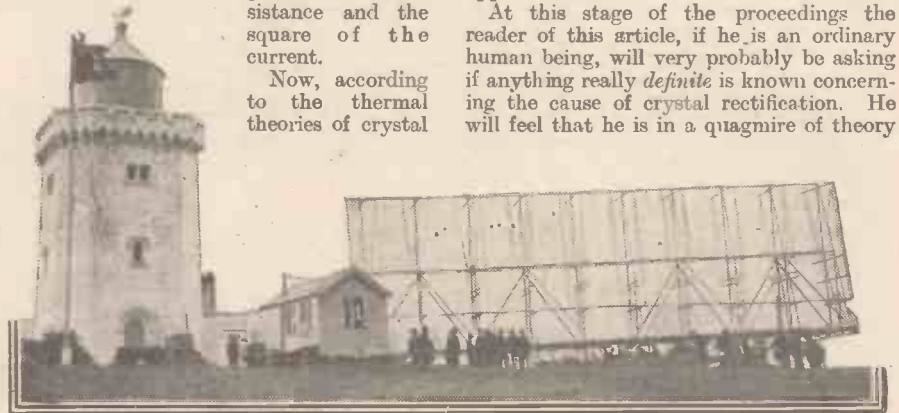
The first of these "effects" is the well-known "Peltier effect." This effect com-

prises the alteration in temperature which is caused when a current passes across a junction of two different metals or alloys. And, conversely, a current is generated at such a junction when it is either lowered or increased in temperature, this being, of course, the principle of the thermo couple.

The "Seebeck effect," first explained by Professor Seebeck, of Berlin, is the name given to the process of current generation which is set up when two dissimilar metals are placed in contact; whilst the "Thomson effect" comprises the production of a current in a conductor, the two ends of which are at unequal temperatures.

Finally, there is Joule's Law, which states that the heat produced by a current flowing through a conductor is proportional to the product of the resistance and the square of the current.

Now, according to the thermal theories of crystal



The South Foreland Lighthouse and the revolving aerial used in the recent wireless beam tests.

rectification, all the above "effects," or laws, or principles, or whatever you like to call them, have a share in the cause of the rectification.

The best known thermal theory of rectification has it that when the oscillatory current passes across the crystal contact a certain amount of heat is produced in accordance with Joule's Law, stated above.

Then, after this, the Peltier effect comes into operation, and the heat produced by the H.F. current gives rise to further minute currents of a unidirectional nature, and it is these currents which flow from the crystal into the headphones of the set.

Dr. Eccles' Theory.

Sometimes, according to more elaborate thermo-electrical theories of crystal rectification, the Thomson and Seebeck effects have a say in the matter as well, and a current is produced in virtue of both parts of the crystal contact being at slightly different temperatures.

If the above theories are true, it would seem likely that the thermo-electric current

generated when a source of external heat is applied to the crystal contact would flow in the same direction as the rectified current. Careful experiment on the part of many workers, however, has proved that this is not the case, and that the thermo-electric current flows in the opposite direction to that of the rectified current.

It was Dr. Eccles who first put forward what may be called a purely thermal theory of rectification as distinct from a thermo-electrical theory based on the Peltier effect, and so on.

According to the theory of Dr. Eccles, which was originally formulated many years ago, crystal rectification is, in the main, due to the alteration in resistance of the crystal and its contact, owing to the variations in temperature which are caused by the passage of H.F. current through it. Thus, the theory is based entirely on the Law of Joule relating to the variation in resistance at the contact.

Nothing Definite Known.

Unfortunately, however, the theory does not explain the precise mechanism of the effect, nor does it make much attempt to show why the crystal can be increased in sensitivity by various methods, and also decreased in sensitive properties by other circumstances. The theory, therefore, is but a tentative one. It may apply to certain contacts, but it cannot by any means be applied all round.

At this stage of the proceedings the reader of this article, if he is an ordinary human being, will very probably be asking if anything really *definite* is known concerning the cause of crystal rectification. He will feel that he is in a quagmire of theory

and hypothesis from which no practical results have been evolved.

And the reader will be quite correct. These theories of crystal rectification may be plausible ones; on the other hand, they may not appear to be so to many minds. The true fact is that, up to the present, the radio scientist is almost quite as much in the dark concerning the real nature of crystal rectification as he was many years ago, and the theories which have been put forward in an attempt to explain the cause of the phenomenon all fail more or less completely to lay down any laws which govern the conditions of rectification and the precise circumstances under which the crystal's sensitive properties may be conserved and enhanced.

However, in the final article of this series, we shall endeavour to look into the manner in which the modern theory of rectification is gradually being developed, and to consider the degree of progress in crystal science which its eventual formulation in a complete form will bring about.

(To be concluded.)

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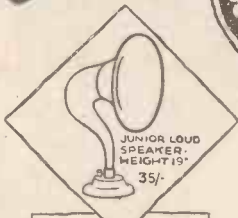
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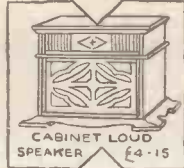
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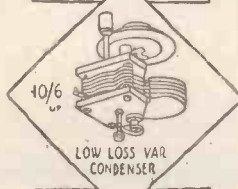
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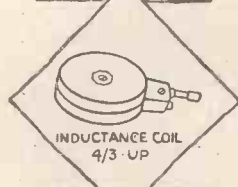


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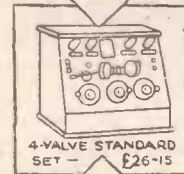
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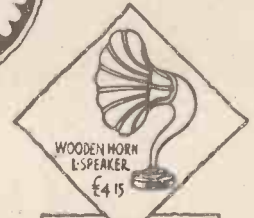
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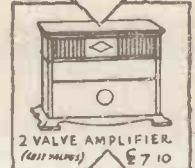
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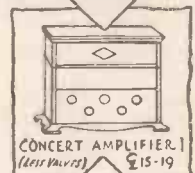
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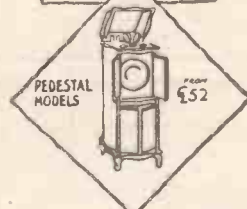
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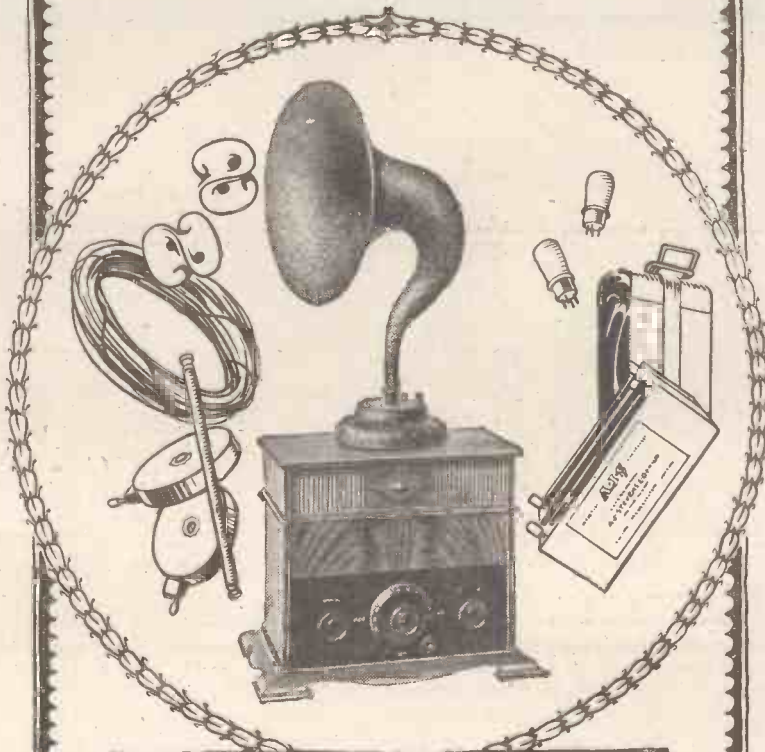
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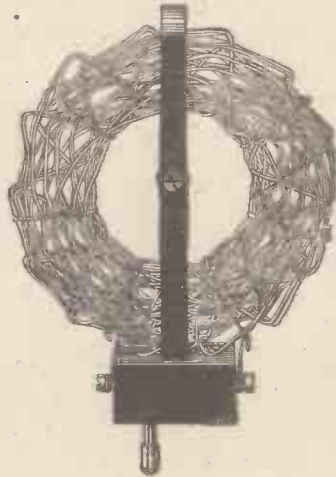
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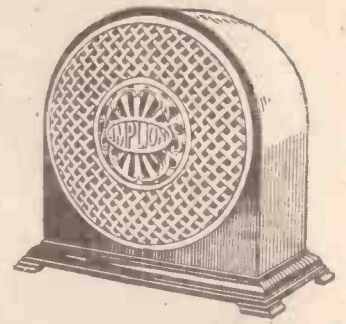
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ON the last page of this issue of POPULAR WIRELESS our readers will find a coupon form entitled "The 'P.W.' Radio Sounds Competition." We venture to think that this competition is one of the most novel ever devised, and we are confident that millions of people will enjoy an amusing and interesting half hour on the night of Friday, October 16th, when the competition will be broadcast from all stations except 5 X X.

Evidence for the B.B.C.

This competition has been organised by POPULAR WIRELESS in co-operation with the B.B.C.

The idea is to broadcast, on the night of October 16th, twenty ordinary well-known sounds which listeners have to identify. The solutions to these sounds must be written, in ink, on the special competition form published in this and future issues.

No one can enter for the prize offered in connection with this Radio Sounds Competition unless a "P.W." Coupon is used and signed in the manner set forth in the rules printed on the last page in this issue.

We have always been anxious to assist the B.B.C. in every way possible, and some time ago it came to our knowledge that no really satisfactory test had ever been made to ascertain how certain radio sounds, especially those used as "effects" in radio plays, etc. "got over" to the millions who listen to the B.B.C.'s programmes.

Mr. G. Marcuse, whose exclusive articles appear every two weeks in "P.W."

possible, and some time ago it came to our knowledge that no really satisfactory test had ever been made to ascertain how certain radio sounds, especially those used as "effects" in radio plays, etc. "got over" to the millions who listen to the B.B.C.'s programmes.

Prizes for Competitors.

We eventually suggested a "Radio Sounds" competition to the B.B.C., whereby twenty different sounds, likely to prove of value to the B.B.C. in connection with radio plays and the broadcasting of "effects" generally, should be broadcast, and prizes given for the listeners who send in the proper solutions, or the highest number of correct solutions, of the sounds transmitted.

Thus the B.B.C. would gain valuable evidence from the results sent in by competitors—results which would enable the B.B.C. to find out how effective were certain broadcast sounds and how unsuitable certain other sounds might be.

In short, the B.B.C. expressed approval of our suggestion and the result is that, in co-operation with the company, we have undertaken to organise a "Radio Sounds" competition, not only to interest and amuse listeners, but in a sincere effort to enable the B.B.C. to gain evidence which will, we feel sure, prove of great value in the development of broadcast radio plays, etc.

We shall have pleasure in publishing on this page next week a letter from Mr. J. C. W. Reith, managing director of the B.B.C., in connection with the competition.

The rules governing this competition are very simple and may be briefly expressed as follows:

CURRENT TOPICS.

By the EDITOR.

The Radio Sounds Competition and the 3rd "P.W." Wireless Meeting.

The First Prize will be awarded to the competitor whose solutions are correct or most nearly correct, and the other prizes will follow in order of merit. The Editor reserves the right to divide the prizes should it be necessary.

Simple Rules.

Any number of attempts may be sent in, but each attempt must be quite distinct from any other attempt and must be made out on the proper form published in POPULAR WIRELESS. All entries must be made out IN INK. Entry forms must not be mutilated or bear alterations or alternative solutions of any kind. No responsibility can be accepted for any efforts lost, mislaid, or delayed.

The Editor's decision will be final and legally binding throughout this competition, and acceptance of this rule is a condition of entry.

No one connected in any way with the proprietors of POPULAR WIRELESS or with the British Broadcasting Co. may compete.

The closing date is TUESDAY, 20th OCTOBER, so that you have about four days in which to complete your entries and send them in. They must be enclosed in envelopes and sent to:

"Radio Sounds" Competition,
c/o POPULAR WIRELESS,
Gough House, Gough Square,
London, E.C.4 (Comp.).

No entries arriving after that date will be admitted to the contest.

The result and the names of the prize-winners will be announced as soon as possible after that date—also, a full statement of the result will appear in POPULAR WIRELESS.

A recapitulation of these rules will be found on the last page of this issue and also the official coupon form.

POPULAR WIRELESS is offering a first prize of £250, a second prize of £100, and over 200 consolation prizes, consisting of telephones, loud speakers, "Winsulators," etc., in connection with the competition.

The actual broadcasting of the twenty sounds on October 16th will not exceed half an hour, and will begin about 7.50 p.m.

The Twenty Sounds

We have had several rehearsals at 2 L O and a selection of sounds, prepared in co-operation with the B.B.C., have been broadcast on a short circuit test arrangement. Many were found to be impossible and of no likely value to the B.B.C.; but we have now evolved a list of twenty representative sounds—sounds familiar to all—which, we think, will make a fair broadcast test.

In certain cases the actual sounds broad-

cast will be prefaced by a short spoken clue. These clues should be very carefully noted before readers write down their interpretation of the sounds which follow. We would specially advise competitors to jot down their solutions—not exceeding five words—on a scrap of paper first, and then to write out, in ink, their answers on the official "P.W." Coupon form. Competitors must not erase, or alter in any way, the answers written on the coupon form.

Further details need not be dealt with here. On the night of the competition the rules will be broadcast.

As a preface to the broadcasting of the twenty selected sounds we have arranged for our staff consultant, Dr. J. H. T. Roberts, F.Inst.P., to broadcast a short popular "talk" on "The Mystery of Sound."

We can only express the hope that our readers will find the competition of interest and that they will enter for it in large numbers and so assist the B.B.C. in obtaining what will undoubtedly prove very valuable evidence.

Another Wireless Meeting.

Many of our readers will remember the wireless meetings organised by this journal in the past, and will be interested to learn that another great meeting has been arranged for Friday, October 23rd.

It will be held, as before, in the Central Hall, Westminster, which has accommodation for over 2,500 people.

A large number of free tickets have been set aside for readers of "P.W." Application for these free seats must be made on the coupon printed on another page in this issue. One coupon entitles readers to book two free seats.

Specially reserved seats close to the platform may also be obtained at the popular prices of 3/6, 2/4, and 1/2, including tax.

Book Your Seats Now.

Readers are advised to make early application for seats as there is sure to be a very great demand. All applications should be made to "R. G. T.," c.o. POPULAR WIRELESS, The Fleetway House, Farringdon Street, London, E.C.4.

The programme for this meeting has not been entirely completed at the time of going to press, but we can definitely announce that the following gentlemen will deliver short lectures at the meeting: Sir Oliver



Mr. E. J. Simmonds, who will also write only for "P.W." His first article appears in next week's "P.W."

Lodge, Lt.-Commander Kenworthy, Captain Eckersley, Major Raymond Phillips, and Mr. Gerald Marcuse. Mr. J. C. W. Reith, managing-director of the B.B.C., has also promised to be present

to present the first and second prizes in connection with our "Radio Sounds" Competition.

Further details about this great wireless meeting will be announced in a later issue.

EFFECT OF GEOGRAPHY ON WIRELESS RECEPTION.

By Lieut.-Comdr. H. W. SHOVE, D.S.O., R.N.



One of the masts of the nearly completed 50 kw. broadcasting station (W J Z) at Bound Brook, New Jersey.

It is well known that the range at which a wireless signal can be received depends, in a great measure, on the

mineralogical formation also plays its part.

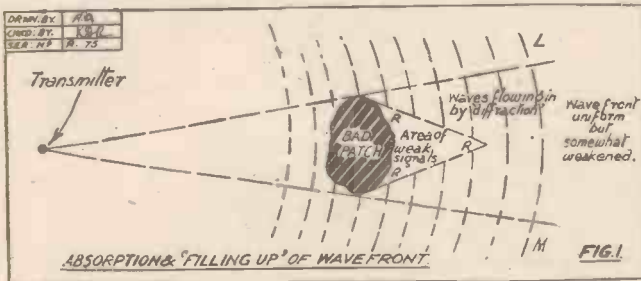
This soil effect is an absolute and permanent one—i.e. the energy of the waves is actually lost in passing over the bad patches. It is true that there is a sort of “filling up” of the wave front by impulses flowing in, as it were, from the sides, so that the loss is more noticeable if the receiving station is near the area causing it than if a consider-

phenomenon. At one mile from the hill signals may be quite inaudible, which, at two miles, come in at good strength.

Anyone who has watched the water swirling round a rock in a rapid river will understand something of the cause of this. Close under the lee of the obstruction there is often an area of almost completely still water. But, further down, the streams from the two sides re-unite and the general current runs on much as before. In the case of the wireless waves, this takes place, not only round, but over, the hill (see Fig. 2).

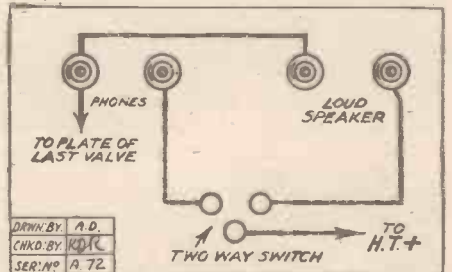
Cause of Fading.

Again, the nearer the transmitting station is to the other side of the hill, the worse the conditions. For, in the case of distant stations, a good deal of the received energy is probably reflected from the Heaviside layer, so that the waves are, so to speak, “coming down” on the receiver. This does not apply to a nearby station, and the direct passage of the waves is evidently more seriously affected by the intervening hill. This is shown (exaggerated, of course) in Fig. 3. Incidentally it may be mentioned that it is generally supposed that the curious phenomenon of “fading,” and the still more curious fact that it only affects distant stations, is due to the peculiar night time conditions of the Heaviside layer which, as we see in Fig. 3 (b), only takes its share in the propagation of the waves when the distance is comparatively great.



A SWITCH FOR 'PHONES OR LOUD SPEAKER.

MANY amateurs when building their sets do not think of including switches which in most cases are not shown in wiring diagrams. When there is only one pair of terminals on the set for connecting the headphones or loud speaker it is quite



a paraphernalia to tune in with the 'phones, then disconnect the leads and connect those of the loud speaker.

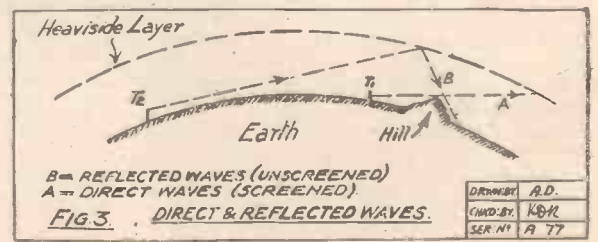
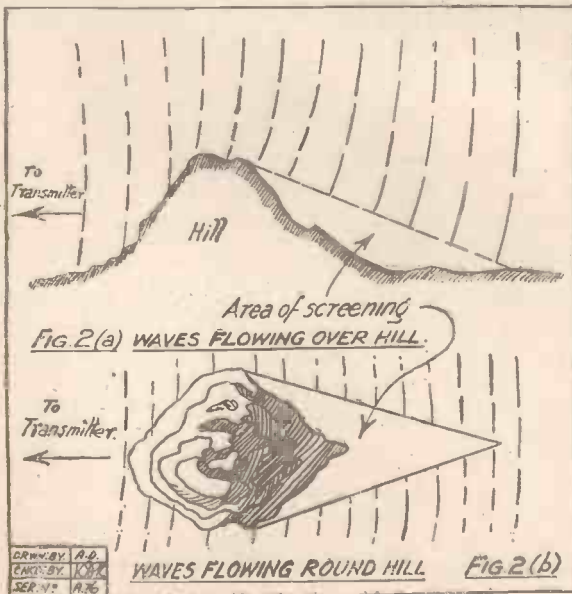
The switch shown here is very simple to include in any set and will save all the trouble of changing over the connections each time a change from 'phones to loud speaker or vice versa is required.

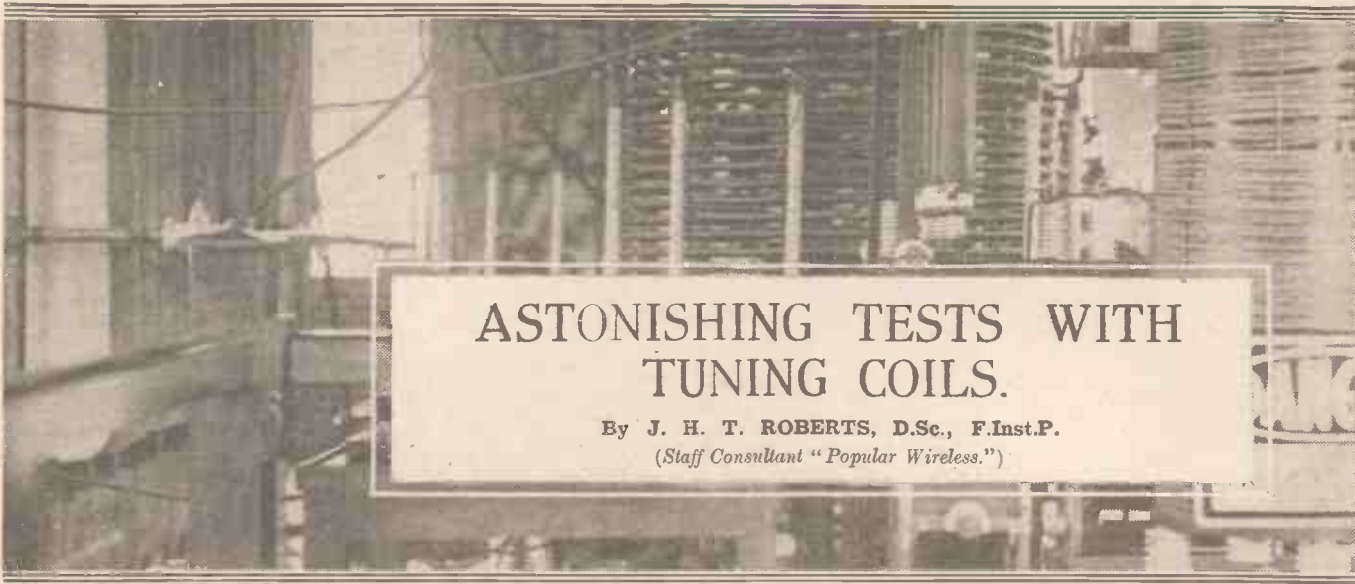
character of the intervening country. Dry soils tend to absorb the waves and reduce the range, while wet ones enable them to travel with greater facility. The actual

able tract of good country lies between them, even though the direct line to the transmitter may pass over the bad district. But signals over the whole wave front, as at and beyond L, M (Fig. 1), are weakened somewhat, though less than in the area R, R.

This inflow of waves is known as “diffraction,” and becomes of importance in considering the effects of hills and mountains. A mountain does not so much absorb the energy of the impinging waves as divert it. Absorption, of course, there is, and a mountainous district, especially if near the transmitter, will always have a deleterious effect.

But the absolute blotting out of a station whose direction is the same as that of a hill overhanging the receiver is a very local





ASTONISHING TESTS WITH TUNING COILS.

By **J. H. T. ROBERTS, D.Sc., F.Inst.P.**
(Staff Consultant "Popular Wireless.")

PROBABLY there is scarcely an amateur who has not, at some time or other, made up for himself tuning coils for different wave-lengths. And after a certain amount of experience, no doubt each forms for himself some prejudice in favour of this or that type of winding, and this or that kind of wire. The instructions which are frequently given in wireless books and periodicals more or less follow the same line in the matter of types of insulation for the wire to be used, and in precautions to be observed.

It becomes, for example, a kind of religion with the constructor to avoid too much insulation and varnish on his coils, and to avoid moisture as he would the plague. Silk-covered wire is sometimes stated to be superior, for particular purposes, to cotton-covered wire, and sometimes the reverse. Enamelled wire is often chosen by the amateur for its cheapness and convenience.

But in all this advice there are seldom, if ever, any actual results of tests given to confirm the recommendations made, and there is no doubt that practical results always carry much more conviction than mere theoretical predictions.

Effects of Insulation.

In this connection it is interesting that one of the American papers ("Popular Science") has been carrying out some important tests on all kinds of wireless tuning coils, some of which tests are already reported, and some of which are to be made public in the near future.

In the first place, it is desired to find out, once for all, the relative efficiency of the three different types of insulation—cotton, silk, and enamel.

In order to make the tests comparative, three coils were made up, each on a length of bakelite tubing, three inches in diameter, winding on 44 turns each of the three different kinds of wire, of 22 gauge in each case. The lengths of the windings of the three coils came out as follows:

- No. 22 D.C.C. About 1½ inches.
- No. 22 D.S.C. 1¼ inches.
- No. 22 enamelled. 1½ inches.

It is interesting at this point to note that to cover the broadcast wave-lengths most

effectively, somewhat different numbers of turns of the three kinds of wire had to be used. This is important, for if the constructor receives his instructions by reading an article in which one type of wire is specified, he may need to make a slight adjustment in the number of turns if he uses wire with another kind of insulation. The variations, however, are not great, and with a suitable variable condenser, no great harm would be done if the type of insulation

length, that is, with decreasing frequency. It should be mentioned, however, that the differences are not great, and it is doubtful whether, in the ordinary way without special measuring instruments, any appreciable difference would be noted. But it is interesting and important to have the relative efficiencies of the three types of wire accurately determined and recorded in this way.

Now the next interesting part of the tests concerns the influence of moisture upon the H.F. resistance (impedance) of the coils, and here is the really astonishing discovery. It was found by the experimenters referred to above that moisture, even when present in considerable quantity, had practically no effect.

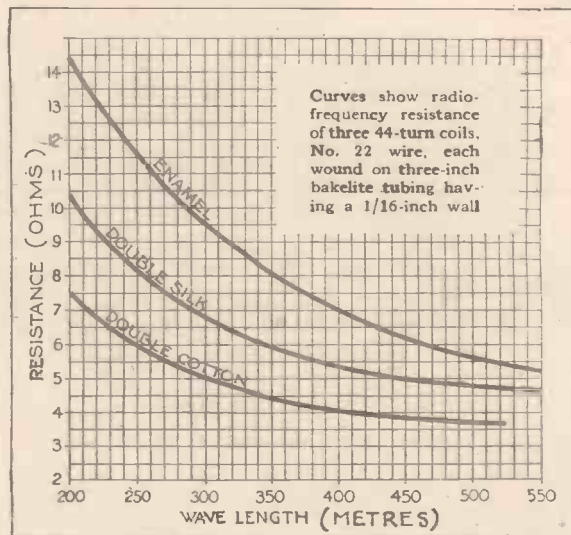
This, indeed, is so at variance with popular belief and preconceived notions, that it seems difficult to believe it, and in fact the experimenters themselves were entirely against believing the result of their test until they had verified it many times.

Moisture not Detrimental.

The *modus operandi* was as follows. A large sheet-iron "oven" was taken, in which the three coils were suspended from a wire stretched horizontally across the oven. On the floor of the latter was placed a vessel of water, which could be heated and boiled away by means of an electric heater.

The box was closed and the current turned on, everything being then left for three hours. At the end of that time the oven was opened, and it was found that the water in the pot had nearly all boiled away, moisture was streaming down the sides of the oven, and moisture was also liberally condensed upon the coils. The coils were then removed and immediately put on test. The results were the same as before their treatment in the box!

In order to make doubly sure of this remarkable result, the cotton-covered coil



were changed without adjusting the number of turns.

The test consisted in determining the H.F. resistance (impedance) of the three coils at different wave-lengths in the broadcast band, and it was found that, from this point of view, the double-cotton-covered wire was superior to the double-silk-covered, the latter being in turn superior to the enamelled.

Measurements of Impedance.

The graph which accompanies this article, and which is taken from the article in "Popular Science," indicates quite clearly the results of the tests. It will also be observed from this graph how the H.F. impedance diminishes with increasing wave-

(Continued on page 298.)

CIRCUIT EFFICIENCY.

A Simple Explanation.

By F. E. COX, B.Sc. (Lond.).

WE are accustomed to see the term "Low Loss" wherever efficient wireless circuits are discussed or described. This term is associated in our minds with self-supporting coils of thick wire together with specially constructed and expensive condensers. Very universal too is the belief that our tuning coils should possess large inductance in order that the voltage supplied to the grid of the valve or to the crystal may have as big a value as possible. How do these two possibly conflicting factors influence real efficiency?

The basis of investigation is the simple rule that the voltage generated by an oscillating current in a coil is given by the product *inductance* \times *the rate of change of current*. Expressed mathematically:

$$V_g = \frac{L \, di}{dt}$$

Where V_g = voltage at the grid, L = inductance, i = current in the coil, t = time.

For any given wave-length received, the rate of change of current is simply proportional to the current. Thus we see that voltage depends solely on both inductance and current; a large inductance and a large current flowing through it will give a big voltage. Thus we want our tuning coil to have as large an inductance and to pass as big a current as possible. Let us consider these two quantities separately.

Increasing Inductance.

Suppose that a certain broadcasting station is being received by the tuning circuit. This can only be done when the product of the inductance of the coil, and the capacity in parallel with it, has a certain definite value.

Thus: $LC = K$.

Where L = inductance, C = capacity in parallel, K is the definite value required.

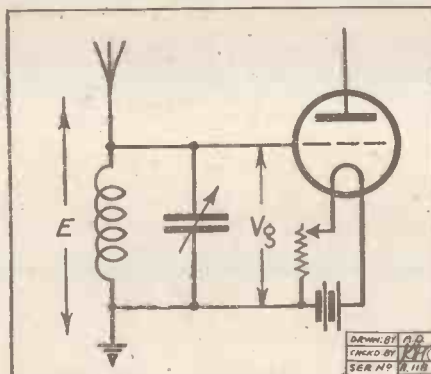
Then provided the product LC remains constant, we can vary L and C at will. By making L larger and C smaller, our inductance is increased, and therefore, if the current remains constant, as shown above, V_g is increased. By using a variometer no capacity other than the self-capacity of the turns is used, therefore L reaches its maximum value with circuit still in tune. Unfortunately, as L is increased by adding more turns to the coil, the current in the coil is decreased owing to the added resistance of the added turns. Provided that by adding turns, the inductance value increases faster than the resistance increases we shall succeed in increasing V_g . An optimum value for L will be found beyond which the addition of more turns does not increase the inductance as fast as it increases the resistance of a coil.

In single circuit tuners the aerial, and in double circuit tuners magnetic induction plus capacity between coils, supply to the grid circuit an external voltage (not to be confused with V_g), which for a certain set of conditions may be considered to remain

constant, say E . Now if the high frequency resistance of the circuit is R , then the current in the circuit, I , is given by Ohm's law:

$$I = \frac{E}{R}$$

i.e. I now depends on R . As R is decreased I increases, and therefore V_g is increased.



E and V_g denote two distinct voltages, V_g being to some extent controlled by conditions existing in the grid circuit.

The resistance R of the circuit at high frequency is many times its D.C. value and consists of the following: the high-frequency resistance of the turns of wire in the coil (the greatest factor), the losses in the variable condenser, leakage in insulation, dielectric losses in the coil, damping due to eddy currents in adjacent metal, damping due to the crystal or to grid-filament cur-

rent, and dead-end losses in the coil. But all these losses can be expressed by equivalent resistances to be added together to make up the total resistance of the circuit, R .

Benefit of Low Loss Coils.

The high-frequency resistance of a coil for broadcasting reception is of the order of 80 ohms, whilst that of the variable condenser is of the order of one ohm. The other losses are generally negligible. Thus the coil best repays improvement. This reasoning shows how it is possible that a low-loss coil, of simple solenoid form, wound with thick wire, supported by a minimum of dielectric, and avoiding dead-ends by use of a low-loss variable condenser for tuning, may give a signal strength superior to that given by a variometer wound with a fairly fine gauge of wire. The same reasoning shows how it is probable that aerial series tuning will (within limits) give better results than parallel tuning.

NEXT WEEK!

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ASTONISHING TESTS WITH TUNING COILS.

(Continued from page 297).

was dipped in a pail of water and left there for several minutes. On putting it on test it was found that the H.F. impedance was nearly seven times the normal, but the curious thing is that even whilst on test, and long before it was actually dry, the meter readings began to rise, and whilst the coil was still damp to the touch the readings had gone back to normal!

Of course it is possible that there may be some "snag" in all this, but if it proves to be true, it seems that all the precautions about keeping moisture out of your H.F. coils are somewhat overdone. An important point to bear in mind is that the coils in these tests were absolutely clean, and the condensed water would be absolutely clean also. The water in the pail was clean water, so that possibly the conditions might be different from those where a dirty coil became moist.

But it certainly would appear that in an ordinary dwelling house, sufficiently dry for habitation, there is no need to worry unduly about the damp affecting the H.F. coils of your set.

Further Tests in Progress.

A final point in connection with the tests on the relative efficiency of the silk, cotton, and enamel, is that the material of the tube which is used as "former," is also probably of considerable importance. If the tube composition is of a type which tends to increase the H.F. impedance, then it might be expected that the thinner the insulation (allowing the wire to come into closer proximity with the material of the "former") the greater the impedance.

Further tests are in progress as to the effect of different materials for making the "former" tube.

It will be understood that these tests were not carried out by the writer of this article, and no responsibility for the results, or for the conclusions drawn from them, can be taken. But the tests are interesting in themselves, and the results obtained are so remarkable, if correct, that they appeared worth retailing for the benefit of amateurs and constructors.

*The N.A.R.M.A.T.
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the question-
made Ediswan
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A.R. (L.F. or H.F.) ..	8/-	4
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A "P.W." Silver Cup for Constructors.

A CHANCE FOR ALL READERS.

AT the Royal Horticultural Hall, Vincent Square, Westminster, S.W., will open on Saturday, October 10th, a Wireless Exhibition and Radio Convention, organised by the British Trades Exhibitions, Ltd., Milton House, 35, Surrey Street, Strand, W.C.2.

The directors of this exhibition, Messrs. Arthur B. Dale and Ernest Schofield, organised the White City Wireless Exhibition last year. The exhibition will remain open until the following Friday, October 16th, and admission will be from 11 a.m. to 10 p.m.

POPULAR WIRELESS has agreed to present a silver cup as first prize in a special constructors' competition which will be organised by the exhibition authorities. The judges will be the Editor and technical staff of POPULAR WIRELESS, and it must be clearly understood that our responsibility is restricted to judging the competition and presenting the first prize. The exhibition authorities themselves will present the second and third prizes.

POPULAR WIRELESS offers the first prize for the home-made wireless set—valve or crystal—which, in the opinion of the Editor and his technical staff, shows the best design and constructional features. The competition is open to all. There is no age limit, and the man with the cheap crystal set will have an equal chance of winning the cup as the man with the expensive four-valve set. It is soundness and fine workmanship which will gain first place.

RULES.

Intending competitors should write without delay to the British Trades Exhibitions, Ltd., at the address given above, asking for an entry form and label; the form should be filled in and returned to British Trades Exhibitions, Ltd., and the label should be used when forwarding the set to the exhibition.

Great care should be taken in packing the set. The set itself and every detachable part of it should be labelled with the name and address of the sender, and in the corner of each label should appear the words POPULAR WIRELESS, indicating to the exhibition promoters that the exhibit is intended for the special competition in which we are presenting the first prizes.

All sets intended for the competition must be received by the exhibition authorities not later than Thursday, October 8th.

The exhibition authorities will not accept responsibility for any loss or damage although they will take every possible care to avoid either.

FOREIGN RADIO NEWS.

(From our own correspondents)

Swedish Amateur's D X Work.

FAIRLY regular communication with New Zealand, and daily communication with South American stations are the results claimed by the Stockholm amateur whose call letters are S M Y Y.

He has just been notified that an amateur in New Zealand, at the other end of the world, whose call sign is 2 A F, has heard his messages very distinctly, sent with 180 watts and with an indoor aerial.

The Swede in question is in daily touch with a Rio de Janeiro station, and with C B 8 in Buenos Aires. From Rio de Janeiro comes the information that three other Swedish amateur stations are frequently heard, of which two have an input of less than 50 watts. The wave-lengths used in all cases varied between 35 and 40 metres.

* * *

A Scandinavian Transmitters' Society.

The radio amateurs in Scandinavian countries now possess an international organisation covering the Baltic area, the S.R.R.L., or Scandinavian Radio Relay League, with headquarters in Stockholm. Membership is open to all amateur transmitters in Scandinavian countries, and two sections, a Swedish, and a Danish one, are already in working order.

In Norway and in the smaller Baltic States and Finland, amateur transmission is still in its infancy, but it is hoped that the formation of this League will greatly activate its development and that sections will soon be at work in every State. The president of the League at present is Dr. G. A. Nilsson, Stockholm.

* * *

New French Colonial Station.

The latest of the French colonial radio stations to be opened is that at Tananarive, on the island of Madagascar, off the south-east coast of Africa.

This station is in constant communication, on the one hand with the Eiffel Tower, and on the other with the French Government station at Noumea, in New Caledonia, 7,500 miles away over the Indian and Pacific Oceans. Starting next month, some of the French broadcasting programmes will be relayed by both these stations, so that French colonists and natives may keep in daily touch with the news and the musical programmes from the mother country.

* * *

Alpine "S.O.S." Station.

The radio station at the Alpine Club refuge on the Monte Rosa, near Zermatt, Europe's second highest peak, has this summer been instrumental in saving the lives of seven tourists and four guides or porters.

* * *

Berlin Station on Short Waves.

It is announced that the Funktechnischer Verein, of Berlin, is at present making short wave-length tests. The call sign is D 9, and the tests take place every Monday, Thursday, and Sunday from 11 a.m. to 1 p.m. Amateurs receiving messages

(Continued on page 301.)



THE BIRTHDAY OF REMARKABLE BRIGHT FILAMENT VALVES

One year ago

—as the result of extensive experience and research—the Mullard Radio Valve Co., Ltd., placed on the British Radio market WONDERFUL SINGLE RING H.F. and L.F. VALVES.

The striking departure of these remarkable bright filament valves from the usual commonplace design and performance immediately claimed the public attention.

A year of heavy tribute has been paid to the

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Green Ring for L.F. AMPLIFICATION.



These Valves only require a 4-volt Accumulator.

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HERE'S more than just a filament, anode and grid in Master Valves. I know because I assemble them. They are just like children to me. Each contains personality—my own personality. This great family of Mullard Valves passing through my hands before it is scattered all over the world must live up to the standard set by those that have gone before.

There are great trans-world record results behind my Master Valves, and they know it.

Even if they will never be given the opportunity to achieve thousands of miles of perfect reception, they will know how to give supreme excellence at the shorter ranges of broadcasting.

You can have faith in my valves.
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 The “RENOWN” is POST FREE.
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**ONE OF HUNDREDS OF
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Crew.

I am pleased to inform you that I have only received good reports from users of the “RENOWN” in several cases replacing much boomed articles, incidentally more expensive. Have had a 4-Valve Receiver here that had given trouble, and finally traced it to one of the two expensive Transformers. I introduced a “RENOWN” 1:4 Ratio, and it is as clear as a bell even on DAVENTRY, which is rough here on 4-Valves. RADIO PARIS and PETIT PARISIEN come in on Loud Speaker, which could not be done before.

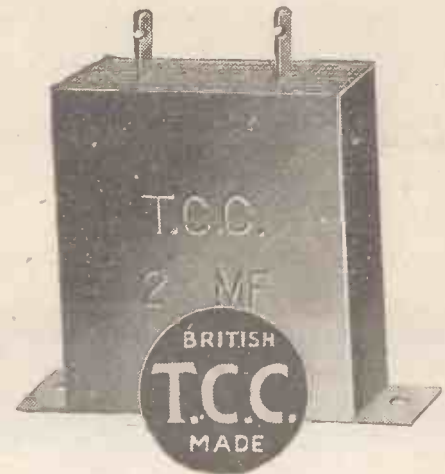
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250 RADIO QUERIES ANSWERED.

Practical Information For All.

COLLECTED BY THE "P.W." TECHNICAL STAFF.

PART III.

Below we give the third instalment of a collection of 250 Radio Questions and Answers brought up to date and written in concise form by members of the "P.W." Staff. The concluding instalment will be published next week in our "Radiatorial" columns.

Fixed and Variable Condensers.

Q.—Is there a direct proportion between the capacity of a condenser and the nature of its dielectric, thickness of its dielectric, and the spacing and area of the plates or vanes?

A.—Yes, if the active plate area is doubled, the capacity value will be doubled; if the spacing between vanes or plates is doubled, the capacity value will be halved; if a material of double the specific inductive capacity of air is employed as a dielectric, the capacity of a condenser is double that of one having an air dielectric, etc., so that calculations are much simpler in the case of condensers than coils, for instance.

Q.—Can a fixed condenser be employed to bring down the capacity value of a .0005 mfd. variable condenser, so that it could be used for anode tuning?

A.—Yes, there is a useful rule that can be applied, and that is that the resultant capacity of any two condensers placed in series will be less than the capacity of the smaller. Therefore, if the large variable condenser is placed in series with a .00025 mfd. or so fixed condenser, a variable capacity range of something less than the .00025 mfd. or so will result.

Q.—The total capacity of a number of condensers in parallel is merely the sum of the individual capacities, but how is the total capacity of condensers in series calculated?

A.—In the latter case the sum of the reciprocals of the individual capacities will equal the reciprocal of the total capacity. The reciprocal of a value is that value divided by 1.

Q.—Are there any methods of increasing the capacity of variable condensers?

A.—Several. The capacity of variable condensers of the moving vane air dielectric type can be increased by inserting thin mica between the vanes, sticking them by means of shellac, or the whole condenser can be immersed in a hard mineral oil. The easiest method, however, is to place fixed condensers or a fixed condenser of suitable capacity in parallel. A switch can be provided so that the additional condenser can be disconnected when required. This is an arrangement that provides a very comprehensive range of capacity adjustments. For instance, if a .0005 mfd. fixed condenser is so connected to a .0005 mfd. variable condenser, a range of values of anything up to .001 mfd. results.

Q.—Why is it generally advised to employ a variable condenser in series for the reception of short wave-lengths?

A.—Because all detectors are, in effect, potentially operated devices, and to bring as much energy into the set as possible it is advisable to "tap" across as much inductance as is available. Placing a condenser in series reduces the capacity of the circuit so that more inductance, or rather a larger coil, can be used, and for the above reason this is advantageous.

Capacity is a "damping" factor, and must be reduced as far as possible for short wave work, and, of course, a reduction is obtained by means of series condenser tuning.

Telephone Receivers.

Q.—Is it possible to use more than one pair of telephones on a crystal set without considerably weakening the signals?

A.—Yes, two pairs placed in series will not result in a very appreciable diminution of signal strength. Separate crystal detectors with 'phones in series can be placed across the one inductance coil. This will allow the introduction of a dozen pairs of 'phones, allowing one detector to two pairs, without noticeably showing a depreciation of the initial single detector signal strength.

Q.—Why should it be advisable to put extra 'phones in series on a set instead of in parallel. Surely by placing them in series the resistance is increased, and therefore current decreased?

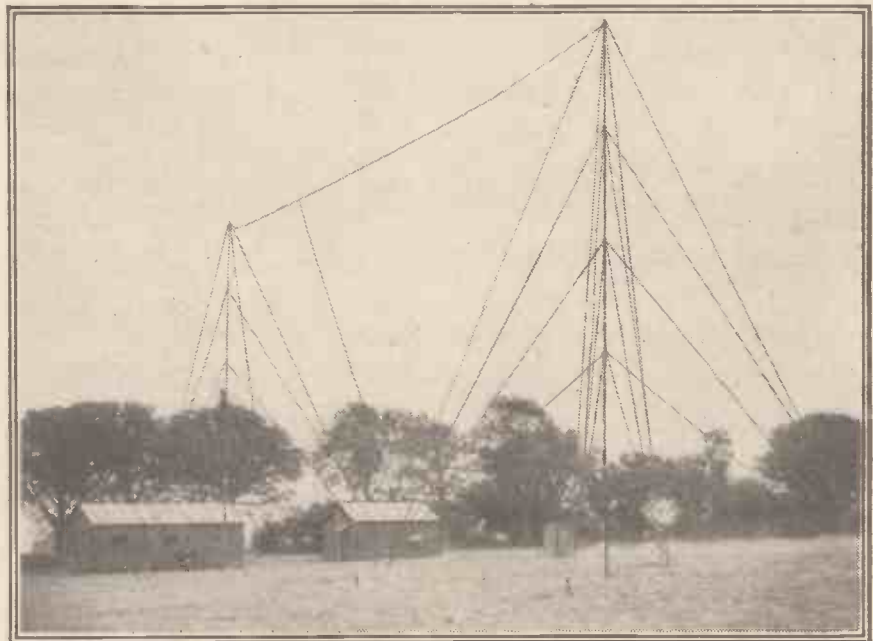
A.—Yes, but the resistance is not doubled. Whereas by placing them in parallel only half the current flowing in the circuit can pass through each pair of telephones, assuming them to be of similar resistance, by placing them in series there will be less current flowing through each than would flow through one, but not half for the following reason: Current equals voltage divided by resistance, but the latter factor must include the resistance of the crystal or valve which may be 10,000 ohms. It is obvious that by increasing the resistance by the addition of another pair of telephones, say 4,000 ohms, there will be less current, but to bring the current down to a half the additional

A.—Undoubtedly the permanent magnets are becoming more or less demagnetised. This can be caused by having the telephone receivers connected wrongly in the circuit. Most telephones of good make are marked positive and negative in respect of their connections, and the positive side should be placed nearer the positive side of the H.T. battery, so that the plate current in a valve set does not tend to pass through the 'phones in the wrong direction.

Noises in 'Phones.

Q.—What is likely to be the trouble when a grating noise is heard in the 'phones every time the head is turned?

A.—Either a loose or broken connection. The con-



The B.B.C.'s receiving station at Hayes, Kent. It is used for picking up foreign transmissions for relaying purposes.

resistance required would be 14,000 ohms—one pair of 'phones plus the resistance of the detector. Thus three additional 'phones could be placed in series, and give the same signal strength as but one additional pair placed in parallel.

Q.—It is stated that high resistance telephone receivers are essential unless a telephone transformer is employed, surely resistance is a misleading term?

A.—Very misleading, and if manufacturers could describe their telephone receivers in terms of, say, so many thousands of turns of wire around the magnets with the comparatively low resistance of 2,000 or 4,000 ohms, etc., there would be fewer listeners under the impression that resistance is the quality that tends to enhance the value of the instruments. Actually, of course, resistance is a decidedly unrequired factor.

Q.—When telephone receivers lose a considerable amount of their original sensitivity and adjustments of the diaphragms do not improve matters, is it due to the permanent magnets in the earpieces becoming weak?

nections at the back of each earpiece should be examined and tightened if necessary, but if the fault exists in the cord, then a new cord will be required.

Q.—A long extension lead is employed for a pair of telephone receivers. When this cord is moved the receiver commences to oscillate and requires readjustment. How can this be obviated?

A.—Doubtless twisted flex is employed, and the telephone receivers being in the plate circuit of the receiver considerable self-induction is introduced by this means. Employ twin wiring that is not twisted as in the case of orthodox telephone leads, or a telephone transformer and low resistance 'phones, and the trouble should not re-occur.

Q.—On a "super" circuit employing a frame aerial and a loud speaker an adjustment of the latter frequently throws the set out of adjustment. Can this be prevented?

(Continued on page 304.)

250 RADIO QUERIES ANSWERED.

(Continued from page 303.)

A.—Yes, generally, by earthing the metal casing of the base of the loud speaker—earthing it, that is, in respect of the circuit. It can be connected to the filament side of the wiring of the set, although a direct natural earth is to be preferred.

Q.—Is a high-resistance loud speaker preferable to one of low resistance employing a telephone transformer?

A.—For the most part, no, as most telephone transformers are wound with stouter gauge wire than high-resistance loud speakers, and there is less chance of a "burn out" when handling very loud signals.

Q.—How can I get an experimental licence for transmitting?

A.—Application should be made to the Secretary, G.P.O., London, E.C. 1. A form will be sent, which must be filled in, giving full particulars of the applicant's wireless qualifications, etc. The form should be signed and returned. No fee need be sent until formal application is made for it.

Some Ebonite Hints.

Q.—What is Wood's metal, and how is it used?

A.—This is a kind of solder which needs very little heat to make it "run," so it is very useful for fixing crystals into their cups, and for similar contacts which should not be unduly heated.

Q.—A sheet of ebonite that I bought for a panel has become warped through careless storage. Can it be successfully straightened?

A.—Two flat boards of suitable size should be thoroughly warmed, and the ebonite placed between them after it has been warmed also. When flat, keep weights on the boards until quite cold.

Q.—Can small holes in a panel be filled so as to hide them?

A.—Black sealing-wax is quite effective, or the very handy preparation known as "Chatterton's Compound." The surface can afterwards be levelled and polished.

Q.—Can a thin sheet of ebonite be safely bent, or will it break if an attempt is made?

A.—The sheet will bend quite well if previously it is thoroughly warmed. This can be done by placing it in boiling water, or a small sheet becomes pliable over the steam from a boiling kettle.

Q.—What is the method of "matting" an ebonite panel?

A.—The surface should be removed by rubbing with fine emery-cloth until all gloss has disappeared. A second rubbing with an old piece of the finest emery cloth will obliterate the "scratchy" appearance, and the final cleaning can be done with knife-powder. Then darken the panel by a thin film of lubricating oil and polish thoroughly with a dry, soft cloth.

Q.—What are the advantages of a "matt" surface on an ebonite panel, as compared with a glossy surface?

A.—"Matting" removes all trace of tinfoil or other metals (used by some manufacturers) which impair the insulation of the ebonite.

Separate H.T. Tappings.

Q.—As there are several kinds of solders, which is the best for wireless work, and what flux should be used?

A.—A good "fine" solder should be used (that is, a solder which contains more tin than lead). There are several fluxes which can be easily handled, but probably the best plan is to buy a good proprietary article, and follow instructions carefully. Do not use an acid flux.

Q.—When drilling ebonite I find it difficult to start the drill at the exact point necessary for the spacing of valve legs, etc. What is the best method of ensuring that the drill works exactly from the centre marked?

A.—When the position has been marked off, a small hole should be punched for the drill to start in. All that is necessary is a light tap on the punch from a small hammer.

Q.—In a straight four-valve set (H.F., Det. and 2 L.F.) is it efficient to have two separate H.T. tappings, so that one can be used for the first 2 valves, and the other for the L.F. amplifying valves?

A.—Two plugs would be better than common H.T. to the valves (which is the most inefficient method possible), but for a four-valve set at least three H.T. tappings should be used. The first of these can very well carry the H.T. supply to the H.F. and detector valves, as these two generally require a low plate voltage (unless the first stage of L.F. is resistance-coupled).

The first L.F. amplifier, if of the usual transformer-coupled type, will need very little, if any, grid bias, and consequently its plate voltage, though higher than the H.F. and detector valves, will not be excessive.

The last valve, which should be a power valve, will generally require separate grid bias and a high plate voltage, so that a separate H.T. tapping is essential in this stage also.

The Use of Loading Coils.

Q.—Can basket coils be used as H.F. transformers for high wave-lengths, and, if so, please give suitable windings for the reception of 5 X X?

A.—Yes. A high-frequency transformer suitable for the reception of the high power broadcasting station on 1,600 metres may be constructed in the following manner:

The secondary winding should consist of two basket coils, each wound with 125 turns of No. 32 D.S.C. wire. The coils should be mounted together on the same axis, with the windings in the same direction, and connected in series.

The primary windings should consist of a basket coil of 100 turns of the same gauge of wire, and should be mounted between the two sections of the secondary winding (the windings being in the same direction). The tuning condenser should be connected to the two outer ends of the secondary winding.

When the transformer is connected in the receiver the connections to the primary winding should be reversed to find the best method of connection.

Q.—When loading coils are added in both circuits to increase the wave-length, should coils of similar size be placed in both circuits, or should the secondary circuit have larger coils than the aerial circuit? I notice that instructions for making secondary coils generally give them as being much larger than the coil on the primary of the same set.

A.—The coils should be loaded at the same rate, and if the inductance of one circuit is increased by a No. 50 coil, the other circuit will need a similar coil to bring it into tune.

The reason that the original primary and secondary coils are of different dimensions should be apparent if it is remembered that the aerial itself is connected to the aerial coil, and therefore a smaller coil in the aerial circuit will be required in order to give the same wave-length as the secondary circuit, which has no aerial.

Once the circuits have been brought into tune in this way they will need equal loading in order to remain in tune with each other.

Unidyne One-Valve Set.

Q.—When a one-valve Unidyne receiver does not oscillate, how should one proceed to get it to do so?

A.—There are several possible reasons why the set does not oscillate, even supposing that the circuit is connected up correctly. In the first place, it is advisable to have the aerial condenser in series with the A.T.I. Secondly, the grid leak must be a variable leak, and must really be a leak. This variable grid resistance is far more important than many people imagine, for it controls the potential of the main grid of the valve, and thus controls the oscillating properties of the valve. Make sure also that the valve is quite O.K. Some of the valves now on the market are too soft to be of any real value. With the condenser in series, either basket or Lissenagon coils should be used, the aerial coil having 75 turns and the reaction 100 turns for ordinary broadcasting. For reception of 5 X X, 200 in the aerial will be required, while 150 reaction may be necessary. We have found that honeycomb and duolateral coils are not nearly so satisfactory in the Unidyne sets as basket or the other types now on the market.

The need for having the aerial condenser in series with the aerial is not so great as the wave-length increases, and to save the number of coils necessary it is a good plan to arrange a method whereby the condenser can be changed from series to parallel, and vice versa. A series-parallel switch is easily fitted, and is an extremely useful addition to the set. A six-volt accumulator and good filament rheostat

should be used, though with one valve quite satisfactory results have been obtained with a four-volt battery. The rheostat should be in the positive lead of the L.T. battery, and the grid-resistance should be connected between the grid and the L.T.+. Make sure, also, that the grid condenser is O.K. A different value may be advisable, say .0003, or even .0004, though this latter is not often necessary. Needless to say, the reaction coil connections should be tested and reversed to see that the coil is acting properly and is the correct way round for coupling to the A.T.I.

Q.—In a three-valve set employing a Detector and two L.F. valves, the last L.F. being coupled by means of a choke made by using one winding of an L.F. transformer, distortion takes place on loud signals. The valves used are A.R. '06, B.5 and D.E.3—all '06 at 3 volts grid bias on the last valve. Variable H.T., on all.

A.—Probably distortion is as much due to the last valve being unable to carry the energy as to anything else. The remedy in that case is, of course, obvious—use a power valve. Without doing this the next best thing is to give attention to the choke and see if this can be improved.

Probably it does not really suit the circuit, but one should be able to reduce the distortion without purchasing another choke. A .001 mfd. condenser across the choke may help. If the other winding of the transformer is O.K. try the two windings in series, and also alternately separately. Also vary the coupling condenser, which should have a value of about .02 mfd.

Loading the unused winding by means of a .001 or .002 fixed condenser might help, though any loading will tend to reduce the signal strength slightly. This reduction will not, of course, be serious close to 2 L.O., and it should always be the aim of the amateur to obtain clarity and purity of reproduction rather than sheer noise and volume. A loud speaker not only delivers what is put into it, but also has an unhappy knack of magnifying any distortion that is present.

A great deal of the distortion heard from loud speakers is due to a distorted input, and not to the loud speaker itself, provided this latter is not being "pushed" and forced to carry too much.

The Oscillation Problem.

Q.—How can I tell when I am oscillating and how can I avoid doing so when tuning in?

A.—You should first of all move your reaction coil as far apart from the aerial coil as it will go, and tune the condenser until signals are at a maximum. You are now tuned in without reaction, and speech should be perfectly clear but not very strong. To strengthen, move reaction coil a little towards aerial coil, and retune slightly if necessary. All controls must be moved slowly and carefully, and the adjustments noted when the signals begin to strengthen.

If you move reaction too near to aerial coil you will oscillate, and interfere with all the listeners in your area, so great care is necessary.

To tell when the set is on the edge of oscillation, and to keep it so on the different wave-lengths without actually slipping over into oscillation, is the whole art of tuning, and requires some practice and great care. At first, therefore, you should not attempt this during broadcasting hours. Tune into the higher wave-lengths, and listen to shipping, or to G.N.F., on about 600 metres, and notice the effect of reaction upon signals from spark stations. Some of these have high musical notes (like a flute), and you will find this can be greatly strengthened up to a point without altering its tone. As soon as reaction is pushed too far the note becomes hoarse and raucous, sounding, in fact, like a totally different station, until reaction is loosened again. Notice carefully how this change is accompanied by a soft rushing sound as the valve commences to oscillate, or by a kind of click or pop in the 'phones.

Try the effect of tapping a moistened finger on the aerial terminal of the set when it is nearing oscillation point, and notice how loud and sharp the clicks grow suddenly when too much reaction is used.

The whole operation must be carried out very carefully, as every time the set oscillates it becomes a small transmitter, sending out a carrier wave which can cause interference.

You would do well to write to the B.B.C., 2, Savoy Hill, W.C.2, asking for their leaflet, "Anti-Oscillation," which will be forwarded free of charge. Copies may also be obtained from the nearest Radio Society, by joining which you could probably get practical lessons in handling sets, which are naturally of greater value than a mere description.

You will find in general that too much reaction invariably spoils your own reception (by distorting speech, etc.), as well as causing interference to all neighbours, so there is absolutely no advantage in keeping the coils too closely coupled or the filament and H.T. voltage too high.

To be continued in the "Radiatorial" as our usual feature.



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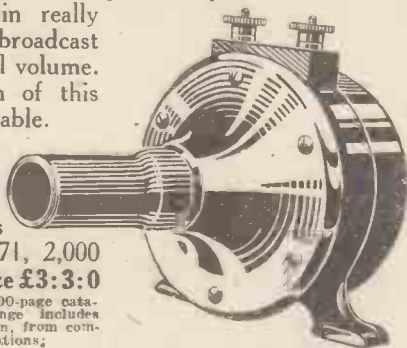
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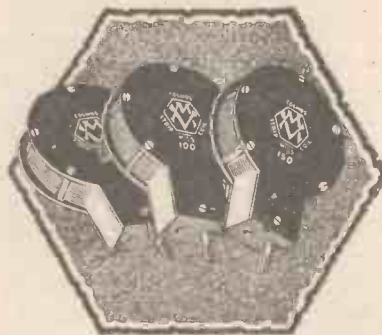


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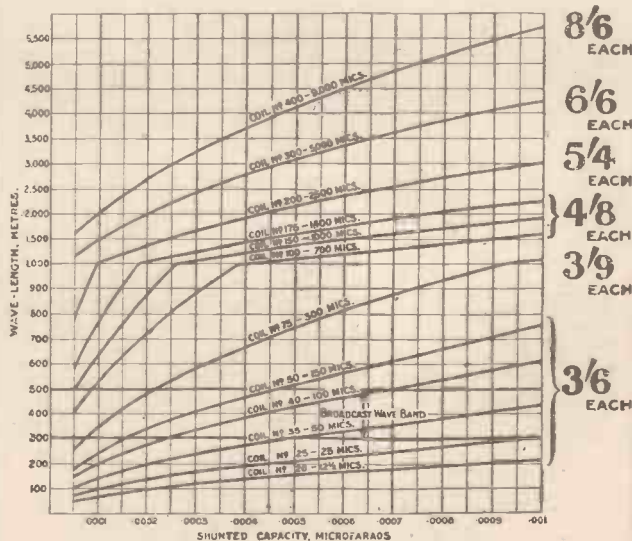


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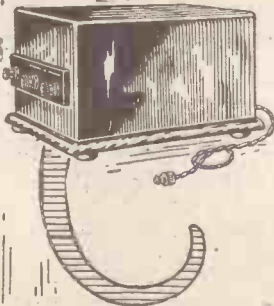
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BROADCAST NOTES.

By O. H. M.

Alternative Programmes—A Post Office Scheme?—The Radio Revel—
Liverpool's Boom—Irish Broadcasting.

THERE is a curious lull in the broadcasting situation. What about those new proposals which everyone who knows anything about the matter regards as absolutely essential? How long are we

There appears to be a great wireless boom in Liverpool—this synchronises with the "Daily Courier" Exhibition. I gather that of the 180,000 letters Mr. Pearson, the station director, has received during the



Mr. Kemp (Mr. Marconi's Chief Assistant), Viscount Wolmer and Mr. Marconi examining one of the earliest wireless transmitters.

to wait for alternative programmes? When are the West Country, the South-east Coast, North Wales, and Northern Scotland to get their promised facilities?

Of course, the B.B.C. has had its plans for these and more besides for months past. But the Post Office is sitting very tight, waiting for the Broadcasting Committee in November.

Rumours are current that the Post Office has drawn up a scheme which will incorporate broadcasting *holus bolus* as a minor function of the Telephone Service.

A Labour Government might give legislative effect to such a proposal, but even then it would not be easy. I wonder if John Henry would be graded as an Assistant Secretary or as a First Division Clerk.

An International Dance Night.

But seriously the real folly of these views is that they tend to prejudice the whole conception of unified control. Rather than that the broadcasting service should be run by a Government department, the vast majority of listeners would prefer free and open commercial competition with all its baneful results.

I have only just realised the quite extraordinary character of the great Radio Revel which will be held on December 15th. One had realised that this was a national concern, and that quite a million people in this country would be dancing simultaneously, but apparently now arrangements have been made to include America and the Continent. There may be as many as 50,000,000 dancing simultaneously to the music at Olympia.

day. This idea is sound, but I hope that it will not be carried to an extreme. The factor of novelty should not be entirely lacking. A good "stunt" not only revives interest where it flags, but tends definitely to improve artistic standards.

There seems to be considerable progress in the development of the groundwork of the Free State Wireless Organisation. Irish listeners are somewhat embarrassed by the invidiousness of their present position, by which they get the B.B.C. programmes and make no return for them.

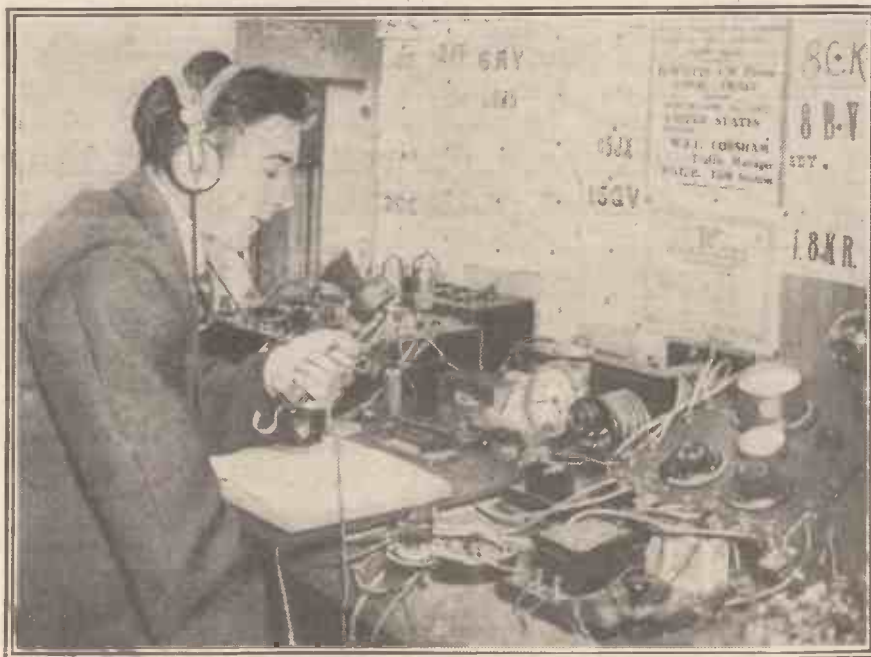
Now, however, that they have definitely decided upon their own system, one main station and two relays, it should be possible for us by about Christmas to sample some of the artistic efforts of the young Dominion across the Irish Channel.

Another "High-brow" Attack.

The Free State Broadcasters intend to join the International Union at Geneva, as soon as they are sufficiently constituted for this purpose. They are to be operated and controlled by the Post Office. They feel that they have a special contribution to make to the general development of world broadcasting, and they are anxious to impart some of their ideas and Celtic inspiration.

The battle over education has recommenced. The "high-brows" have made a determined attack, and this time with no "limited objections." They are out to secure double the amount of programme time they have at present. If they succeed in this, it would mean that there would be about two hours of talks and lectures every night. The very thought of such a catastrophe is surely enough to condemn it.

I understand that in B.B.C. quarters considerable importance is attached to the Radio Sounds Prize Competition being organised by POPULAR WIRELESS. This promises to provide the first criticism of the comparative efficiency of the various devices used to assist in the communication of radio drama.



Mr. W. S. F. Corsham (G 2 U V), who carries out regular tests with Yugo-Slavia.

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Mr. J. C. W. REITH, M.Sc., (Managing Director of the B.B.C.) will be present to give away the First and Second Prizes for our great "RADIO SOUNDS" Competition.

Further programme details will be announced in a later issue of "Popular Wireless."

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Premises close 1 p.m. Thursday.Agent for Brighton District: **A. S. HILL & CO., 8, YORK HILL, BRIGHTON.****LARGE CLEARANCE SALE. Large stock of all goods below.****BARGAIN CLEARANCE OF HIGH CLASS HEADPHONES**, all new at half prices.**BEST FRENCH S.F.R. LOUD 4,000 ohm HEADPHONES**, complete with Cords. Brand new, to clear, 4/6 per pair, post 9d.**BEST FEATHERWEIGHT HEADPHONES**, 4,000 ohms, with cords, new, 4/6. Post 6d.**SPECIAL CLEARANCE OF HIGH-CLASS MAKE LIGHTWEIGHT HEADPHONES**, 4,000 ohms. List price 15/- each, price to clear 8/-, post 6d.**FALLON CONDENSERS**. 0005 Variable Standard List, price 7/6, to clear 4/-, post 6d.; 0005 Square Law, list price 8/6, to clear 5/-, post 6d.; Fallon all-moulded Variometers, in boxes, list price 10/6, to clear 5/-, post 9d. Fixed Condensers, 001, 0002, 0003, 9d. each, post 2d.**MARBLE SWITCHBOARDS**, complete with all fittings, in new condition, 10/- each.**POCKET VOLTMETERS**, 0-12 volts, clear scale, 5/6 each, post 6d.**AERIAL AMPMETERS**, 1-5 amp., 7/6 each, panel mounting.**CHARGING AND LIGHTING DYNAMOS**. Shunt wound, 30 volt, 5 amps. Ball brushes, Carbon brushes, solid built commutator, drum armature. All brand new. Every machine fully tested before dispatch, price £3, passenger train 5/-.**R.A.F. MARCONI OSRAM AMPLIFYING R VALVES**. Standard fitting, all brand new. Fil. voltage 4 volt, anode 40-60 volt. These are, without doubt, the loudest valves to be obtained at the above voltages. Price, to clear, 5/- each, post 6d. Guaranteed.**CHOKE COILS**. Iron enclosed core, as used in thousands of sets for resistance coupled sets, smoothing, filters, etc., etc. Sizes 1,000 ohms, 9d.; 500 ohms, 9d.; 250 ohms, 9d. Worth 8/- each, post 3d.**CHLORIDE UNSPILLABLE ACCUMULATORS**. These accumulators are brand new, with 3 months' guarantee. Specially designed to prevent acid spilling or bubbling over the top. At Given-away prices: 2 volt 40 amp., 7/-, post 6d.; 4 volt 40 amp., 14/-, post 1/-; 6 volt 40 amp., 20/-, post 1/3; 2 volt 100 amp., 14/-; 4 volt 100 amp., in case, 28/-; 6 volt 100 amp., 40/- All Celluloid cases.**D.III WATCH PATTERN MICROPHONES**. Useful for Speech amplifying, etc., 2/- each, post 3d.**BARGAIN CLEARANCE OF COMPLETE MARCONI 2-VALVE SETS**. Our last advertisement for these sets was outnumbered with orders, but we have now been able to purchase another large supply of these sets from the Government. These sets comprise: Mahogany canvas-covered portable case, containing 2 high-grade Transformers, Condensers, Fil. Rheostat, non-capacity Valve Holders, Tuning Coil. Beautifully engraved Ebonite Panels and other necessary fittings, completely wired, and all brand new. Also 1 pair 4,000 ohm new Lightweight Headphones, one brand new 4 volt 40 amp. Chloride Accumulator, 2 brand new R Valves, one 66 volt H.T. battery, and necessary Plugs, etc. The retail price of the accessories alone is £3. Our offer is for the complete set, with all accessories as above, £3 10s. each. Passenger train, 3/6. All Sets guaranteed new and perfect.**VULCANISED FLEXES AND WIRES** at half retail prices. Heavy Maroon Twin Flex, 2/6 doz. yds., post 3d. Light Twin Flex, 2/- doz. yds., post 3d. 4-way Telephone Flex, 3/- doz. yds., post 4d. 22, 23 and 24 gauge Instrument Wire, 1/3 lb., post 6d. 36 gauge Enamelled Instrument Wire, in 3 lb. reels only, 7/- per reel, post 1/- 7/22 Enamelled Aerial Wire, 2/6 per 100 ft. 7/20 super Aerial Wire, 4/- 100 ft., post 6d. Rubber and Vulcanised Lead-in Wire, 2/6 per doz. yds., post 3d. 1/18 Single Wire, already covered for wiring sets, 1/6 doz. yds., post 3d. Red and Black Positive and Negative coloured Flex, 2/6 doz. yds., post 3d. 1/18 Vulcanised Cable, Black, 5/6 100 yds. coil, post 1/-, etc., etc. All above are highest grade makers and brand new stock.**TRANSMITTING SETS R.A.F.** These sets are high-class instruments, containing 1-in. Sterling spark coil, wound with 3 lb. 38 gauge silk wire, Ebonite panels, high-grade Aluminium Spark Gap, mounted on Ebonite, with adjuster, mica dielectric condenser, Ebonite panel. Helix variable tuning, 0-600 metres wavelength. Terminals and other sundry fittings. All above are mounted in ebonite panelled case. Ebonite alone is worth more

than we ask for completed article. Cost £15 each. Price, to clear, 12/- each, post 1/6. Useful to all experimenters for parts, etc. Anyone can purchase one of these sets.

HIGH GRADE LABORATORY INSTRUMENTS, all brand new. Accuracy guaranteed. Laboratory combined moving coil, readings, 0-10 volt, 0-100 volt, 0-5 amp., 0-5 milliamps. Lowest reading 1-10th part of a milliamp., 57/6 each, post 1/-.**MILLIAMPMETERS**. Moving coil, panel mounting, reading 0-50, 17/6 each, post 6d.**AMPMETERS**. Centre zero, panel mounting, dead beat. 10-0-10 amps., 15-0-15 amps., 8/- each, post 6d.**MOVING COIL VOLTMETERS**. 0-50 volt, 0-120 volt, 0-200 volt, 0-250 volt, 30/- each, post 1/-.**MIRROR REFLECTING 0-1,000 MOVING COIL VOLTMETERS**, 50/- each, post 1/6.**INSULATION TESTERS**, with Hand Generator, £5 10s. each.**SWITCHBOARD AMPMETERS AND VOLTMETERS**, 4-5 in. dial, 0-30 amps., 22/- each, post 1/-; 0-50 amps., 24/- each, post 1/-; 0-80 volts, 24/-, post 1/-.**LABORATORY BRIDGE CONDENSERS**, 5,000 volt mica dielectric, and contain 7 separate condensers. Any condenser can be plugged in separate, and any combination of capacities can be obtained. Condensers all in 3 1/2 mfd., £2 each.**AMPLIFIERS, M.III and M.IV**. Containing 3 Intervalve Transformers and 1 Telephone Transformer, Stud Switch, Fil. Rheostat, etc., etc. These are well known as perfect amplifiers, price 50/-, post 1/6.**M.III SINGLE VALVE TRANSMITTERS**, range 300-1,450 metres, containing tuning coil with stud tapping, 2 Variometers, Variometer reaction and Variometer tuning, with ratchet movement. All coils wound on heavy ebonite. Condenser 01. Wound leak and condenser. Multiple switch, lamp, heavy key, aerial amp-meter, etc., etc.; 1/2 in. ebonite panel. Cost £15. Price to clear, 30/- each. With slight alteration these can be used for receiving, microphone to suit, 2/6. Passenger train, 2/6. Brand new sets.**COPPER EARTH MATS**. Size 20 ft. by 2 ft., 12/6 each, post 1/6.**FULLER'S ACCUMULATORS**. Brand new, especially designed for heavy or light discharges, without sulphating or shedding of plates, 2 volt 120 amp., 14/-, post 1/-; 4 volt 120 amp., 28/-; 6 volt 120 amp., 40/-.**PETROL ELECTRIC COUPLED GENERATING SETS**. A B C Sets, 50 volt, 20 amp., £20. Austin 4 cyl., 3 1/2 kw., 110 volt 32 amps., £40. Austin 2 cyl., 2 1/2 kw., 110 volt 23 amp., £35. Switchboards quoted for separately; state requirements.**GENERATORS**. D.C. Shunt Wound, 75 volt 40 amp., 4-pole, £12; 110 volt 65 amp., £18; 400 volt 12 amp. motors, £15; 220 volt 8 H.P. motors, £15, and various other motors and generators in stock; state requirements.**INTERVALVE TRANSFORMERS**, small ex-gov. type, the best to be obtained; to clear, 10/6 each, post 6d.**1,000-VOLT 100 MILLIAMPER**. H.T. Generators complete with 2 valve Rectifier and 2 Rectifying Valves, £2 10s. each.**MASTER VIBRATOR BUZZERS**, useful for rectifiers, Buzzers, etc., cost 35/- each, price to clear 2/6, post 6d.**ACCUMULATOR PLATES**. Standard 4 x 3 3/8 in. Positive plates, 10d. each, post 3d.; Negative plates 7d., post 3d.**MANSBRIDGE CONDENSERS**. 2 M.F. 2/6. 1 M.F. 1/6, post 3d.**BRASS ODDMENTS**, consisting of small brass parts, such as nuts, screws, spindles, Vernier parts and thousands of other parts useful to all, to be cleared at 1/- per lb., post 6d.**LOUD SPEAKER**. Extension leads for extending loud speaker to the garden, etc., without loss of signal strength, 2/- per dozen yards; 4/- 2 dozen yards, etc., post 3d.**5 mm. LEAD-IN WIRE**, rubber covered, 2/6 per doz. yards, post 3d.**CHOKES**, 1,000 ohms 9d. each, post 2d.**47 GAUGE WIRE**. On Spool, 9d., post 2d.**LOUD-SPEAKER BOBBINS**. Ready wound 1,000 ohms, 6d. each.**EBONITE PANELS**. Brand new, ready drilled and engraved 13 1/2 x 7 x 1 1/2 in. thick, 2/6 each, post 6d.**WESTERN ELECTRIC TRANSFORMERS**, to clear, 4/- each, post 9d.

TWO TECHNICAL HINTS FOR AMATEURS.

A FAIRLY good quality voltmeter reading up to 6 or 8 volts, with an open scale, so that fractions of a volt can be read easily is, unfortunately, somewhat expensive, and for that reason most valve users prefer to do without a voltmeter, and to judge the condition of their dull-emitter valves when operating by merely observing the filament. Now, in the old days, when you simply turned your bright emitter up until you got whatever volume you wanted, it was not a matter of great difficulty to estimate when the filament was nearing the danger point.

But with the modern dull emitter (and most of us use them now) this is not so easy, particularly as many valves have a silver or other semi-opaque deposit on the inside of the glass bulb. As most people are aware, a dull emitter may be overrun, that is, run with too large a heating current, for some time without showing any great difference in its operating properties. But in course of time this abuse has the effect of destroying the characteristic properties of the filament, and the latter ceases to function as a dull emitter; its emission, in fact, falls off rapidly.

It is here, then, that the occasional use of a filament voltmeter is a piece of really

good practice. Apply the voltmeter across the filament terminals of each valve at a time, and regulate the rheostat until the voltage applied to the filament is equal to that rated by the makers of the valve. Then, if you like, note carefully the appearance of the filament, and try to memorise the degree of brightness. Or you may note the position of the pointer on the rheostat.

Another reason for keeping to the correct voltage is that the grid bias from the filament battery is affected by the voltage, and this often makes a considerable difference to the efficient working of the valve.

Microphonic Noises.

IT often happens with the receiving set, especially if dull-emitter valves are used, that every time you touch the table, or even walk across the floor, a loud ringing noise is heard from the 'phones or loud speaker. This effect is due to what are known as "microphonic" causes, and these arise owing to the mechanical vibration of the filament and the consequent change in its distance from the other electrodes. Dull emitters are apt to be much more microphonic than bright emitters, owing to the more slender nature of the fila-

ment and to the fact that it is supported in a somewhat different way.

These microphonic noises, which are sometimes very annoying, are, however, easily overcome by any one of several different methods. There are special "anti-microphonic" valve holders on the market, which are supported on springs, or in some similar way, so that the extraneous mechanical vibrations are much reduced before reaching the valve.

Another simple method of eliminating, or at any rate reducing microphonic noises, is to support the set as a whole upon a sponge-rubber mat, or upon feet of the same material.

Reducing Valve Vibration.

A third method, and one which has been found to work excellently, is to make small "washers" from pieces cut from a rubber tube (such as is used in the laboratory for gas-tubing) and to insert washers between the valve holder and the baseboard, and also between the valve holder and the head of the screw which holds it in position. In this way, the valve holder is held entirely through rubber and is mechanically insulated. Of course, the screws must not be pulled up too tightly, or else the rubber will be so squeezed that its natural resiliency will have little effect.

PHOTOGRAPHS.

Readers are invited to submit photographs of wireless interest for publication in "Popular Wireless." Every photograph accepted and published will be paid for at the rate of 10/6 per copy.

Wireless Wonders at Westminster—

WIRELESS EXHIBITION

at the ROYAL

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from **OCTOBER 10th to 16th, 1925.**

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The greatest show yet

This year's Exhibition will be even better than last year. Many new exhibitors will be included, and a host of new ideas will be shown for the first time. Amazing progress has been made in many directions.

Working Exhibits

Machinery at work, showing the actual manufacturing processes will be seen.

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Entries for the two cups offered for Amateur constructed sets will be on view.

How to get there

By 'bus, alight at Westminster or Victoria or near Army & Navy Stores, Victoria Street. By Underground, alight at St. James' Park Station.

"BELLING-LEE" INDICATING TERMINALS & "MULTY-KONTACT" PLUGS & SOCKETS




(Handles and dome-shaped Indicating Rings in Red or Black) Stocked in the following indications:

PATENTED

Aerial, Earth, Phones +, Phones -, L.T. +, L.T. -, H.T. +, H.T. -, Input +, Input -, Output +, Output -, L. S. +, L. S. -, Grid +, Grid -, A. T. I., Reaction, Ap. Aerial, H. T. Medium, and Blanks.

Price: Brass 4d. Nickel 4½d.

DIAL INDICATORS



Price - 6d. each.

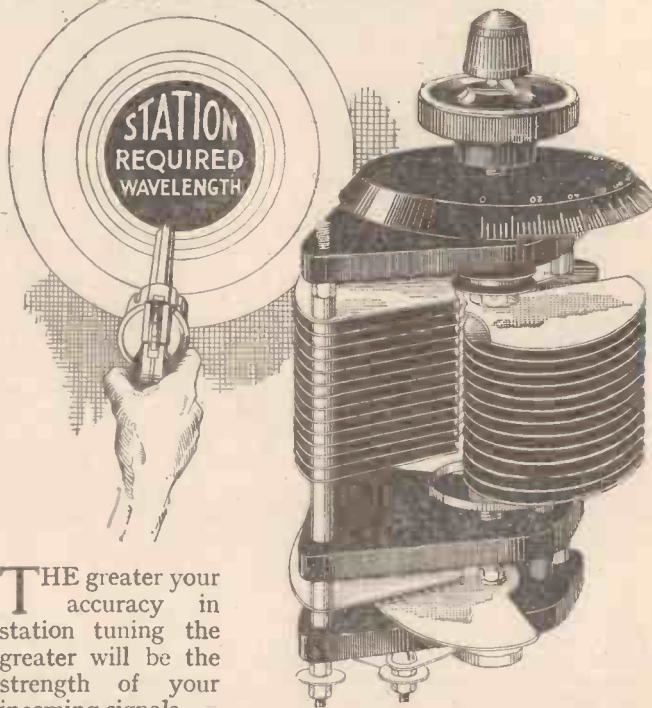
SUB-CONNECTORS
Eliminate Soldering.



Price 1d. each.

Every high-class dealer stocks them, but in case of difficulty send to **BELLING & LEE, LTD.**, Queensway Works, Ponder's End, Midx.

Get Yesly Tuning for ACCURACY



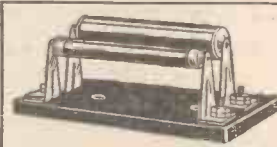
THE greater your accuracy in station tuning the greater will be the strength of your incoming signals.

You cannot expect abundant volume free from distortion and heavy running costs if your tuning lacks concentration and decisive accuracy.

The immediate increase in reception and economy will repay you manifold for your preliminary care to obtain the best tuning. With **YESLY TUNING** you can pick out your stations instantly and focus them to full strength for **MAXIMUM VOLUME**. The accuracy required for this concentrated tuning is the feature of the **YESLY SQUARE LAW VARIABLE CONDENSER**.

NOTE

(1) The first-class GENERAL FINISH.	nut to eliminate all backlash and spindle play.	Plain Vernier '001 - 11/6 - 15/-
(2) The pure EBONITE highly polished plates.	(5) The special panel pin to prevent bodily rotation.	'0005 - 10/6 - 14/-
(3) The coiled MOVING contacts.	(6) The ROBUST CONSTRUCTION.	'0003 - 10/- - 13/-
(4) The ONE - HOLE FIXING with embedded	(7) The MODERATE PRICES.	'00025 9/6 - 12/6
		'0002 - 9/- - 12/-



THE YESLY COMBINED GRID LEAK AND CONDENSER. This grid leak is absolutely silent in operation and both this and the condenser are of excellent workmanship. There is little doubt that this novel type of combined component will eventually displace the older patterns. Tubular Grid Leak (2 mags.) and Condenser ('0003) Complete 3/9 each.

The highest possible standard in aerial tuning demands **YESLY COMPONENTS**.

LOOK FOR THE NAME REGISTERED




Ask for Leaflet C3 giving complete information.

Obtainable from your local dealer. If you have any difficulty write to—
ENGINEERING SUPPLIES Ltd.
235, Blackfriars Road, London, S.E.

Remember—

to get the best out of your Set, to obviate annoyance through batteries running out after only short periods, to save money—you must use batteries of proved value.

"ELKA" P.L. & H. T. Batteries will give you lasting satisfaction. Get your's NOW. Demand "ELKA" from your dealer and refuse substitutes.



L. KREMNER,
49a, Shudehill, Manchester.

9 v. Grid Bias	2/-
60 v. H.T. Bty	8/8
100 v. H.T. Bty	12/6
4½ v. P.L. Bty	6d.

Trade prices on application.

HELLO EVERYBODY!!!

Over 63 per cent of Postal Applications for our NEW CATALOGUE have RESULTED IN SALES. Have you got yours? First issue of 20,000 NEARLY EXHAUSTED. Free and Post Free on receipt of a P.C.

SHOP BY POST WITH SECURITY FROM "UNCLE TOM"

Newcastle's First B.B.C. Station Director.

LARGEST WIRELESS FIRM IN GREAT BRITAIN

WHOLESALE & RETAIL.

PAYNE & HORNSBY LTD.,
GALLOWGATE, NEWCASTLE - ON - TYNE.
and at Leeds, Belfast, Notts., Sunderland, North and South Shields.



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

A DETECTOR of more than usual interest is the "Kathoxyd," a sample of which has been sent us by Kathoxyd, Ltd., 41, High Holborn, London, W.C.1. It is hardly a crystal detector inasmuch as it consists of a small metal plate covered with a chemical compound (not powdered crystal), a small zinc-iron contact on a spring and a graphite contact. The two last-named are used alternatively, as circumstances dictate.

The small metal plate takes the place of the crystal in an ordinary detector while one or other of the two contacts takes the place of the cat's-whisker or, in a "perikon" type of detector, the second crystal contact. The three elements are sold at 1s. 6d. complete.

The zinc-iron contact is stated to be more suitable for local station work, and in an ordinary crystal set it gave very

excellent results. Signals were louder than with a standard cat's-whisker type of detector. The adjustment was easy and a sensitive point very quickly found, and after this the device functioned with commendable stability during an extended period of observation. In a reflex circuit results were good, and the use of considerable high-tension failed to affect it.

With the graphite point weak signals were brought in with an ease that spoke well for Kathoxyd's sensitivity, although we preferred the zinc-iron contact. Kathoxyd will prove an interesting study for the crystal experimenter as well as being able to take its place as a good-standard detector in the listener's receiver.

From the British Sangamo Co., Ltd., Ponders End, Middlesex, we have received

a number of "Sangamo" fixed condensers. They are very neat in appearance, being moulded in bakelite, and no wax or similar filling is employed. Being so constructed they are, of course, unaffected by atmospheric variations.

They are each provided with two screw holes, one at either end, and four screws are fitted so that four tag connections can be taken. Alternatively the screws can be removed and square section wire, when such is used, passed through the holes and soldered, thus making a most rigid connection.

Two of the samples were tested carefully and were found to be well up to standard, with immaterial capacity errors and high insulation efficiencies. At prices ranging between 2s. 6d. and 4s. "Sangamo" mica fixed condensers are worthy of every constructor's attention.

Constructors whose purses are not long will welcome the "Gudwrun" radio soldering set which, sold at the low price of 1s. 9d., is manufactured by the Sanitary and Water Fittings Mfg. Co., of 35, Friday Street, London, E.C.3. It consists of a very nice little "iron" just the right size and shape



The new A.J.S. pedestal loud speaker.

(Continued on page 314.)

BONTONE PHONES

100,000 SATISFIED USERS

STARTLING ANNOUNCEMENT!

Owing to increased manufacturing facilities in their new Works, Messrs. B. D. & Co., are able to defy foreign competition and now offer their all-British "BONTONE" 'Phone at reduced prices.

"Bontone" Originals - 11/6
 "Bontone" Lightweights, 12/6

Backed by a famous name, every detail of manufacture carefully studied, and tested by specially designed scientific apparatus.

These 'Phones are of the highest possible value yet offered to the British public. They are manufactured throughout in our own Works and can be procured from all Radio Dealers, Stores, or direct from:—

B. D. & Co. (Ed. A. Boynton),
 Government Contractors,
 167-173, Goswell Road, LONDON, E.C.1



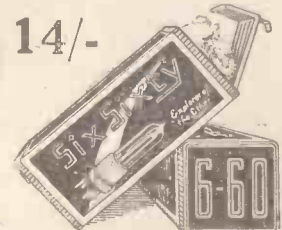
Short one: "That's a bright idea!"
 Tall one: "Yes, old chap, and a good dull emitter!"

Fitted with the 100% efficient electron emitting filament—**MOLYBDENUM-THORIUM COVERED.**

Filament volts 1.5-2. Filament current 3 amps. British made. B.B.C. Stamped.

If your local dealer cannot supply send direct to us. Have you had our free folders yet? If not, send a postcard for them to-day.

THE ELECTRON CO., LTD.,
 Triumph House, 189, Regent Street,
 London, W.1. 'Phone: Regent 5336.



The Seal of Excellence

ON every Igranic Radio Device appears the distinctive Igranic Trade Mark—the seal of excellence—which is a guarantee of highest efficiency and the finest materials, workmanship and finish.

With the Igranic Trade Mark goes the liberal Igranic Guarantee under which any Igranic Radio Device is repaired or replaced free of charge, should the user fail to derive that complete satisfaction in performance which Igranic Radio Devices are consistently giving to thousands of radio enthusiasts throughout the world.

Write for interesting new booklet Z 724, and leaflets showing the latest Igranic Radio Devices, to IGRANIC ELECTRIC CO. LTD., 149, Queen Victoria Street, London, or to the Works at Bedford.

Branches at
Birmingham,
Cardiff,
Glasgow,
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and Newcastle.



DON'T BLAME THE SET!



Nine times out of ten there is a fault in the circuit which can be put right in a minute or two with the aid of FLUXITE.

Solder all joins with FLUXITE, and they cease to be joi is, but become one unbroken piece of metal. No

chance of leakage there! It's so easy, too. A child could do it. No wireless enthusiast should dream of making joins any other way.

Ask your Ironmonger or Hardware Dealer to show you the neat little

FLUXITE SOLDERING SET

It is perfectly simple to use, and will last for years in constant use. It contains a special "small space" Soldering Iron with non-heating metal handle, a Pocket Blow-lamp, FLUXITE, solder, etc., and full instructions. Price 7/6. Write to us should you be unable to obtain it.

FLUXITE SIMPLIFIES SOLDERING

All Hardware and Ironmongery Stores sell FLUXITE in tins, price 8d., 1/4 & 2/8.

Buy a Tin To-day.

FLUXITE LTD. (Dept. 324), West Lane Works, Rotherhithe, S.E.16.

Price 7/6



ANOTHER USE FOR FLUXITE. Hardening Tools & Case Hardening. ASK FOR LEAFLET on improved methods.

Sangamo



The New Fixed Condenser is accurate - stays accurate

FIXED condensers are important units in a radio receiver and should be carefully chosen for **sustained accuracy**. In reflex and other circuits where capacity is a critical factor, accuracy in the fixed condenser may make the great difference between a set that performs perfectly and one that is uncertain as the weather.

Sangamo Fixed Mica Condensers are guaranteed to be accurate under all temperature and humidity conditions. Neither the intense heat of soldering nor the rain-soaked atmosphere will impair their accuracy. Even at the seashore, where the salt air creeps in to change the capacity of exposed condensers, the accuracy of the Sangamo is not affected in the least.

Moulded in smooth brown bakelite, the Sangamo Fixed Condenser is most pleasing in appearance.

Sangamo Condensers are made in all standard capacities, and are supplied with or without grid leak clips.

Ask your usual supplier to show you the Sangamo Fixed Mica Condenser. If he doesn't yet stock it, send us his name and address and we will send you the name of the nearest stockist.

TRADE INQUIRIES INVITED.



0.0001—0.0009 mfd.	...	...	...	2/6
0.001—0.009 mfd.	...	...	...	3/-

SANGAMO
Accurate
Radio Parts

THE BRITISH SANGAMO Co., Ltd.
Ponders End, Middlesex.

APPARATUS TESTED.

(Continued from page 312.)

for wireless work, being neither too large nor too small, a tin of "Gudwrun" flux and a coil of solder of generous dimensions. We gave the outfit a trial, and it proved to be quite O.K. in every working respect.

Panel mounting crystal detectors must be in great demand, and yet there are not so many makes on the market that a few more of good quality would meet with ready sales. For that reason we consider Messrs. Palmer's, of 17, Brownlow Street, Leamington Spa, are to be commended for introducing the "Double Eccentric" at 3s. 6d. It is an excellent little component, small, nicely finished and just the design that is required.

It is a double crystal type, completely enclosed in a glass tube, and provided with two neat little adjusting knobs. By means of the latter both the crystals can be rotated eccentrically so that their whole surfaces are explored. This, in the case of the one crystal, is small, as it is but a small sharp pointed piece of mineral, but it enables a very close adjustment to be made. The tension of the spring is not varied, but this does not appear to be at all necessary—it certainly simplifies matters.

On test the detector functioned excellently, sensitive points were very easy to find and signals were as loud as anything in crystal detectors could well provide.

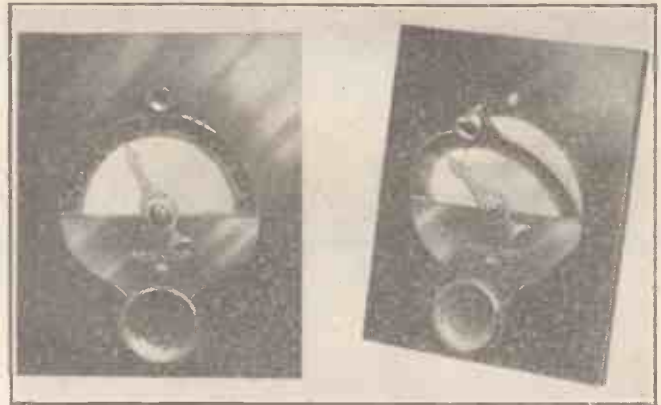
Readers will, of course, remember the "Winsulator," a self-cleaning aerial insulator constructionally described a month or two ago in "P.W." They will, therefore, be interested to learn that the Goswell Engineering Co., Ltd., of 95, White Lion Street, London, W.1, have placed "Winsulators" in production, and that they are now obtainable at 2/6 each. We have received a number of samples of the commercialised article, and are pleased to be able to report that they are entirely satisfactory. Nicely made with first-class materials, they present an appearance of solidity which indicates that they are intended for real hard work. And such carefully manufactured "Winsulators" do work hard, too, and carry out their "self-cleaning" in a most business-like manner.

Tests have shown that "infinity" is an easily obtained reading with these "Winsulators" at any time, even in most "smoky" districts. Leakage through dirty insulators can be the cause of great loss of signal strength, and as they render frequent aerial overhauls quite unnecessary, Messrs. Goswell's excellent interpretations of the original "Winsulator" should meet an overwhelming demand at the very reasonable price quoted above.

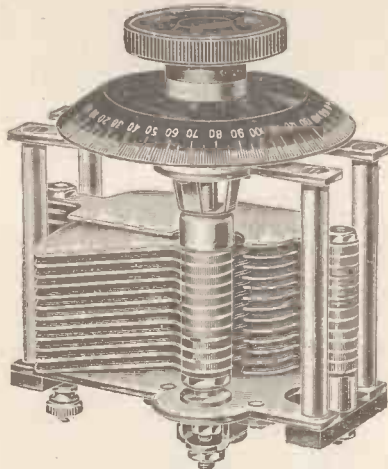
"Valpo" spring grip terminals, a number of which were recently sent us for examination, are designed to take either pin or spade tags or wire, and they are particularly useful as telephone receiver terminals.

Nicely made in black and red colours, they are provided with sufficiently strong springs to ensure efficient contacts under all conditions. Obtainable at the majority of wireless stores, they retail at 4d. each, in either of the above-mentioned colours.

We have inspected a number of the sets of parts Messrs. Peto Scotts are supplying for building "P. W." sets, and have no hesitation in recommending them to the attention of readers. The prices quoted, too, are such that it becomes economical to purchase components and materials in this manner.



A condenser dial of interesting design—a new Radiosun product. Note the two positions.



J.B. LOW LOSS	
'001	13/-
'00075	11/9
'0005	10/6
'0003	9/-
'00025	8/9
'0002	8/6
'0001	8/3

J.B. LOW LOSS GEARED VERNIER	
'001	17/6
'00075	16/3
'0005	15/-
'0003	13/6
'00025	13/3
'0002	14/-
'0001	12/0

Post, One 6d.
Two 9d. Three 1/-

Deliveries in strict rotation as and from Sept. 15, 1925

Announcing the New J.B. Condensers

THE name J.B. holds an enviable position in radio. Consistently from the earliest days the J.B. trade mark has been synonymous with better radio condensers. The new model J.B. Condensers here announced embody vital improvements, each of which is the outcome of our own practical experiments. They will perform thoroughly and in every way fulfil the high standard of quality and efficiency for which J.B. stands.

- FEATURES:**
- Losses absolutely negligible (.02 ohms at a million cycles '0005 mfd.)
 - Plates rigidly supported at two points. Pigtail connection.
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RADIO TORIAL

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PATENT ADVICE FOR READERS.

The Editor will be very pleased to recommend readers of POPULAR WIRELESS who have any inventions to patent, or who desire advice on patent questions, to our patent agent. Letters dealing with patent questions, if sent to the Editor, will be forwarded to our own patent advisers, where every facility and help will be afforded to readers.

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 point-to-point wiring is required an additional fee of 1/- must be enclosed.

Wiring diagrams of commercial apparatus, such as

sets of any particular manufacture, etc., cannot be supplied. (Such particulars can only be obtained from the makers.)

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

No questions can be answered by 'phone.
Remittances should be in the form of Postal Orders.

Questions and Answers

FRAME AERIAL RECEPTION.

R. H. J. (Birmingham).—I have no facilities for erecting an outdoor aerial, but I wish to receive broadcasting from the Birmingham station on a frame aerial. How many turns of 24 S.W.G. wire shall I need on a fairly large frame?

If the sides of the square frame measure four feet each, and the wire is spaced a quarter of an inch apart, you will need five turns of insulated wire.

A small variable condenser should be connected across the frame to afford exact tuning, and a convenient capacity to use would be either '0002 or '0003. An aerial of this kind will have very marked directional tendencies, and give good results close to the broadcasting station.

PROTECTION AGAINST LIGHTNING.

T. M. B. (Liverpool).—As a protection against lightning, is it sufficient to connect the aerial to a water pipe in a cellar?

This depends upon exact situation of set, etc., the only rule covering all cases being the one which says that to be really efficient the earth should be directly under the aerial with the lead-in going

(Continued on page 318.)

The Secret of Better Reception

Every day more and more wireless users are finding out what an immense improvement in reception is effected by the new GECOPHONE Super Capacity H.T. Radio Batteries. These batteries are the latest development in BRITISH battery manufacture and are distinguished for

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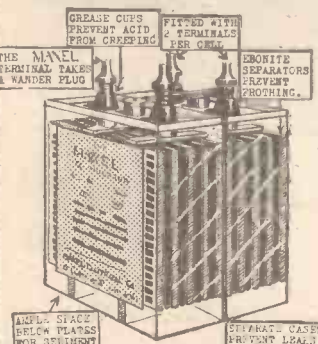
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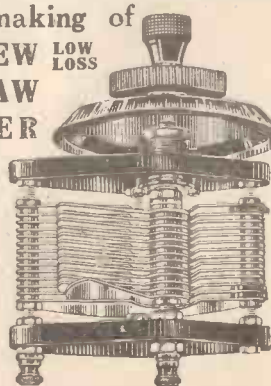
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THE WIRELESS DEN
56 Ludgate Hill, London, E.C. 4



RADIOTORIAL QUESTIONS AND ANSWERS.

(Continued from page 316.)

straight down to it. Protection against electrical discharges is best secured by an earthing switch which connects the aerial to earth, when the set is not in use. This switch should be outside the house.

GRID LEAKS AND CONDENSERS.

A. J. M. (Slough).—Is there any rule whereby I can work out the correct values of grid leak and condenser to use in any circuit?

It has been proved by experiment that quality of speech received is impaired if the product of the capacity of the grid condenser is micromicrofarads and the resistance of the grid leak in millions of ohms exceeds 200. Generally speaking, the higher resistance and less capacity factor is advisable. Owing to the different qualities of apparatus it is always advisable to experiment in the values of these two items if optimum efficiency is required. For instance, the grid "leg" or wiring insulation or the grid condenser may be "leaky," in which cases it may be advantageous to dispense with the leak altogether.

THE BEST AERIAL.

"MAROON" (Ascot).—What is the best aerial that I can make conforming to P.M.G. regulations. Do you advise single or twin aerial. What is the best earth?

You will probably find that a single wire aerial will be best for the reception of broadcasting, provided you are not restricted for space. See that it is well insulated at both ends. Theoretically, loudest signals will be obtained if the lead-in end of the aerial points towards the station that it is required to receive. Use 7/22 enamelled copper wire, and keep your aerial as far away from trees as possible, and, as height is the all-important factor, get it as high as practicable. It should be at least 30 ft. high for really good results. For an earth plate you will find that a sheet of copper will give excellent results, or a large sheet of galvanised metal will be quite O.K. Bury to a depth of about 3 ft., or more if possible, in damp ground, and make sure that the earth lead is well soldered to the metal sheet. You will find that a water

pipe or tap will make quite an efficient earth if it is impossible to use the direct method.

THE ARMSTRONG SUPER.

P. N. E. (Woking).—I have constructed a single-valve Armstrong super-regenerative receiver, but cannot get it to work. It does not even oscillate, unless a faint whistling I can hear is oscillation. The note of this whistle does not change when I vary the tuning of the variable condenser. Can you tell me what is wrong, please?

We should imagine, by the nature of your queries, that your knowledge of super circuits is not extensive, and in these circumstances we can only advise you to carefully read the subject up. We can hardly help you unless we know exactly the nature of the circuit you employ, as there are several distinctly different one-valve circuits that operate on the Armstrong principle. Do you employ a variable grid leak or grid biasing batteries? One or other of these is almost essential for easy working. Also quite 120 to 150 volts H.T. will be necessary. You may be using too little, and the conditions seem to indicate that this is the case. If you are using a reaction coil in the direct grid circuit this may be wrongly connected; try reversing its leads. The frame aerial will not be suitable in size or winding. There are, in fact, a great number of possible causes of failure, and without explicit detail of the set and the circumstances in which it is operating, it is impossible for us to give you any very useful advice on the subject.

USING CONDENSERS WITH VARIOMETER.

H. C. (Shepperton-on-Thames).—I have a crystal set consisting of a broadcast variometer, 'phones, with small condenser, and crystal detector, and with a 25-ft.-high aerial I get very good signals. I am told that a variable condenser would still further improve results and give better tuning. Is this so, and how should it be connected?

You would not improve results by adding a tuning condenser, as this is only useful for tuning a fixed coil or for "loading" a variometer.

The latter by itself is capable of very fine tuning and the addition of a capacity across it would be

detrimental, unless it is necessary to increase the tuning range of the instrument.

This tuning range is merely the band of wavelengths which the instrument will cover, and has nothing to do with the range of reception, which is what you wish to increase.

NO REACTION.

F. S. (Edgware Road, London, W.) encloses a diagram of his 3-valve receiver, with a letter complaining of very bad results.

The set is the usual H.F. (tuned anode) Detector and L.F. with reaction and variometer tuning. The reaction may be wrongly connected; try reversing its connections. Also see that the anode coil is of the correct size to receive the required signals. A further point is that, although in every other respect the circuit is quite correct, it contains no grid-leak. This is necessary, and should be connected between the grid of the second (detector) valve and the L.T. minus terminal, or any point going to L.T. minus, such as one of the filament connections. The resistance of the leak should be about 2 megohms, but as this value depends upon the type of valve used it is preferable to use a variable leak of the usual compression type. A fixed condenser (.001 mfd.) across the primary of the L.F. transformer may be useful, and also one across the 'phones and H.T. battery.

See that you are not using unsuitable valves. If, by any chance, you are using a soft detector and hard amplifiers, it is probable that the H.T. voltage on the detector is not enough to operate the amplifiers, or, if the voltage is enough for the amplifiers, it is probably too much for the detector. Separate H.T. control will be necessary for each valve, or better still the H.T. supply for each valve should be tapped off separately by means of wander plugs, inserted in the H.T. battery.

Finally, make sure that every connection is O.K. and is clean, especially such connections as aerial, earth, tuning coils, and valve legs. Also make sure that there is no chance of capacity or other leakage on the H.F. side of the receiver. H.F. currents are very tricky to deal with, and they will leak away at the most surprising places unless great care is taken with cleanliness and spacing.

If there is anything in these pages that you do not like, please let us know what it is when writing to us.

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This week's "Pop. Wireless" Sets

—here are the parts you need.
Order them to-day—and get them by return.
The "Popular Wireless" Ultra Receiver.

(Described in this issue.)

"Pilot" Chart Kit of Components comprises of the following :—

1 Peto-Scott Standard square law condenser with vernier-0005mfd.	£ s. d. 10 6	1 Dubilier fixed condenser, .003 mfd.	£ s. d. 3 0
1 Peto-Scott 2-way Coil Holder, friction drive, with long handle	5 6	14 Mark III Terminals	2 4
1 Isernic Ultronic coil	9 0	8 Flash pattern valve sockets	1 0
1 Peto-Scott Concert coil, No. 5, for reaction	4 0	Necessary Busbar, panel transformers, screws, nuts, etc.	1 8
1 Max.-Amp. L.F. transformer (first stage)	19 6	One Panel of "Red Triangle" guaranteed ebonite, 10 x 8 x 1/2 ins., cut dead square and matted, ready for use	5 0
1 Nesthill S.T.B.T. switch	1 6	One Polished Mahogany Cabinet to fit	8 6
2 Peto-Scott Filament rheostats 5 ohms	5 0		
1 Dubilier Grid condenser, .0003 mfd., and Grid leak, 2 megs.	5 0		
1 Dubilier fixed condenser, .002 mfd.	3 0		
			£4 4 6

The "Popular Wireless" One-Valve Reflex Receiver.

(Described in this issue.)

"Pilot" Type 3 Kit of Components comprises of the following :—

1 Peto-Scott Standard square law condenser, .0005 mfd.	£ s. d. 8 0	1 Dubilier fixed condenser, .001 mfd.	£ s. d. 3 0
1 Peto-Scott Standard square law condenser, .0003 mfd.	6 9	1 Dubilier fixed condenser, .002 mfd.	3 0
1 Lissenstat major filament rheostat	7 6	9 Mark III Terminals	1 6
1 Max.-Amp. L.F. transformer (Reflex)	19 6	Necessary Busbar, panel transformers, screws, nuts, etc.	1 9
1 Burndept anti-phonie Valve Holder	5 0	One panel of "Red Triangle" guaranteed ebonite, 13 x 6 1/2 x 1/2 ins., cut dead square and matted, ready for use	5 0
1 Peto-Scott Tuned Coil Holder, friction drive with long handle	5 6	One Polished Mahogany Cabinet with baseboard	1 1 0
1 Eureka Gravity Crystal Detector	6 6		
1 Dubilier fixed condenser, .0002 mfd.	2 6		
			£4 16 6

Special Note When all parts are purchased with panel a Marconi royalty of 12/6 per valve holder must be remitted.

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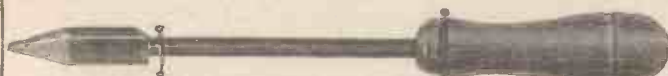
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THE VALUE OF GRID BIAS. Some Remarkable Experimental Results.

From a CORRESPONDENT.

THERE is probably no point in a wireless receiving set where "value for money" is obtained so readily as in the grid bias battery; it costs next to nothing to instal; it lasts an extremely long time, owing to the very small current taken from it; it has a profound effect often on the quality and volume of the reproduction; and it effects a great saving in H.T. battery current and cost of upkeep.

It is remarkable, then, that so many amateurs still do not avail themselves of the advantages to be gained so easily by the introduction of a grid battery into the set.

Saving in H.T. Current.

The advantage of the grid battery are chiefly employed, of course, in connection with the low-frequency amplifier; here it may have the effect of increasing the life of the high-tension battery by as much as 60 per cent.

Having regard to the short life of the average high-tension battery, and to the fact that replacements constitute one of the main items (if not the main item) in the maintenance costs of a valve set, anything which so materially economises at this point should be recognised as a most valuable adjunct.

We have said that a grid battery affects the quality of the reproduction, the volume, and the H.T. battery current.

Now some interesting experiments have lately been made by Mr. A. Senauke, the well-known U.S. radio engineer, on the influence of the grid battery considered from the three points of view just indicated, and he has obtained some results which are of importance to every experimenter and amateur.

It was found that the influence of grid bias on the quality and the volume of the reproduction depended to a large extent upon the grade of L.F. transformer used. This point will be dealt with presently. But in all cases the H.T. battery current could be cut down by anything from 20 to 60 per cent.

Increased Volume.

As regards the volume of the reproduction, or rather the voltage amplification, this was measured with a normal signal and over a frequency range of 150 to 3,000 cycles per second. It was found that the voltage amplification depended upon the nature of the transformer; with a high-quality transformer, one of the best on the market, a grid battery of 4½ volts had the effect of increasing the voltage amplification by about 80 per cent., at the same time keeping to the straight part of the curve over practically the whole of that range.

Indeed, towards the higher frequencies, both with the grid battery and without it, when using the high-grade transformer, there was a slight rise in the curve, in-

dicating somewhat, higher voltage amplification for the higher frequencies.

This is considered by some experts to be a desirable feature of the transformer curve, as it means that the higher overtones are preserved and somewhat enhanced, with a corresponding improvement of the resultant quality. The important point for the moment, however, is that with the grid battery, in the case of the high-grade transformer, the shape of the transformer curve was preserved whilst the voltage amplification was very considerably increased.

With a low-grade cheap transformer, whilst the grid battery had the effect of increasing the voltage amplification by about the same percentage as in the previous case, there was a considerable change in the character of the transformer curve, the latter rising rapidly up to a frequency of about 1,500 and then falling rapidly again.

Thus there was great lack of uniformity in the lower frequencies, and a falling off in the higher frequencies, both undesirable features, making for distortion and lack of purity. So with the low-grade transformer, although increased volume is obtained by the use of the grid battery, this may be counter-balanced by loss and purity in the tone.

Elimination of Distortion.

These advantages and disadvantages are, of course, accentuated when two (or more) stages of L.F. amplification are used. Moreover, when a strong signal is being received the grid battery, by giving a negative bias to the grid, has the important effect of permitting volume to be obtained with a minimum of distortion.

To sum up these results, it will be seen from the tests described that in all cases the use of negative grid bias cuts down H.T. battery current and so prolongs the life of the battery; it increases the volume obtainable; and it may—or may not—improve the quality of the reproduction, the latter depending upon the nature of the intervalve coupling. With a good transformer (and a good transformer should always be used if a transformer is to be employed at all) the grid battery materially improves the quality of the reproduction.

Essential for L.F. Amplifiers.

The usual type of grid battery is composed of 1½-volt cells and is supplied with varying steps of 1½ volts upwards.

To repeat what was said at the commencement of these remarks, having regard to the great advantages to be gained so easily by the use of the grid battery, the amateur should remember always to avail himself of it whenever possible. No L.F. amplifier with more than one stage of amplification is complete without it.

FOREIGN RADIO NEWS.

(Continued from page 300.)

are requested to inform the Verein at 43 Dorotheen Strasse, Berlin, N.W.7.

The "Berliner Funk Stunde" announces that it is going to imitate the action of some of the American broadcasting stations in sending out the words of command for physical exercises and Swedish gymnastics.

It is circularising its subscribers to find out what will be the best time of day to do so, in order that schools and institutions may take full advantage of it.

* * *

Good News for Viennese Listener.

A bank clerk in Vienna, who had taken a ticket in the Austrian State lottery, was listening-in some nights ago to the Vienna broadcasting programme when, among the news announcements, the winning numbers were broadcast.

When he heard his own number read out the very first of the list, he threw away his carpieces and performed a wild war dance on the floor. He had won 300,000,000 crowns. That is not so much as pounds or even dollars would have been, but in these hard times it is a nice little sum to play with.

* * *

Novel Belgian Experiment.

The station Radio-Belgique has been trying a new experiment, which has met with considerable success. By means of telephone and microphone, it carries on conversation with its listeners-in, the operator in each case repeating the question addressed to him and replying to it.

* * *

Efficient South American Stations.

There has been of late a consensus of reports from amateur listeners in France, Germany, Switzerland, and all Central European States remarking on the frequency and distinctness with which certain South American transmissions are heard. The best of the lot seems to be WK A Q, Porto Rico, which works on a wave-length of 340 metres with 500 watts. Every Monday and Wednesday, from 8 to 9 p.m. (local time), it transmits the dancing music from the Plaza de Porto Rico, and every Tuesday, at 8.30 p.m. (local time), a concert given at the Cafestera.

Another station frequently heard is that of Buenos Aires, with a 400 metres' wave-length and 500 watts, the programme of which is usually heralded by a series of Morse signals. The Praia Vermelha station at Buenos Aires, which has been erected by the Brazilian Radio Club, is another contributor to many amateurs' collection of programmes. Its wave-length is 250 metres with 500 watts, and the daily concert is at 4 p.m. and 8 p.m. (Brazilian time).

ANSWERS £10,000 PRIZE

Always famous for its generous cash prizes, ANSWERS has beaten all records in the issue now on sale, by offering the gigantic sum of £10,000 in a no-entrance-fee competition of unusual simplicity and fascination. Briefly, all competitors have to do is to find a small number of missing words which have been omitted deliberately from selected extracts of speeches of famous men. There is nothing to pay. All our readers should make a bid for this fortune. All particulars in ANSWERS to-day.

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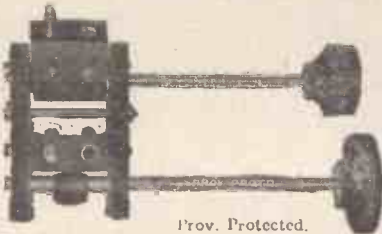
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Acts as own drilling jig.

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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.

UNIDYNE MODIFICATIONS.

The Editor, POPULAR WIRELESS.
Sir.—The following may interest Unidyneists. Although my one-valve Unidyne is giving good results I find the set "reaches out" better when the earth wire is removed and attached to the telephone terminal, which goes to reaction coil, but the great advantage in my case is the almost elimination of the persistent A. C. hum which accompanies very long phone extension leads. The set operates with its usual stability, but a few more degrees have to be added to condenser readings than formerly.
— In my case a telephone condenser is necessary, otherwise signals are too weak to read.
Hoping the above may be useful to some reader of "P.W.," I will close with best wishes to you and your staff.

Yours, etc.,
H. T. HART.

1, Cameron Grove,
York.

UNIDYNE RESULTS.

The Editor, POPULAR WIRELESS.
Dear Sir.—While testing a one-valve Unidyne set on September 8th, for distance, I was rewarded handsomely.
I tuned in someone playing a violin solo, so I hung on for a bit, and this is what followed: "E A J 8 the San Sebastian station testing on 350 M., power 500 watts." Considering my aerial is low (20 ft.) and badly screened between two houses, the above result speaks highly of the wonderful detecting powers of the H.T.-less circuit. Please convey my most sincere thanks to the inventors.
Best of luck to you and your most popular "POPULAR."

Your well wisher,
W. H. HARRIS.

26, Cornbury Road,
Rotherhithe, S.E.16.

THE CHITOS SET.

The Editor, POPULAR WIRELESS.
Dear Sir.—Recently I made the 1-valve "Chitos" receiver described in Thursday's issue of POPULAR WIRELESS, and have pleasure in giving below list of stations received during week-end:

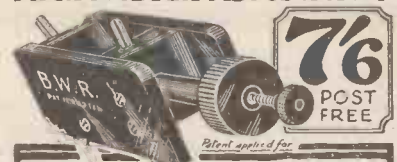
- Radio Toulouse du Midi—very loud.
 - Radio Belgique—very loud.
 - Bournemouth—good on 'phones.
 - Petit Parisien—weak but clear.
 - One B.B.C. station—call sign not heard.
 - One German station—call sign not heard.
 - 5 C T—Relaying Radio-Paris.
 - "6 Y George."
 - 2 B E.
 - 2 B L.
 - "5 Ices."
 - 5 Z A.
 - 2 L O—On large Amplion L.S., but strength was not enough for the large L.S., but under the circumstances I consider the results from it could not be bettered without L.F. I hope in the winter months to get America on this set, and from what I have so far seen, I can honestly say it is the best one-valve set for distance I have ever had.
- Wishing your paper every success,
Yours faithfully,
J. H. CANT,
Regular reader.
295, Hither Green Lane, Lewisham, S.E.13.

A READER'S APPRECIATION.

The Editor, POPULAR WIRELESS.
Dear Sir.—Having perused your paper for a considerable period, I have been amused often at the various opinions on matters relating to wireless and the B.B.C. If one were to pay much attention to the different theories, it would be much the same as a buffeting on a wild sea. As the science is but yet in its infancy, I think there are but a very few points on which anyone can be very positive. However, it is interesting reading and diverting. Your queries department is a great boon to amateurs like myself who are isolated from any wireless club.
Any of the firms advertising in your paper that I have dealt with are very reliable.
If all your readers have derived as much benefit from your pages as I have done, there is no need to wish you success—you have it.

Yours faithfully,
J. WATT.
Hilland, Cairnie, by Keith, Scotland.

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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/-; 14" x 10", 3/5; 14" x 12", 4/-; 7" x 5", 1/- thick. Post Free.
Callers, cut any size, and quote by Post. Sample, and prices, post free to the Trade.

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LOUD SPEAKERS. Any make. Your selection. Amplion, Brown, Sparta, Sterling, etc. Quarter deposit. Balance six monthly payments.
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9 11 CURSOR ST. CHANCERY LANE, LONDON.

TECHNICAL NOTES.

(Continued from page 280.)

Whilst on the subject of call-signs, I am reminded that a rather interesting innovation has lately been made in this connection by station W R N Y—the station of "Radio News," New York. At this station an instrument known as the "staccatone" is used—the staccatone was described in these notes some months ago. It is an arrangement of valves and tuned circuits, by means of which a flute-like note may be produced. In addition to announcing the ordinary call-sign of W R N Y, the staccatone is used to emit three distinct notes.

These notes soon come to be recognised by listeners, and thereafter a listener, if he is tuned to W R N Y and happens to miss the ordinary call-sign, is not likely to be mistaken as to the staccatone notes, which are very easily recognisable.

This idea is very good in its way, so long as it is applied to one station or to a few stations, so that there are not many distinctive sets of notes to memorise, but, of course, if it became general confusion would follow rapidly.

Sulphur Panels.

Experimenters are now trying sulphur as an insulating material for use in experimental sets and home-made components. Although sulphur, owing to its brittleness and certain other qualities, would hardly be suitable for use in commercial components, it has much to recommend it for experimental use in the laboratory. In the first place, it has an exceedingly high resistivity and its surface leakage is very low. Secondly, its dielectric constant is also very low. And thirdly, the material is very cheap and can readily be melted and moulded. A sulphur rod or moulding may easily be turned in the lathe and takes a good machined surface. Insets can also readily be moulded into sulphur.

Any reader desirous of experimenting with sulphur as an insulator should commence by making sulphur legs for the set or baseboard. These may easily be cast by pouring the molten sulphur into a small mould consisting of a piece of brass (or even paper) tube, about $\frac{3}{4}$ in. long and $\frac{3}{8}$ in. in diameter. In melting the sulphur (which process may be carried out in a tin vessel or pan) care should be taken to heat it slowly and gently, and not to let it catch fire. Sulphur liquefies in rather a peculiar way, and as soon as it runs to a clear limpid state, it should be poured.

Metallic Detectors.

It does not appear to be commonly known that detectors may be made by the simple process of producing a film of metallic sulphide upon the surface of a metal, particularly if this can be produced in a pronouncedly crystalline form. For example, if you take a threepenny piece and sprinkle a few grains of sulphur upon it, holding the coin by means of tweezers over a flame until the sulphur is burned away, you will be able to make quite a fair detector.

The crust of oxides and other mixed products may be snipped off, leaving the metal apparently little affected. But try it then with a cat's-whisker, and you will be surprised at its rectifying power. It is

(Continued on page 324.)



What Others Think.

IT would be easy for us to write an advertisement telling you all about the sterling merits of the M.L. Transformer.

We think it is the best transformer that has ever been placed on the British market. Perhaps that is only natural since we are so interested in it. But here is what someone thinks who has no interest in the M.L. transformer, other than that of a satisfied user.

His testimonial is entirely unsolicited. Here is what he says:—

"As you are aware, I have tried out practically every make of L.F. Transformer available to the amateur, and, in my considered opinion your latest production is superior to anything I have previously tested."

The 1:6 ratio is used for amplification after a crystal rectifier. The 1:4 ratio is used for single stage L-F Amplification. The 1:2.6 and 1:4 ratios are used respectively in the first and second stages of two-stage amplification.

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TECHNICAL NOTES

(Continued from page 323.)

To announce GREAT £500 PROFIT-SHARING PRIZE SCHEME

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(Crystal or Valve Sets).

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British Radio Users Association.

Constituted in the exclusive interests of all users of wireless, and for the general betterment of purchasing conditions and facilities for all amateurs.

SPECIAL HONORARY MEMBERSHIP
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Numerous Benefits and Privileges in addition to
Unique £500 Prize Scheme

—BIG CASH PRIZES—

Free Crystal and Valve Sets, Loud Speakers,
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—OPEN TO ALL—

(including those who intend to become Radio Users).

Don't wait! Seize this unique opportunity *now* of securing Honorary Membership in an Institution which marks an important milestone in British Wireless Advancement.

IT COSTS YOU NOTHING

Full particulars, explanatory brochure and special form of application on receipt of a postcard to—

The Secretary, B.R.U.A.,
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WILLESDEN, N.W.10.

APPLY AT ONCE

VISIT US AT STAND 23, ROYAL HORTICULTURAL HALL,
WIRELESS EXHIBITION, OCTOBER 10th—16th INCLUSIVE.

really for reasons similar to those which apply in the above case that you sometimes get rectification on placing the cat's-whisker in contact with the crystal cup without any actual crystal there.

An Automatic Cut-out.

The shutting-off of the battery-charger when the battery is fully charged is a problem that does not appear to have received the attention it deserves. Everyone who uses a battery-charge knows that when he comes to look at his battery next day he usually finds either that the charging is far from complete, or else that the battery is gassing merrily, and has probably been doing so for some hours: this means not only that the specific gravity of the acid is changing, but that current is being wasted.

Moreover, in some cases the acid will froth up and out of the vent, with the danger of damage to surrounding carpets, and so on. I see, however, that a patent has lately been taken out for a simple device for cutting off the battery when the latter is fully charged. This little device makes use of the gassing which occurs when the charge is complete. It consists of a form of tube which is inserted into the vent-hole (in place of the ordinary stopper) whilst the battery is on charge, and which is provided with two tiny electrodes projecting into the interior of the tube.

When the battery gasses freely, the acid is forced up this little tube and makes contact across the two electrodes. A relay is thereby actuated, and the charging-current is cut off.

The Master Rheostat.

Speaking of batteries, it always appears strange to me that so many people continue to use valves designed for odd voltages, thus requiring rheostat adjustment, when they could so much more conveniently use valves designed for some particular battery voltage, such as the Cossor 2-volt type, for example.

Of course, in some types of circuit, where the filament temperature is one of the critical controls, it is necessary to use excess filament voltage and adjust by means of a rheostat—even a vernier rheostat being in some cases a necessity. But for some types of circuit, where filament temperature is not a critical matter, it always appears to me much simpler to use valves designed for a definite accumulator voltage, such as 2 volts or 6 volts, and then to use a master rheostat (one for all valves) merely for the purpose of gradually turning on the filament current and for switching it off.

I may remark that with all valves, and especially with dull-emitters, it is a wise plan not to throw the full battery voltage on to the filament suddenly: it is much safer to have a rheostat in series and then to turn down the resistance value until the necessary current is passing. But if the battery voltage is correct for the filament, all you have to do is to turn the rheostat slowly down to zero value, whereas if the battery voltage is in excess of the proper value for the filament, you have constantly to keep a watchful eye on the filament. 1

(Continued on page 325.)

TECHNICAL NOTES

(Continued from page 324.)

might also say, although it is not considered good practice, that I have observed many amateurs using 2-volt valves with a single accumulator, who simply dispense with rheostats altogether and switch the battery straight in and out as required. And the curious thing is that I have never yet known any fatal results to accrue from this alleged dangerous practice.

In any case, whether a rheostat is used for "breaking it gently" on the filaments or not, the use of valves designed for a particular accumulator voltage, and the corresponding use of the proper number of cells, makes for much greater safety from the risk of burning-out valves.

For most of my sets—in fact, wherever possible—I use Cossor 2-volt dull-emitters, and I find them most reliable and convenient.

This firm also make a valve having a 2-volt filament and a compensating resistance enclosed in the valve cap, a tiny switch being provided so that when used with a 6-volt battery the resistance is "in," and when used with a 2-volt cell the resistance is "out." This reduces filament control and filament safety to the simplest possible terms.

Need for Neat Wiring.

Most experimenters, in wiring up a set, take a pride in making the wiring so that it will not only bear inspection but invite favourable comment. It has sometimes been said that whilst a carefully wired set looks pretty, there is no technical advantage gained. This, however, may be far from the truth.


There is a right and a wrong way of doing most things and usually the way which appears most systematic and ordered is the best. This undoubtedly applies to the wiring-up of a receiver. A set in which the various leads cross at all sorts of impossible places, run parallel and nearly touching, and sag about in the most dangerous manner, cannot possibly be operated for long before some trouble develops: then there is the task of tracing out the wiring, and usually most of the wiring has to be pulled apart before anything can be done properly. In other words, it would have been far more economical to have done the work properly in the first instance.

Probably the neatest looking wiring is that in which right angle bends are employed throughout and where most of the wiring is in parallel lines. Now, the running of the various leads parallel to one another is, in general, undesirable. Provided the wires are not too close together, the objectionable effects may not be serious, but generally speaking it is a good thing to run the leads as directly as possible. This will mean a number of slanting leads and will necessitate the abandonment of the parallel wiring and right-angle bend system.

Direct Connections.

But the wiring can nevertheless be made to look very neat indeed, if the leads are straight and cut to the correct length, the soldering properly done, and so on. You will find that many of the commercial sets now on the market do not go in for the parallel wiring, but for the "direct" wiring.

(Continued on page 326.)



**For the Reflex Circuit,
the new Eureka Reflex,
of course!**

IF you are using any Crystal Reflex Circuit you should use a transformer specifically designed for the job. You will remember, of course, that the first valve in such a Set amplifies at both high and low frequencies. This new Eureka Reflex has just the ratio that our extensive tests prove to be correct for purity and volume. Couple that fact to the exclusive Eureka design and you'll get a transformer as near perfection as experience and knowledge can make it.

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Wireless Aerial Masts
IN STRONG GALVANISED STEEL TUBE

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3 to 10-fold AMPLIFICATION WITHOUT VALVES
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TECHNICAL NOTES.
 (Continued from page 325.)

New crystals are continually being received for test and whilst in some cases the claims made for them are found to be fairly well substantiated, there are many specimens, unfortunately, of which this cannot be said. I have recently, however, had brought to my notice a new series of crystals which have just been placed on the market under the curious name of "Synclastic" crystals.

There are a series of four at present, which are designated Synclastic "straight A," Synclastic "straight B," Synclastic Reflex, and Synclastic Permanent Combination. The first two are for ordinary crystal receivers, and although I have tried a vast number of crystals at various times, I must admit I have never had any which were more satisfactory for general sensitivity and multiplicity of sensitive spots.

The Synclastic Reflex, I understand, is for reflex valve circuits, but I tested it on an ordinary crystal circuit, and found it wonderfully stable as well as sensitive. I believe, as a matter of fact, the makers recommend it for crystal circuits as well as valve circuits. I have not yet had an opportunity of testing it in a valve reflex circuit. The fourth one, the Permanent Combination, is not yet, I understand, available on the market, but if it is anything like the others, it certainly should be excellent. These crystals cost 1/6 a pair, and are sold by the Synclastic Co., 34, Hatton Garden, E.C.1.

The Use of Lacquer.

A simple way to keep the appearance of terminals on a set is to lacquer them with ordinary shellac varnish. This must be done, however, whilst the terminals are new and before they have begun to lose their original lustre. The shellac coating is merely a protective coating and does not in any way clean up the metal beneath it.

Ordinary shellac varnish is sold at electrical shops. The varnish bought in this way should be thinned down with about four times its volume of methylated spirit before using for terminals. Or the varnish may be made by dissolving a few flakes of pure shellac in methylated spirit. A thin coat of the varnish should be applied to the terminals and allowed to dry before the second coat is applied.

Tuning Loading Coils.

Many crystal users employ a loading coil in series with the aerial tuning inductance when tuning for 5XX or other long wave stations. If the ordinary tuning coil is of the tapped variety, this is quite a good plan, as the latter gives the fine tuning if the value of the loading coil is approximately correct. If, however, a variometer is used for the shorter wave-lengths, it is possible that it may be found insufficient in range to cover the adjustment required with the loading coil. In that case, a variable condenser across the coil will put matters right.

THE "P.W." TWO-VALVE ULTRA.

(Continued from page 276.)


letter (E) gives a diagram of the "series-earth" connections where 40 turns are being used. Obviously, however, either 20- or 60 could be used by varying the connections.

In fact, there is hardly an end to the number of different arrangements possible with this circuit.

The great advantage of such a circuit is, of course, that every amateur may try the various connections until he finds the one best suited to his particular aerial system, and the one which suits his purpose best. For optimum results a receiver should really be built to suit the individual aerial and earth, and the particular local circumstances under which it is to be used. This is an impossibility practically, as it would entail a great deal of expense and many years' research. So to overcome as many as possible of the difficulties most likely to be met the circuit above explained was designed, and there is no doubt that it is of great assistance in enabling the listener to get the best out of his set without having to rebuild it repeatedly, and without having to waste time and money on complicated switching arrangements, which, even if efficient—a doubtful point—are cumbersome and undesirable.

One final point—there is no need to discuss valves and batteries. Any good make of either should be satisfactory, the former being chosen to act as detector and L.F. respectively—and that concerns the "Ultrynic" coil connections. The plug-in connections cannot go wrong, but those on the top of the coil can, and if reversed they may result in poor or no signals. It is not possible to state exactly which way round they will operate best, and so we advise the constructor to try both ways to make sure he gets the best out of his set.

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4,000 ohms	22/6
120 ohms	17/6
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First £250 Prize

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Over 200 Consolation Prizes

Friday, October 16th, 1925

IN co-operation with the British Broadcasting Company we have been able to arrange a splendid novelty in the way of competitions. Nothing quite like it has ever been done before, and when the great night comes you will find it easy and amusing, and in addition you have an opportunity of winning one of the fine prizes we are offering.

THE object, apart from entertaining POPULAR WIRELESS readers, is to find out how far certain sounds are recognisable by wireless. So at 7.50 o'clock in the evening of FRIDAY, the 16th OCTOBER, you will have an exciting half-hour during which the B.B.C. will transmit twenty ordinary, well-known sounds—which you have to identify.

ALL YOU HAVE TO DO

is to listen carefully to each sound and then write what you think it is on the form which we are giving you on the right, here.

THE B.B.C. announcer will give the number of each sound before its transmission, and you should immediately note the corresponding number on the form, so that you enter your solution in the proper space. In some cases spoken clues will be given before the sounds, which will make your task easier.

HERE we may include a word of advice as regards the use of the form. It would be as well to provide yourself beforehand with some scrap paper, so that should you be in doubt at the time about any particular sound, you can make notes and decide on your solution later, rather than put a hasty answer on your form only to spoil it afterwards by alterations.

ANOTHER point—the form must be written out IN INK.

WHEN all the sounds have been given, listen for any remarks or directions which the announcer may be giving, then complete your form, sign and address the coupon properly, and send it to :

"Radio Sounds" Competition,
c/o POPULAR WIRELESS,
Gough House, Gough Square,
London, E.C.4. (Comp.).

ALL entries must reach this address by TUESDAY, the 20th OCTOBER. And any arriving thereafter will be disqualified.

RULES

THE First Prize will be awarded to the competitor whose solution is correct or most nearly correct, and the other prizes will follow in order of merit. The Editor reserves the right to divide the prizes should it be necessary.

Any number of attempts may be sent in, but each attempt must be quite distinct from any other attempt, and must be made out on a proper form as published here. All entries must be made out IN INK. Entry forms must not be mutilated or bear alterations or alternative solutions of any kind. No responsibility can be accepted for any efforts lost, mislaid or delayed.

The Editor's decision will be final and legally binding throughout this contest, and acceptance of this rule is a distinct condition of entry.

No one connected in any way with the proprietors of POPULAR WIRELESS or with the B.B.C. may compete.

The British Broadcasting Company have deposited with us, under seal, the correct solutions of all the "Sounds" to be given. All the solutions can be expressed in very few words, and it is particularly requested, therefore, that none of your answers should exceed FOUR WORDS.

"Radio Sounds" Coupon

Please Write Plainly in INK

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13
- 14
- 15
- 16
- 17
- 18
- 19
- 20

Closing date, Tuesday, 20th October, 1925.

In entering the "P.W." "Radio Sounds" Competition, I agree to accept the Editor's decision as absolutely final and binding.

NAME

ADDRESS



Better and Cheaper than Coils

Think what this means! At first it is not easy to grasp the wonderful advance in wireless reception which this R.I. Retroactive Tuner implies. With the aid of this perfectly designed instrument the use of plug-in coils is entirely eliminated, and correct and efficient aerial reaction is assured over a wave-length range of from 175-4,000 metres. In addition, it is practically impossible to obtain equal efficiency with plug-in coils, firstly because of the difficulty of selecting the correct combination over such a wide wave-length band, and secondly because coils of fixed value are not so finely graded as a tapped inductance, in which the same station can be got on 2 or 3 different switch positions.

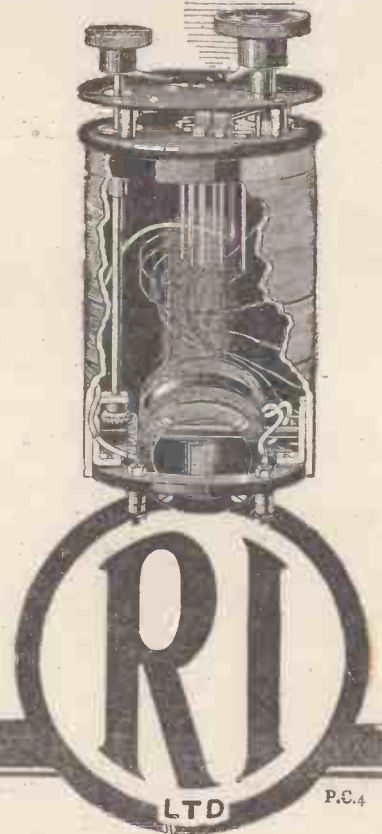
The special dead-end switch entirely eliminates all energy loss, and when used in conjunction with a variable condenser it practically forms a complete receiving circuit.

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There are many imitations of the original R.I. Retroactive Tuner, but you will only be satisfied if you insist on R.I.

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In practically all modern circuits, selectivity plays an important part, and the non-selective set is considered by many as out of date. Since the re-arrangement of wave-lengths at the Geneva Conference, many stations are separated by only a few metres and a receiver capable of long distance reception is wasted if it is not selective, owing to the interference experienced.

If you are building a new receiver or are not satisfied with the tuning on your present set, the most simple means of obtaining selectivity is the use of LISSENIUM X COILS.

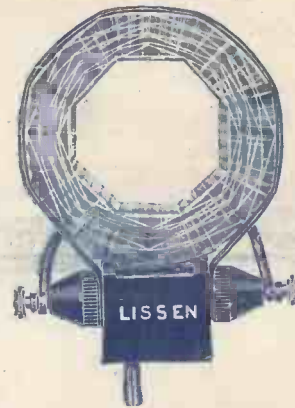
Single or multi-valve receivers—straight or reflex—there are few circuits using plug-in coils in which the selectivity cannot be increased by the substitution of LISSENIUM X COILS.

LISSENIUM X COILS can be used for aerial or anode tuning, Reinartz, Neutrodyne and wave-trap circuits, and their use makes possible many interesting experiments.

LISSENIUM X COILS are interchangeable with, and can be used as, standard coils. They possess all the characteristics and high efficiency which have made standard LISSENIUM COILS famous. In many receivers LISSENIUM X COILS can be used without alteration to wiring: often in others it is only a matter of reversing two wires.

LISSENIUM X COIL No. 60 covers the broadcast wave-lengths, but in order to obtain the best coil combinations for all conditions of reception, LISSENIUM X COILS No. 50 and 75 are recommended for the lower and higher broadcast wave-lengths respectively. LISSENIUM X COIL No. 250 covers the Daventry and Radio-Paris wave-lengths.

The experimenter usually buys the complete set.



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No. 50	6/-
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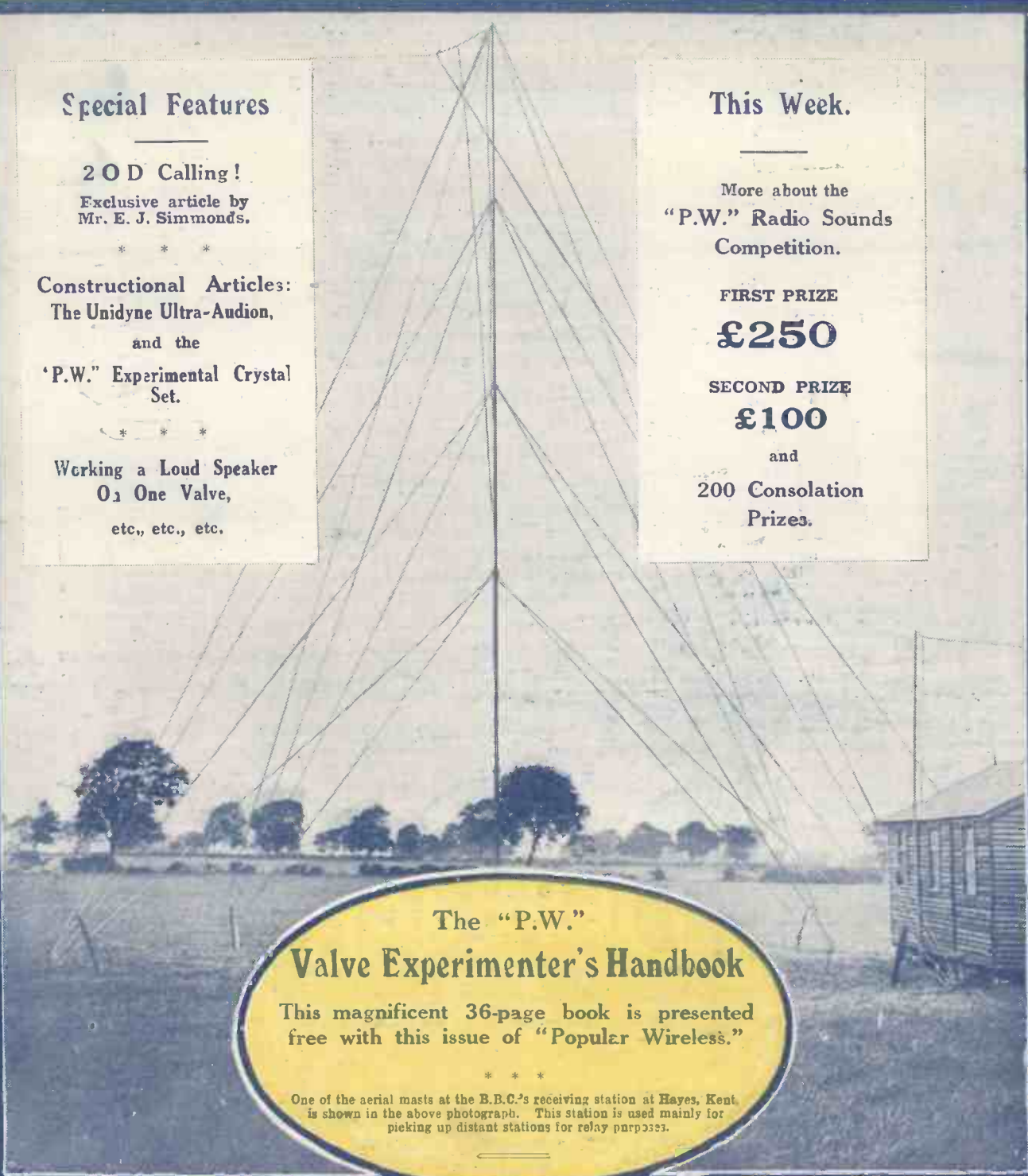
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* * *

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Because we value our reputation, and because we take a genuine pride in our manufactures apart from their function as profit-makers, we are always exerting ourselves to the utmost to maintain the high standard that it has always been our aim to achieve. For this reason, therefore, the two words—"Specify Dubilier"—are buttressed by all the moral weight and all the material resources of the world's largest Condenser Manufacturing Firm. A Dubilier Guarantee is a genuine guarantee, and a Dubilier Product is the best of its kind.

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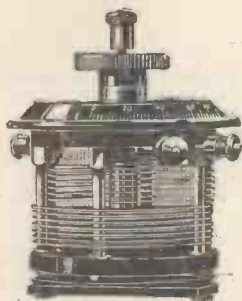
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A Dubilier Variable Condenser giving simultaneous control of two tuned anode circuits. This is a very useful condenser to the experimenter. Capacity of each side 0.00025 mfd., complete with balancing plate

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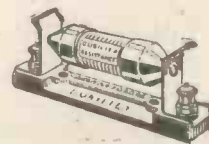
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Complete with holder 5/6
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A very good quality condenser for use everywhere in wireless receiving sets. This condenser is supplied in a polished metal case, and is provided with tags for soldering. It can also be supplied with flexible wire leads if required. All capacities from 0.0001 mfd. to 0.01 mfd.

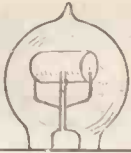
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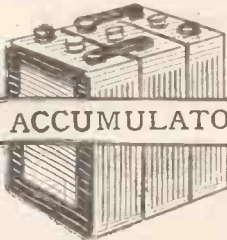
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Dull Emitter Valves cost 14/- each. It takes a 2-valve Set to operate an ordinary Loud Speaker. Valves need renewal when burnt out. The Crystavox uses no valves—it works straight from your Crystal Set.



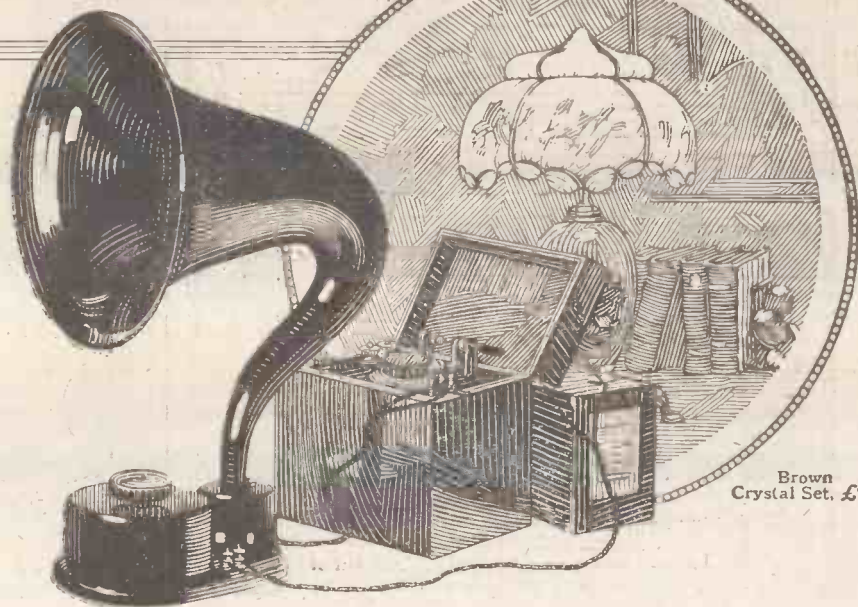
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Owing to the wide variation of local conditions it is not possible to guarantee that every Crystal set will work a Crystavox. The test is this: Tune in to greatest strength and hold the headphones 12 inches from the ear. If the signals can still be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

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The *A Loud Speaker working from a Crystal Set.*
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Accuracy!

IT is twenty years since the first T.C.C. Condenser merited the approval of the electrical industry. When Wireless loomed ahead—we, as the largest condenser-building specialists in this country—were quick to realise its immense possibilities.

New plant was laid down—factories were extended—but still the demand for the familiar Green Condenser exceeded the available supply. Under such circumstances, any other firm might have been tempted to relax some of the restrictions which govern the quality in an effort to speed up production.

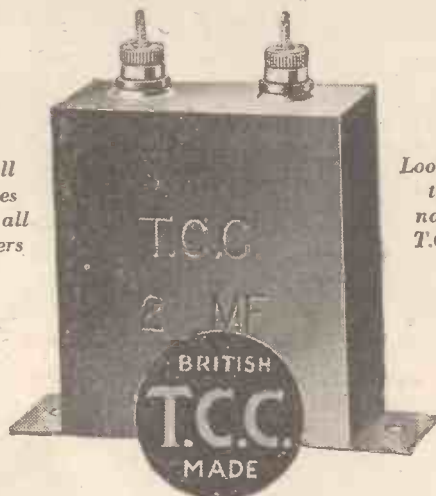
But twenty years of manufacturing experience have proved the wisdom of keeping faith with the public. A condenser for wireless use—nine times out of ten—is bought on the reputation of the maker. We are proud to think, therefore, that within the last three years many hundreds of thousands of T.C.C. Condensers have been chosen for the most strategic points of the Receiving Set.

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At our Stand No. 9, at the Royal Horticultural Hall (Oct. 10th to 16th) we are arranging for one of our technical staff to test and calibrate any fixed Condenser free of charge.

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WIRELESS ON EASY TERMS!

GAMAGES

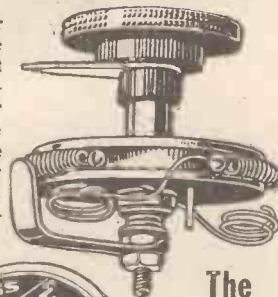
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The "VELVET" Resistance

A high-class Variable Resistance for one or two valves with a perfect movement. The quality is of Gamage's usual high standard—exceptionally well made and finished throughout.

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The most sensitive Crystal obtainable. Try a piece—remains in adjustment longest. Hundreds of testimonials. Obtainable in two sizes, each complete with silver catswhisker. Larger size, easily broken into several small pieces to fit the cup. Complete with catswhisker.

Smaller size to fit the cup. Post free. Price with silver catswhisker

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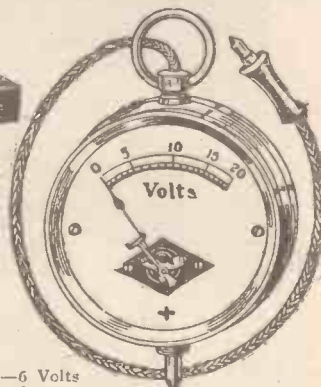
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Fitted with ebonite protector and knob for wireless work, as illustrated, well finished, burnished and lacquered metal parts, mounted on mahogany base, silver contacts. Base 5 1/2 ins. by 3 ins. Usual Price 7/6. Sale Price Post 6d.

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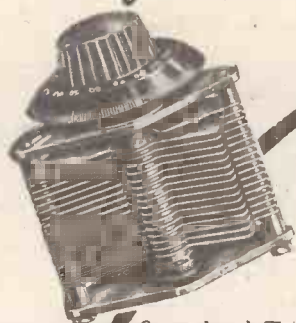
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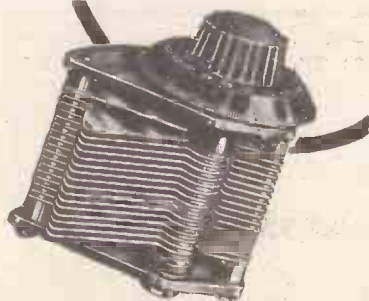
Something New from the B.T.H.



Standard Type



Standard with Vernier



Square Law Type

THE initials "B.T.H." on any piece of radio apparatus, as everyone knows, stand for perfect workmanship and design. This fact is exemplified in the three B.T.H. Variable Condensers illustrated, which are unsurpassed in mechanical and electrical efficiency.

The STANDARD TYPE is a very robust instrument, and the moving vanes are so rigidly set that they remain parallel to the fixed vanes throughout the whole movement. Constancy of calibration is therefore maintained. It is perfectly silent in operation.

The STANDARD WITH VERNIER, whilst retaining a perfectly rigid construction, provides a very delicate adjustment. Maintenance of calibrated capacities and silence in operation are important features. A definite stop prevents complete rotation. The vernier vane is actuated by a small knob mounted on the main dial.

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	s.	d.	s.	d.	£	s. d.
Standard	13	6	15	6	1	1 0
Standard with Vernier	17	0	19	6	1	6 0
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From four horse-power to 40 h.p.

—from the first Bright Emitter Valve to
the Super-sensitive Wuncell Dull Emitter

NOTHING can stem the pitiless tide of progress. The four-horse coach of two decades ago has now been superseded by the 40 h.p. car. And the bright emitter valve of two years ago is now being rapidly superseded by that most economical of all Dull Emitters—the Wuncell.

Wireless enthusiasts are everywhere realising that economy in valves means much more than actual current consumption. It means *long life*. Obviously a valve with an ultra-low current consumption and a short life—due to its fragile nature—cannot truthfully be called an economical valve.

The Wuncell puts life first and current consumption second. In spite of this, its wattage is still less than one-sixth of any bright emitter valve. That is to say, any six-volt accumulator which might, for example, have given 20 hours at a

charge with bright emitters would give 120 hours using Wuncells.

The abnormally long life of the Wuncell Valve is due to its special filament, manufactured under a patent process known only to Cossor. Instead of being whittled down, as in most dull emitters, it is actually built up layer upon layer until it is as stout as that used in any standard bright emitter, and when in use it merely glows at a temperature not exceeding the embers of a dying match.

Its prolific output of electrons—harnessed to the well-known Cossor principles of construction—ensures a sensitivity which has no counterpart in any make of valve. For the first time since the Dull Emitter appeared on the market, users are saying that here at last is a perfect match in performance for the best bright emitter valve ever made.



The Wuncell Dull Emitter

Voltage 1·8 volts. Consumption '3 amp.
W₁ for Detector and L.F. ... 14/-
W₂ for H.F. amplification ... 14/-
W₃ Cossor Valve for Loud Speaker use
Voltage 1·8 volts. Consumption '5 amp.
Price 18/6

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RADIO NOTES AND NEWS.

An Interesting "First Night"—S. B. Developments—Alternative Programmes—The "P.W." Meeting—Another Marcuse Record—Fewer Stations in Future?

All the Difference.

ONE of the reports I have received this week interested me, because at first the set wouldn't "go." It was a one-valve Unidyne, and its owner tells the story in the following words: "On Monday night I first tested the set, but found the grids were connected the wrong way. After altering I received the following stations: Liverpool and Manchester (too loud for earphones), Birmingham, Belfast and Bournemouth (beautiful)."

An Interesting "First Night."

THESE first night results were obtained on an indoor aerial (run across the bedroom) by Mr. C. K. Williams, of 133, Ashbourne Road, Liverpool. He says that he is situated about four miles from 6 L V, so that the set's selectivity leaves nothing to be desired, especially when it is remembered that he is so close to the shipping in the Mersey that jamming from this source is inevitable. Of course, there are plenty of Unidyne users who can beat this on one valve, but, all the same, it was pretty good for a first-night performance.

A Wireless "Fire."

NOT every London reader who passes down Farringdon Street has noticed the three-feet long Winsulators on the aerial above Fleetway House. But the other night a policeman happened to look upwards and saw them, and they gave him a bit of a shock. It was too dark to see anything of the aerial or masts, but as the metal vanes of these special Winsulators turned round the revolving blades reflected the light of the street arc lamps and made it appear as though a fire were flickering on the roof! He promptly called a Fleetway House fireman, and after studying the "fire" closely they solved the mystery, and

the policeman went happily on his way. But not before he had taken down all the particulars in a book, explaining that he was a bit of a dab at wireless himself, but a rotating insulator was new in his experience!

Amateurs Notifying Wave-lengths.

THAT'S a good idea the short-wave transmitters have adopted recently—they now sign off with their call-sign and a number, the latter representing the

Alternative Programmes.

THE subject of more alternative programmes is coming steadily to the fore again. The decision that Daventry should, for a month's trial, send out a three-hour morning programme daily (except Saturday and Sunday) is one straw which shows the way the wind is blowing, and there are continual rumours of increased power, or new stations. The experiment at 5 X X is a step in the right direction, but I think the B.B.C. will be forced down on the lower waves sooner or later, if only to keep in the fashion!

Simultaneous Broadcasting Development.

THE B.B.C.'s new control-room arrangements for simultaneous broadcasting are now well under way. Some time ago I referred to the decentralisation which would enable Northern stations to plug-in for S.B. items at Leeds instead of coming right through to London for the purpose. 2 L O's arrangements are already completed, Leeds will be ready by November 1st, and there may ultimately be another sub-division in the neighbourhood of Bristol.

An Exceptional D.X. Feat.

ONE of the best long-distance feats of which I have heard lately is that of Professor B. Kull, of 1,382, East-94th Street, New York, who succeeded in tuning-in clear signals from Nottingham! Now 5 N G is only a relay-station, but what makes the feat so exceptional is the fact that it was a *daylight reception*. At 3 p.m. one afternoon the professor tuned-in an 8 p.m. item from Nottingham, and heard every word of it, and his detailed report has since been confirmed by the Nottingham station director. I said the other week that 5 N G's record was envied by more
(Continued on page 334.)

The "P.W."

RADIO SOUNDS COMPETITION. First Prize £250.

LISTEN-IN on October 16th at 7.50 p.m. and solve the mystery sounds we shall broadcast. The **SECOND PRIZE** is £100. and over **200 CONSOLATION PRIZES** are also offered. Coupon and full details will be found on the last page in this issue.

The 3rd Great "POPULAR WIRELESS" MEETING. SENATORE G. MARCONI, G.C.V.O.,

Has accepted an invitation to speak at the "P.W." meeting, his engagements permitting.

wave-length in metres. It doesn't take a second to transmit, and it's very helpful to the man who is searching on unfamiliar coils.

A Winter Overhaul.

RECENT gales have been finding out the weaknesses in aerial equipment, and perhaps it is just as well, for it affords a timely reminder that now is the time to set about the winter overhaul. The probability is that unless you attend to the mast and stays now you won't get such a good chance until after Christmas, and it is a pity to impair reception for months on end because an insulator is dirty or cracked, isn't it?

NOTES AND NEWS.

(Continued from page 333.)

than one of the main stations, and I fancy the news of this will flutter the best of them.

Idea for Ideas!

WHEN Sir Oliver Lodge was recently engaged in a discussion with Dame Henrietta Barnett before the microphone, the B.B.C. announced the subject as a talk on "Matters that Matter." If this habit grows, the next "improving" lecture will be given out as "Mind your Mind," and, of course, the Time Signals could always be snappily announced as "Watch your Watch!"

A Savoyan Innovation.

THE new Tango Band, which in future will broadcast tunes from the Savoy between the items by the Havana Band and Orpheans, consists of seven Argentinians and a tenor singer. They have come to London straight from Deauville, where they have just concluded a very successful season. The full name of this new turn is "Vaadi's Tango Band," and they are introducing to the microphone all sorts of unfamiliar instruments, including guitars, a symphonia, and a bandeleon, the latter being a kind of glorified concertina, "with knobs on."

Striving for a Better "Earth."

"WIRELESS may help to solve the 'Back-to-the-Land' problem by making life in the country better worth living," says the "Liverpool Daily Courier." I think this landward movement has started already, for several of my friends with no previous agricultural skill, have become quite expert in digging deep holes in the ground since they started listening-in.

A Territorial Wireless Service.

HAVING in mind the Army's request that 5 X X should be closed during manoeuvres recently, I inquired how they managed in the U.S.A., where the problem of jamming is much more acute. And I found that instead of making transmitters close down, the U.S. Army is establishing a corp of civilian wireless men, trained in Service methods, to keep the communications in an emergency. An agreement, authorised by the War Department, aims at establishing a complete network of Army-and-Amateur radio stations throughout the country. The Signal Corps will thus scoop in a reserve of proved men, able to "keep the air" when the lines are down through storm, civil commotion, or warfare.

What does Whitehall think of that little arrangement?

"Chitos" Set Coils.

I WAS talking over the 'phone the other day to Mr. H. G. Childs, the originator of the "Chitos" circuit, and I asked him a question which has frequently been raised

with regard to this circuit, viz. What are the correct coils to use in the Chitos set for Daventry? He tells me that he gets best results with 300 aerial and 250 reaction, but it is probable that on different aerials these values could be improved by experiment.

A Loud-speaker Effect.

DURING a fête held at the end of the summer in Chelmsford, some remarkable acoustic effects were noticed in connection with the powerful loud-speaker equipment supplying the dance music. It

SHORT WAVES.

"I am sure that the future of broadcasting will lie in the listener's interest in what he hears, not in how he hears it."—Capt. Eckersley, writing in the "Morning Post."

"It is stated that you can tune-in in Tunis without paying for a licence. We understand, however, that the same Tun-is broadcast every day."—"Electrician."

"Broadcasting, it is clear, will play a great part in moulding the future destinies of our race."—"Daily Telegraph."

was a calm evening, so the Savoy bands could be heard distinctly about a mile away from the fête, where one listener tuned in the same signals direct from 2 L O. Because of its longer air-journey the loud-speaker music lagged a note or two behind the tune in the 'phones, and the listeners could hear every note being played twice.



Wireless in the Riff War. One of the stations used by Abd el Krim as exclusively described in "P.W." some weeks ago.

"An Englishman's Home—"

MR. R. M. FORD, of London, S.W., the listener who recently defied the Postmaster-General to proceed against him for not taking out a receiving licence, has apparently been taken at his word!

I hear that after he had nailed the Union Jack across the doorway and challenged the P.M.G. to enter his "castle," the premises were visited (in Mr. Ford's absence) by a policeman and a P.O. official. The only wireless gear they could find was an aerial, of which they took possession, so developments promise to be interesting!

The Grumblers.

IT is a curious fact that the people who are the first to complain about the broadcasting service are the last to pay the licence fees. I saw one complaint recently from a grumbler who wanted all sorts of alterations made in the programmes for his benefit—and it transpired that not only had he no licence, but he had never

owned even a crystal set! Apparently his neighbour had a powerful loud speaker, and by sitting quietly it could be heard distinctly in the next house. It was these programmes which came through the wall for nothing that were the subject of the complaint!

Fewer Stations in Future?

FOLLOWING the recent reports of more broadcasting stations and the use of increased power, comes the news that possibly the B.B.C. stations will be reduced in number. This possibility was foreshadowed at the Geneva Conference, and was hinted at by Capt. Eckersley in a recent talk before the microphone. But I fancy that most listeners would prefer the jamming to any thinning-out process.

The "P.W." Meeting.

THE great "P.W." Wireless Meeting at the Central Hall, Westminster, on Friday, October 23rd, will afford Londoners an opportunity of seeing more radio celebrities on one platform than have ever before been gathered in public. Provided that his engagements permit, Mr. Marconi himself is coming, and in addition to those whose names were announced last week—Sir Oliver Lodge and Captain Eckersley amongst them—Lord Wolmer, the Assistant-Postmaster-General will be present.

Radio Celebrities.

THIS gathering of "all the heads" will, it is hoped, include two radio celebrities whose rise to fame will have been so recent and rapid that their names are at present unknown! I refer, of course, to the winners of the first and second prizes in the Radio Sounds Competition. Next Friday they will only be ordinary listeners, entering the competition, and a week later they will be raking-in £350

between them, and sharing the platform with Sir Oliver Lodge and Mr. Marconi! Wireless is quite full of possibilities, is it not?

Another Marcuse Record.

MR. GERALD MARCUSE, the inveterate ether-traveller of Caterham, Surrey, whose call-sign is 2 N M, has been at it again! He notified me of his latest record reach-out in the following words: "For the first time I have successfully established two-way communication with Kohat, North-West Frontier, India, on September 25th. I used telephony only, and every word was received. The replies were in Morse." But if you want to hear Mr. Marcuse's voice there is no need to go to Kohat to listen, for he will be speaking at the great "P.W." Meeting on October 23rd, so all you have to do is to catch a Westminster 'bus, and follow the crowd into the Central Hall—if you can get in!

ARIEL.



I DO not know how many of the readers of this article, and the chats which are to follow, are transmitters, but I think I shall be safe in assuming that the majority of them will only be interested in the reception side of short-wave work, and it is to these, therefore, that I address the following sentences.

Apart from the work of Franklin and a few others, the short-wave has been left fairly well alone until recently, when amateur transmitters in this country and America commenced operation on the low wave of 100 metres or so. KDKA, that famous station at East Pittsburg, also took an energetic and practical interest in the proceedings in the form of regular broadcastings on 103 metres, to be followed later by experiments on still higher frequencies.

Interest in these low wave-lengths and the phenomenal successes achieved in the way of long-range communication on low power, heightened the popularity—if I may use the term—of this band of wave-lengths, and hundreds of enthusiasts devoted a considerable amount of time to reception, while comparatively few transmitters were busy on their side of the business.

As time went on the results obtained grew more and more spectacular, and the whole world was spanned on low power, for two-way communication between this country and New Zealand became not only an accomplished fact, but a fairly regular occurrence, albeit only possible at certain hours of the day; while Australian work has been carried on at times totally different from those which favoured working with New Zealand. Wave-lengths as short as 20 metres have been used by private experimenters in daylight communication

We are pleased to publish this week the first of a series of fortnightly articles by the famous British amateur, Mr. E. J. Simmonds, M.I.R.E., F.R.S.A. Mr. Simmonds' articles will appear only in this journal and he will not write in any other wireless paper until further notice.—The Editor.

No. 1.—Some Notes on Short-wave Work.

with Australia, New Zealand, and U.S.A., and at the present time the wave-length of 45 metres is regularly used, not only for C.W. operations, but also for telephony, and the Antipodes and Mesopotamia are being reached by the human voice with regularity.

A Fascinating Hobby.

In considering these performances it is preferable to avoid the term "wave-length," and to express the frequency in kilocycles, and it is hoped to discuss this point

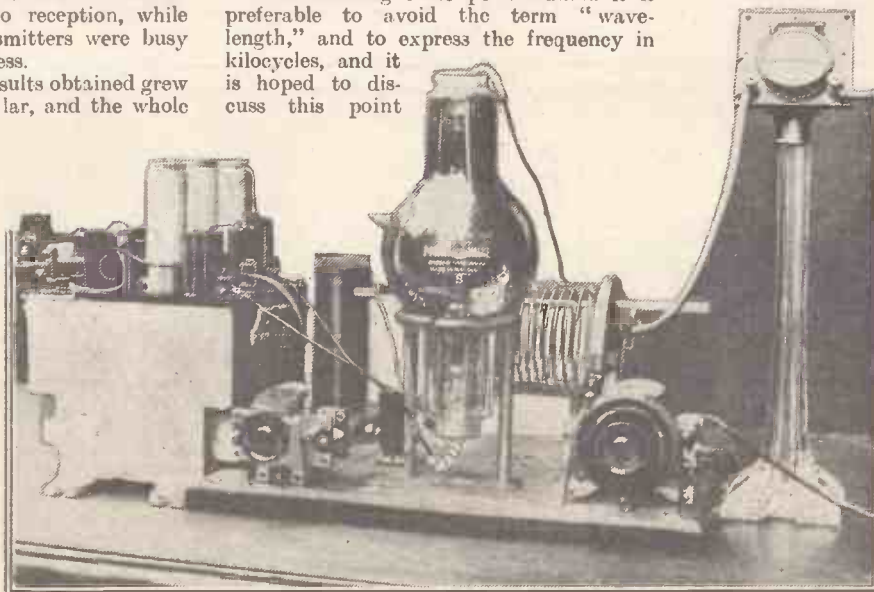
further in the future. All this seems simple when looked at in cold print, and after the events have become past history, but I can assure readers that those who spend night after night, week after week, anxiously sending out test calls into the ether, and still more anxiously waiting their answer, is at once a thrilling and wearying business.

But it is an alluring branch of wireless, for there is something almost uncanny about the short waves and the way they behave. Tuning a short-wave receiver is also a most fascinating business, though it needs real operating skill. It would probably surprise a great many listeners if they were suddenly asked to tune in a short-wave transmission—every adjustment is incredibly fine and the slightest roughness in handling is sufficient not to weaken a signal, but to lose it altogether. And once lost these signals are none too easy to pick up again.

So the first piece of advice I should like to offer prospective constructors of short-wave receivers, and those who intend to try

their luck on the low waves, is "Don't"—unless the art of tuning in weak signals has been thoroughly acquired.

It is quite a different experience to tune in a station, even if it is on C.W., sending on about 45 metres, from picking up and rendering moderately audible a station sending on 400 metres. And as for the set, none of your rough "hook ups" will do for really high-frequency work. The lay-out of the receiver has to be properly considered, and then, often, when it has been completed, many trying hours have to be spent in endeavouring to pick up a station. (Continued on p. 336.)



The 23-metre C.W. transmitter used at 20D when communication with Australia was carried out in daylight.

20D CALLING.

(Continued from page 335.)

vours to subdue it to operation under the particular conditions of your own aerial and earth.

Because you used such and such a valve as a detector on your broadcast receiver, it does not follow that you will be successful with the same "tube" on 40 metres. It may be noisy in operation, and prone to burst into oscillation at just the wrong moment. Generally variations of grid leak and condenser will remove this difficulty, although sometimes that valve will have to be put aside and another tried. The question of suitable valves will be discussed in future articles.

Condenser Action must be Smooth.

This does not always happen, and you must not think I am trying to throw cold water on the ambitions of would-be short-wave enthusiasts, but you must not be surprised if such an occurrence takes place.

Then, again, that .0005 or .0003 variable condenser you used to employ with such success will have too high a capacity for useful work on wave-lengths below 70 metres. A .00015 to .0002 mfd. condenser is usually best. And even with this low capacity the tuning is very sharp, and anything of a vernier control is a tremendous advantage. Failing a good vernier movement a long extension handle will be found extremely useful if the condenser works smoothly.

If it does not operate evenly, making good contact everywhere, then you may as well scrap it as far as this set is concerned, for the slightest unevenness will cause you to miss many an interesting transmission, and anything in the way of a poor or doubtful contact will cause noises almost unimaginable in their number and strength, for it must not be forgotten that reception is

carried out with the valve in its most sensitive condition—just oscillating—and that makes any alteration in contact in the grid circuit a very noticeable thing when it comes to the 'phones, especially as you will probably be using one stage of L.F. after the detector. Anything in the way of loose contacts must be avoided; even metal objects in proximity to the receiver will set up noises if there is any possibility of microphonic contact.

Keep a Log.

About circuits I will not say anything in this article, except to mention that there are plenty of really good ones, and to advise the constructor, if he be really enthusiastic, to try several of the better known "hook-ups," such as the Reinartz, or even the straight Det. with reaction, to see which operates best as regards ease of handling, and which operates most satisfactorily on his aerial and earth system.

Then, in conclusion of this chat, I should like to say that, in my opinion at any rate, the whole joy of short-wave reception is missed if one fails to keep a log. I don't mean just a list of stations received, but a real scientific record of the proceedings. This adds to the pleasure of mere achievement by making the business of real value, besides making it possible that a discovery of importance may be made. Unlisted events stand alone as events, but when full details of the proper kind are tabulated with them it is very often possible to draw interesting, if not valuable,

deductions, based on the observations of a series of experiments or tests.

Such logs should be complete in every sense. The text of the message does not matter of course, but the strength of reception should be noted, type of receiver used—it is best to keep to one and use it as far as possible under the same internal conditions—whether fading was noticeable,

NEXT WEEK.

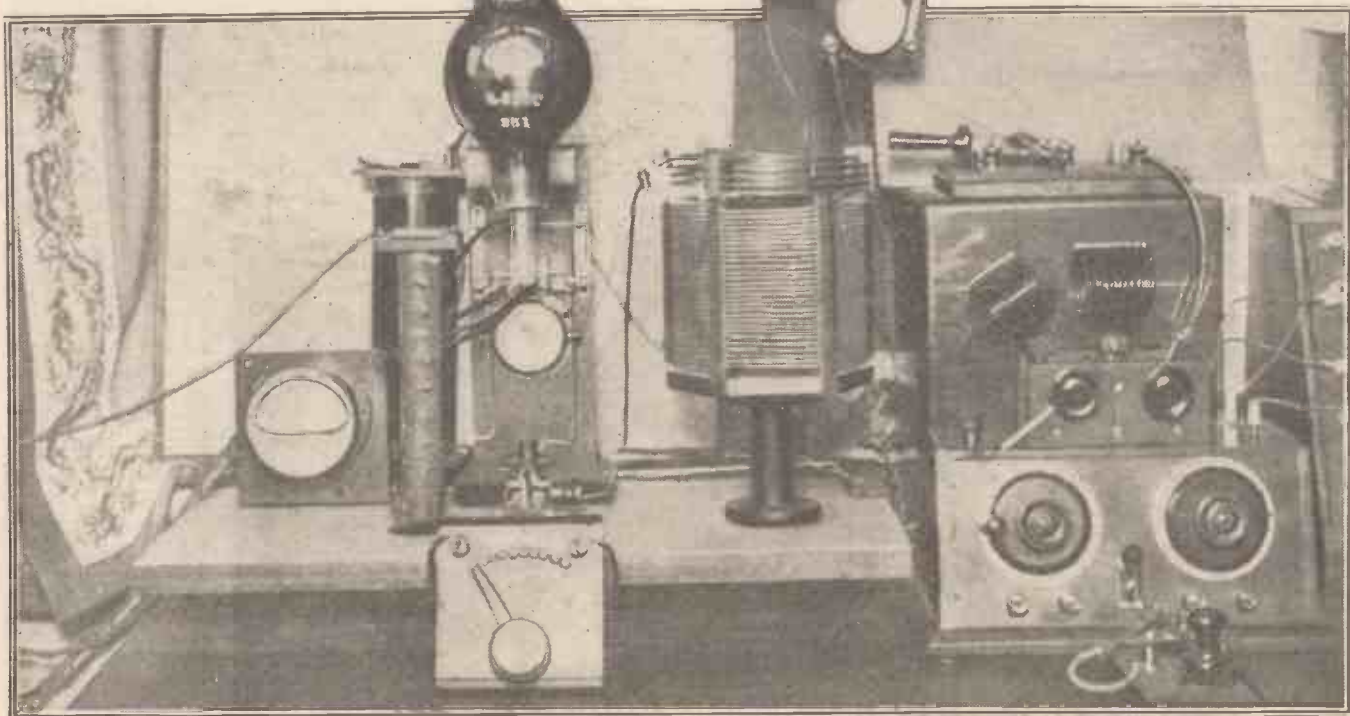
ANOTHER EXCLUSIVE ARTICLE

By Mr. GERALD MARCUSE.

MAKING A SELECTIVE CRYSTAL SET, AND HOW TO CONSTRUCT A TWO-VALVE L.F. AMPLIFIER.

and if possible times of periods of fading in seconds, weather (including barometric pressure), direction and strength of wind, and state of the sky, the time and date being entered as a matter of course.

You will be surprised after a few months of really careful logging what a great deal of interesting matter has been collected, and it is practically certain that very interesting if not valuable deductions will accrue from a study of your log. In addition the whole business will become much more fascinating.



The transmitter shown in this photograph was used for the higher wave-lengths and for telephony transmissions. Part of the receiving system can be seen on the right of the picture.



A photograph of the finished Ultra-Audion Unidyne receiver. The shorting strip is in the "Audion" position, and the switch is over to "L.F."

ONE of the most popular of one-valve circuits is the Ultra Audion introduced by Dr. Lea de Forest some time ago, and sets made up on this principle are capable of surprising volume and range if carefully handled. Only one tuning control is necessary, and the principle of the Ultra-Audion lends itself very readily to adaptation to the Unidyne type of receiver,

is no doubt but that excellent results could be obtained with the Ultra in operation.

It will be noted that the reaction coil no longer acts as a mere "tickler," but has to do duty as an H.F. choke as well. For some low-wave stations, on switching over from Ultra to straight, it may be found advisable to change the choke for a coil of about 100 turns—150 being the size used when the choke is to play its double part. For the reception of 5 X X the reaction and aerial coils will have to be altered, both being increased, while the Ultra-Audion circuit should be switched out of action, the straight Unidyne only being used.

The S.P.D.T. switch shown in the photographs and diagrams is for switching in or out the L.F. valve and can be used whether the Ultra or straight circuit is being used.

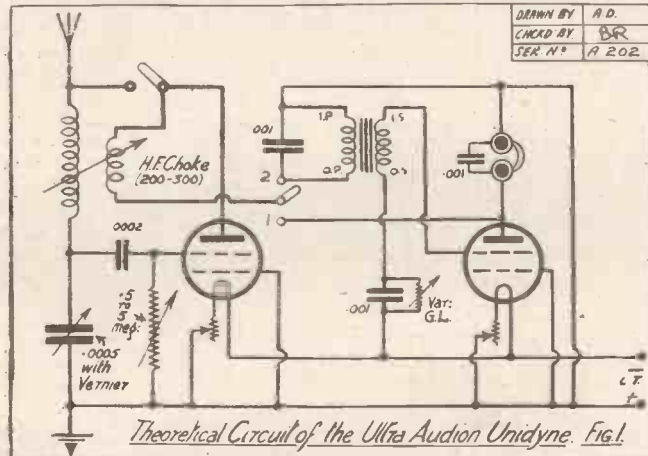
The components necessary for the construction of the Ultra-Audion Unidyne are the same as for the 2-valve Unidyne, with the addition of the S.P.D.T. switch, and are as follows:

	£	s.	d.
1 Panel 10 in. x 8 in. x 1/4 in.			
1 Box to fit, 4 1/2 in. deep (Peto-Scott)	0	12	6
1 L.F. transformer (R.I., Ltd.)	1	5	0
2 5-pin valve holders (Bower Electric Co., Ltd.)	0	2	6
1 S.P.D.T. switch (Nesthill)	0	1	6
8 Terminals W.O. type	0	1	0
1 .0005 variable condenser with vernier (Peto-Scott)	0	10	6
2 Filament rheostats (Lissen) Lissenstat majors	0	15	0
1 Variable grid leak (Bretwood)	0	3	6
1 Variable anode resistance (Bretwood)	0	3	6
3 .001 fixed condensers (Dubilier)	0	7	6
1 .0002 fixed condenser (Lissen)			
1 2-way coil holder (Peto-Scott)	0	5	6
2 Unidyne valves	1	8	0
	£5	16	-0

Wiring should be carried out with 18-gauge tinned copper wire of square section, care being taken to keep the wires as far apart as possible. The diagram shown in Fig. 3 will give a good idea as to how the components should be connected up, while the point-to-point wiring diagram given below will act as a double check upon the connections made.

Point-to-Point Connections.

One filament leg of each valve holder to
(Continued on page 338.)



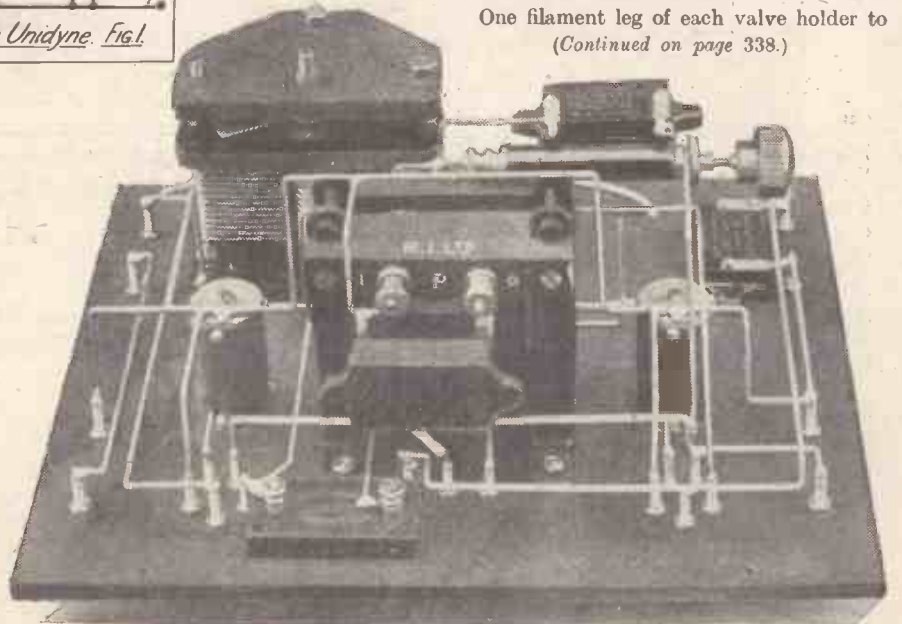
giving at once the advantages of the De Forest circuit and the absolutely silent operation of the H.T.-less set.

A correspondent of POPULAR WIRELESS has recently sent us his experiences, using a two-valve (Det. and L.F.) Unidyne on the Ultra-Audion principle (See "P.W.," No. 168), and results on the circuit used by him have been so satisfactory that we consider the full description of the construction of a set on those lines will be welcomed by a great many of our readers—certainly by all Unidyne enthusiasts.

Two Circuits Available.

In order that the best should be obtained from the circuit a switch is incorporated so that either "Ultra" or "straight" can be used, though the "straight" varies slightly from that generally used. On test the Ultra-Audion is slightly more difficult to handle, but on local stations the increased volume obtained is well worth a little more care taken in tuning.

For long-range reception we prefer the straight circuit, though with practice there



A general view of the reverse side of the Panel. All the components with the exception of the grid leak can be seen in the photograph. The leak is situated behind the R.I. transformer.

AN ULTRA-AUDION UNIDYNE

(Continued from page 337.)

one contact of each filament rheostat. The other sides of rheostats joined together and taken to the + L.T. terminal and to one 'phone terminal.

Other filament legs of valve holders

I.S. of the L.F. transformer to the main grid (M.G.) leg of the second valve holder.

O.S. of the L.F. transformer to one side of the second variable grid leak (not fitted to panel) and to one side of a second .001 fixed condenser. Other side of the second .001 fixed condenser to the other side of the second variable grid leak and to the - L.T.

Right-hand contact of the S.P.D.T. switch to the plate leg of the second valve holder and to the 'phone terminal not yet connected.

be really good, however, and there must be no possibility of their working loose later, or noisy reception and perhaps total failure to get signals will result. If there is any doubt about a connection, the best thing to do is to solder it, taking care that the iron is hot enough so that a "dry joint" is not made. Any flux remaining after connections have been soldered should be wiped off while the place is still hot, or it will be difficult to remove.

There are no special troubles likely to be encountered in the construction of this set, and so long as firm joints are made and the connections are correct, the receiver should operate as soon as the battery is connected up, the only battery necessary being a 6-volt accumulator, no H.T. being used on this receiver.

As regards the handling of the set, the constructor may find this a little difficult if he has not used a Unidyne before. The dead silent background typical of this type of receiver, due to the absence of H.T. noises, is disconcerting at first; but when one gets used to it it is one of the points that make Unidyne receivers so fascinating to operate.

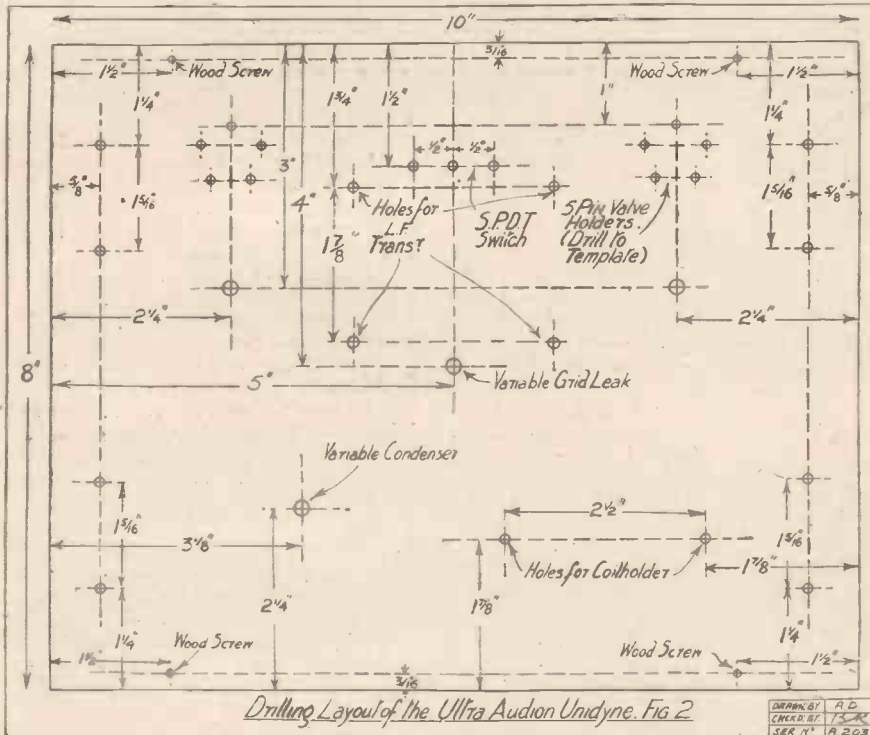
Handling the Receiver.

A decided click on connecting the telephones to their terminals—the L.T. being on so that the valves are moderately bright—will show if the circuit is properly wired up and if the valve pins are making proper contact—a point that must always be watched carefully in these H.T.-less receivers.

At first we advise the use of the set as an ordinary receiver (the shorting strap on the left of the panel being in the "undone" position) unless the constructor lives fairly near a broadcasting station, and also the use of the L.F. side of the set, so that signals may be heard more readily. Tuning is the same as in the ordinary type of receiver, but much sharper, and for use as an ordinary set we advise the use of a 75-turn aerial coil and a 100-turn reaction.

When the nearest station has been tuned in, adjustment of the variable grid leak should enable a fine reaction control to be obtained, and then it should be found that the further the leak is "out" the easier

(Continued on page 339.)



Drilling Layout of the Ultra Audion Unidyne. Fig 2

joined together and taken to the - L.T. terminal.

The inner grid legs of the valve holders to the + L.T. lead.

Earth terminal to the + L.T. lead, to the moving vanes of the .0005 variable condenser and to the contact of the variable grid leak nearest the panel (fitted to the panel).

Main grid leg of the first valve holder to one side of the .0002 fixed condenser and to the terminal side of the variable grid leak (fitted to the panel).

Other side of the .0002 fixed condenser to the fixed vanes of the .0005 variable condenser and to the socket side of the fixed coil holder.

Aerial terminal to the terminal engaging with the shorting strip and to the plug side of the fixed coil holder.

Completing the Wiring.

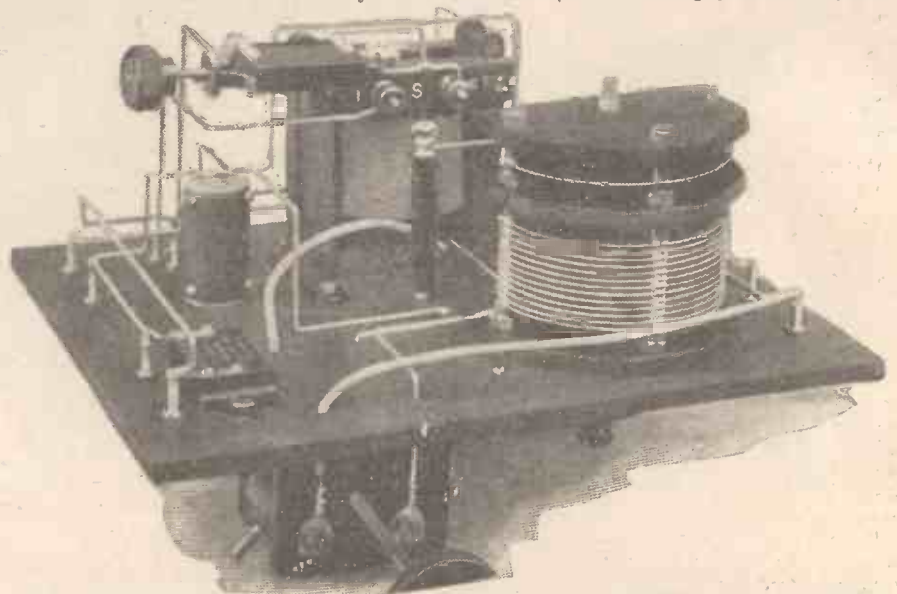
Plate leg of the first valve holder to the terminal having the shorting strip fitted. A flexible lead then joins this terminal to the socket side of the moving coil holder.

Plug side of the moving coil holder is then joined to the centre contact of the S.P.D.T. switch by means of a flexible wire.

Left-hand contact of the S.P.D.T. switch to O.P. of the L.F. transformer. I.P. of L.F. transformer to the + L.T. lead. A .001 fixed condenser is then connected across the primary of the L.F. transformer,

A third .001 fixed condenser then goes across the 'phone terminals and completes the wiring.

Though nearly all joints are soldered in the set shown in the photographs, there is no need to solder them if really good connections can be made without. They must



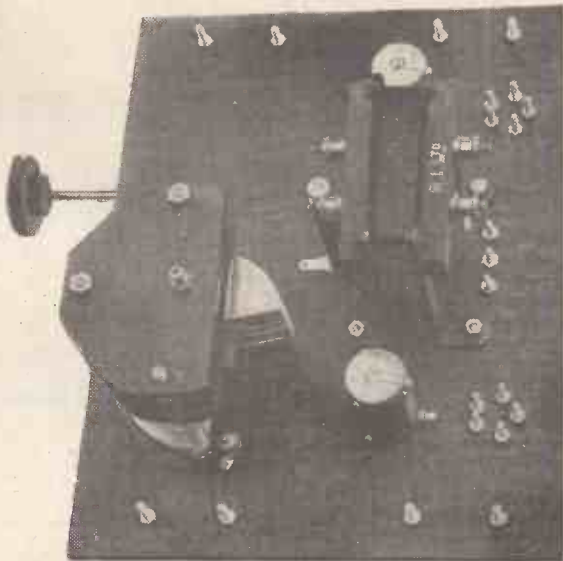
The positions of the filament rheostat-(L.F. valve), grid leak, and anode resistance are clearly seen from the above. The fixed condenser in the foreground is connected across the 'phone terminals.

AN ULTRA-AUDION UNIDYNE.

(Continued from page 338.)

will the set oscillate. For local stations the leak is usually best about $\frac{1}{4}$ "in", or for very loud signals sometimes right "in"—that is, the resistance is at a minimum of about .5 megohms.

When loud signals have been obtained,



A photograph of the reverse of the panel taken just before the wiring was commenced.

the variable anode resistance across the L.F. secondary condenser should be varied till best amplification results, after which no further adjustment of this should be necessary.

For use as an "Audion" the shorting strip on the two bottom left-hand terminals is brought into use and the terminals are shorted, while a larger coil, say 150-200 turns, is placed in the reaction coil socket. This coil is not tightly coupled to the aerial coil, but only brought up towards it as a final adjustment of tuning and to steady the receiver. It acts as an H.F. choke and not as a reaction coil when the set is used on broadcasting wave-lengths. Tuning is as before, though the distant stations may be more difficult to find at first.

Good D.X. Receiver.

For 5 X X the large reaction coil is retained and a larger aerial coil substituted, the shorting strip being *undone*.

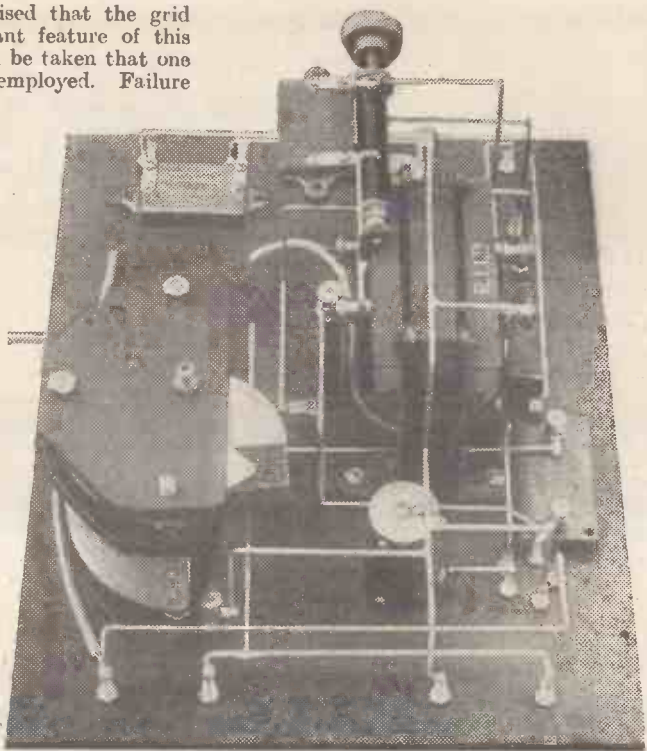
As regards valves, the best type to use, and one which fits the sockets described on this set, are the "Unidyne" type, and these are used with a 6 volt accumulator, their filaments being kept as low as is consistent with good results. Fine filament control on the detector is sometimes very beneficial in the reception of distant stations, and it is the reception of weak transmissions that is the main feature of the Unidyne receivers. This is partly due to the silent background and also to the fact that the grid is allowed to act in its most sensitive state, it being well known that very slight or no H.T. should be used when extremely weak signals are to be received.

It should be emphasised that the grid leak is a most important feature of this receiver and care should be taken that one of good manufacture is employed. Failure of the grid leak to operate may mean complete failure of the set to function, while a leak that is not variable is almost useless and is totally unsuitable for use when distant stations are to be

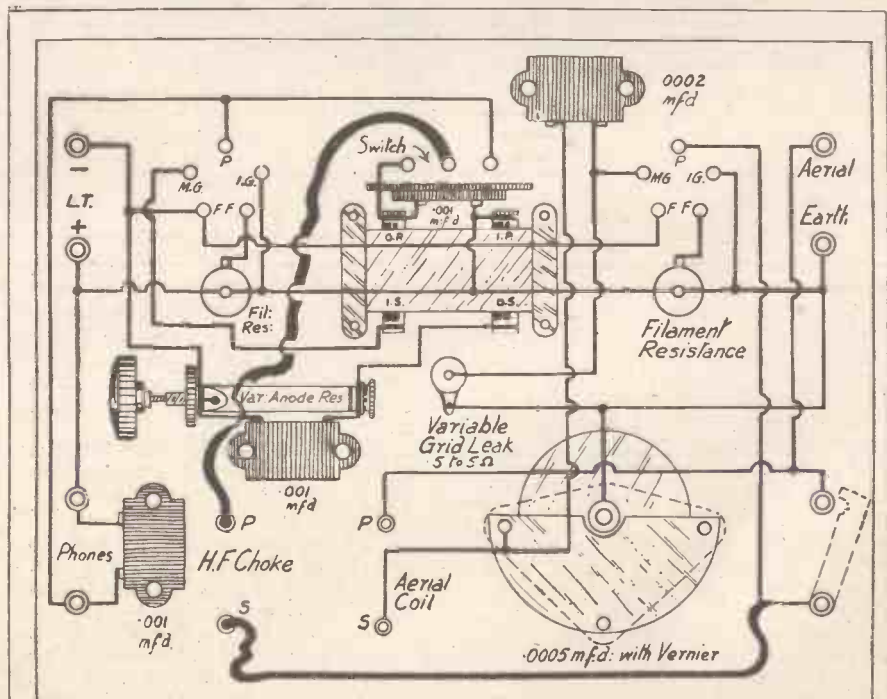
tuned in. All Unidyne receivers rely very largely on the grid leak for their final control when weak transmissions are being received, for this "leak" not only acts as a leak but also as a grid resistance and, as such, controls the amount of positive bias on the main grid of the valve. Smooth action of the leak is therefore essential if the receiver is to operate at its best.

The coils used on test with the set described were Lissenagon coils, but Igranic or basket coils can be used if desired. The latter suit both circuits quite well, but should

be wound with fairly stout wire—say, 22 to 26 gauge for aerial tuning. Finer gauges can be employed for the choke and reaction coils if desired, while for these duplex winding may be utilised in order to decrease the bulk of the coils. Coils having a high self-capacity should not be used, as results will be considerably reduced.



This photo was taken after the set had been completed and clearly shows how the various leads are arranged. The anode resistance (for L.F. grid circuit), it will be noticed, is supported with its condenser above the L.F. transformer. The grid leak is mounted on the panel.



Wiring Diagram of the Ultra Audion Unidyne Set
Fig. 3.

DRWN BY AD
CHECKED BY BR
SER. NO. A 204



Technical Notes

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

The "Electrical Educator."

A NEW and valuable work is being published by Messrs. Pitman's, the well-known publishers, entitled the "Electrical Educator," of which a copy of the first part has just been sent to me. The complete work is to be published in 30 fortnightly parts. It is edited in general by Prof. J. A. Fleming (the famous engineer and inventor of the wireless valve), and there is a long and imposing list of special contributors, many well-known names being recognised.

The work is arranged in a special way, which should make it interesting as well as useful to the student of any branch of electrical engineering. Every turn-over page begins a different subject and a single lesson is contained therein, in many cases followed by a series of questions and exercises. In this way the reader goes on from part to part in a series of carefully graded lessons, and should find the study much simplified.

I was very pleased with the number sent and recommend it to readers desirous of taking up the study of any branch or branches of electrical work.

A New H.T. Battery.

During the past few years there has been little or no real advance made in the manufacture and construction of high-tension batteries such as are used for wireless work. Apparently, when wireless first started to be popular, and the need for a low-output high-tension battery was felt, somebody turned to the ordinary flashlamp battery, which was available already on the market, and putting a number of these together in series, found himself fairly well suited. And since then manufacturers seem more or less to have gone on following one another like sheep. No doubt improvements have been made in the nature and quality of the ingredients; but, speaking broadly, no great change in style or construction has been noticeable.

The Ever-ready Co. of America, however, have now come forward with a battery which is probably a great advance on anything previously offered. It is a high-tension "dry" battery, and so far as I know, there are the same ingredients used in its construction as in the former types made by the same concern. But instead of the carbon element being in the form of a short rod and the zinc in the form of a cylinder, both of the elements are in the form of flat sheets and the electrolyte material, etc., is sandwiched in between them. A number of these layers are built up vertically, and two or more vertical rows are arranged side by side into a case to form a complete battery. In this way the whole of the volume within the battery case is filled with active material, the blank spaces between adjacent cells, inevitable with the

ordinary types, being avoided. It is stated that on actual tests in ordinary working life, the new batteries last from 30 per cent. to 50 per cent. longer than the previous conventional types.

The Toroidal Coil.

The stray field of an H.F. coil is often troublesome and necessitates careful spacing of the coils. In many cases it prevents the making of a really compact set. For this reason, many attempts have been made to produce a coil, the stray or external field of which should be negligible at a distance of an inch or so away from the coil, and some of



This portable super-heterodyne receiver of American design includes a self-contained loud speaker.

the attempts have been very successful. The coil known as the "binocular" coil in the United States, which is used by the makers of a well-known American set, is arranged with two straight coils side by side, and this arrangement is found to minimise the external field to an important degree.

The toroidal coil (in various modifications) is finding increasing favour amongst constructors and set manufacturers on the other side of the Atlantic. The simplest form of the toroidal may be said to be a spiral spring wound round a circular former. Imagine a spiral spring, say, 1 inch in diameter and 10 inches long, and let this be bound around a cylinder of about 3 inches diameter: you will have something resembling a balloon motor-tyre. This is roughly the construction of the toroidal coil. Its characteristic advantage is that the magnetic field follows the coil, and the stray field is practically eliminated. It is claimed that with these coils there is no

detectable external field at a distance of 1 inch from the coil.

No "Pick-Up" Effect.

In making coils of this type, however, care must be exercised to avoid capacity effects, as the inner parts of the turns are apt to come into very close proximity, and as they are parallel at that part, the capacity effects may become unduly great. By proper spacing of the turns, however, and other precautions, the capacity effects may be reduced to a very small value.

Another advantage of the toroidal type of coil, which follows upon the first advantage just mentioned, is that there is practically no "pick-up" effect. As every reader knows, it is often possible with ordinary coils to receive without aerial or earth, and whilst this might seem to be a good thing for some purposes, it is generally a great disadvantage when trying to receive distant stations whilst a local station is working.

An Aerial Lead-in Hint.

A little trouble often experienced by constructors is that the aerial lead-in comes

into too close proximity with the outside of the wall of the house, and there is danger of contact between the two if the aerial sways in the wind. This is one of those little things that may be overcome very simply when you know how: a reader sends me a hint which he found useful. Instead of increasing the length of the insulating lead-in tube (which would be the first thing you might think of) he simply took a length of brass tube, about 2 ft. long, and threading this upon the lead-in wire, forced the brass tube upon the outer end of the lead-in insulator. The brass tube makes contact with the lead-in, and, in effect, forms part of it. It is simply as though you had been able to stiffen the lead-in at the required part, so as to make it stand well away from the wall.

Alternatively, a narrow brass tube may be pushed right through the lead-in insulator, the lead-in passing within the brass tube.

(Continued on page 386.)



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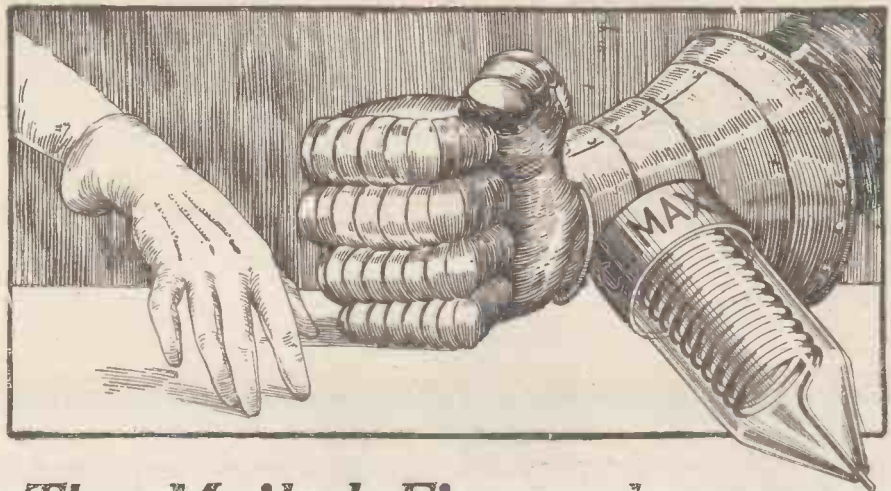
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WORKING A LOUD SPEAKER ON ONE VALVE

By Lieut.-Commander H. W. SHOVE, D.S.O., R.N.

A practical discussion on various one-valve circuits capable of operating loud-speakers with satisfactory results.

THERE seems to be little doubt that the strictly correct method in wireless reception is to increase the number of valves in the set when more volume is required. For range, this does

of course, is a different matter, and although I have an acquaintance who is prepared to swear an affidavit that he has heard Melbourne on a one-valve crystal reflex—well, I have met both fishermen and golfers before! Anyway, this "record" was made with headphones, and, for really good loud-speaker results, it is generally agreed that at least two stages of L.F. amplification are usually desirable even for local reception.

Small Loud Speaker's Capabilities.

Nevertheless, the poorer brethren of the wireless fraternity, who cannot afford multi-valve sets, are the very ones to whom a loud speaker is the greatest boon. For it enables several persons to enjoy a programme without the necessity of providing a pair of 'phones for each one (which comes out even more expensive than additional valves). There is, therefore, a "felt want" for an efficient "one-valve loud-speaker set" to operate one of the small instruments now obtainable at a price comparable with that of a single pair of good headphones.

The writer has used one of these (the 25s. Amplion "Dragonfly") for some time, and has found its capabilities

really surprising, both on multi-valve and on specially designed one-valve sets. With the heavy current from a powerful set, a filter circuit should be employed for these small speakers; but this is hardly necessary with the one-valvers, and even with these good, clear speech, distinctly intelligible anywhere within several yards of the loud speaker, can be obtained at 40 miles from 2 L.O. and used to be obtained at 70 miles from the old 5 X X. (No trial has yet been made with Daventry at 120 miles.)

A "Loose-Coupled" Reflex.

Several types of one-valve circuit have been used to get these results. The most obvious, and perhaps the most popular, is the valve-crystal reflex. There are, of course, a large number of possible arrangements of this, many of them good. The writer's favourite is shown theoretically in Fig. 1. This is a loose-coupled H.F. transformer arrangement which is slightly more complicated to handle than the

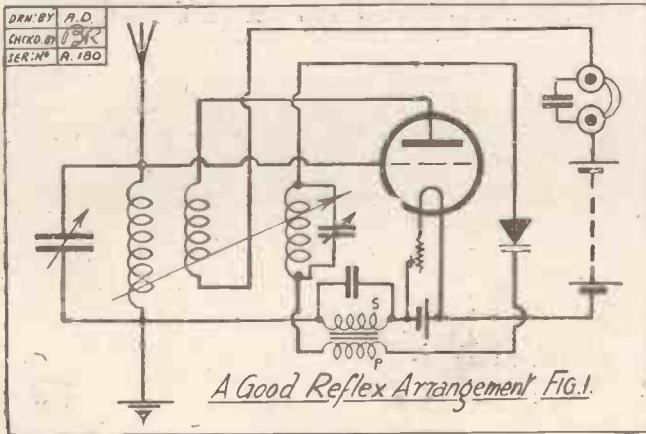
ordinary "tuned anode," but has two important advantages over it, viz., increased selectivity and the isolation of the crystal from the H.T. battery circuit, with great benefit to its retention of sensitivity and reliability of working.

The ordinary galena crystal is admittedly a nuisance in a valve circuit, and a good deal of "fiddling about" is saved by getting rid of it. Some of the variants of the ultra-audion circuit, used preferably with a soft valve, are capable of wonderful volume.

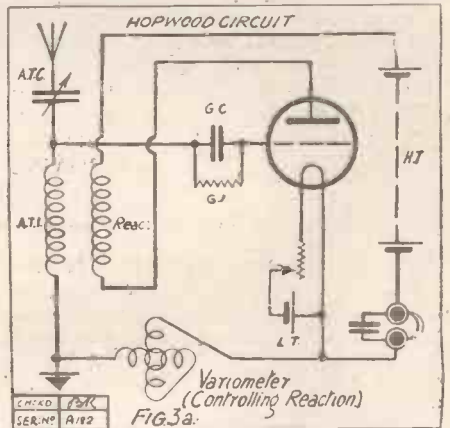
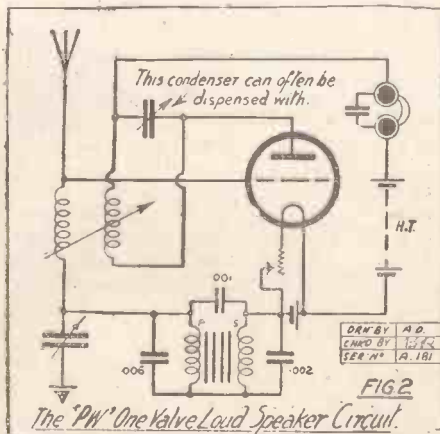
In this connection the famous "Chitos" circuit is well worth trying for small loud-speaker work at moderate range. But, in the writer's experience, none of these circuits can compare with the "P.W." one-valve loud-speaker circuit shown in Fig. 2.

Pronounced Hand-Capacity Effects.

The writer has used this, and several variants of it, with marked success. A little experiment with the condenser values



not seem to be necessary, reception from New Zealand having actually been accomplished (in C.W. Morse, at any rate) by a single-valver in this country. Telephony,



and transformer connections often makes all the difference between success and failure, and the transformer must be suitable (the R.I. is a favourite with many users of this circuit). The chief defect of these circuits (which are really based on the "Hopwood" and Armstrong "super" circuits shown in Fig. 3) is the very accurate tuning adjustments necessary, and the very pronounced hand-capacity effects generally encountered with them.

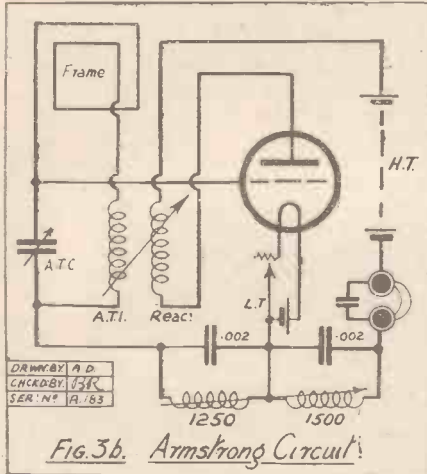
The latter is perhaps more marked in the original "one-valve loud-speaker" circuit of Fig. 2 than in some of the simpler variants, as e.g. that of Fig. 4, though the volume obtainable is perhaps greater when the A.T.C. is placed as in Fig. 2.

(Continued on page 344.)

WORKING A LOUD SPEAKER ON ONE VALVE

(Continued from page 343.)

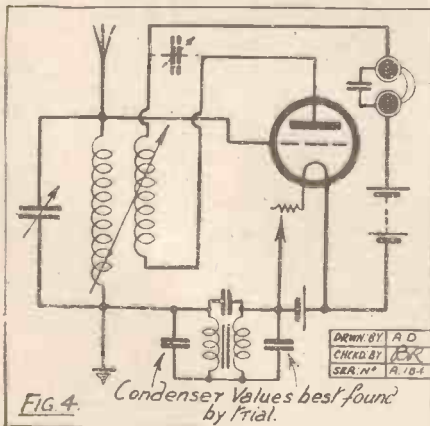
It is, of course, this position of A.T.C. (placing the bulk of the receiver at an H.F. potential to earth) that tends to increase the hand-capacity effects, and makes this circuit hardly suitable for use with head-



phones (though some users report good DX results).

Careful Handling Necessary.

These circuits can "howl" in a perfectly terrifying manner, and some care is necessary to avoid becoming an "ether hog" when using them. A marked peculiarity is the extraordinary difference in effectiveness caused by the slightest variation of filament temperature. Brightening, as well as dulling, the filament may cause an immediate and complete loss of signals with nearly all variants of this type of circuit. The reaction setting is also very critical, as well as the tuning, which generally requires a vernier attachment to the A.T.C. With some transformers, and in most of the circuits, there is often difficulty in avoiding "muffling" of the signals, with consequent poor intelligibility, if "boosted up" much by the use of reaction. This is due to inefficient amplification of the "side-band" modulations, and is a common fault in many regenerative



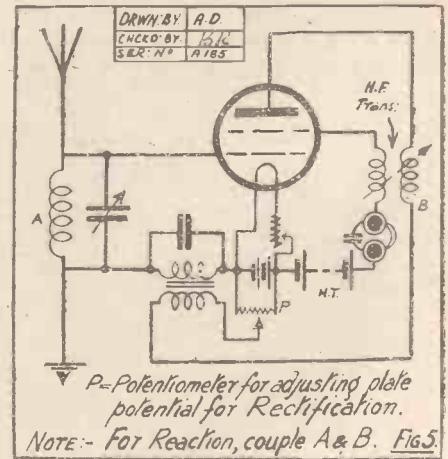
circuits, though more marked here than in some others.

Interesting Experimentally.

A four-electrode valve can be employed in a reflex circuit without a crystal, as shown in Fig. 5. This must not be confounded with Unidyne practice. What is attempted here, where an H.T. battery of ordinary voltage is used, is the employment of the outer grid in the same way as the plate of an ordinary valve, while the plate provides rectification somewhat after the fashion of a Fleming two-electrode valve. Though it has been well spoken of by others, the writer must confess that he has never himself got results from this circuit comparable to those from a reflex set in which a crystal is employed. The reason may be that he has not employed the most suitable components. The valve, for instance, was a Phillips' dull-emitter, which, although it gave very good results in other circuits, may not have suited this one so well as a bright emitter. The circuit is, however, worth the experimenter's trying out.

Reflexing Without a Crystal.

There are also reflex arrangements of a three-electrode valve in which a crystal is dispensed with, but these, though of experimental interest, do not seem to be very great-volume producers. The idea



behind these arrangements is to make one valve do the work of a "detector and L.F." two-valve set. There is, of course, always a measure of amplification in a detecting valve, and if another stage can be provided by feeding back the L.F. impulses, we should (theoretically) get results somewhat like those from a crystal two-L.F. set, with the additional advantage of being able to apply reaction. But the working out of these sets in detail is rather beyond the novice, and the whole subject will be best left to be dealt with in a future article.

TWO PRACTICAL TIPS. A CRYSTAL IDEA—WIRING UP THE SET.

From a Correspondent.

A CRYSTAL IDEA.

ONE of the principal difficulties of the crystal user is the keeping of a sensitive spot after it has been found—perhaps with the exercise of great patience! A simple method to ensure keeping to a particular spot is to make a small disc out of any suitable material—say fibre—and to mount this in a fixed position over the crystal.

In the disc are a number of tiny holes, large enough for the cat's-whisker to pass through easily. The whisker is then passed through one hole after another until a suitable sensitive spot on the crystal is found. The cat's-whisker is then constrained to remain more or less fixed. If no suitable spot is found, the disc is shifted slightly and the process repeated.

Elaborating the Method.

Another simple method, which is really a modification of that just described, is to mount, instead of the perforated fibre disc, a small piece of fine wire gauze. This is, in effect, a disc pierced with a much larger number of holes than you could drill in the fibre. The procedure is the same. It has the effect of dividing up the crystal surface into a large number of isolated areas, each little larger than the tip of the cat's-whisker.

If you want to elaborate on the above method, you can use the perforated disc and, say, ten cat's-whiskers, each one passing through one of the holes. These ten cat's-whiskers are connected to the

studs of a multi-point switch, so that any one can be switched in as desired.

WIRING UP THE SET.

WHEN finishing off the set by completing the wiring behind the panel, you naturally like to make it look nice, and for this reason you may go in for the parallel wiring and right-angle bend system. It certainly looks very well when properly done, but you can overdo it. The parallel wiring has certain drawbacks, for capacity effects are apt to be introduced, and howling may be the result in the completed set.

Most makers of commercial sets do not now trouble about the straight-line parallel-wiring system, but just connect together the parts by the shortest and most direct route possible. This results in the wiring having the appearance of a number of slanting busbars, not so neat as the parallel system, but technically superior.

Wherever the leads have to cross in the wiring of the set, always make them cross, as far as possible, at right-angles to one another, as by this means the inter-capacity effects are kept down to a minimum. Never allow leads to come closer together than you can possibly help.

It is a good plan to start with the grid circuits, and then proceed to the plate circuits, the filament circuits coming last. The filament leads should be kept well away from the H.F. leads, that is, the grid and anode leads.

IN this short series of articles we have so far dealt with the various theories of crystal rectification which have from time to time been advanced in an attempt to get at the real cause of the crystal's action as a rectifier of high-frequency oscillatory currents. Naturally, within the space at our disposal, we have only been able to outline the general nature of these theories. It has not been possible to consider their pros and cons in minute detail, nor have we been able to discuss the various modifications of them which have been for mulated at various periods.

Where Earlier Theories Fail.

All the rectification theories with which we have so far dealt have many inherent defects. In the first place, none of them makes the slightest attempt to explain the practically very important fact that many crystals decrease in sensitivity after continued use. Nor do the theories offer any explanation as to why one crystal may be

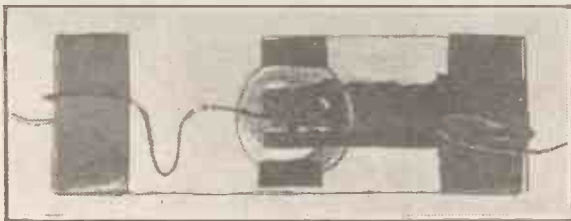


Fig. 1. The Microscope Detector.

entirely satisfactory in sensitive properties, whilst another crystal of an identical composition and form may be utterly useless for employment in a broadcast crystal receiver.

Furthermore, most of the older theories of crystal rectification assume that the rectifying contact must necessarily be a light one. On the contrary, however, many crystal contacts are quite well known which will work exceedingly well under continual pressures of two or three pounds, or even more.

It is an interesting fact to note that most of the early theories of rectification were worked out from experiments which were made with locally applied potentials across the crystal contact, and that the early investigators in this subject seemed almost to ignore the fact that crystal rectification could be obtained quite as efficiently without any applied potential.

Again, none of the older rectification theories explain exactly why it appears to be necessary that a substance must possess some crystalline form before it can act as a satisfactory rectifier of high-frequency currents.

An Interesting Experiment.

Until recently, it was assumed that rectification very probably took place in the body of the crystal, and any attempt to account for the apparent necessity of crystalline form in the production of rectification was based upon the suggestion that the crystal had a certain interior structure upon which the rectification effect depended.

However, the evidence in this direction now seems to point to the contrary. For

THE CAUSE OF CRYSTAL RECTIFICATION.

By J. F. CORRIGAN, M.Sc., A.I.C.
(Staff Consultant.)

PART III. (Conclusion).

instance, if an ordinary sensitive crystal of galena is ground up into an extremely fine and impalpable powder, and then sifted through fine cheese-cloth, or some similar fabric material, it may be dusted on to the surface of a little mercury in a dish to such an extent that an extremely fine layer of the mineral is formed on the surface of the metal, giving it a peculiar bluish appearance.

The Microscope Detector.

Now if a lead is taken from the mercury itself and suitably connected in the crystal set, excellent rectification will be obtained when a very fine cat's-whisker contact is applied to the dusted surface of the mercury in the dish.

This proves that the conditions necessary for rectification must be present in the surface layers of the crystal, and not within its mass.

For many scientific purposes it has been necessary to investigate the conditions at the point of crystal contact by means of the microscope, and in view of this fact, the accompanying photographs, Figs. 1 and 2, will probably be of interest to any keen amateur who, possessing the requisite instruments, desires to take up the investigation of the subject for himself.

The finely ground and sifted galena is lightly spread on the surface of a strip of silver paper which has been lightly covered with a thin layer of mercury amalgam, and cemented by means of Canada balsam or shellac to an ordinary microscope slide. An extremely fine wire contact of platinum (this does not reproduce in the photograph, Fig. 1) was provided, and then a thin cover glass was cemented over the whole in order to render the slide dustproof. By means of a micrometer device attached to the microscope, the contact point can be varied very minutely in order to obtain the most suitable setting, and to investigate the behaviour of the microscope detector under various conditions.

By means of a few experiments on these lines, the amateur can prove for himself that one single and almost invisible particle of galena, or other similar crystal, can act as a

rectifier in a manner equally as efficient as the material in the mass is able to do. Further, the experimenter may by means of this device obtain a very interesting series of data respecting the rectification produced by different degrees of fineness in the particles of crystal used.

This brings us to the beginnings of the modern molecular theory of rectification which assumes, as a starting point, on these and on other grounds, that the seat of rectification is existent, not in the mass of the crystal, but in its surface layers, and perhaps in a surface layer which is not more than two or three molecules thick.

There is another point which is of importance. By altering the chemical composition of the crystal, it is possible to increase or decrease the resultant sensitivity. Thus, for instance, by incorporating small amounts of silver sulphide with a fused mass of galena, the resulting product will be greatly increased in sensitivity. On the other hand, if the silver sulphide is increased beyond a certain maximum amount, the sensitivity of the crystal rapidly falls off. Tin, and a number of other metallic sulphides also act in the same manner.

The Composition of Atoms.

When a galena crystal becomes insensitive it can generally be resensitised by soaking it in a solution of sodium thio-sulphite (the photographer's "hypo") for an hour or two. The hypo is one of the few substances which exert a solvent action on galena. This solvent action is only slight, but nevertheless it is sufficient to dissolve away the surface layer of the crystal, and so to expose a new and satisfactorily sensitive area.

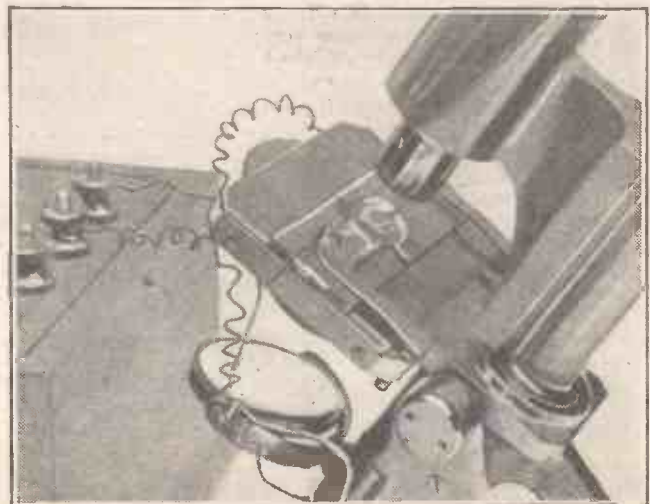


Fig. 2. The Microscope Detector in use.

The above are only a few of the many facts which appear to point to the rectification taking place in the surface layer of the crystal, and not in its interior mass, or at its actual point of contact.

The recent investigations which have been made into the subject of crystal

(Continued on page 346)

THE CAUSE OF CRYSTAL RECTIFICATION.

(Continued from page 345.)

structure will probably throw a good deal of light on the matter of crystal rectification. Crystals, we now know, are composed of regular arrangements of atoms. They comprise an atomic squad, to use a military expression, whereas a non-crystalline substance has its constituent atoms arranged almost any-old-how, and thus, in this latter case, they may be compared to the individuals which make up an ordinary crowd.

"Jogging Off" Sensitive Spots.

The atoms or molecules of the surface layers of the crystal are reasonably assumed to possess a greater amount of freedom, or mobility, than those which are situated in its interior regions, and accordingly it is coming to be believed possible that crystal rectification may be bound up with certain atomic movements which take place in the surface layers of the crystal under the influence of applied oscillatory currents.

In passing, it is interesting to note that many amateur crystal users have often recorded that strong signals sometimes result in the light cat's-whisker contact being "jogged off" the sensitive spot on the crystal, and that whilst in some quarters this effect has been pooh-poohed as impossible, other investigators see in it a definite mechanical result of the movements in the crystal's surface layer.

Working in the Dark.

Of course, this surface molecular theory of crystal rectification has not yet been completely developed, nor has it yet explained exactly *how* the rectification is produced. Nevertheless, the upholders of the theory appear to be making praiseworthy attempts to account for well-known properties of the crystal which the exponents of the older conceptions of crystal action almost entirely ignored.

It is, therefore, very likely that the true explanation of crystal rectification will be based upon such a theme, and that it will afford some practical method of enabling the crystal manufacturer to standardise his products more readily and to devise methods of increasing their sensitivity. This would be a very welcome result of such a theory, for, at the present time, the crystal manufacturer, in common with the amateur, works almost entirely in the dark when it comes to devising methods for increasing and maintaining the crystal's stability and sensitive properties.

Atomic Arrangements.

It is also likely that the property of oscillation generation and of light transformation which some crystals possess may be directly concerned with the nature of the atomic arrangement in the surface layers of the crystal, and thus, the final theory of crystal rectification will not only account for that property of the crystal, but it will explain many other of the crystal's remarkable effects, the precise origin and mechanism of which we are, at the present time, entirely ignorant.

WATER-PIPE EARTH CONNECTIONS.

WHILST most beginners in wireless are particularly anxious to provide themselves with as good an aerial as possible, few seem to realise that the earth is just as important a factor in good reception as the aerial. In fact, it is entirely wrong to think of the aerial as one thing and the earth connection as another. You should always think of the aerial-and-earth system as a whole. It is not a bit of good having an efficient aerial if you have an inefficient earth. If you doubt this, try an inefficient earth and an efficient one, and mark the difference!

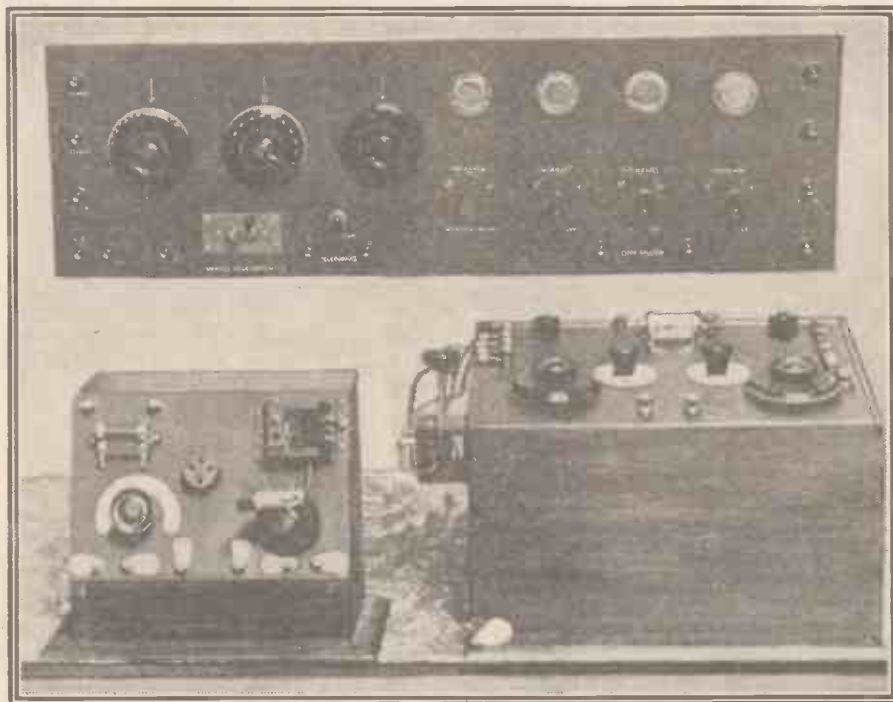
Good Contact Essential.

A good kind of earth to have is a direct thick lead, as short as possible, to a water

pipe on the main. Some of the water-taps of the house are not on to the main, but to a supply cistern, which is not necessarily connected to earth; at any rate, the connection may be a very poor one. Make sure that the water-pipe to which you attach your earth-lead is the main pipe and comes direct in from the ground. Make a really good contact with it. It is rather difficult for the beginner to make a soldered joint on to a cold-water pipe, but you can make quite a good joint by means of any of the various screw adaptors on the market.

A Final Point.

The earth-lead should also be kept as short as possible and should be of good, thick wire. Aerial wire, or the wire used for the aerial lead-in, will do perfectly well for the earth-lead. Do not let the aerial lead-in come into close proximity with the earth-lead, even though they may both be insulated.



Three sets that gained prizes in a Newcastle Wireless Exhibition. The four-valve receiver won a "P.W." silver cup.

SELECTIVITY MAY BE OVERDONE.

SELECTIVITY is a very desirable quality in a receiving set, but it is not generally recognised that if the set be made too selective, its sensitivity may be reduced. The reason is as follows. A broadcast station sends out the main wave, or "carrier" as it is commonly called, and when signals are being emitted, it also sends two other waves, differing in frequency from the carrier by speech frequency.

What Happens.

Or rather it may be considered that this is what happens. In actual practice it is called "modulation," and the carrier wave

is modulated with superimposed waves of speech frequency. But the point is that the receiver behaves, as regards reception, as though it were receiving the carrier-wave and two other waves, one of higher frequency and the other of lower frequency, each differing from the carrier by speech frequency.

The Practical Limit.

If the set is exceedingly selective, there may be a tendency to tune out these extra frequencies, particularly with the high notes. It has been found that the higher speech frequency harmonics are reduced by the use of too selective a receiver, and the quality suffers in consequence. This is the reason for the poor quality of some superheterodynes. The new compensated H.F. sets are near to the practical limit of selectivity, at any rate if the best quality in the received sound is to be secured.

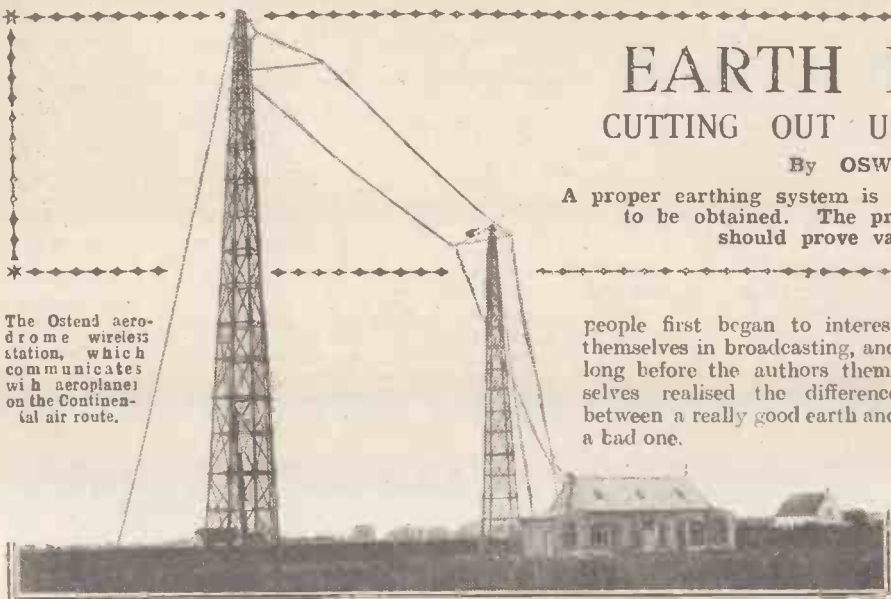
EARTH EFFICIENCY.

CUTTING OUT UNWANTED RESISTANCE.

By OSWALD J. RANKIN.

A proper earthing system is essential if good results with a set are to be obtained. The practical advice given in this article should prove valuable to "P.W." readers.

The Ostend aerodrome wireless station, which communicates with aeroplanes on the Continental air route.



people first began to interest themselves in broadcasting, and long before the authors themselves realised the difference between a really good earth and a bad one.

point where it joins the tube or other arrangement, is of considerable importance; a bare lead which is stapled to a wall, or allowed to make contact with earth in any way, means a high resistance path to earth—the one thing to be avoided—before the

IT is a fact that unless one seriously considers the importance of making a really efficient earth connection, no amount of tinkering with other parts of the system will eliminate such troubles as flat tuning, interference, and instability—the inevitable results of an inefficient contact to earth. If the earthing system is not properly arranged; that is, if the resistance at the

No doubt many difficulties were encountered in describing the art of wireless telephony to the man-in-the-street, and it may have been because one or two authors rather overstepped the mark in "simplifying" matters that the earth was described as a metal peg, simply stuck into the ground, or a piece of wire wound round any old water-pipe. There is, of course, an excuse for those who have followed such misleading advice.

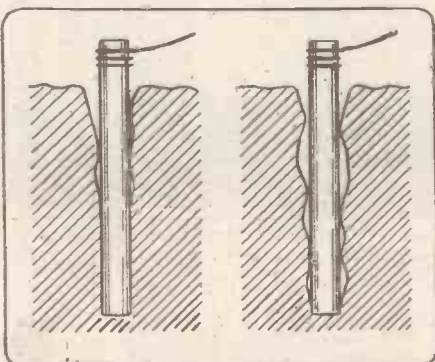


Fig. 1. A type of earth connection that becomes unsatisfactory in dry weather.

point of contact is not kept down to a minimum, then no matter how elaborate the receiver may be it cannot possibly be made to function satisfactorily, since the damping caused by the earth resistance renders the aerial circuit inefficient, and consequently the whole system is affected.

An All-Important Matter.

Therefore it should be obvious that in order to obtain the best results there should be as little resistance as possible between the earth terminal of the receiver and the actual contact with earth, and if one is unable to trace the cause of bad reception after examining his receiver and other parts of the system, such as the aerial and lead-in, he should immediately direct his attention to this all-important matter.

In many instances the beginner is not to be blamed if he makes a mistake in this direction. There are, unfortunately, many cheap "guide books" obtainable, the majority of which were rushed on to the market to meet a sudden demand when

Insulating the Earth Lead.

What might be considered as the most common earthing arrangement is shown in Fig. 1, where a piece of brass or copper tubing, about 1 in. in diameter by 15 ins. long, is driven into the ground for a distance of about one foot. Water is sometimes poured down the tube, the idea being to moisten the surrounding earth and so improve conductivity, but unless the tube is well perforated and blocked at the base, then obviously the water has little or no effect.

It might be said at once that this arrangement is often inefficient; one can never feel sure about a good earth contact all round the tube (and with an average size tube the contact would not be any too good even if it was possible to keep the earth in a highly compressed state against its sides), and since it is usually placed in the surface layer of earth, which is subject to rapid changes in expansion and contraction, it is altogether a most undesirable proposition. The right-hand sketch in Fig. 1 shows what happens in very dry weather. The expanding properties of earth arc, of course, altogether out of proportion with those of the metal tube, and what contact remains offers a very high resistance.

Matters may be considerably improved by burying the tube as shown on the left in Fig. 2, and by making the connection by means of a heavy insulated lead, but since the top portion of the tube will, to a certain extent, be subject to the above mentioned conditions, the better plan would be to bury the tube in a horizontal position, as indicated on the right.

The matter of insulating the earth lead, from the earth terminal of the set to the

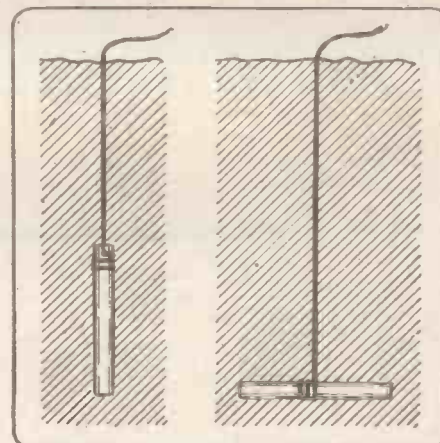


Fig. 2. (Left) An improved method (Right) A further improvement.

impulses reach the prepared low resistance path, and therefore, in order to obtain the maximum degree of efficiency from a well arranged earth, it becomes necessary to insulate the earth lead so that the contact takes place only at the desired point.

Effect of Intermediary Contacts.

In order to understand this more clearly the reader should again refer to the arrangement shown in Fig. 1, and reckon the lower portion of the tube as the real low resistance earth (this part is usually well embedded in the ground) and the broken or semi-contact points at the top half of the tube as the undesirable paths of high resistance. Obviously then, the impulses running from receiver to earth first "hit" the bad con-

(Continued on page 348.)

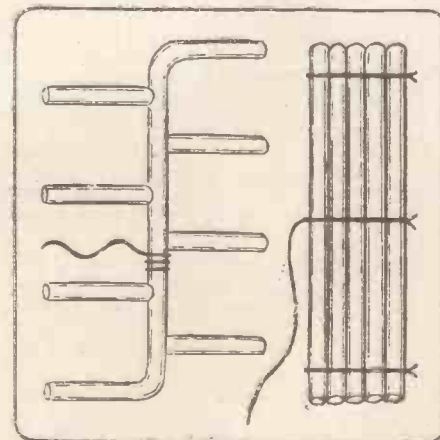


Fig. 3. The use of metal tubing.

EARTH EFFICIENCY.

(Continued from page 347.)

tacts, with the result that a very high resistance is set up, and this amounts to practically the same thing as using an un-insulated lead in conjunction with a deeply buried earth plate.

From this it will be seen that very little is gained by using an efficient earth if the "delivery pipe" to same is leaky, and that only by carefully insulating the lead can the full efficiency of the earth system be obtained.

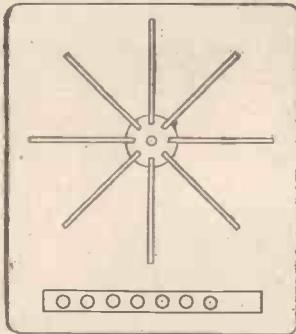


Fig. 4. An efficient earth "plate."

In other words, never allow the earth lead to come into contact or indirect contact with earth until it is actually earthed, in the true sense, at the connecting point on the plate.

Quite a good earth can be made from a roll of clean wire netting buried about four feet deep, preferably in clay sub-soil. Two other arrangements equally as efficient are shown in Fig. 3, where a few lengths of lead or "compo" piping are bound and soldered together, as shown on the left, and buried in a horizontal position.

Alternative Methods.

Alternatively the pipes may be cut and soldered together, as shown on the right, and buried in a similar manner. The local plumber would no doubt make up such a device from one's own specification. The pipes should not be smaller in diameter than those used for ordinary house supply mains, and should they be twice or even three times larger, then so much the better.

A more elaborate arrangement may consist of a series of perforated metal arms attached to a central brass hub in the manner shown in Fig. 4, the arms being soldered into

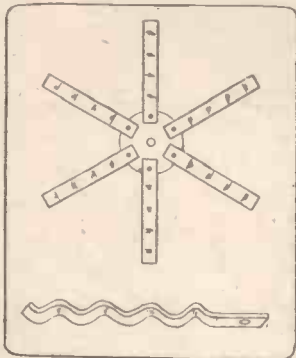


Fig. 5. A radial "plate" made of corrugated strip.

The bared end of the lead is soldered into a small hole in the centre of the hub. A fairly stiff wire jig should be made to hold the arms in position during the soldering operation; the device is then placed on a

flat, sheet of tin-plate while the heat is applied to the hub by means of a large blow-lamp, the joints of the arms and the end of the lead being soldered at the same time.

A more simple arrangement is shown in Fig. 5, where the arms are first riveted to a sheet brass disc, and afterwards soldered. The arms may be straight, corrugated, plain or perforated, as desired.

Another Successful Arrangement.

Fig. 6 shows another very successful arrangement. Here the arms, which are cut from thick sheet brass, and pointed at one end, are riveted to a sheet brass disc about 2 in. in diameter, in the manner shown in Fig. 5. A second disc is then placed over the inner ends of the arms (the countersunk rivet heads being filed flush with same if necessary) and the two discs are clamped firmly to one end of a 36-in. length of $\frac{3}{16}$ in. round brass rod which takes the place of the wire connection in the previous examples.

The device is then held over a gas burner while a little solder is run over the edges of the discs; inner portions of the arms, and also over the two clamping nuts and central parts of the discs. The rod is covered with a length of thick rubber tubing, which should be well bound over with adhesive tape. The tape should be given two coats of shellac varnish which, when dry, will form a hard surface and thus prevent small flints from cutting through the rubber and making contact with the rod.

Of course, if one can afford it, there is nothing to equal an ebonite tube. The top of the rod is fitted with a small spring brass clip (shown on right of sketch), which is clamped between a terminal and nut, as shown, so that when the three arms of the clip are bent downwards a suitable cap may be fitted over the terminal to protect the joint from the weather. If the arms of the clip are well tinned they may be used as tags if a soldered joint is preferred. On the other hand, the wire could be soldered direct to the top of the rod, in which case the present fittings could be dispensed with.

Counterpoise "Earths."

The length of the rod, or in other words the depth of the device, will, of course, depend on "how the land lies"; in some districts one strikes a good clay or similar sub-soil at a depth of 12 in. or so, while in other districts it lies much lower, and is sometimes not to be found at all. The next best thing to clay is good solid earth, but where the former will usually look after itself as regards moisture, the latter will require an occasional soaking, especially during dry weather.

So far nothing has been said of the capacity or counterpoise "earth." This really is not an earth at all, but a second aerial stretched under the main antenna to act as a balancing capacity or counterpoise.

The aerial and earth can be looked upon

as two plates of a condenser, between which the etheric strain is imposed by the oscillating current that rushes up and down the aerial. If the earth is removed the condenser effect is destroyed unless a counterpoise is employed, when the balance is restored.

It must not be thought from the above that a counterpoise is just as efficient as a direct earth; for general purposes it is not, but it is, nevertheless, a useful substitute if a direct earth cannot be obtained, or if, for interference reasons, it is undesirable to use one. In the latter case the most likely reason is interference, caused by what are known as earth currents, set up more often than not by the presence of power or electric lighting mains.

Counterpoises should be erected about six feet above the ground, stretching fan-wise from under the aerial lead in to the farther end. Three wires will be sufficient as a rule,



An interesting 4-valve set and home-made loud speaker constructed by Mr. R. S. Rudland, of 36, Gipsy Road, Welling.

of the same type as those used in the aerial, well insulated from earth, and coming into the operating-room through a lead-in tube similar to that used for the aerial. The centre wire of the three should be directly under the aerial and slightly longer.

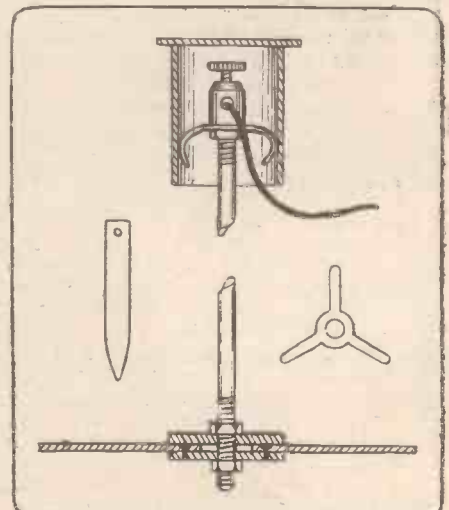


Fig. 6. A method of screening the joint between earth lead and actual earth contact.

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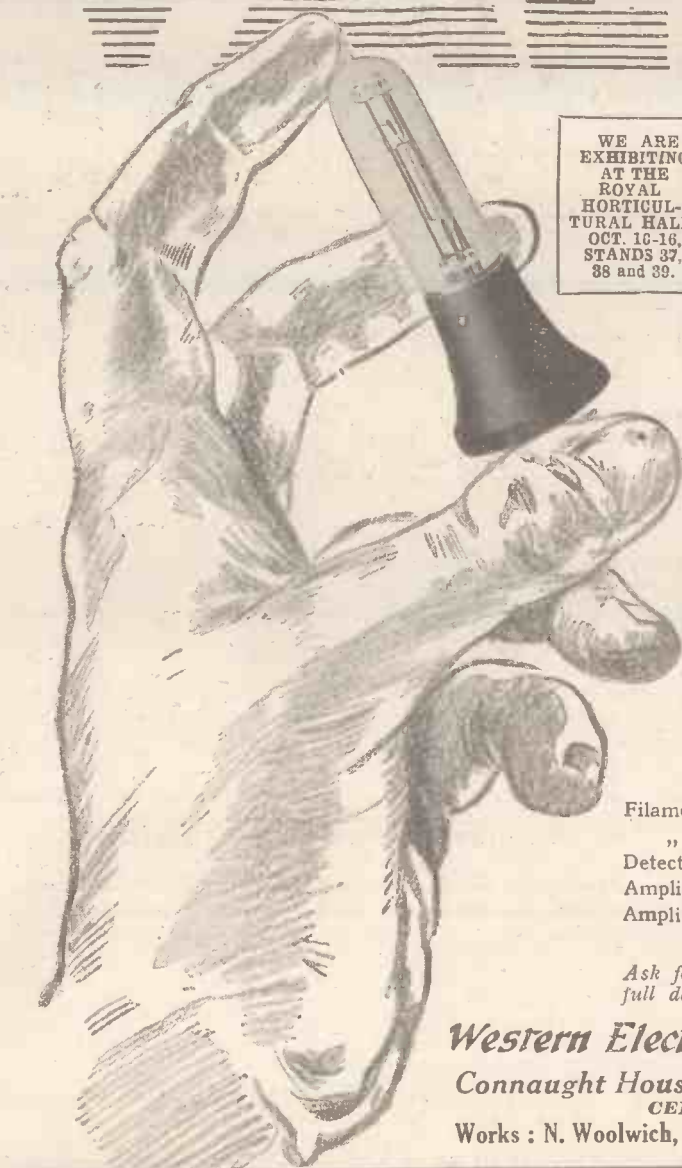
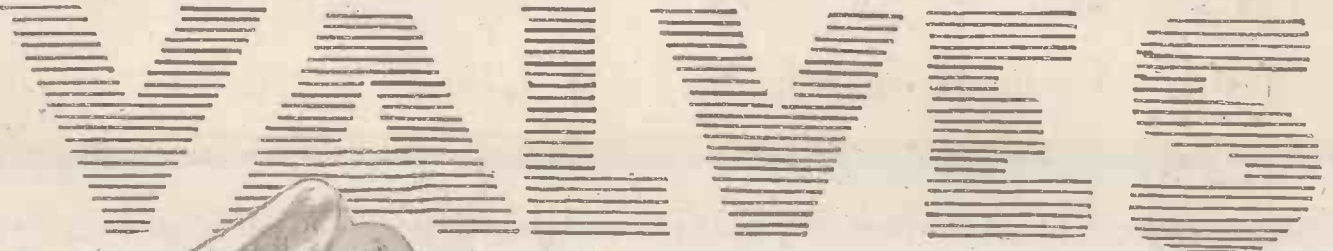
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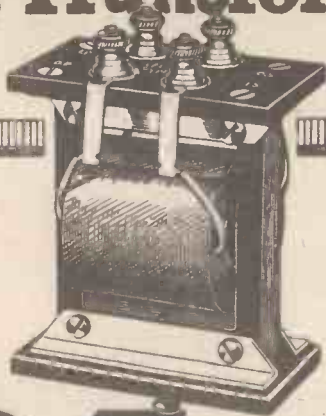


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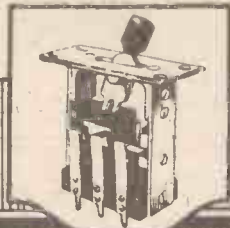
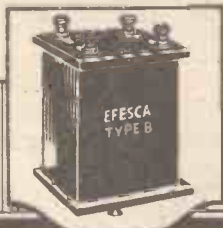
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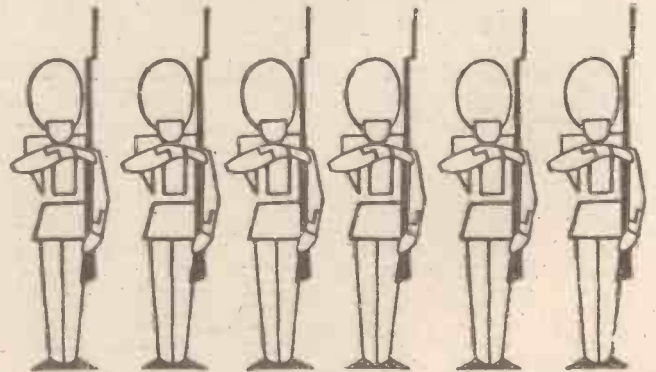
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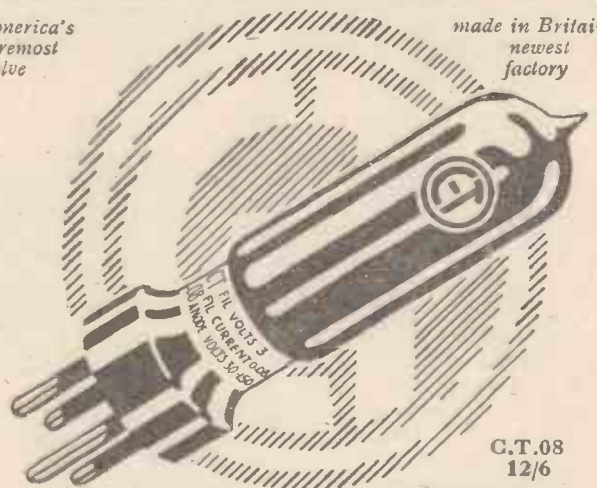
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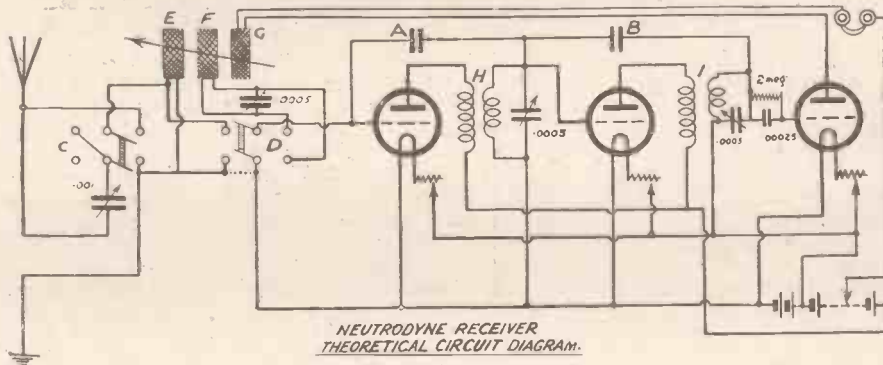
HINTS ON THE NEUTRODYNE CIRCUIT.

By P. R. BIRD.
(Assistant Technical Editor.)



THE neutrodyne set is sure to be immensely popular this season, because it is the only set whose fame as a distance-getter can hope to compare with

double-pole double-throw switch (C) which places the aerial condenser in series or parallel with the aerial coil. The use of such a switch in an ordinary circuit is nearly



that of the super-heterodyne. Unlike the super-het., it requires only three valves for efficient operation, but—again unlike its rival—it is *not* an easy set to handle. Already a great many constructors who have tried the neutrodyne have been badly disappointed, and it is with the object of pointing out the main pitfalls that this article is written.

Faults in Design.

The apparent simplicity of the neutrodyne is the first trap to be aware of. We are told, for instance, that the set is an ordinary 2 H.F. and det., stabilised by the addition of two neutralising capacities between the H.F. stages. But the home-made 2 H.F. and det. receiver is likely to have far too much capacity-coupling between the grid and plate circuits in any case, so the introduction of more capacity to neutralise this is likely to be a very tricky business. The diagram above shows the theoretical circuit of a 3-valve receiver, in which the two H.F. valves are stabilised by the neutrodyne condensers A and B.

On the face of it, this represents an extremely selective set, but a little consideration will disclose some serious weaknesses. On the left of the diagram is a

designed to be flexible, but is especially suitable for the reception of broadcasting on wave-lengths up to four or five hundred metres.

This excludes 5 X X, so as the receiver is to work over a very limited band of wave-lengths a series-parallel switch is unnecessary. Everybody knows that switching in H.F. circuits should be avoided if possible, so instead of the switch (C), two separate plug-in aerial coils should be used, to cover the upper and lower halves of the wave-length range.

Next comes the arrangement shown at D, which is the standard "Tune-Stand-by" switch for coupling the aerial either directly or inductively to the grid circuit of the first valve. Whilst this is a good arrangement for improving the selectivity of an ordinary set it does *not* help the neutrodyne to any great extent. It does, however, complicate the operation of the set, and introduce H.F. losses at the switch contacts, so the arrangement shown can be improved as follows:

Simplifying the Tuning.

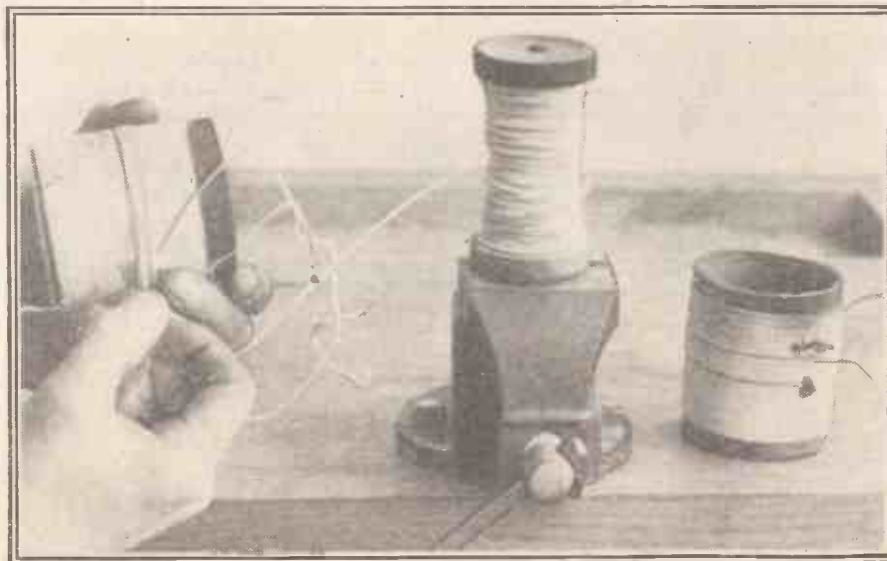
Where the local station is not particularly troublesome the coil E can be dispensed with altogether, aerial and grid connections being made direct to the left-hand side of the coil F, and earth and filament connected to its right-hand side.

Closer in to the local station, at distances ranging between five and ten miles, an aperiodic aerial coil of the Ultronic type will give sufficient selectivity. And even "close under" the local station the arrangement at D can be improved upon by using the coil E as an inductively coupled wave-trap (in a 3-coil holder), connecting a .0003 condenser across it for tuning purposes. When carefully coupled to the aerial coil, and tuned exactly to the local station's wave-length, this isolated little circuit will absorb a surprising amount of interference without impairing the efficiency of the set in any direction.

Having simplified the whole of the tuning adjustments by abolishing the switches, the remainder of the circuit can be scrutinised for likely causes of trouble. Besides the adjustment of the reaction coil, there are still three variable condensers to tune, and

(Continued on page 354.)

always justified, but in the neutrodyne it is generally nothing but a nuisance. Owing to the nature of the circuit the receiver is not



Winding on the primary of the neutrodyne transformer. A completed unit is shown on the right.

**HINTS ON THE
NEUTRODYNE CIRCUIT.**
(Continued from page 353.)

each of these should be provided with a vernier. This means that tuning is never easy, but owing to the silence and stability of the circuit the controls will be found to "hang together" well.

Tuning is very critical, but not erratic, and if suitably designed H.F. transformers are used at H and I, their respective variable condenser settings can be arranged to keep almost exactly in step. An attempt is often made to control these two condensers by one knob, thus reducing condenser controls to two in number, but obviously if this is attempted the mechanical movement must be absolutely free from sag or slackness, and most experimenters will prefer the system of separate adjustments.

Neurodyne Transformers.

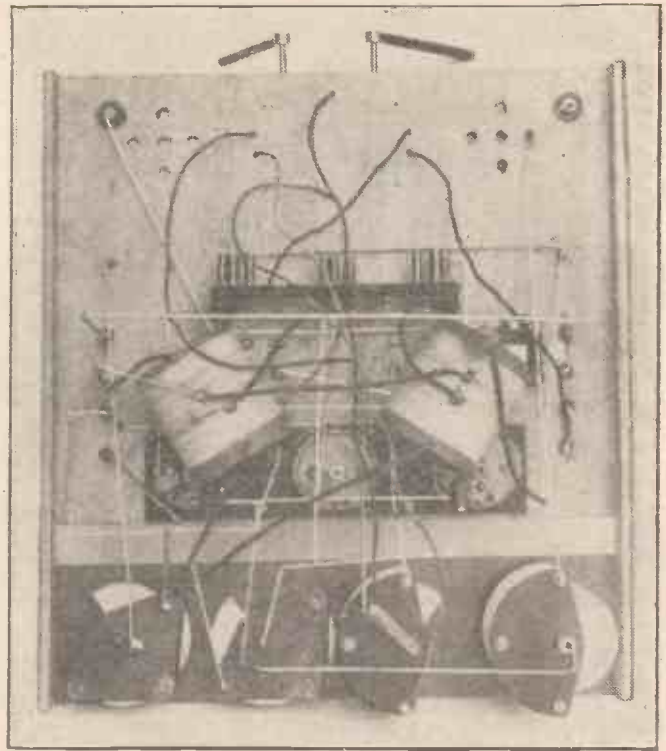
The H.F. transformers themselves can be made at home quite efficiently. Instead of the usual flat type of plug-in transformer, they should take the form of solenoids, wound upon an ebonite or cardboard tube. The latter should be 3 in. in diameter, and each transformer will need a 3-in. length of the tube. The secondary is wound on first, and consists of 52 turns of No. 24 D.C.C.

12 turns of the same wire should be wound over the secondary in the exact centre of the winding, to form the primary circuit of the transformer. The method of winding is clearly shown in the photograph on page 353, which shows one transformer completed and the other in course of construction.

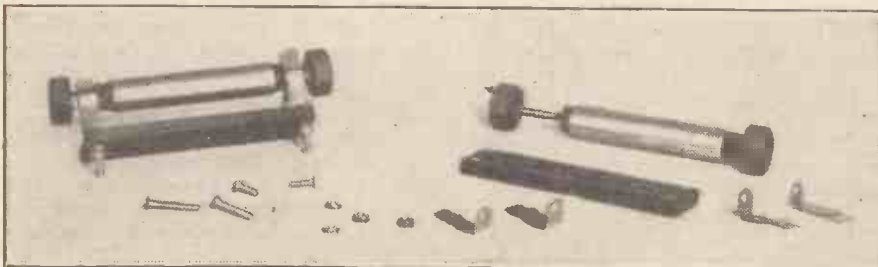
The best method of mounting these transformers is shown in the photograph on the right. By inclining the coils at an angle of 45 degrees to the base of the set, their magnetic fields are at right angles, and the interaction is reduced to a minimum.

Apart from the neutralising condensers A and B, the circuit is an ordinary 2 H.F. and det.

Normally it would be extremely unstable, due to the



This photograph shows how the H.F. transformers are mounted behind the panel.



The parts of the neurodyne condenser, described on this page, ready for assembly. How the complete component appears is shown on the left.

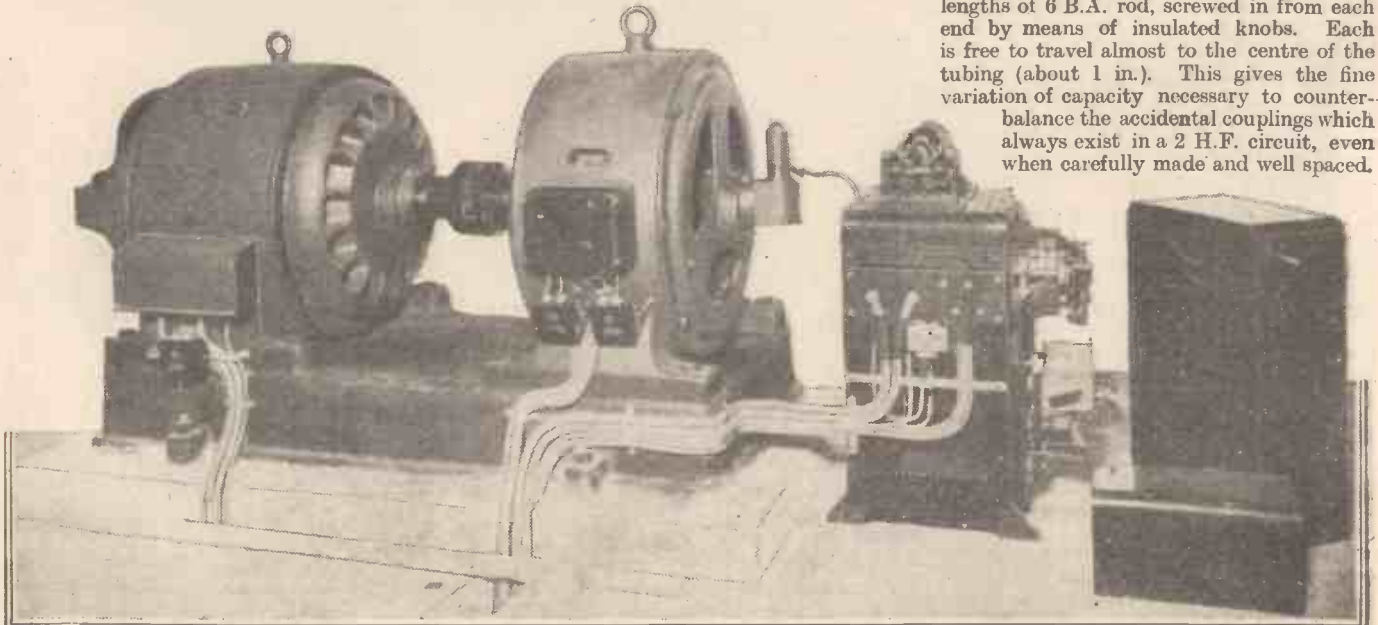
wire, the winding being commenced about half an inch from the edge of the tube. When the secondary has been completed,

accidental couplings existing between plate and grid circuits. The magnified currents in the plate circuit find their way back to

the grid circuit, and the set continually breaks into self-oscillation. The effect is exactly as though the primary of H (Fig. 1) were connected to its own grid by a very small condenser.

The neurodyne principle takes advantage of the fact that in the secondary of H equal and opposite currents are flowing, so by connecting the secondary to the grid through a small condenser, these unwanted couplings can be exactly balanced out.

The condensers A and B may be purchased, or can be made from 1/2-in. brass tubing, through which an ebonite rod has been driven. The rod is tapped 6 B.A., and the "plates" of the condenser are short lengths of 6 B.A. rod, screwed in from each end by means of insulated knobs. Each is free to travel almost to the centre of the tubing (about 1 in.). This gives the fine variation of capacity necessary to counter-balance the accidental couplings which always exist in a 2 H.F. circuit, even when carefully made and well spaced.



Part of the powerful plant installed in the transmitting room at Königswusterhausen (L P).

AN EXPERIMENTAL SYSTEM.

By OSWALD J. RANKIN,

PART III.

THE valve panels are perhaps the most simple of all, each one being cut 6 in. long by 3 in. wide, and fitted with a low-capacity type valve holder, a 30-ohm rheostat, and four large terminals.

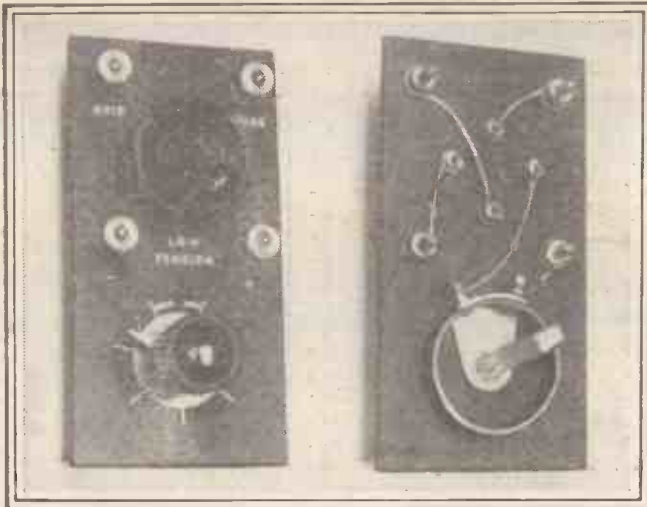


Fig. 16. Front and reverse view of one of the valve panels.

The general arrangement of these will be readily understood by a careful perusal of the photographs in Fig. 16 which represent front and back views of one of the panels. The rheostats are placed in series with the L.T. negative terminals; that is, the connections are made from negative terminal to rheostat helix; rheostat arm to one filament socket, and the other filament socket direct to the L.T. positive terminal, good stout bus-bar being used for making

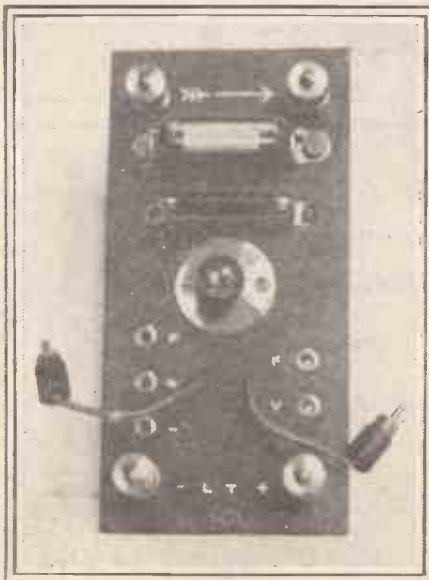


Fig. 17. The disposition of the components on the grid leak panel is clearly shown above.

the connections. Other types of valve holders and rheostats may, of course, be fitted if desired, but the writer has found the "Peerless" rheostat and the low-capacity valve holder always efficient and reliable.

Figs. 17 and 18 show front and back views of a panel embodying several little refinements of great utility. This is the grid leak and condenser panel, which is placed in front of the valve detector panel, and to solve the mystery it is only necessary to glance at the circuit diagram, Fig. 19, where it will be seen that either a variable or fixed grid leak, V or F, may be placed in parallel with the interchangeable grid condenser, C; in series with the L.T. positive; or in series with the L.T. negative, according to the type of rectifying valve

in use. Thus by placing the top plug (right of panel in Fig. 17) in the socket F, one can try out several different fixed leaks in conjunction with various fixed condensers, or change over to the variable leak by placing the plug in the socket V.

The Grid Leak Panel.

The position of the lower plug (left of panel in Fig. 17) is best found by trial; using a single valve detector only, this should engage socket P so that the leak in use is in parallel with the condenser, and where H.F. amplification is employed, or where several different types of valves are used, then it might engage either of the sockets marked positive and negative, so as to give the grid a positive or negative potential as required.

The arrow shown between the two top terminals in Fig. 17 merely saves an otherwise complicated conglomeration of transfers; the left-hand terminal is connected to the A.T.I. or plate of the H.F. valve, and the right-hand terminal to the grid of the detector valve, the two lower terminals being connected to L.T. positive and negative at any convenient junction. Wates' "K" type fixed condensers are used, and these, with the Watmel variable and Dubilier fixed leaks, make up a thoroughly efficient and reliable unit. The "K" condensers are admirably suited to the purpose, and these are used exclusively in all parts of the system.

Figs. 20 and 21 show front and back views of the high-frequency transformer panel, where provision is made for ordinary interchangeable plug-in transformers, and also for that uncertainty with respect to

their connections. Instead of connecting the four terminals direct to the sockets they are each fitted with a wander-plug, these plugs being arranged to engage four sockets which are linked up to the transformer sockets by means of brass strips. Thus one is able to make permanent circuit connections to the terminals, and then change over the plugs, as desired until the best method of connect-

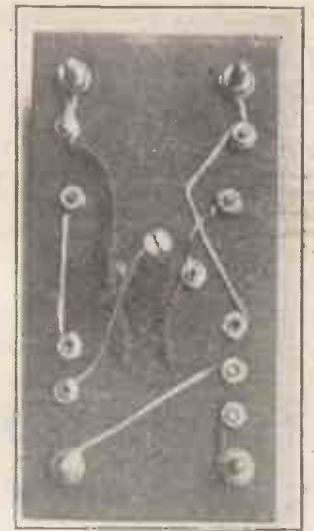


Fig. 18. The underside of the leak panel.

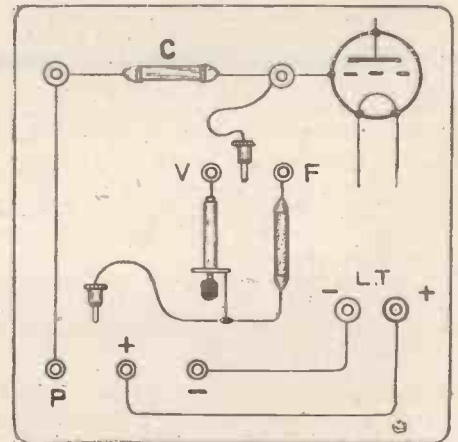


Fig. 19.

ing the primary or secondary winding is found.

The .0003 mfd. variable condenser is then connected in shunt with either winding,

(Continued on page 356.)



Fig. 20. A useful unit for testing H.F. transformers.

TWO TECHNICAL TIPS.

Where Resistance is Unimportant—Reflex Receiving Sets.

FROM A CORRESPONDENT.

IN his desire to avoid all possible losses, many an amateur worries himself quite unnecessarily about the resistance of the leads of the set. For example, it has been suggested that because silver is a better conductor than copper, it would be a good thing to use silver bus-bar instead of copper, or to silver-plate the copper heavily. Theoretically this is true, but when you come to consider how very minute a fraction of the resistance of the set is due to the bus-bar, you see you are only reducing a factor which is already negligible, and therefore you are wasting your time and labour.

It has also been argued that the bus-bar leads should not be covered with insulation, owing to the consequent increase in their high-frequency resistance. Now it can be shown that the increase due to this cause is infinitesimal, whereas the practical advantage of having your leads insulated, so that there shall not be a disastrous "short" if they touch one another, is very real.

Short v. Direct Leads.

The desire to shorten the leads is another point which is often exaggerated in importance. It is true that short leads are desirable, but what is more important than short leads is direct leads. In any case neither short leads nor direct leads will overcome the disadvantages of overcrowding the parts of the set. In a very carefully-designed set, it may be possible to crowd the parts together without ill-effects but, speaking generally, overcrowding does not pay, and it is far better to spread out the parts somewhat (especially the high frequency parts of the set), even if it means using somewhat longer leads. In other words, the advantage of having the parts properly spaced far outweighs the tiny disadvantage of using longer leads.

Remember in all these questions that it is a matter of relative importance of the different factors. The coils are employed on account of their property of inductance, and the condensers for their capacity, but both have resistance, and the resistances introduced in such ways into the set usually far exceed the resistances of the bus-bar leads.

Reflex Receiving Sets.

The beginner with a reflex set is often puzzled by the many peculiarities which these sets are apt to exhibit. For example, the stability of a reflex set will sometimes depend upon the degree of damping which may be introduced by the crystal detector, and if the latter is cut out (by the removal of the cat-whisker from contact with the crystal, for example) the set will howl.

Howling may also be caused in a valve reflex receiver by the use of a grid leak of unsuitable value. If the grid leak resistance is too high, for example, signals will probably fade and become faint, only recovering their normal value when a pause occurs in the incoming wave-train, allowing the

negative charge on the grid to leak away. As the resistance of the grid leak is reduced, the rapidity or frequency of the fading effect will be increased, and this may eventually become so rapid that a howl will be set up in the receiver.

Sometimes a humming may be heard in

AN EXPERIMENTAL SYSTEM.

(Continued from page 355.)

on the face of the panel. The condenser is wired to two independent terminals so that it can also be used for other purposes.

A Useful Unit.

An example of what can be accomplished with a few odd fittings and a panel measuring only 6 in. by 2½ in. is given in Fig. 22. Here we have an interchangeable

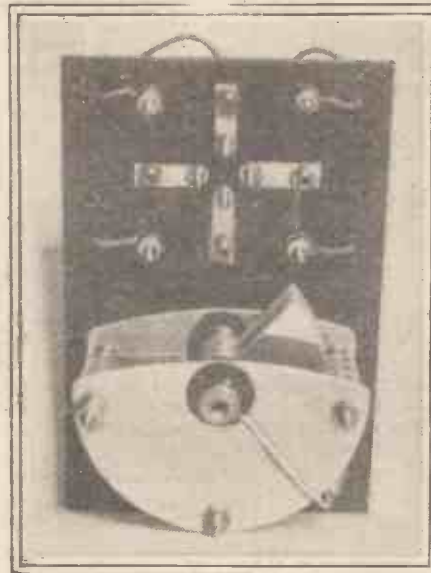


Fig. 21. The reverse side of the H.F. transformer panel.

fixed condenser complete with terminals, a variable anode resistance with terminals, a fixed anode resistance with (the same) terminals, a device for switching one resistance in series with the other, and a small neutralising condenser with terminals. The circuit arrangement of the resistances is shown in the diagram, Fig. 23. If the circuit connections are made to the terminals marked 1 and 2 (terminals each side of variable resistance in Fig. 22), then either the fixed or variable resistance can be tapped by inserting the plug into sockets

the 'phones or loud speaker which does not seem to be affected by any ordinary adjustments of the set. This will probably be found to be due to interference from some alternating current source, such as the electric-light line. If it is due to interference from some outside power-line, loose-coupled aerial tuning should be tried. If the interference is due to indoor electric-light wires, the set should be placed as far away from such wires as possible, but if this does not overcome the trouble, it may be necessary to mount the set in a metal-lined box, or shield it in some other way.

A 1 mfd. condenser in the earth lead of the set may have a beneficial result if the A.C. induction is very bad, while the use of a counterpoise "earth" will often assist in removing the interference.

F or V, and if the plug is ignored altogether and the circuit connections made to the terminals 3 and 4 (marked "F plus V series" in Fig. 22) then the fixed resistance is in series with the variable resistance. The advantage of this arrangement should be obvious.

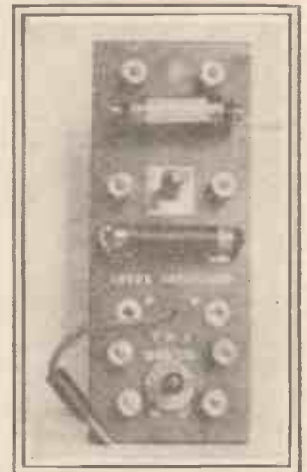


Fig. 22. An "extra" which often proves most useful.

The neutralising condenser is made up from a ball socket and spindle taken from an old crystal detector, a brass flange for clamping the socket into a countersunk hole in the panel; a ½-in. diameter brass disc soldered to the end of the sliding spindle, and another disc, forming the fixed plate, which is provided with an extension piece, bent over, and clamped under one of the terminal nuts. The other terminal is, of course, connected to one of the bolts holding down the clamping flange.

(To be continued.)

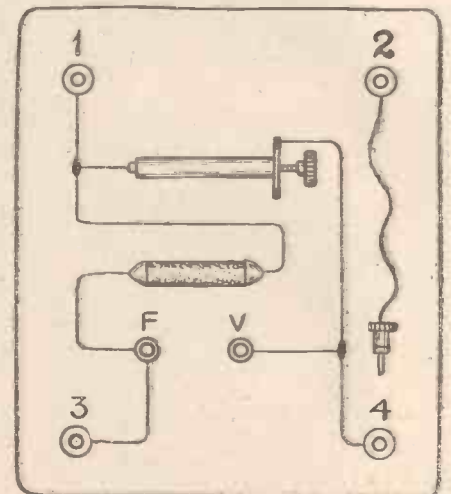


Fig. 23.

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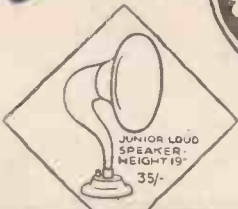
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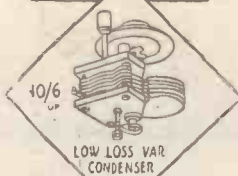
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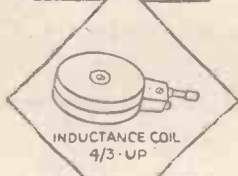
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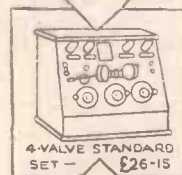
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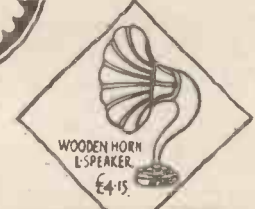


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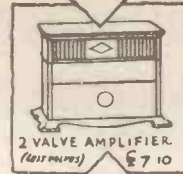


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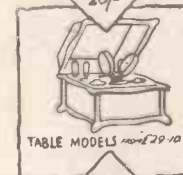
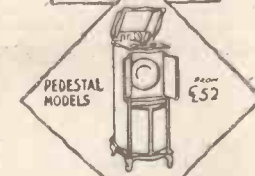


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CURRENT TOPICS.

By THE EDITOR.

The "Radio Sounds" Competition—Mr. Reith's Letter—The Central Hall Meeting—Viscount Wolmer and Senatore Marconi—Mr. Marcuse's New Record.

THE details which we published last week concerning our great "Radio Sounds" broadcasting competition have aroused universal interest throughout the country, and we have to thank the many hundreds and thousands of readers who have already written to us offering their congratulations on what the majority agree in considering a very novel competition.

We also publish on this page a letter from the managing director of the B.B.C., Mr. J. C. W. Reith. This letter, as readers will see, indicates the high opinion the B.B.C. have of this "Radio Sounds" competition. It gives us very great pleasure, indeed, to think that in organising this competition we shall undoubtedly be able to obtain evidence of considerable value to the British Broadcasting Co., and, incidentally, to be of some service to the hundreds and thousands of listeners in this country.

The "P.W." Coupon.

As Mr. Reith says, "the development of the new technique of the radio drama is not the least difficult of (these) problems." The problem of sounds in connection with broadcasting has always been an important one. For several months we were aware of the fact that the B.B.C. would be grateful for any evidence in connection with this problem, and it was this knowledge which prompted us to evolve the "Radio Sounds" competition, and to invite the B.B.C. to co-operate with us in obtaining, by a competition method, the evidence which they stood in need of.

We published last week very full particulars concerning the competition, but we would again draw the attention of readers to the condensed competition rules, and to the coupon form published on the last page of this issue.

The coupon will be again printed in next week's issue of POPULAR WIRELESS, on sale Thursday, October 8th. The competition will be broadcast at 7.50 p.m. on the night of Friday, October 16th, and we would once more point out that listeners not in possession of copies of POPULAR WIRELESS on the night of October 16th need not be prevented from entering the competition.

Dr. Roberts' "Talk."

They can jot down their solutions to the broadcast sounds on a piece of paper, and obtain a copy of POPULAR WIRELESS next morning, and then write out their solutions in ink on the officially printed form. Any number of entries may be sent in, but every effort must be sent in on the official coupon published exclusively in this journal.

We announced last week, very briefly, that the competition would be prefaced by a short talk by Dr. J. H. T. Roberts, our staff consultant. Dr. Roberts' talk will not last more than a few minutes, but



Mr. J. C. W. Reith.

he will present to listeners in a condensed and popular form some exceedingly interesting information regarding broadcast sounds—information which will inevitably make listeners realise the great importance of the evidence which we shall be able to present to the B.B.C. in connection with this competition.

The "P.W." Meeting.

Our announcement last week that we propose holding another great wireless meeting at the Central Hall on the evening of Friday, October 23rd, has also aroused very great interest. We have published

the names of some of the gentlemen who will deliver short lectures at this meeting, and this week we are very glad to supplement this list with the names of two more distinguished gentlemen who have kindly consented to be present.

Viscount Wolmer.

One is the Viscount Wolmer, M.P., Assistant Postmaster-General. Viscount Wolmer has promised to deliver a short address of interest to all listeners. It is not policy at the moment to reveal the nature of this address, but we can assure readers that it will create considerable interest.

Senatore Marconi.

The Editor has also invited Senator Marconi to be present at the meeting, and to say a few words in connection with a matter which we must again refrain from discussing in detail at this early stage. Senatore Marconi has promised to be present, engagements permitting, on the night of the meeting.

In a letter to the Editor, he expressed his appreciation of the invitation, and stated that, should he return from abroad in time for the meeting, he would be most delighted to be present.

Full details regarding free seating accommodation for readers will be found on another page in this issue, and also details concerning the prices of a certain number of reserved seats. We have already received a large number of applications both for free and paid seats, and we would again advise our readers to make early application, as we anticipate disposing of every seat in the course of the next week or so.

2 N.M.'s D.X. Records.

Readers are already aware that both Mr. Gerald Marcuse and Mr. E. J. Simmonds are now contributing exclusive articles only to this journal. In the case of Mr. Marcuse we have also arranged that he shall announce only in "P.W." the facts concerning any new D.X. records he may set up. This information, which has hitherto appeared as exclusive news information in the daily papers, will now appear exclusively in "P.W.," and this week we have pleasure in publishing the following report from Mr. Marcuse:

"I beg to inform you that I have, for the first time, successfully established two-way communication with Kohat (North-West Frontier?), India, on Friday, September 25th, on Morse and telephony. On the evening of September 26th I used telephony only, and every word was received. The replies were in Morse."

(Signed) GERALD MARCUSE.

We offer our warmest congratulations to Mr. Marcuse on the occasion of this new record, and hope that he will communicate as regularly with Kohat as with Mosul—which latter town, by the way, Mr. Marcuse chats with every Friday night.

FROM THE MANAGING DIRECTOR OF THE B.B.C.

Dear Sir,

We are very glad that you have evolved a "Radio Sounds" Competition. It seems to me that the results of this Competition will be of considerable value to us.

We are pleased to acknowledge our obligation to the Press for the efforts it makes to help us in the solution of some of the difficult problems which arise in connection with our work. The development of the new technique of the Radio drama is not the least difficult of these problems and we therefore look forward with special interest to the outcome of your Competition.

Yours faithfully,
J. C. W. REITH.

A COMBINED TONE CONTROL, FILTER CIRCUIT, AND DISTRIBUTOR.

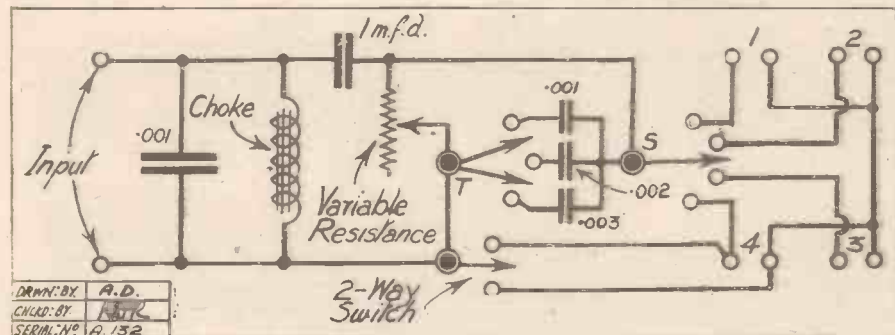
By R. H. BRADLEY.

THE loud speaker is often blamed for distortion which can be traced to the receiver itself, and when this is the case the only remedy is to get at the root of the trouble. But even when the necessary steps have been taken to obtain pure amplification there is much which can be done to improve the tone of even the best of loud speakers, especially when dealing with any considerable volume.

The use of a condenser of the correct capacity across the loud speaker has an appreciable effect upon the tone, and care

long extension leads are used, and there is difficulty in distinguishing which is which. It is also possible to work the loud speaker with only one connection to the filter circuit by earthing the other. This is sometimes an advantage when the loud speaker is taken into the garden some distance from the set, and provided a good earth connection is made there need not be any great loss of signal strength.

The size of choke coil is not important. The writer has experimented with different chokes varying greatly in resistance and



should be taken to select the best value for the particular loud speaker used. Without a condenser the reproduction will often be slightly harsh and tinny. A condenser of too large a capacity will lower the tone, and make it woolly and guttural.

When testing for the best capacity it may be rather difficult to detect the difference when, say, a .001 is substituted for a .002 condenser, but if a selector switch is provided so that the change can be made very quickly the difference will be evident. There is a further advantage when a switch of this description is used if the loud speaker is used in different rooms in a house. Extension leads, if of any great length, can have an appreciable capacity, so that the size of condenser necessary across the loud speaker when it is used in a distant room should be less than when it is used in the same room as the receiver.

Obtaining Pure Production.

Another popular means of obtaining better reproduction, without loss of volume, is the use of a filter circuit across the output terminals of the receiver. This consists of an iron-cored choke connected across the usual telephone terminals, with a condenser of 1 or 2 mfd. connected in series with the loud speaker. The condenser prevents the current from the H.T. battery passing through the loud-speaker windings, so that it obviates the risk of a burn-out, and also permits of a closer adjustment of the diaphragm to the magnets, and a consequent reduction in diaphragm distortion.

The elimination of the D.C. component from the loud-speaker windings makes it unnecessary to consider the polarity of the magnets, and this is of advantage when

number of turns, but has not noticed any marked difference provided the choke is above a certain size. As the choke is connected in the position usually occupied by the loud speaker, a similar resistance is suitable, and a choke having a resistance of, say, 2,000 ohms, will be satisfactory. It is quite usual to use the secondary of a burnt-out transformer, and, as a closed core is advisable, a transformer is very suitable.

Another means of overcoming harshness is the use of a leak across the loud-speaker terminals. A commercial grid leak has rather too high a resistance, and a variable anode resistance is preferable.

The loud speaker unit described below combines the parts mentioned above, and also acts as a distribution board, so that the loud speaker may be connected in any room simply by turning the knob of the switch.

Besides the advantage of improved reproduction and the convenience of a distribution board, the combination in one unit permits of rapid connection to any set under test and obviates the necessity of any duplication of parts when the user possesses more than one receiver.

The circuit diagram of the "tone control-filter-distributor" is shown herewith. In the actual unit, the pairs of terminals

Nos. 2 and 3 are connected to extensions to other rooms, No. 1 pair being for the loud speaker when it is used in the same room as the receiver, and No. 4 for the 'phones. The connections to Nos. 2, 3 and 4 are made permanently, and selected by means of the switch arm "S." The two-way switch is for the purpose of connecting the 'phones in series with the loud speaker, irrespective of the extension to which it is connected. By changing the switch over, the 'phones are disconnected, or can be used by themselves by moving the selector switch to No. 4.

The three tone-control condensers are .001, .002, and .003, and one side of each is connected to a valve socket. Two valve pins are connected to the terminal "T," so that by plugging in both, two of the condensers can be used in parallel in order to obtain a larger capacity than .003 if required.

The .001 condenser across the choke was found an advantage with the particular one used, although with another type of choke it might not be necessary. The choke was an old transformer, and it seemed to make no difference if the two windings were connected in series or the secondary used alone.

Testing the Distributor.

The panel used measured six inches square, but the actual lay-out is not shown as it is not important. The wiring is not difficult, and as there is no risk of reducing the efficiency by capacity in the wiring, no particular care is necessary in designing the lay-out or wiring.

The loud speaker should first be tested in the same room as the receiver, and experiments made to find the best capacity. It should then be connected to each pair of terminals in turn, with the extension leads also connected, and the best capacity found and noted for the extension. Instead of a selector arrangement for the condensers, one of the correct value should be connected across each pair of terminals, but this might lead to a duplication if a number of exten-



Dr. Lee de Forest (right) demonstrating his latest receiver to M. Lucien Levy, the original inventor of the super-heterodyne system.

sions were used. The user of such a unit who has a good ear for music will probably find that a band, for instance, sounds better with a different capacity from that used for a single instrument or voice.

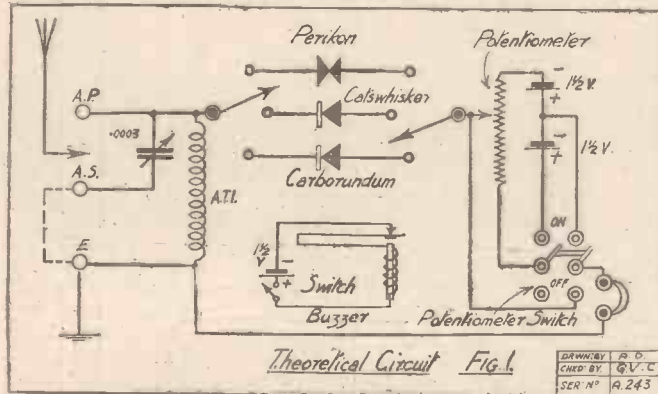
The complete unit will be found very convenient and extremely interesting from an experimental point of view, besides considerably improving the loud-speaker reproduction without loss of volume.



Designed, built and described by G. V. COLLE ("P.W." Technical Staff).

THE set to be described was designed to meet the requirements of the more "advanced" crystal amateur. It is unique in that it is easily adaptable for use with an H.F. valve or in a reflex capacity. In view of this, a plug-in coil, tuned by a .0003 mfd. variable condenser, was employed in preference to a tapped coil, as it becomes an anode coil when the instrument is connected to an H.F. amplifying unit. The circuit utilised is quite an ordinary one, except that several switches are incorporated, and these permit the selection

"strap" connected between the "series" terminal and the earth terminal, while the earth lead itself is connected permanently to the latter terminal. For wave-lengths under 600 metres the aerial lead is connected to the "series" terminal, while the earth lead remains on the earth terminal. The piece of wire connecting the "series" terminal to the earth terminal should be removed in this latter arrangement, and the "parallel" terminal is left unconnected.



Theoretical Circuit Fig. 1. DRAWN BY P. D. CHKD BY G. V. C. SER. NO. R. 243

of any one of three crystal detectors, the eliminating or introduction of a potentiometer, and other useful arrangements. Referring to Fig. 1, it will be seen that provision is made for series or parallel aerial condenser tuning. A considerable number of our readers are probably quite familiar with the three-terminal system employed; but for the benefit of those who are not, it will, perhaps, be as well to describe the arrangement.

Three Detectors Provided.

For wave-lengths over 600 metres, and including that of 5 XX, parallel condenser tuning of the aerial coil is to be advised. In order to obtain this the aerial lead should be connected to the terminal marked "parallel," and a short lead or brass

useful asset if the crystal set is operated with a valve as a reflex set. Two three-stud rotary switches of the miniature type are employed for changing over from one crystal detector to another. Both the switch arms are moved simultaneously. Thus, if the reader wishes to use the cat's-whisker detector, both switch arms are moved

to the No. 2 position, or to the centre studs. One switch arm only could have been employed, but as this would have led to dead-end losses, the writer decided to use two and so get the very utmost from the set. The last switch needing any full description is the D.P.D.T. switch. This switch is marked "potentiometer on" and "off." When in the "on" position a potential is applied to whichever crystal detector is in use.

PARTS REQUIRED.		s. d.
1 Panel, 8 1/4 x 7 x 1/2 in. (Peto-Scott)		4 0
1 Box, 8 1/4 x 7 x 3 in. deep (Peto-Scott)		4 6
5 Terminals, W.O. type		7
1 Coil holder for panel mounting		6
1 Push-pull switch		1 6
2 3-stud switch arms (miniature type), (Peto-Scott)		2 6
1 .0003 variable condenser, with vernier		5 6
1 Potentiometer, 300 or 400 ohms		3 6
1 D.P.D.T. switch (Nesthill)		2 0
1 Carborundum Crystal detector (Gamage's)		3 9
1 Perikon Crystal detector (Lion)		2 6
1 Vertical Crystal detector (miniature type), (Bowyer-Lowe)		4 6
1 Buzzer (miniature type), (Silver-town)		3 6
1 4 1/2 volt. round torch battery (having 3 small cells)		10
"Glazite" wire		1 6
Screws, ebonite, transfers, etc.		1 6
6" 2 B A Brass Rod		2

However, as the carborundum is the only detector really needing a potential to operate it successfully, the D.P.D.T. switch should be in the "off" position when this crystal detector is not in use. In any case, when the set is not in use this D.P.D.T. switch should be in the "off" position, otherwise the batteries across the potentiometer will be unnecessarily wasted. Operating the Buzzer. The last three pieces of apparatus fitted to the panel and not yet mentioned are the push-pull switch, the "high-note" miniature buzzer, and the potentiometer. (Continued on page 362.)



Adjusting the potentiometer; the carborundum crystal detector is in use.

AN EXPERIMENTAL CRYSTAL SET.

(Continued from page 361.)

The push-pull switch simply operates the buzzer. When pulled out the buzzer is set in operation, and when pushed in it switches it off.

Perhaps it will be advisable to mention here to what use the buzzer is put and how the carborundum detector is adjusted.

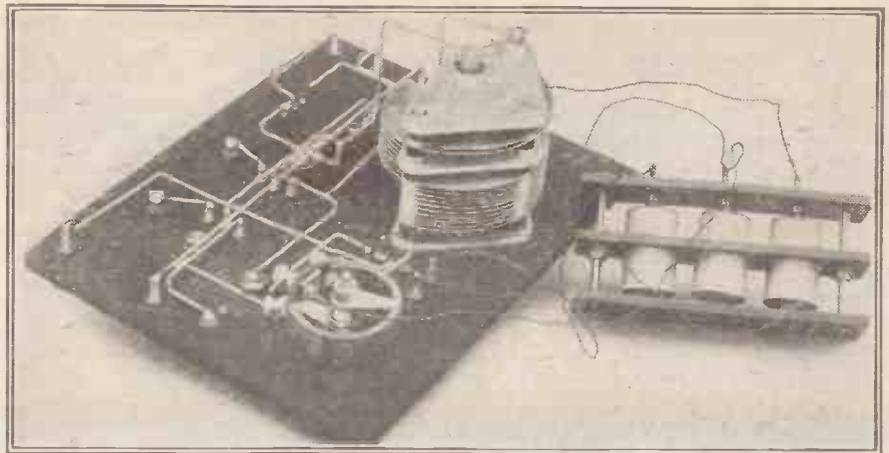
Carborundum Detector Adjustment.

As the reader will see from the theoretical circuit, the buzzer is contained in a complete circuit of its own. The buzzer circuit constitutes the buzzer, a 1½-volt cell, and the push-pull switch.

It is used to excite the aerial circuit of the set, and when the potentiometer is adjusted, and the carborundum detector set, a distinct buzz should be heard in the phones.

Before adjusting the potentiometer, the aerial coil should be inserted and the phones connected to their terminals.

The aerial and earth need not be connected, as they do not affect this adjustment.



A view of the wiring showing the three cells employed for operating the buzzer and carborundum detector.

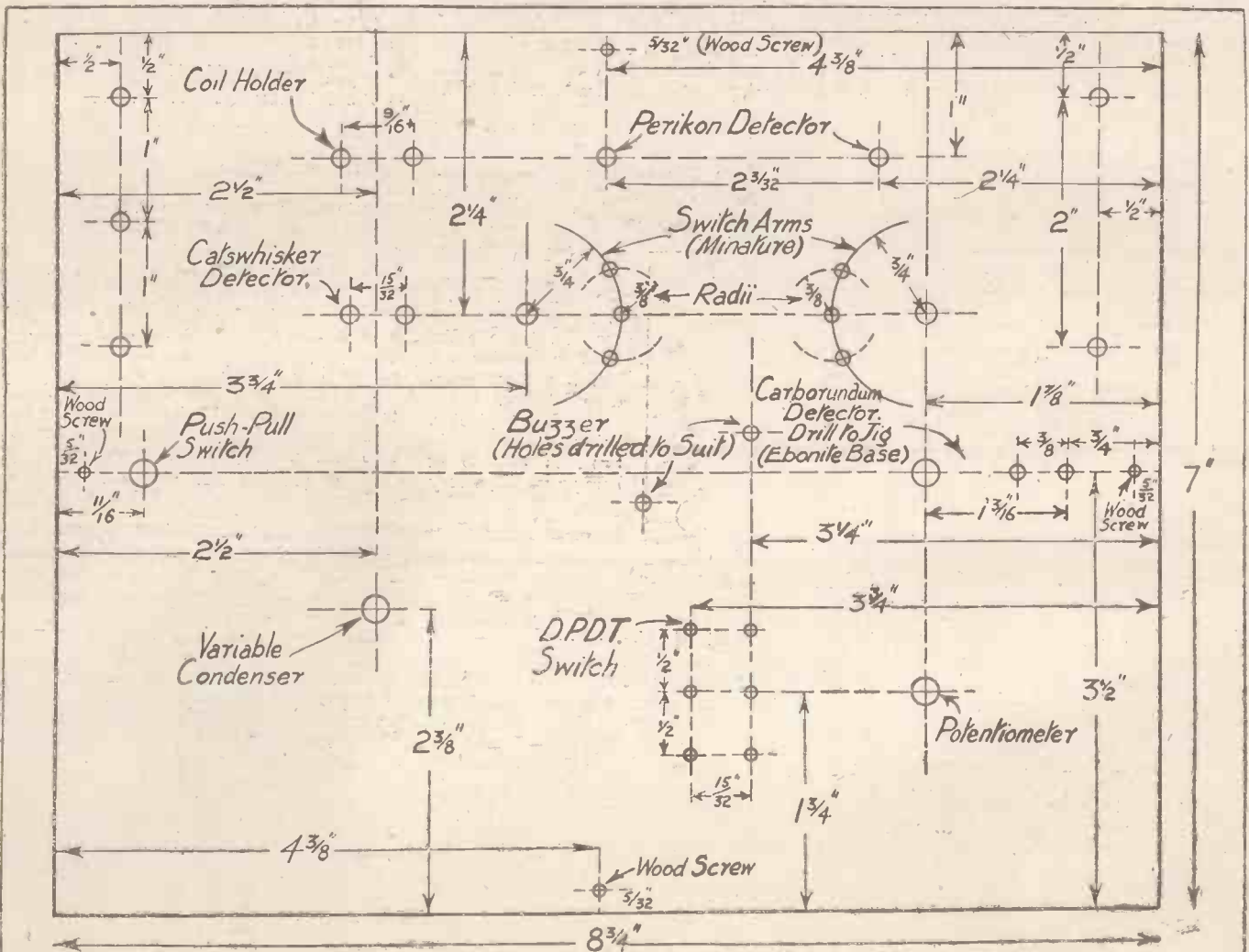
Having inserted the aerial coil, the buzzer should be set going and the D.P.D.T switch placed in the "on" position. The two rotary switch arms should, of course, be in the No. 3 position.

The steel arm of the carborundum detector is now brought into contact with the crystal.

The last adjustment is then made with

the potentiometer by turning its arm slowly round. In one position on the potentiometer a "mushy" buzz will be heard, which will gradually get clearer as the arm is rotated, until at one particular point somewhere near the centre of the winding the buzz will be very sharp. The potentiometer is then set to give the most suitable

(Continued on page 367.)



DRW: BY	A. D.
CHKD: BY	G. V. C.
SER: N°	A 244

Panel Layout of Experimental Crystal Set. FIG. 2.



FOUR MILLION horse power under control

NIAGARA FALLS supply the energy for huge electric power stations—power that is used to drive electric trams in cities 250 miles away.

A button pressed, a lever moved, the turn of a knob; that is how things are done to-day—the result of inventive genius and modern engineering skill.

ORMOND PRODUCTS are typical examples, and the outcome of 25 years' British Manufacturing experience.

Ormond Low Loss Condensers (SQUARE LAW)

A new departure in British Condenser design, giving the following advantages:—

1. Practically negligible losses. 2. One-hole fixing—one $\frac{1}{4}$ in. diam. hole is needed to fix this condenser to panel. 3. Rigid construction—cannot warp; end plates of stout aluminium, perfectly flat. 4. Fixed vanes supported by $\frac{1}{4}$ in. ebonite strips. 5. Smooth action, spindle tension is maintained by a specially designed friction washer. 6. Moving vanes and end plates are at earth potential. 7. One-piece knob and dial—supplied loose. Secured by 4BA Set Screw.

This condenser is fitted with optional soldering Tags, or Terminals, and can be supplied with or without Vernier as desired.

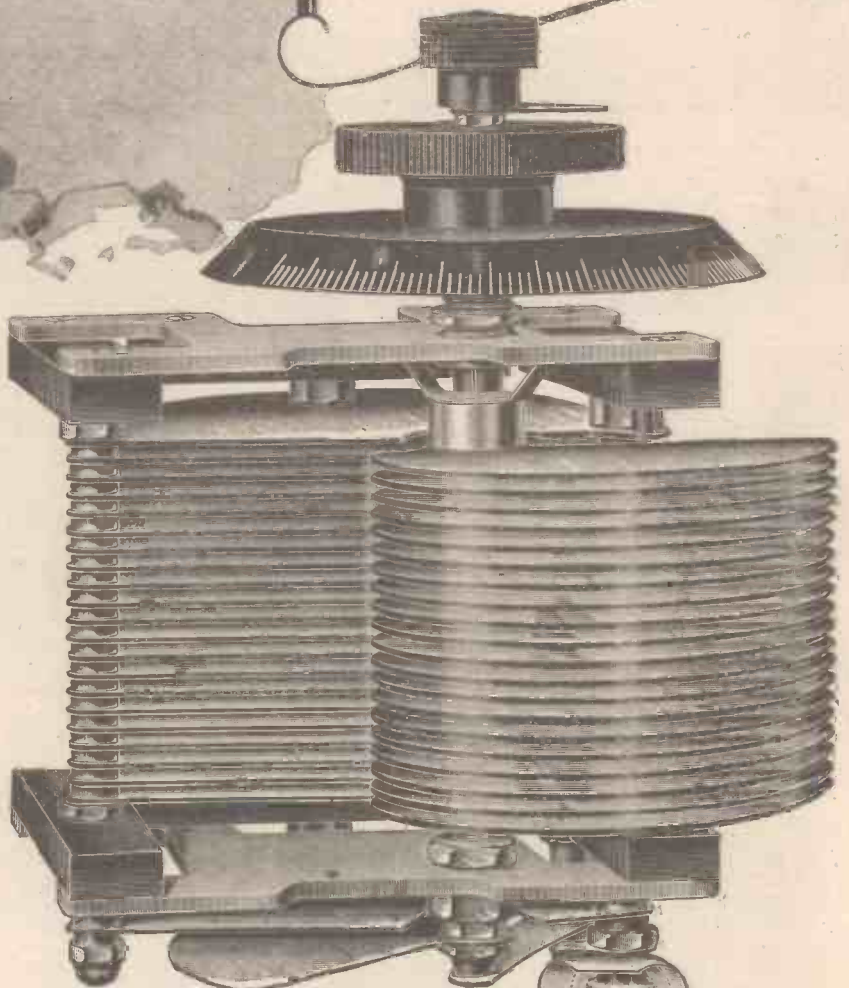
Supplied in the following sizes:

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

Complete with Knob and Dial.

We specialise in turning Brass and Steel Screws and Machined Parts and Accessories of all descriptions.

All Cheques and Postal Orders should be crossed and made payable to "The Ormond Engineering Co."



Write for new (1925) Catalogue. Trade Terms on request.

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Inspection
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FOREIGN RADIO NEWS.

FROM OUR OWN CORRESPONDENTS.

The Berlin Wireless Show.

THE exhibition organised by the German radio industry, the second of its kind in Germany's capital, has proved, from every point of view, a great success, and offers many points of considerable interest and novelty.

One of the notable events in connection with the show was the special session for the Press on the day before the official opening, in September. Representatives of the entire Press, editors of all important periodicals and reviews, leading writers and dramatists, were invited to attend two conferences on the subject of (1) the relations between wireless and the Press, and (2) the relations between wireless and music and the drama.

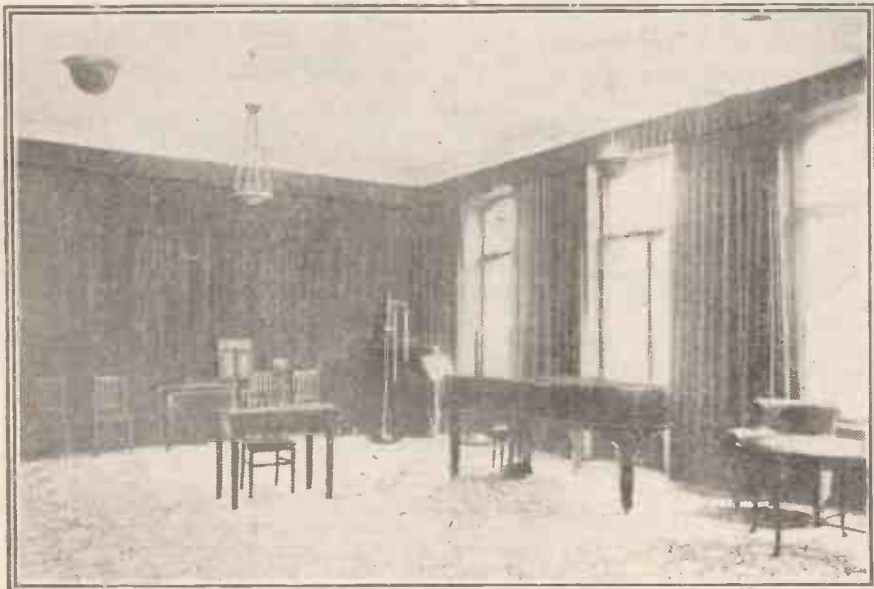
The first of these was delivered by Herr Gustav Richter, the president of the German Press Association on the general, and by

very complicated scene from the opera "Der Freischütz" was the *pièce de résistance* of the demonstration, which amply showed that the original idea of broadcasting—merely playing or singing something into a receptor—was by no means the whole art, but only the very rudimentary beginning of it.

Among other features of the exhibition was a film showing in detail the whole working of a big transmission and broadcasting station, and a special exhibit of self-made reception and sending wireless apparatus by amateurs, among which were some extraordinarily ingenious and clever contrivances, with which, as was demonstrated to the visitor on the spot, remarkable results were attained.

More Radio Exhibitions.

Three more radio exhibitions are signalled in various Central European countries. These are the wireless section of the Prague



The studio of the Stockholm Broadcasting Station.

Professor Leithauser on the technical, sides. Interesting speculations were indulged in regarding the division of labour which, in the future, must be made between the "spoken Press" and the "written Press." The general consensus of opinion appeared to be that, more and more, people would look to radio for the actual news, the skeleton on which the Press of to-day is built up, while from the newspapers themselves they would look for the "flesh," the descriptive specials, the comments, the editorial, the intelligent anticipation.

The second lecture was delivered by Herr Schaeffer, and was illustrated copiously by demonstrations. The speaker showed that, to attain good results in transmission of the speaking or singing voice, or of instrumental music, certain precautions were essential, the neglect of which was more than anything else responsible for the indifferent nature of many of the radio concerts picked up from even first-class broadcasting stations. A

International Fair, which was held from September 6th to 13th, and that of the Lwow (Poland) Oriental Fair, held from September 5th to 15th. Also a forthcoming International Exhibition of Wireless Telephone, to take place at Zagreb, in Jugoslavia, from the 15th to the 20th of this month. It is being found that these shows create a lively interest in radio work, and react very favourably on the local and import trade in radio apparatus.

More French Amateurs.

During the last six months, the number of private transmission stations in France has increased by no less than 91. On January 1st, 1925, there were 120 amateur sending stations, the call numbers of which were strung from 8 A A to 8 E R. On July 1st, there were 211, the last number granted being 8 I K, ascribed to the Radio Club of Touraine.

(Continued on page 384.)

A DULL FILAMENT VALVE IN THE TRUE SENSE!

The P.M.4 Master Valve

The P.M.4 Master Loud-speaker Valve stands triumphantly alone above the accepted standard in valves for loud speaker reception.

It is the NEW "N" FILAMENT VALVE!

This "N" filament is prepared by an entirely new process, whereby the special coating is obtained in an extremely adherent condition, making it capable of giving considerable electron emission at very low temperatures.

The ample proportions of this "N" filament, with its exceedingly low current consumption, results in truly dull filament operation. In fact, the heat present in the filament of the P.M.4 Valve is so small that no sign of glow can be discerned.

There are four supports to this unique "N" filament. It is absolutely non-microphonic. The low current consumption of only 100 milli-amperes means vastly increased valve life and longer battery service without recharging.

Only a 4-volt accumulator or three dry cells are required for the P.M.4 Master Valve.

Try one in your set to-night and note the wonderful purity of tone and volume you will obtain from your loud speaker.



PRICE EACH 22/6

Ask for Leaflet V.R.28

Mullard

THE MASTER VALVE

Advt.—The Mullard Wireless Service Co., Ltd.,
Batham, London, S.W. 12.



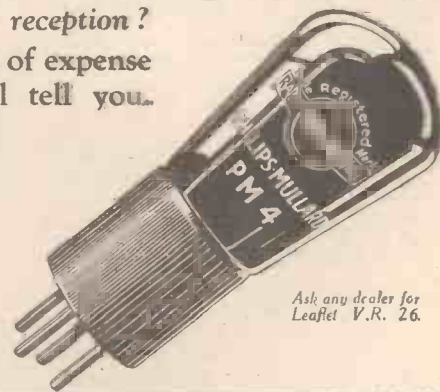
“What I come home to”

I'VE GOT A REAL radio set at home and a jolly fine arm-chair. If any of you chaps told me of anything better than those two joys—I wouldn't believe you.

I come home just bursting with keenness to have my evening of real music in comfort. But it wasn't always like that. I had to find out the one great secret. Anybody can buy a really good arm-chair and build a good set, but can you buy the valves that will give you strength and beautiful purity of reception?

If you want to save a lot of expense and disappointment, I'll tell you.

Ask for



Ask any dealer for Leaflet V.R. 26.

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THE · MASTER · VALVE

Advt. The Mullard Wireless Service Co., Ltd., Nightingale Lane, Balham, London, S.W.12.



Bring in the D.X. stations thro' the local!

If you would separate Radio-Paris from 5XX, 2LO, from Cardiff and so on up and down the scale . . . if your local station is too "high-brow" this evening or too "low-brow" as the case may be . . . you want an Ericsson WAVE TRAP.



By a careful combination of circuits skilfully arranged you can easily reach out to your heart's content. It simply means 50% extra selectivity for your set. Minimises trouble from electric mains, local disturbances like trams, electric trains, etc. You can easily get distant stations on the loudspeaker you never could try for before . . . all through having an Ericsson WAVE TRAP in your aerial lead.

Price 60/-

Write for further information, also lists describing our receivers, crystal and valve, Super Tone Loudspeaker, telephones, components, etc.

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Ericsson
WAVE TRAP



Buy British Goods Only

"TANGENT" The Better Coil!



THE first job of a coil is to tune-in signals, but the reason one coil is better than another is not always apparent to the prospective user.

Where coils are concerned, it is agreed, you simply need to eliminate thoughtless, ill-considered purchases.

In other words—know in advance just what you are going to buy—and why.

In the first instance, coils must be really efficient. There is no mystery about the efficiency of the Tangent Coil: the special method of winding allows a larger gauge wire to be used, which naturally offers a minimum resistance to high-frequency currents.

There is ample air spacing between the windings, reducing the self-capacity to a minimum. The windings are in no way interlaced and this absence of turn crossing turn is a factor of no small importance. The tuning is so sharp that the resulting selectivity is surprising, and there is a complete absence of distortion at all frequencies.

Finally there is the quality of the coil. A sound mechanical job, substantially built on a stout frame, each coil is a solid and compact unit, not affected in any way by handling.

Made to fit all standard coil holders.

See Tangent—The Better Coil Now. Ask your Dealer to-day.

COIL No.	25	35	50	75	100	150	200	250
Self-Capacity in	8	9	25	31	22	16	22	22
Micro-Microfarads	4/3	4/3	4/3	4/6	5/-	6/-	7/-	7/6

COMPLETE SETS
4 Concert Coils (W/L 250 to 1,180) 18/- the set.
11 " " (W/L 250 to 9,500) 67/- " " "

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TANGENT
FITMENTS
GENT & CO. LTD.
Established 1872

GENT & CO., LTD., FARADAY WORKS, LEICESTER.

AN EXPERIMENTAL CRYSTAL SET.

(Continued from page 362.)

potential to the detector, and the buzzer is switched off.

The buzzer, it should be mentioned, gives

Having set the carborundum detector, the aerial and earth can be connected, and the set tuned with the variable condenser in the usual way.

Do not forget to switch the potentiometer "off" when not using the carborundum detector.

On the writer's set, the honours of being the best crystal detector were shared between the perikon and the carborundum,

POINT-TO-POINT CONNECTIONS.

(Looking at back of panel.)

Aerial parallel terminal to socket side of aerial coil holder, to switch arm nearest the cat's-whisker detector, and to the moving vanes of the '0003 variable condenser.

Aerial series terminal to the fixed vanes of the '0003 variable condenser.

Earth terminal to the plug side of the aerial coil holder and to one 'phone terminal.

Other 'phone terminal to the centre left-hand contact of the D.P.D.T. switch.

Top left-hand contact of the D.P.D.T. switch to the moving arm of the potentiometer and to the switch arm nearest the carborundum detector.

The perikon detector is now connected to the top stud of each rotary switch (No. 1).

The cat's-whisker detector is then connected to the centre stud of each rotary switch, and the carborundum detector as follows:

Crystal side of carborundum detector to bottom stud of the right-hand rotary switch. The steel arm is connected to the bottom stud of the left-hand rotary switch (No. 3).

Right-hand terminal of the potentiometer (one end of the winding) is connected to the centre right-hand contact of the D.P.D.T. switch. One side of the push-pull switch to the coils of the buzzer.

Thin flexible wires are joined to the following:

Other side of the push-pull switch to the contact stud (positive) on cell 1.

Pillar side of buzzer (pillar joined to the adjusting key), to the spring of cell 1 (negative).

Left-hand terminal on the potentiometer (other end of the winding) to the spring on cell 2 (negative).

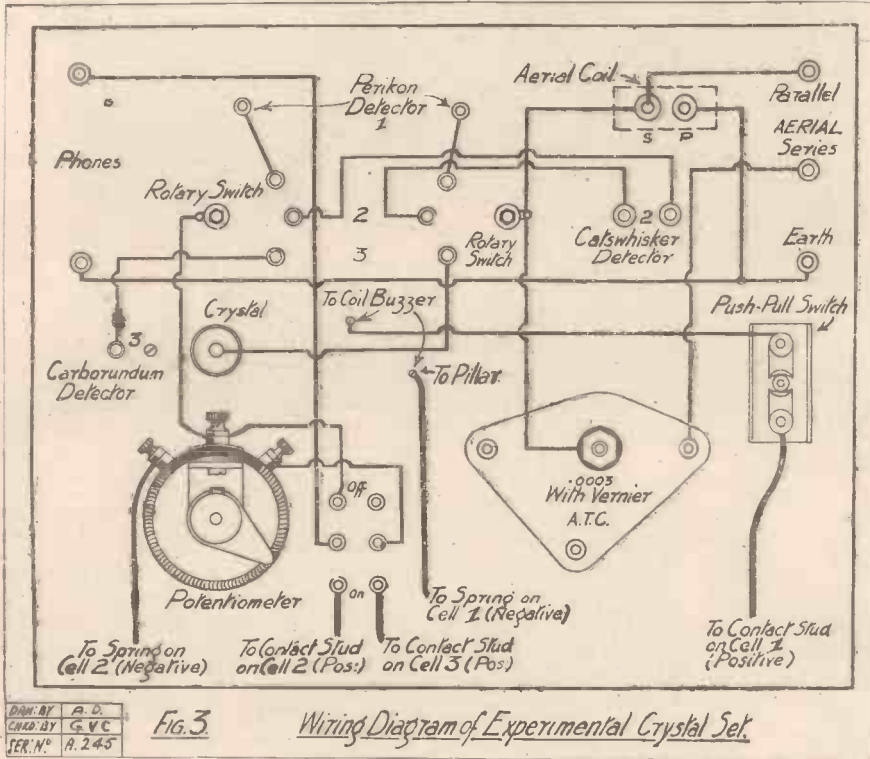
Bottom right-hand contact of the D.P.D.T. switch to the contact stud (positive) on cell 3.

Bottom left-hand contact of the D.P.D.T. switch to the contact stud (positive) on cell 2, and also to the spring of cell 3 (negative).

This completes the wiring.

NOTE.—When not using the set, the D.P.D.T. switch should be in the "OFF" position, otherwise the batteries across the potentiometer will be in operation, and therefore be wasting.

(Continued on page 368.)

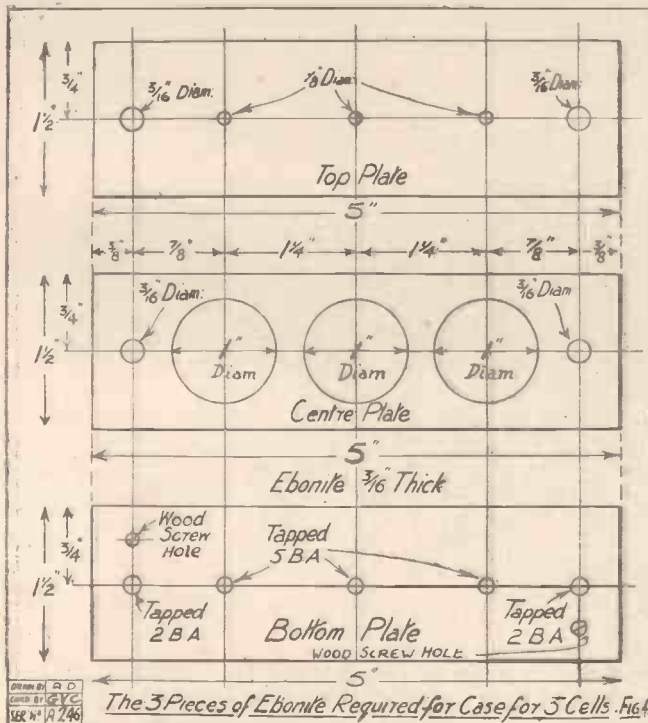


DRW. BY A.D.
CHKD. BY G.V.C.
SER. N° A. 245

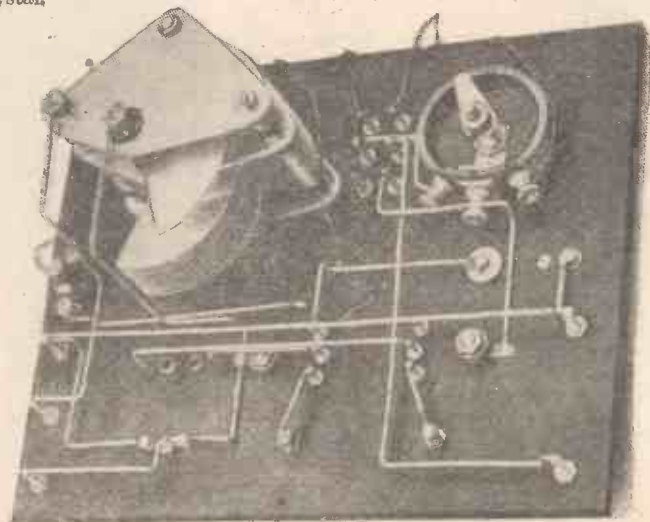
the best results when the note obtained is very steady and rather piercing, as it enables a "sharp" setting to be obtained with the potentiometer.

although the latter detector was undoubtedly the most stable, it being practically an impossibility to upset its adjustment. The writer strongly advises the reader who

makes the set to employ the carborundum detector in the event of there being no broadcasting on at the time of using the set, as he will then be certain of a sensitive crystal.



DRW. BY A.D.
CHKD. BY G.V.C.
SER. N° A. 246



Another view of the wiring showing the connections to the various switches.

AN EXPERIMENTAL CRYSTAL SET

(Continued from page 367).

Nothing has yet been said about the making of the set, but as the various diagrams shown on these pages are very clear, it is nearly possible for the reader to build the set from them without further description.

There are, however, several little points which may crop up, and therefore the following few hints may prove useful.

First of all, all measurements given in the panel lay-out (Fig. 2) only apply to the apparatus employed, and the reader should, therefore, use caution in seeing that either his apparatus is identical with that shown in the photographs, or else that the drilling is arranged to suit his own particular components.

Holes which may vary are those for the plug-in crystal detector, the buzzer, and the carborundum detector.

Templates are given with the "Lion" perikon detector, the D.P.D.T. switch, and the ebonite base of the carborundum detector—which was removed—can be used for the latter component.

Other apparatus on the panel—with

from a $4\frac{1}{2}$ -volt round torch battery, and are about $\frac{7}{8}$ in. diameter.

If the reader does not wish to go to the trouble of making the case, although he is strongly advised to do so, then he can solder the wires going to the springs to the zincs direct.

Cell Connections.

The wires going to the contact studs will then be soldered to the brass caps on the carbons. So as to avoid confusion, the writer advises the reader to number each cell with a pencil.

The zincs of the cells are negative and the carbons positive.

The Coils to Use.

The ebonite case or "crate" for the cells can be screwed to the bottom of the box so as to avoid placing strain on the flexes to the cells.

Finally, for the benefit of those readers who wire from the wiring diagram, (Fig. 3) and who wish to check their wiring, a list of point-to-point connections is also given, and a list of the components required together with their cost (approx.).

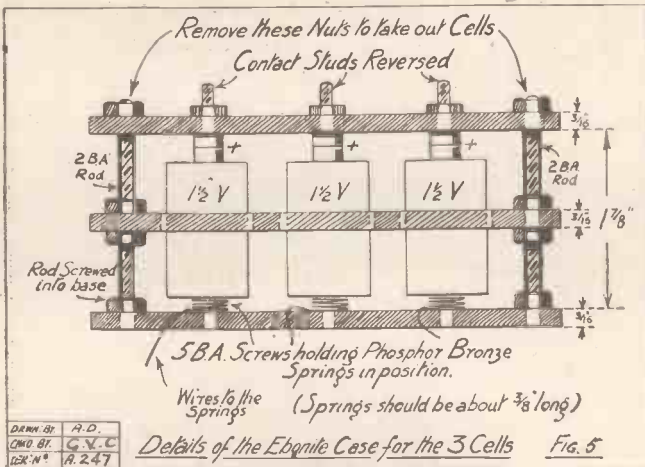
Suitable coils for the various wave-lengths are as follows:

For B. B. C. stations:

- Aerial in series, 75.
- " " parallel, 35 or 50.

For 5 X X:

- Aerial in parallel, 200.



the exception of the rotary switches—is of the single-hole fixing type.

Having drilled the panel and fitted the apparatus, the wiring can be commenced.

The original set was wired with the now well-known "Glazite," one coil of 10 ft. being sufficient to wire-up the whole set. As readers will doubtless like the set wired in different colours, several lengths totalling 10 ft. of assorted colours can be obtained.

The resultant wiring, if carefully carried out, is very pleasing in appearance as well as being neat.

The Battery Case.

Readers are well advised to make the little ebonite case for three $1\frac{1}{2}$ -volt cells if they wish to avoid the bother of unsoldering and resoldering wires to them at any future date—in the event of replacements.

With the arrangements shown in Figs. 3 and 5 it is possible, on removing the two 2 B.A. nuts, to replace the cells with new ones in a couple of minutes.

The cells used in the set were obtained



The completed set as will be seen above, is a very compact, neat little instrument. The switches are "set" for the perikon detector, the potentiometer battery being switched off.

from a $4\frac{1}{2}$ -volt round torch battery, and are about $\frac{7}{8}$ in. diameter.

The zincs of the cells are negative and the carbons positive.

The Coils to Use.

The ebonite case or "crate" for the cells can be screwed to the bottom of the box so as to avoid placing strain on the flexes to the cells.

Finally, for the benefit of those readers who wire from the wiring diagram, (Fig. 3) and who wish to check their wiring, a list of point-to-point connections is also given, and a list of the components required together with their cost (approx.).

Suitable coils for the various wave-lengths are as follows:

For B. B. C. stations:

- Aerial in series, 75.
- " " parallel, 35 or 50.

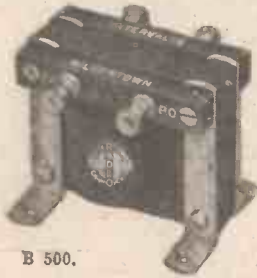
For 5 X X:

- Aerial in parallel, 200.



The cells can be quickly removed and changed if the case described is employed.

Silvertown Wireless Accessories



B 500.



B 558.

Quality guaranteed by over 50 years' electrical manufacturing experience.



B.500. INTERVAL VALVE TRANSFORMER. Guaranteed for 12 months. Price 21/- each. This Transformer has been adopted by leading manufacturers of Wireless Receiving Sets and discriminating amateurs in all parts of the world. Excellent results have been obtained on tests carried out by the National Physical Laboratory. Copy of the curve can be had on application.

B.558. VARIABLE CONDENSERS. (For use as Independent Units.) Strongly constructed on the same principle as variable condensers for panel mounting. Enclosed in dust-proof non-inflammable Celastoid covers, and fitted with dial, knob, two terminals and three feet for fixing to table or board if required. Price 12/- each.

EBONITE CONDENSER DIALS AND KNOBS. In one piece, graduated in white, 0-180°, highly finished, complete with fixing screw, dial approximately 3 in. diameter. Complete, 1/3 each. Dials only, 10d. each.

B.599. SILVERTOWN FILAMENT RHEOSTAT. ONE HOLE FIXING. Circular pattern, on ebonite former, complete with knob, pointer, black celluloid scale engraved in white and two terminals for connections. The resistance wire is wound on an insulating rod, thereby giving a perfectly smooth adjustment. B.599—Wound to approximately 5 ohms resistance. B.600—Wound to approximately 30 ohms resistance.

B.505. TESTING BUZZERS. Complete with Switch. Mounted on ebonite base with terminals and shunt, or mounted with terminals, shunt and switch. 7/- and 8/- each. Supplied unmounted, 3/6 each.

B.570. 10-WAY INDUCTANCE OR CAPACITY SWITCH. (Patent 226245.) This switch is of the under panel mounting type, and is fitted to the panel by means of the two counter-sunk head screws supplied. It enables the experimenter to build up large capacities, and is an invaluable addition to any set. Price 5/6 each.

B.513. TELEPHONE HEADPIECES. The "Stalloy" diaphragms are matched so as to secure a balance of tone and quality. Resistance from 120 to 12,000 ohms. Price (4,000 ohms), 20/- each.

B.529. POTENTIOMETERS. (For panel mounting.) On rectangular ebonite former, complete with knob and pointer. Former mounted on cast brass frame. Resistance approximately 400 ohms. 7/6 each.



B 599.



B 570.



B 505.



B 513.



B 529.

AN AID TO ENTHUSIASTS.
We have prepared a logging chart for recording wavelengths, condenser settings, etc., of those stations which require careful calibration to tune in. A copy of this chart, printed on stiff card, with hanger, can be obtained free of charge at any of our Branches or from any high-class dealer.

MAKERS:

THE SILVERTOWN COMPANY

106, CANNON ST., LONDON, E.C.4.

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BRISTOL: 4, Victoria Street.
CARDIFF: Pier Head Chambers, Bute Docks.
DUBLIN: 70, Middle Abbey Street.
GLASGOW: 15, Royal Exchange Square.
LEEDS: 1, New York Road.

LIVERPOOL: 54, Castle Street.
LONDON: 100 and 102, Cannon Street.
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NEWCASTLE-ON-TYNE: 59, Westgate Road.
PORTSMOUTH: 49, High Street.
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Insist on a Scientific HEADPHONE—

which combines all the following advantages—

Its total weight being only 8½ ounces, it can be worn for long periods without the smallest sensation of discomfort. This extreme lightness and the woven headband make it *the ideal headphone for ladies' use.*

It is instantly adjustable to the head, without the use of screws.

It ensures a clarity and strength of tone which one usually associates with only the most expensive instruments, and it is fully guaranteed for 12 months.

Price 12/6

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The little more—that makes the "MARS" seem Marvellous

A coil's a coil and no method of winding can make it do more than a coil's job.

But there are coils and coils. Some are gluttons for capacity; in others capacity is reduced to an absolute minimum.

The new "Mars" Coil belongs to the latter class. From start to finish of the winding there are no parallels and therefore, for all practical purposes capacity simply is not.

Moreover, the "Mars" Coil is peculiar in this respect. It gives better results than it should do. Why, even experts have so far failed to fathom. Technically it is only 25% superior to other coils; but audibly it is 75% superior. The little more—how much it is. How much is it? Test a set and see how much more listening-in pleasure the Mars will bring to you!



THE NEW "MARS" COIL

(Patent Applied For.)

For Broadcast Wave-lengths.		
No.	Price	'0005 Condenser
35	4/9	280 to 440 metres
50	5/0	390 " 680 "
75	5/3	600 " 1,000 "

For Daventry, etc.		
No.	Price	Wave-lengths
150	7/1	1,110 to 2,050 metres
200	8/0	1,450 " 2,300 "
250	8/9	1,800 " 2,700 "

Have you got your "MARS" AERIAL yet?

Little need be said of an aerial which has gained the enthusiastic goodwill of over 50,000 listeners, but as it costs 9/6 per hundred feet many will want to know exactly what it does.

According to National Physical Laboratory tests its ohmic resistance is 10 times less than that of 7/22's (ordinary aerial wire.) Translated into terms of greater interest to the average listener this means that the "Mars" aerial gives valve set volume to the simplest crystal set; increases the effective range of every type of valve set. Sold by all leading wireless dealers, 9/6 a hundred feet—and worth it.

In case of difficulty in obtaining "Mars" specialties please write to E. & W. G. Makinson Ltd., Wellington Works, Wellfield Road, Preston, stating your requirements and enclosing a postal order. All goods sent post free at prices above. But try your local dealer before you write to us.



9/6 100 ft.

For the Best Components and Sheet Ebonite cut to the exact size you require

also our marvellous

DAYZITE CRYSTAL (Regd.)

Sold only Boxed, 2/6 each
 You cannot do better than go to

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19, Lisle Street, Leicester Square, London, W.C.2.
 'Phone: Regent 4577. 'Grams: "Tilles, Vestrand, London."

THERE is good news about the re-organisation schemes at B.B.C. headquarters. I have heard of this only indirectly, but I have heard enough to enable me to say with full confidence that the ambitious plans already outlined on this page for the coming winter season will certainly be realised. Of course, it is quite impossible as yet even to presume the stabilisation of broadcasting. Where the position is so fluid and changes almost from week to week, organisation must be continuously flexible and must be capable of responding to new needs and new conditions, many of which cannot possibly be foreseen.

But the really important point at the moment is that the B.B.C. has recognised the need of greater showmanship and more of the touch of the journalistic mind. New blood has been introduced, with results which will soon be obvious to all listeners, particularly in the metropolitan area.

The readers of these notes will not have been surprised to hear of the agreement between the British, Canadian, and the United States Governments for the restriction of the wave-band of merchant shipping within 250 miles of the coasts of the three countries.

Restricted Spark Transmissions.

Morse interference is becoming chronic, and has largely vitiated the programmes transmitted by the coast stations of the B.B.C. The new arrangement calls for the cessation of the operation of wireless telegraphy apparatus of the ships under the British, Canadian, and American flags in the wave-band between 300 to 450 metres within 250 miles of the coasts of the respective countries. This is not only of immediate importance to British listeners. It signifies the first considerable recognition by the official mind of the paramount importance of broadcasting facilities. The change of heart is hardly complete, for we cannot claim the credit for having pressed it strongly on this side of the Atlantic so far as government officials are concerned. I doubt very much if our own pundits would have been prepared to accept the agreement had it not been for the insistence of the Americans and Canadians.

I hear that Monday, October 12th, will mark the beginning of the Scottish music week. It is the week devoted to the encouragement and fostering of music throughout Scotland. The Edinburgh station of the B.B.C. will take a leading part in the proceedings. Mrs. Kennedy Fraser, well known as a sponsor of Hebridean songs, will broadcast a special talk from Edinburgh on Friday, October 16th. This will be one of the features of the Scottish Music week.

More Dance Music.

As a result of suggestions which have been increasing in number for some time, it is likely that before long the B.B.C. will evolve a National Broadcast Orchestra, based upon the very excellent nucleus which Mr. Dan Godfrey, Junr., has been evolving at the London station. The National Orchestra will be on a large enough scale to be really distinctive, and when its concerts are relayed through Daventry to foreign countries, it will bring even greater credit to the enterprise of our British broadcasters than they get at present.

BROADCAST NOTES.

By O. H. M.

Greater Showmanship—Morse Interference—A Scottish Music Week—A National Broadcast Orchestra—Longer Hours for 5 K X—The Geneva Conference—B.B.C. Wave-lengths—Broadcasting Parliament.

To be really effective, the National Broadcast Orchestra must develop a new technique. It cannot be primarily a dance orchestra, for the reason that, on the average, dance music from studios is ineffective. On the other hand, a national orchestra of this description must be able on occasions to reproduce reasonably good and vivacious dance music.

TO OUR READERS.

We would draw the special attention of new readers to the weekly notes published on this page under the heading "Broadcast Notes." A Study of them will clearly indicate that our special correspondent O.H.M. is the best and most reliably informed writer on broadcasting topics, and that his notes invariably contain exclusive news items concerning the activities and general progress of the B.B.C.—The Editor.

It is excellent news that the B.B.C. has decided as from November 2nd to extend the Daventry transmissions until midnight on week days, in order to provide additional dance music for those who want it. The Savoy bands will still be heard, and there will be a pleasant variety of music, including Jack Hilton's band, the Kit Cat Club band, and several others of equal eminence.

While I welcome the move to provide dance music every night from Daventry, I shall not be quite satisfied until similar facilities are extended to London, and some of the other main stations as well. I gather that the difficulty is a financial one, and is concerned with the considerable payments that have to be made in copyright charges.

The B.B.C. representatives who attended the technical conference at Geneva have returned full of enthusiasm for the International Union of Broadcasters, of which Mr. Arthur Burrows is the manager. Having examined in detail the results of the various rehearsals, the experts have agreed upon a new scheme of distribution. This turns out to be pretty closely on the lines of Captain Eckersley's original suggestions, but, of course, its universal application will call for sacrifices all round, and I gather that it may be necessary to reduce the wave-lengths of some British relay stations.

Re-arrangement of Wave-lengths.

If this course is to be followed, then it will be necessary at the same time to increase the power of main stations so that listeners will not suffer in consequence. All of which involves a great deal of negotiation, but such is the urgency of an early solution that I hope the broadcasters will continue to show that they can produce results

rapidly, and circumvent the red-tape of their Government departments.

I am surprised to note that a fuss is being made about the alleged discrepancies between the published wave-lengths of the B.B.C. and the actual measurements of these wave-lengths. It would seem to be a perfectly reasonable proposition that the B.B.C. should endeavour first of all to provide programmes that are intelligible. In order to do this in the present uncertain state of international wave-lengths it is essential to allow for a certain margin of flexibility of, say, one to two per cent, on the average, and an extension for London and Manchester.

All the stations of the B.B.C. adhere to this small margin of flexibility. London and Manchester have been forced to exceed it slightly, for the simple reason that in order to get their programmes across they have to move a few metres outside their official zone. This movement is continuous. It cannot be suggested in advance, because the conditions of each day are unforeseeable. My own advice to the B.B.C. would be to continue to emphasise the importance of getting out the programme in a way in which they can be received and to ignore the stunt journalism of those who profess to be supporters of a precisionist school of thought.

Broadcasting Parliament.

The news that the House of Commons is experimenting with amplification apparatus has perhaps more significance than appears on the surface. On the occasion of the announcement of the appointment of the Broadcasting Committee, the Government declared that the question of the broadcasting of the proceedings of Parliament would be considered by this committee.

It was generally known at the time that this announcement did not meet with favour amongst a large section of the House, of all parties.

It was felt that the report of the Committee would not be complete until about February, and that if the broadcasting of Parliamentary proceedings were to depend on the enactment of legislation arising out of this report, then no parliamentary proceedings would be broadcast until about the beginning of 1927.

Hopes for Next Session.

The sponsors of the broadcasting of Parliament within the House itself were too well advised to continue their direct agitation.

What they did was to work for the introduction of amplifiers so that speeches could be made more audible to members themselves. The real objection to the broadcasting of Parliament has its origin in the inherent dislike of the custodians of the old tradition for anything in the nature of a mechanical innovation.

Now that amplifiers have been introduced, even if only experimentally, half the battle for broadcasting has been won. I confess my admiration for those young members of the House who managed to work the introduction of amplifiers. They have still to be tactful.

I think there is now quite a reasonable chance that some of the proceedings of the next session of Parliament will be broadcast not only in this country, but also throughout the Dominions.

The 3rd GREAT "P.W." WIRELESS MEETING

AT THE
CENTRAL HALL, WESTMINSTER
On Friday, October 23rd, at 7.30 p.m.

FREE SEATS FOR OUR READERS

"POPULAR WIRELESS" has organised another great wireless meeting, to be held on the evening of Friday, October 23rd, at the Central Hall, Westminster, London. Arrangements have been made for the following well-known gentlemen to deliver short lectures of interest to all wireless amateurs.

Sir OLIVER LODGE, D.Sc., LL.D., F.R.S.
(Scientific Adviser to "Popular Wireless").

Lt.-Comdr. The Hon. J. M. KENWORTHY, R.N., M.P.
(Vice-President, The Radio Association).

Major RAYMOND PHILLIPS, I.O.M.
(The Well-known Authority on Wireless Control).

Captain P. P. ECKERSLEY, M.I.E.E.
(Chief Engineer, The B.B.C.).

GERALD MARCUSE, Esq.
(The Famous British Amateur).

Mr. J. C. W. REITH, M.Sc. (Managing Director of the B.B.C.), will be present to give away the First and Second Prizes for our Great "RADIO SOUNDS" Competition, and Viscount WOLMER, M.P. (Assistant Postmaster General), will also deliver a short address of interest to all listeners.

His engagements permitting, Senatore Marconi has promised to attend the Meeting and to say a few words.

TICKETS

A number of Free Tickets has been reserved for readers of this journal who wish to attend the meeting. All applications for free tickets (one or two) must be made on the Coupon printed below and sent to

"R.G.T.," "POPULAR WIRELESS," FLEETWAY
HOUSE, FARRINGDON STREET, LONDON, E.C.4

"P.W." MEETING COUPON.

CENTRAL HALL, WESTMINSTER, October 23rd.

To "R.G.T.," "POPULAR WIRELESS,"
FLEETWAY HOUSE, FARRINGDON ST.,
LONDON, E.C.4

Sir,

Please reserve me $\frac{\text{one}}{\text{two}}$ FREE SEATS for the

"P.W." Meeting on October 23rd.

I enclose a stamped and addressed envelope.

Signed (in ink).....

Address.....

A number of seats (reserved) may also be booked at 3/6, 2/4 and 1/2 (including tax) by application to "R.G.T." at the above address. The Coupon need not be used when applying for paid seats.

Readers are advised to make early application for seats as there is sure to be a tremendous demand.

"BELLING-LEE" INDICATING TERMINALS & "MULTY-KONTACT" PLUGS & SOCKETS



Internal Metal Chuck to grip 14 to 44 gauge wire or flex.
Price: Plug 4d. Socket 2d. Indicating Ring 1d.

(Handles and dome-shaped Indicating Rings in Red or Black) Stocked in the following indications:

Price: Brass 4d. Nickel 4½d.

PATENTED

Aerial, Earth, Phones +, Phones -, L.T. +, L.T. -, H.T. +, H.T. -, Input +, Input -, Output +, Output -, L.S. +, L.S. -, Grid +, Grid -, A. T. I., Reaction, Ap. Aerial, H. T. Medium, and Blanks.

DIAL INDICATORS



Solid cast metal, with raised, polished letters showing white on a black background. Single hole fixing, complete with nut. Stocked in Tuner, Filament, Reaction, Aerial, Anode, H. F. Tuner, Secondary, Rejector.

Price - 6d. each.

SUB-CONNECTORS
Eliminate Soldering.



Price 1d. each.

Perfect connection; lowest possible self-capacity; low resistance; connection changed in an instant. Tapped to screw on to 2, 4, 5 and 6 B.A. threads; also T connectors for joining wires.

Every high-class dealer stocks them, but in case of difficulty send to **BELLING & LEE, LTD.,** Queensway Works, Ponder's End, Midx.

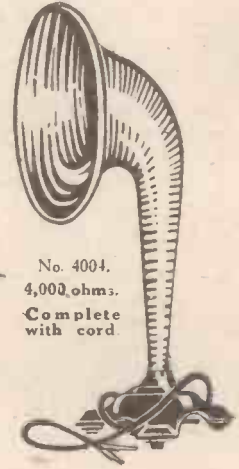
25/- saved

Western Electric LOUD SPEAKERS

Here is an opportunity you surely must not miss. We have acquired the whole available stock of these standard Western Electric Loud Speakers and are able to offer them more than 43% cheaper than you can obtain them elsewhere. You have long wanted a really good Loud Speaker, not a toy, but prices have been too high. Here is your chance to get a really efficient instrument, admittedly one of the finest ever placed on the market by The Western Electric Company Limited, giving full volume of tone, of excellent quality, and at a price that you can afford. The non-sonorous trumpet avoids all metallic twang, whilst the large diaphragm with adjustable air gap gives ample margin for modulation.

57'6 full size Speaker

Guaranteed by Western Electric Co., Ltd., to be of their manufacture, fully tested and not despatched unless in perfect order. Send remittance 32/6 with order, plus 1/3 for carriage and Speaker will be sent at once. These Loud Speakers have never previously been offered at less than 57/6 each.



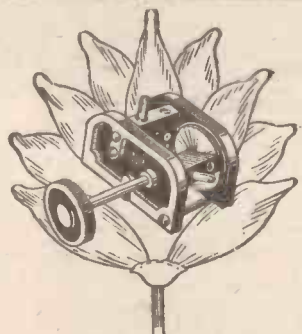
This is absolutely a genuine offer

AND CANNOT BE REPEATED

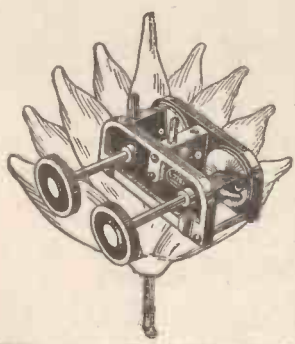
RADIO DISTRIBUTORS,
(Dept. P.W.)- 34, MARK LANE, LONDON, E.C.

for 32'6

FIT THE "LOTUS" COIL-HOLDER
and Realise what Perfect Reception means



THE "LOTUS" cut-gear Vernier Coil-Holders are fitted with Vernier movement actuated by three sets of encased precision-cut gears representing a reduction of 8 to 1.



Moving Block CANNOT FALL. Made from Bakelite Mouldings with Nickel-Plated Parts

Retail Selling Prices:
Two-way - 7/-
Three-way - 10/6

With six-inch handle for inside mounting.
Two-way 1/- extra.
Three-way 2/- extra.

GARNETT, WHITELEY & Co., Ltd.,
Lotus Works, Broadgreen Rd., LIVERPOOL

The Improved and Cheaper Coil Plug



SAVE 25%

Get your COIL PLUGS for 5/6 per doz. (4/6 gross lots). Made of best tested materials throughout, these Plugs offer the advantages of nickel-plated side plate contacts, having patent lip. Send 6d. to cover postage upon sample dozen orders.

CECIL RIDLEY
35 & 37 OUNDAS MEWS
MIDDLESBROUGH



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

THE increasing interest that is being shown by amateurs in short-wave wireless work, has naturally created a demand for low-loss coils of suitable values. In order to meet this Messrs. L. J. Hyde-man and Co., of 32, Queen Victoria Street, London, E.C. 4, are placing "Baltic" low-loss coils on the market.

These coils are very efficiently designed, and of such generous dimensions that they should prove just as useful for short-wave transmission as they are for reception.

The samples sent us, 12 and 40 turns, were carefully tested and found to be O.K. for ranges between 10 and 70 and 40 and 250 metres. Other sizes are, of course, available. The prices of the two mentioned are 14/- and 18/-. They are, however, excellent productions, and well deserving the name "low loss." The wire is silver

plated copper, and is of very stout gauge. Two widely separated plugs are fitted to correspond with the plugs of the special holders available at 3/6 each.

The insulating material, which is sparingly used throughout, is high-class Bakelite.

Constructors who build sets in American types of cabinets—and these, by the way, are becoming increasingly popular—will appreciate the little device recently placed on the market by the London Electric Stores, Ltd., of Oxendon Street, London, S.W. 1. It is an extension piece for lengthening the control handle of coil holders. Previously one of the difficulties encountered in back-of-panel mounting was to find a coil holder with a long enough handle to allow it to clear variable condensers, etc., this

"L.E.S." device solves the problem and makes any standard type of coil holder adaptable for such purposes.

It consists of a nicked rod some four inches in length by a quarter of an inch in thickness. It is, of course, hollow for nearly its whole length, and is threaded for about 3/8 in. at one end, and provided with a large grub screw at the other. It sells at 1/-, and is sufficiently stoutly made and useful to be worth that price.

Messrs. Garnett, Whiteley and Co., Ltd., Lotus Works, have sent us samples of their latest types of "Lotus" coil holders. We (Continued on page 376.)



One of the several "Radiolux" loud speakers recently introduced by Messrs. Graham.

COMFORT AT LAST!

PATENT AUDION HEADPHONE

DETACHABLE SILK
ELASTIC BAND

EASILY ADJUSTABLE
TO FIT EVERYBODY

WEIGHT **6 1/2** OZS.



CLARITY WITHOUT
RESONANCE

ENTIRE ABSENCE OF
SCREWS

PRICE **17/6**

EVERY 'PHONE GUARANTEED

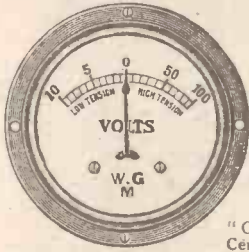
The Ideal 'Phone for Invalids. Can be used Lying Down with Complete Comfort

BRITISH MADE THROUGHOUT
OBTAINABLE FROM ALL DEALERS

In case of difficulty apply to the Sole Distributors: O. RUHL (1922) LTD., 85, CITY ROAD, LONDON, E.C.1

"GOLTONE" (Regd.) VALVE RECEIVING SETS

"GOLTONE" DOUBLE READING
CENTRE ZERO HIGH and LOW
TENSION
VOLTMETER



(British Made)
Patent Applied.
Dia. of Flange
2 1/4 ins. Is your
Accumulator fully
charged?
Is your H.T. Bat-
tery run down?

The
"Goltone"
Centre Zero
Panel Mounting instrument answers
these important questions. The meter
indicates by pressing a push button
connected in the circuit, the state of
voltage of your high and low-tension
batteries. Price 12/9 each.
Two panel mounting push buttons for
use with above, 1/6 pair.
To ensure the genuine instrument insist
on our initials or trade mark on dial.

"GOLTONE" FIXED CONDENSERS,
ANODE RESISTANCES, GRID LEAKS, Etc.



Made in all standard values. Each Unit
laboratory tested before despatch. See
Catalogue No. R/112 for full particulars.



"GOLTONE" SPRING PLUG
Makes perfect contact, thus
eliminating parasitic noises.
Fits the Standard High
Tension Battery and also the
"Triparte" Terminal listed
below. Supplied with red
and black tops.
Price 2 1/2d. each, 2/3 doz.

"TRIPARTE" TERMINAL
Will securely clamp tele-
phone cord pins, spade
terminals, and drilled down
centre to take Standard
Wander Plugs. When used
in conjunction with the
"Goltone" Spring Plug forms
an admirable connector for
every Radio requirement.
Price 3d. each; 3/- doz.

HIGH TENSION
WANDER PLUGS



EASIFIX

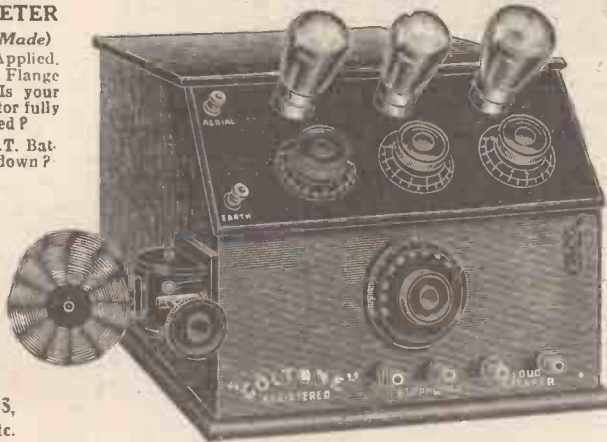
RADIO BATTERIES
ASSEMBLIES

Eliminates all ugly loose wiring
and minimises the risk of burn-
ing out valves.
Each Conductor is distinctively
coloured and enclosed within
an outer braiding. Complete
with Wander Plugs.

64 IN
LONG
OVERALL

TO
HIGH & LOW
TENSION
PANEL
TERMINALS.

- 4-way, providing 2 High-Tension and 2 Low-Tension
Conductors. Price 3/- each.
- 5-way, providing 3 High-Tension and 2 Low-Tension
Conductors. Price 4/- each.
- 6-way, providing 2 High-Tension, 2 Low-Tension
and 2 Grid Bias Conductors. Price 5/6 each.
- 7-way, providing 3 High-Tension, 2 Low-Tension and
2 Grid Bias Conductors. Price 6/6 each.



Highly efficient. Designed for reception on any wave-length. All
components are of the finest quality and the circuits employed have
been tested under varying and severe conditions. TYPE "A."
Fitted in polished hardwood cases. TYPE "B." As illustrated,
Cabinet Type with sufficient space inside to take the Batteries and
ample space on top for the Loud Speaker. All Battery connections
are concealed in the Cabinet. Prices include 5 Basket Coils covering
all the British Broadcasting wave-lengths, including Daventry High
Wave Station.

TWO-VALVE SET.

TYPE "A." £5 : 0 : 0 TYPE "B." £6 : 12 : 6
Plus Marconi Patent Royalties 25/-.

THREE-VALVE SET.

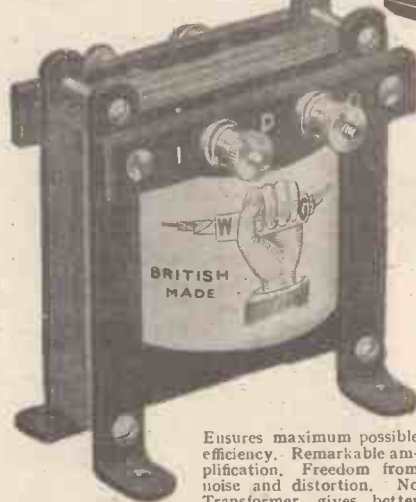
TYPE "A." £7 : 10 : 0 TYPE "B." £9 : 0 : 0
Plus Marconi Patent Royalties 37/6.

FOUR-VALVE SET.

TYPE "A." £9 : 5 : 0 TYPE "B." £10 : 10 : 0
Plus Marconi Patent Royalties 50/-.

See Catalogue No. R/112 for full details.

"GOLTONE" LOW FREQUENCY
TRANSFORMER



Ensures maximum possible
efficiency. Remarkable am-
plification. Freedom from
noise and distortion. No
Transformer gives better
results. Ratio 2 to 1 and 5 to 1. Price 17/6

Our large 36 pp. Radio Catalogue No. R/112
illustrates an extensive range of Crystal and Valve
Receiving Sets and Component Parts of every
description. Competitive prices. Prompt de-
liveries. Catalogue post free on request. Enclose
Business Card or Memo for special Trade
Terms and Discounts.



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

"GOLTONE" HIGH FREQUENCY
PLUG-IN
TRANSFORMERS

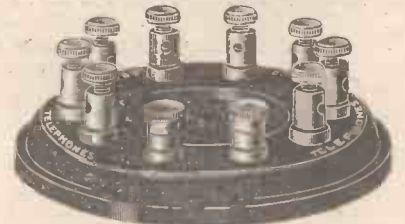
High grade Instruments
made with extreme
care, and wound on
Ebonite Formers.

Metres
80-150
150-300
300-600
600-1200
1200-3000

Specially wound
Neurodyne Model
350-550 metres.
7/- each.



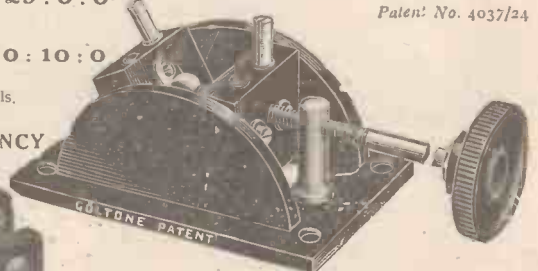
"GOLTONE" MULTIPLE
TELEPHONE BLOCK



Moulded base, ebony finish, fitted with 4
additional pairs of Telephone terminals. A
remarkable success. Price 3/- each.

"GOLTONE" MICROMETER
REGULATING COIL HOLDERS

Patent No. 4037/24



EXCELLENT DESIGN

Used by all experienced Constructors, and recommended
specially by the Technical Journals. Enables the
finest possible tuning, considerably increasing the
selectivity, reliability and efficiency of the Receiving Set.
Two Coil Type 7/- Three Coil Type 10/6

"GOLTONE"
BASKET COIL

to plug in on Crystal
Sets for the reception of
"Daventry"
High-Wave Station.
Wave-length 1,400
to 2,400 metres.
No. G9.

Price 2/9

See List for
other coils.



"GOLTONE" NO-
CAPACITY SWITCHES

Fitted with screwed
front plate for panel
mounting. Its out-
standing features
are low price, com-
pactness, easy fit-
ting and sweet
action.

2-Way Double Pole,
3/6 each.

4-Way Double Pole,
5/6 each



These Lines are stocked by
the Leading Radio Stores.
Write direct if unobtainable.

APPARATUS TESTED.

(Continued from page 374.)

have, of course, reported favourably upon their components before, and ever since we have heard nothing but praise of their positive smooth action and reliability from such of our readers who have purchased them. The "cut gear" action is excellent, and although the ratio of movements is only about eight to one, they are quite irreversible and without backlash, this being something of an engineering achievement.

The new models, which sell at 7/- and 10/6 for two and three-way types respectively, include moulded bakelite side plates, coil blocks, and knobs, and are both handsome in appearance and efficient in operation.

"Mars" aerial wire is, of course, well known, and has been proved to be very efficient; it is therefore interesting to record that Messrs. E. & W. A. Makinson, Ltd., of Preston, have now placed "Mars" coils on the market. These coils (a number of samples were recently sent us) are wound with "Mars" coil wire, which is a miniature edition, as it were, of "Mars" aerial wire. "Mars" coils are rather peculiar in appearance, slightly resembling basket coils, but having radial "waves" as well as eccentric rotational turns. This method of winding is quite original.

They are, of course, of commendably low capacity, and very efficient in operation. Conforming with standard wave-length ranges they provide sharp tuning and close couplings, and in every receiver in which we tested them results were excellent.

The construction of the coils is electrically commendable in that a minimum of material is employed, but from a mechanical point of view they are open to criticism. Greater rigidity of mounting, even at the expense of capacity increases, would be well worth obtaining, as coils of the plug-in type frequently have to face rather hard usage.

"Mars" coils are retailed at various prices, the 35 turn at 4/9, 50 turn at 5/- and the 75 at 5/3.

A combined valve holder and filament resistance of the carbon compression type has been introduced by the Enterprise Manufacturing Co., Ltd., of Grape St., London, W.C. 2. The filament resistance is of standard "E.M.C." design, and is provided with an interchangeable resistance element. "Cartridges" giving ranges of 0-5, 0-10, 0-20 and 0-30 ohms being available.

The valve holder is mounted on the barrel of the resistance in such a manner that its position can very easily be varied.

For back-of-panel work this E.M.C. component should prove very useful, more especially as it is a "one-hole mounting" device. The resistance operates smoothly and efficiently, and the valve holder is well up to standard. It is sold at 6/6, including a 0-30 ohm cartridge.

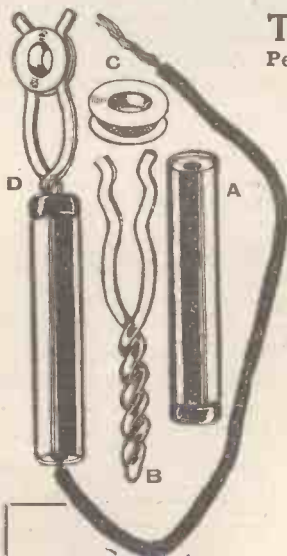
Messrs. J. J. R., of 7a, Ross Parade, Wallington, Surrey, have sent us a pair of their J.J.R. wander plugs for test. One, black in colour, is designed to function as a fuse as well and thus protect the valves from the H.T. current. They are retailed at 1/- per pair.

On test the safety fuse, which consists essentially of a thin strip of replaceable tin-foil, was found to burn out at 45 amps. Thus it would have saved a B.E. filament and most D.E.'s except, of course, '06's.

They are well-made little plugs, brightly nickelled and with polished "Erenoid" bodies.



The new tuned-reed telephone receivers recently placed on the market by Messrs. S. G. Brown, Ltd.



The "P. & F." IDEAL Terminal
Perfect Contact and Insulation. No Screws!

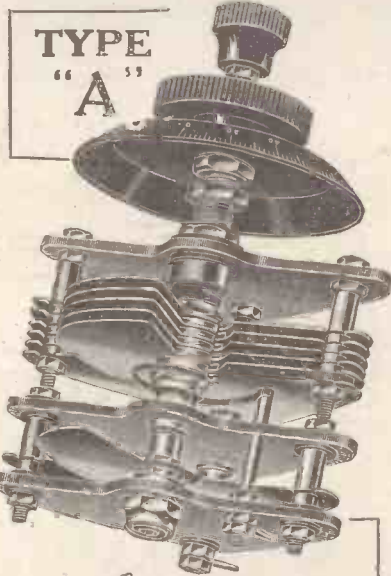
Tube A. Metal tube with red or black insulated top, containing thick insulating rubber bush. Clip B. Slips into rubber insulation of Tube A, holding wire tight, and makes perfect contact at D. Ring C. Will hold firmly on any existing terminal of any set. Clip B pushes into this as shown.

The "P. & F." Square Law Condenser

The "P. & F." Square Law Condenser "A" Type, Ebonite End Plates; Permanent Contacts; One Hole Fixing. An entirely British product.

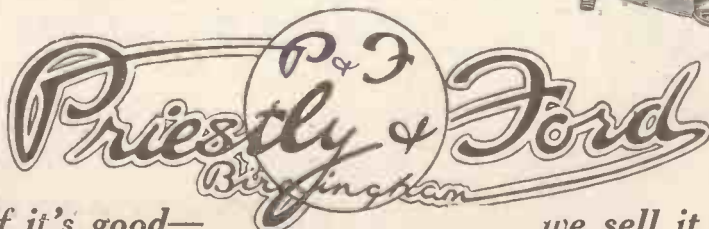
Prices:

'001 .. 12/6	.. 14/6	with Vernier
'0005 .. 10/6	.. 12/6	" "
'0003 .. 9/6	.. 11/6	" "
'0002 .. 8/6	.. 10/6	" "
'0001 .. 6/6		Vernier .. 4/6



TYPE "A"

Price
6 D.
EACH



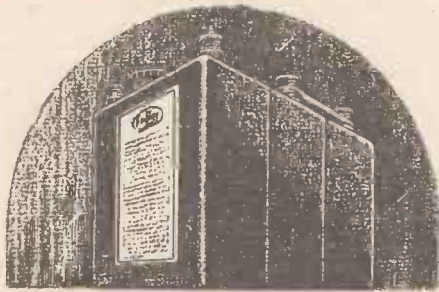
If it's good—

we sell it!

Complete with BALL BEARINGS and EBONITE END PLATES

EVERYTHING IN RADIO

3, CARRS LANE, BIRMINGHAM. 'Phone: CENTRAL 2942 (Private Branch Exch.) Wires: PEEANEFF, Birmingham.



*First in 1853
best in 1925*

Two essentials go to the making of every consistent product—knowledge and experience.

We have always made good batteries because we have the resources and the right men to use them effectively. But to-day we make better batteries, because for 72 years we have been tackling practical problems connected with battery construction.

The Fuller L.S.L. Type Portable Plate Type Accumulator is designed to meet the demand for an economical yet dependable unit of 4 or 6 volts. It has proved wonderfully successful for Radio and other work.

All cells are fitted with non-corroding grease-cup terminals and supplied in ebonite or celluloid cases.

Write
for
List
No.
250F.

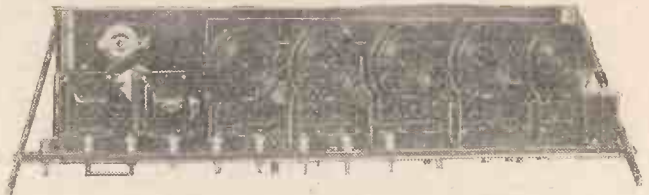


Fuller
ALL QUALITIES
**PORTABLE
BATTERIES**

FULLER'S UNITED
ELECTRIC WORKS, LTD.,
Chadwell Heath - - - Essex

Telephone - - - - - Ilford 1200
Telegrams - - - - - "Fuller, Chadwell Heath"

174-60



Back of panel view of set built with IGRANIC Supersonic Heterodyne Receiver Outfit.

A
message
to
Super-Het.
Constructors

See the greatest advance in Supersonic-Heterodyne design yet made—on

**STANDS
30 & 33**

at the
Wireless Exhibition
and Radio Convention,
Royal Horticultural Hall,
Westminster, S.W. 1.

Here you will see THE ALL-IGRANIC RECEIVER EMBODYING the

**Igranic Supersonic
Heterodyne Outfit**

It contains novel reactance capacity coupling units obviating the deliberate introduction of losses as a means of suppressing undesirable oscillation, such as by potentiometer control, and any tendency of the intermediate frequency amplifier to oscillate is cut off at its source.

The special method of securing stability employed in the self-stabilised reactance units enables a far higher degree of amplification to be obtained than would otherwise be possible.

Oscillator Units can be obtained in three sizes giving wave-length ranges of from 215 to 4,500 metres. If you cannot visit the Exhibition send for the IGRANIC Instructional Envelope.

The IGRANIC INSTRUCTIONAL ENVELOPE for constructing a Six-valve Super-Heterodyne Receiver according to the Igranic system, complete with full-sized general arrangement drawing, wiring and drilling diagrams, and fully illustrated descriptive booklet can be obtained from your dealer. Price 2/6.

If you want to see the very latest components for all circuits you will find all the new



on the same stands at the

Royal
Horticultural Hall,
Westminster, S.W. 1
5 minutes from Big Ben

Oct. 10 to 16

Write for the new Igranic List Z 766 if you cannot visit the Exhibition



149, Queen Victoria St., London
Works: - - - - - BEDFORD

Front view of set.



RADIOTORIAL

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PATENT ADVICE FOR READERS.
The Editor will be very pleased to recommend readers of POPULAR WIRELESS who have any inventions to patent, or who desire advice on patent questions, to our patent agent. Letters dealing with patent questions, if sent to the Editor, will be forwarded to our own patent advisers, where every facility and help will be afforded to readers.

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 point-to-point wiring is required an additional fee of 1/- must be enclosed.
Wiring diagrams of commercial apparatus, such as

sets of any particular manufacture, etc., cannot be supplied. (Such particulars can only be obtained from the makers.)
Readers may submit their own diagrams, etc., for correction or for criticism. The fee is 1/- per diagram, and these should be large, and as clear as possible.
No questions can be answered by phone.
Remittances should be in the form of Postal Orders.

Questions and Answers

CLASSIFYING SIGNALS.

Q.—What is the usual method of classifying signal strength according to a scale ?

A.—There are several scales in use by different authorities, some of which apply to Morse signals and some to telephony. They are all based on the numbers 1 to 9, the former indicating weak and the latter strong signals. The following list shows the different numbers, with their corresponding variations
R 1—Signals dead weak and almost inaudible.
R 2—Signals audible, but not continuously readable.
R 3—Signals just readable (but not easily).
R 4—Signals clear and easily readable.
R 5—Signals fairly strong.
R 6—Strong 'phone signals.
R 7—Signals loud.
R 8—Signals very loud ("small loud speaker").
R 9—Signals extremely loud ("large loud speaker").

CONDENSER POSITION.

Q.—When adding a condenser in series with the aerial in order to reduce the wave-length, does it matter whether the condenser is connected above the coil, or next to earth ? Also, is there any difference in the way in which the

(Continued on page 380.)

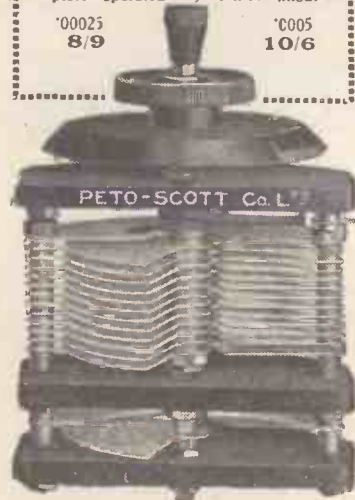
A new Service for "P.W." readers —complete kits of components for these two new "Popular Wireless" Receivers

When all parts are purchased with panel a Marconi royalty of 12/6 per valve holder must be remitted.

Peto-Scott Square Law Vernier Condensers

Thoroughly well made and fully guaranteed. Permanent spiral contact to centre spindle. Vernier plate operated by centre knob.

'00025 '0005
8/9 10/6



The "Popular Wireless" Two-valve Ultra

1 Peto-Scott Standard square law condenser with vernier-'0005 mfd.	£ 3. d.	10 6
1 Peto-Scott 2-way Coil Holder, friction drive, with long handles	5 6	
1 Igranite Ultrasonic coil	9 0	
1 Peto-Scott Concert coil, No. 5, for reaction	4 0	
1 Max-Amp L.F. transformer (first stage)	19 6	
1 Nesthill S.T.B.T. switch	1 6	
2 Peto-Scott Filament rheostats 5 ohms	5 0	
1 Dubilier Grid condenser, '0003 mfd., and Grid leak, 2 megs.	5 0	
1 Dubilier fixed condenser, '002 mfd.	3 0	
1 Dubilier fixed condenser, '003 mfd.	3 0	
14 Mark III Terminals	2 4	
8 Flash pattern valve sockets	1 0	
Necessary Busbar, panel transformers, screws, nuts, etc.	1 8	
	£3 11 0	

One Panel of "Red Triangle" guaranteed ebonite, 10 x 8 x 1/2 ins., cut dead square and matted, ready for use

One Polished Mahogany Cabinet to fit

£4 4 6

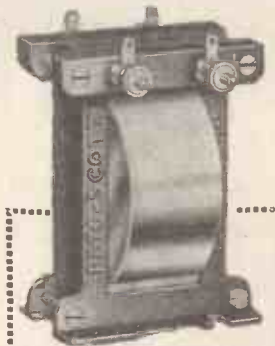
The "Popular Wireless" One-Valve Reflex

1 Peto-Scott Standard square law condenser, '0005 mfd.	£ 5. d.	8 0
1 Peto-Scott Standard square law condenser, '0003 mfd.	6 9	
1 Lissenstat major filament rheostat	7 6	
1 Max-Amp L.F. transformer (Reflex)	19 6	
1 Burndept anti-phonetic Valve Holder	5 0	
1 Peto-Scott Tuned Coil Holder, friction drive with long handle	5 6	
1 Eureka Gravity Crystal Detector	6 6	
1 Dubilier fixed condenser, '0002 mfd.	2 6	
1 Dubilier fixed condenser, '001 mfd.	3 0	
1 Dubilier fixed condenser, '002 mfd.	3 0	
9 Mark III Terminals	1 6	
Necessary Busbar, panel transfers, screws, nuts, etc.	1 9	
	£3 10 6	

One panel of "Red Triangle" guaranteed ebonite, 13 x 6 1/2 x 1/2 ins., cut dead square and matted, ready for use

One Polished Mahogany Cabinet with baseboard

£4 16 6



The New Max-Amp

Now available in three ratios. Normal use and for first stage. Blue band ; second stage Black band; reflex circuits, Red band. All one price 18 6

The Famous "P.W." Continental 2-valve Set

Complete kit, including drilled and engraved panel and all components, together with polished mahogany cabinet. 68/-

PILOT CHART showing how to build all the most popular Receivers ready in a few days time. 3d.
PETO SCOTT'S WIRELESS BOOK, 1/3, Post free 1/5

Head Office, Mail Order and Showroom—

77, CITY ROAD, LONDON, E.C. 1.

Also at 62, High Holborn, London, W.C. 1. WALTHAMSTOW—320, Wood Street. PLYMOUTH—4, Bank of England Place. LIVERPOOL—4, Manchester Street.

P.S. 3733

PETO-SCOTT Co., Ltd.

Have you entered for the "SYLVEREX" Radio Crystal Prize Scheme?

Read the side panel for full particulars of a competition in which every competitor receives a prize.

Sylverex is a natural Crystal and is a revelation in sensitiveness. It is subjected to the fullest tests of any crystal on the market, and as a consequence is fully guaranteed.

Ask your Wireless Dealer for Full Details—or send 2/- to Sylverex Ltd. (Dept. B), 41, Figh Holborn, London, W.C. 1, when the crystal will be forwarded by return post.

Visit us at the Exhibition, Royal Horticultural Hall, Oct. 10th to 16th. Stands 74 and 78



Entrants for the Sylverex Prize Scheme are asked to write down the following list of "turns" in their order of popularity. Put down first which item you consider most popular; then the item you consider second in popularity, and so on. Write only the items listed here. Prizes will be awarded to those entries most nearly in accordance with the total voting of all competitors.

- Covent Garden Opera.
- Symphony Orchestra.
- The Children's Hour.
- The Savoy Bands.
- The Wireless Drama.
- "Celebrity" Speeches.
- Sports Talk.
- Humorous Entertainers
- De Groot and Piccadilly Orchestra.
- Concert Parties.
- "Star" Musicians and Vocalists.
- News and Weather Reports.

Your list of items must be written on the plain side (back) of the printed direction slip enclosed with each packet of Sylverex Crystal.

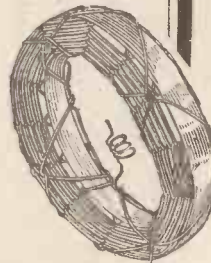
£200

in Cash Prizes

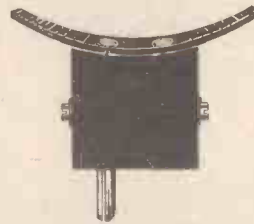
- 1st Prize - £100 Cash
- 2nd Prize - £50 Cash
- 3rd Prize - £25 Cash
- 50 Prizes of 10/- each

Numerous additional prizes, consisting of Valve Sets, Crystal Sets, Loudspeakers, etc., and thousands of Consolation Prizes of copies of popular published songs.

The REFLEX COIL will improve your set!



Manufactured under licence. Burrell Patent No. 168,249



REFLEX COIL PLUG.

You cannot do better than use the REFLEX COIL PLUG in conjunction with the REFLEX COIL. Made from the finest grade lapped ebonite and packed in separate cartons. Price 1/- Entirely British Made.

You may or you may not be getting what you consider to be perfect results. But until you have tried the REFLEX COIL you cannot honestly say you are getting the most out of your set. The "REFLEX" is the outcome of careful and scientific research, and is the only successful self-supporting coil made. It's the "low-loss" coil that gives perfect results. Get a Reflex for your set to-day and notice the difference.

NOTE THE LOW PRICES:

Wave-length with '0005 in parallel (approx.).	No.	Price
No. 25	100-250	8d.
No. 35	150-300	8d.
No. 50	200-500	9d.
No. 75	300-750	1/-
No. 100	400-1,000	1/2
No. 125	500-1,250	1/6
No. 150	600-1,500	1/8
No. 175	740-1,750	2/3
No. 200	800-2,000	2/9
No. 250	900-2,500	3/3
No. 300	1,200-3,000	4/3
No. 400	1,500-4,000	5/-
No. 500	2,000-5,000	5/6
No. 600	2,500-6,000	6/-
No. 750	3,000-8,000	7/-
No. 1,000	4,000-10,500	8/-
No. 1,250	5,000-15,000	9/-
No. 1,500	6,000-18,000	10/-

5 XX Loading for Crystal Sets, 1/6
Reflex Coils can be obtained from all good wireless retailers. Ask to see them to-day. Trade enquiries invited.

STAND NO. 4.
Wireless Exhibition, Royal Horticultural Hall, October 10-16.

The REFLEX RADIO CO., Ltd.
198, LOWER CLAPTON RD., LONDON, E.5.

Phone: Clissold 4852.

Why is BECOL

THE HALL MARK OF "QUALITY" EBONITE?
Because it is made from finest rubber and sulphur

IT HAS ITS POLISH PROVED ITSELF SPEAKS FOR ITSELF

All branded panels are guaranteed free from surface leakage.

Write for full particulars and List C.
THE BRITISH EBONITE CO., LTD.,
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Rods, Tubes and Mouldings.

WHY BUY ACCUMULATORS ?

and suffer the depreciation and many annoying inconveniences caused by unskilled changing.

IF you add depreciation to the expense and inconvenience of having your own accumulators unskilfully recharged, it costs you considerably more than our inclusive Hire Service

WE SUPPLY and deliver a New Rotax Wireless Accumulator of suitable size for your set. We call and exchange it for another fully-charged one weekly or fortnightly for 13 weeks from 8/- inclusive.

IF you have your own accumulators we give the same continuous service from 6/- per quarter—and if you have only one, lend you one of ours, alternate exchanges.

RADIO SERVICE CO., 103a, TORRIANO AVENUE, KENTISH TOWN, N.W.5.

REAL SERVICE-HIRE OR MAINTENANCE

Write for Folder Z9, or Phone: North 4161 & 4162.

SAXON GUIDE TO WIRELESS

THIS IS THE BEST BOOK OBTAINABLE, AND ENABLES ANYONE WITHOUT PREVIOUS EXPERIENCE TO MAKE WIRELESS SETS WHICH ARE UNEQUALLED IN PRICE, QUALITY, OR EFFICIENCY.

Everything connected with Wireless is clearly and simply explained, and full instructions, WITH CLEAR WIRING DIAGRAMS, are given for making:

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Radion Bramid Valve

RADION
Reliable Valves

RADIOTORIAL QUESTIONS & ANSWERS.

(Continued from page 378.)

actual condenser connections are made—i.e. moving plates to earth side or fixed plates to earth side?

A.—Generally a difference is noticeable on a valve set when the condenser position is reversed, and sometimes one position is decidedly better than the other. In certain cases, and especially on the longer wavelengths, there is a noticeable difference in the signals of a crystal set when the condenser position is altered.

With a valve set it should be noticed that when the series condenser is in the earth-lead the set is insulated from earth, and hand capacity effects are consequently more marked.

The actual condenser connections are also found to affect body capacity, and where fixed metal end-plates are used, it is generally preferable to connect these to earth. If ebontite fixed end-plates are used the best connection for reducing unwanted capacity effects is when the moving plates are on the "earth" side, and the condenser itself between aerial and coil.

Fixed Condensers.

Q.—Is it essential to have a fixed condenser across the 'phones and H.T. and across the primary of the intervalve transformers in a four-valve set, using two stages of L.F. amplification.

A.—The condensers are not absolutely necessary in either case—that is, so far as the actual "working" of the set. But you will probably find that the apparatus will not function with its maximum efficiency unless the condensers are used. The presence of these condensers—they should be about .002 to .003 mfd.—is required to provide a path for the H.F. currents that are passing through the plate circuit.

If the condensers were not there the high resistance and inductance of the H.T. battery and the 'phones would form a path, but it would have a very high value of impedance, and would choke back the H.F. impulses. This would result in a loss of efficiency, and therefore a decrease in signal strength. There is no need to have a condenser across the primaries of

all the transformers. If there is one in shunt with the first L.F. transformer that will be sufficient. If you require the absolute maximum out of your set, a great deal can often be accomplished by a little experimenting with the values of these fixed condensers.

For instance, you will probably find that large deviations in the size of the condenser across the H.T. battery will not have any noticeable effect, but that if you alter the capacity across the L.F. transformer to any great extent the signal strength will be impaired or increased according as you vary away from or towards the correct value. There is a correct value, though it is not so critical in this case as it is when you are dealing with H.F. circuits.

Power Valve Alterations.

Q.—I have a three-valve set, Det. and 2 L.F., and wish to replace the last valve with a power valve. Do I have to make any alterations to the present wiring of my set, and is a special holder employed?

A.—Power valves take the usual shape and standard holder of the ordinary three-electrode type of valve, the difference being that these valves have electrodes of much larger dimensions to allow for the handling of louder signals.

No actual structural alterations are needed either to wiring or lay-out, the replacement being merely to substitute your present valve by the power valve.

Separate H.T. should, however, be employed with a valve of this type, and also grid bias, but these should be essential features of your present set.

A. Counterpoise Earth.

Q.—What is a "counterpoise" earth, and has it any advantages over the ordinary earth connection?

A.—The "counterpoise" takes the place of a direct earth in cases where the latter cannot easily be made or where it is undesirable owing to the presence of earth currents from neighbouring electric power plant.

It generally takes the form of a second multi-wire aerial of similar length to the other, placed directly underneath it but near the ground (say, seven feet high). Insulation should be good, and is quite as important in the counterpoise as in the main aerial and lead-in. It will be found that the counterpoise often sharpens tuning of the set as well as minimising local interference.

Unidyne Radiation.

I am using a two-valve Unidyne set and am very satisfied, but would like to know if Unidyne sets can cause interference when they oscillate. I have been told that the absence of H.T. prevents this, but on the other hand a friend of mine who lives very close has got a Unidyne and is, I believe, the cause of quite a lot of the "howls" I can always hear at the commencement of the broadcasting transmission.

A.—Unidyne receivers can, when the reaction is mis-handled, cause just as much interference as H.T. sets. There is one difference, however, and that is that an interfering Unidyne invariably makes itself known to other listeners in the form of a rather low "moaning" note instead of the usual higher pitched "screaks" and "whistles." But there are, of course, other causes for similar heterodyning, and such must not be accepted as the true indication that a Unidyne is misbehaving itself.

The "Ultra" Crystal Set.

Q.—Can the "P.W." Ultra crystal set be used with valve amplifiers in the same way as any ordinary crystal set?

A.—Yes: and this set, with valve amplification added has recorded excellent results.

Valve Bye-passing H.F.

Q.—I have a two-valve set with tuned anode coupling and find that, having tuned in to a station, pulling out the H.F. valve makes little or no difference to the signals. Madrid is readable on the one valve, also German and French stations, whilst all the B.B.C. (other than relays) are very clear—still on one valve. Should not disconnecting the H.F. valve automatically break the circuit?

A.—The effect is not an uncommon one, and is due to the capacity of the holder passing the H.F. impulses like a small condenser. The fact that signal strength is not much improved shows that the first valve is working inefficiently, and you will probably find that by experimenting with the tuning of its anode circuit or with the value of its coupling condenser you will be able to improve the first stage H.F. results.

(Continued on page 382.)

The Crystal with Valve Power



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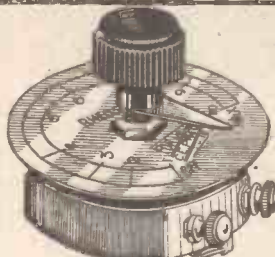
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Issue of September 12th, 1925.
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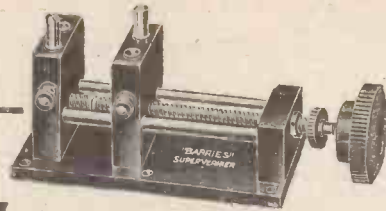
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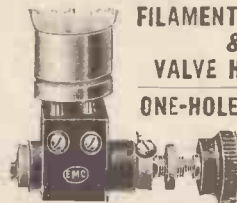
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OHMS.	PRICE COMPLETE
0-5	5 9
0-10	6 -
0-20	6 3
0-30	6 6

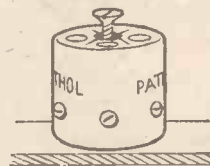
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GRAPE STREET, SHAFTESBURY AVENUE,
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ESTABLISHED 1909.



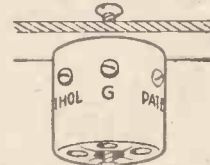
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For any circuit, any set, anywhere

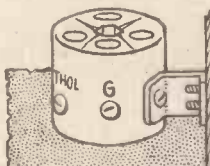
Its porcelain base gives perfect insulation. The four brass sockets fit loosely, and are almost entirely air-spaced. The connecting screws are brought out to the sides, reducing capacity effects to a minimum.



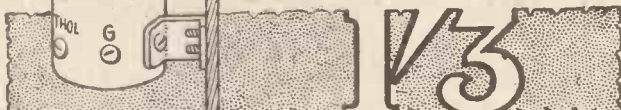
The ATHOL is truly the Valve Holder for every use. It allows of one-hole fixing to base board, or above panel; can be easily mounted below the panel thanks to reversible brass sockets; or behind vertical panels with the aid of special brass support.



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CORNET STREET, HIGHER BROUGHTON,
MANCHESTER.



RADIOTORIAL QUESTIONS AND ANSWERS.

(Continued from page 380.)

Landlords and Aerials.

Q.—During my temporary absence on holiday recently my landlord erected a mast at the bottom of my garden without having mentioned the fact or asking permission.

My neighbour residing next door and living under a different landlord to me, asked if he might fix an aerial to my pole to run to his skylight. This permission was granted by me, but on commencing to fix up the same the landlord of the property where I live came out and raised objections, and said he would not allow it, so the matter was allowed to rest pending inquiry.

Will you inform me of the exact position? I am of opinion that my landlord exceeded his rights both in erecting a post in the garden which I rent from him with the house, and also in objecting to allow my neighbour to connect to my mast. Kindly inform me if I can cause him to remove his mast or claim a nominal rent for same. Should he lose his case, can he cause me to quit the house I occupy as his tenant?

A.—Your landlord had no right to erect the mast on the ground leased by you, and you are entitled to demand rent for it or ask him to remove it.

Strictly speaking, your landlord is within his rights in refusing to allow your neighbour to fix his aerial to your pole, but he would experience difficulty if he attempted to do more than protest.

If your landlord lost his case it would not affect your tenancy. Provided you pay your rent regularly you are protected by the provisions of the Rent Act, and you cannot be evicted unless an order to that effect is made by the court, and the dispute as to the mast affords no grounds for applying to the court for an order for possession of the premises.

THE CHITOS CIRCUIT.

Q.—Can a fixed grid condenser be used on the Chitos one-valve circuit?

A.—Yes, though the value should be found by experiment. A variable is more efficient.

Q.—Can H.F. amplification be added to the circuit?

A.—No; this would entail re-designing the whole circuit, and thereby destroying its sensitive properties.

Q.—Is L.F. amplification possible?

A.—Yes, one or more stages of L.F. amplification may be added in the usual manner, provided a separate H.T. battery is used for the L.F. portion of the set. The same L.T. battery is used, of course.

Q.—What type of valve is most suitable in the circuit?

A.—Either bright or dull emitter valves can be used, provided correct L.T. is employed, and also provided the valve is of the proper type. It must be suitable for operation as a detector, an amplifier valve (designed specially for H.F. or L.F. work) would not give maximum results.

Q.—How much H.T. should be necessary to make the set oscillate?

A.—It will probably be found that this receiver oscillates very readily, 20 volts being sufficient as a rule. It does not mean, however, that maximum results are being obtained at this voltage, and for general use 48-60 volts will be found most satisfactory.

Q.—What is the range of reception of the Chitos one-valve set?

A.—This depends upon local conditions, etc., but it should certainly be more sensitive to weak signals than the ordinary one-valve set. But as it is a little more tricky to operate, it may be some time before the newcomer to the circuit gets the best out of it. Most of the B.B.C. stations and a number of Continental ones should be picked up by careful handling of the set—at any rate, during the winter evenings.

Q.—Are vernier variable condensers necessary, or will the ordinary type do?

A.—The ordinary type will give results on the nearer stations, but for real D.X. reception—for which the receiver was originally designed—vernier

control should be used. Many long-distance stations will be missed, or only tuned in with difficulty, unless verniers are employed.

Q.—Should the reaction coil be tight-coupled to the aerial coil while tuning in?

A.—No; it should be adjusted so that the set is just on the verge of oscillating, otherwise interference will be caused to other listeners. When D.X. work is being carried out, and the B.B.C. stations are not transmitting, the set can be made to oscillate—just over the point, no more—and the stations picked up by their carriers, oscillation being checked afterwards in order to resolve the carrier into speech or music.

Q.—Is the set capable of operating a loud speaker on the local station with or without an L.F. amplifier?

A.—If an amplifier is used, yes. Without this it will not operate a speaker at all satisfactorily. In any case, the set is not designed for loud-speaker work, and though pure results can be obtained if it is handled carefully we do not recommend the set for anything but 'phone reception.

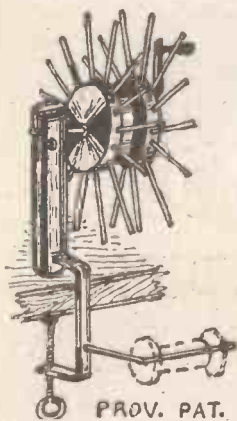
Q.—Can any method of reflexing the Chitos circuit be employed either by a crystal or other means?

A.—No; the circuit must be left as originally described by its designer, or its properties as a D.X. receiver will be lost. It is not possible to reflex the set in any way without destroying its sensitivity as a long-range receiver.

Unidyne Amplification.

Q.—What causes the failure of the L.T. Unidyne to amplify?

A. Several faults may result in this. Provided all connections are sound and L.T. is not reversed the main cause is a faulty grid condenser and leak or the L.F. transformer. The former is easily tested but the latter may prove a difficult matter to trace. Very often, even if the connections to the transformer are correct, good amplification is not obtained. Some transformers seem to have too much self-capacity and amplification suffers accordingly. It is best to keep to the exact type and connections of transformer given in the various articles describing this circuit.



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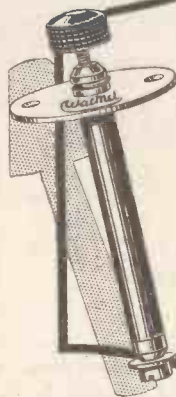
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—functioned splendidly on test—no hesitation in recommending," says the Editor of "Popular Wireless" in the September 19th issue—referring to the

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It positively banishes catwhisker worries—just a turn of a milled knob finds the sensitive spot. The whisker does not leave the specially prepared crystal. Results are remarkable when the "K" Detector is used. Fits to the panel in sockets. Price (complete with Nickel Plated Sockets) **5/-**

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 35/36, Aldermanbury, LONDON, E.C.2.

FOREIGN RADIO NEWS.

(Continued from page 364.)

Two Polish Stations.

The Polish Government has granted a new radio concession to the "Polskie Radio" for transmission stations.

A temporary station of 2 kilowatts will be installed at Warsaw, and, in about ten months' time, transferred to Cracow, when it will be replaced in Warsaw by a 15 kilowatts station.

New Time Signal.

The Rome station announces a complete alteration in its method of announcing the time at 10 p.m., when the daily watch-correcting signal is broadcast.

At 9.59 p.m. a series of five rings on a bell will be given, at 10 seconds interval. After a space of 20 seconds after the last of these, the sixth and last ring, on the stroke of 10 o'clock, will give the official Italian time. This seems rather a complicated procedure, but the Italian operators claim that tests of the various systems used in other countries have shown this to be the most practical.

More Norwegian Stations.

The progress of radio was at first rather slow in Norway, but it is taking rapid strides forward at the present time. The main society, "Kringkastingselskapet," has at present one station at Oslo and is constructing two relay stations. Plans have just been approved for the building of main stations at Bergen, Trondhjem, Tromsoy, Stavanger and Christiansand, with a number of secondary relay stations.

Radio-Toulouse.

The Toulouse station, known as Radio-Toulouse, has altered its wave-length from 273 to 432 metres, as it was found that the previous length used led to interference from various other stations.

This station has only been working since the middle of April, but has proved a triumphant success, and, thanks to its programmes, radio is extending very rapidly in use and popularity throughout South-Western France.

Danish Relay Stations.

The Copenhagen station is at present closed for reconstruction, and transmission is made, in the meantime, by the Ryvang radio station near the Danish capital, with a wave-length of 1,150 metres, using 1 kilowatt.

Two new Danish relay stations have just been opened at Odensee and at Hjoring, with respective wave-lengths of 950 and 1,250 metres. Both relay the Copenhagen programmes.

Peru Commences Broadcasting.

It is announced that the latest country to instal its first radio station is Peru. The post, which will be known as the Lima station, is of the same type as 2 L O, London, of 1,500 watts with a wave-length of 360 metres.

Short Wave Tests.

The Radiogiornale station at Bellagio, on Lake Como, will make short wave-length tests every Sunday, at 2 p.m. with 10

(Continued on page 385.)



Stop that continued vibration of the filament!

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FOREIGN RADIO NEWS.

(Continued from page 384.)

metres, at 3 p.m. with 20 metres, and at 4 p.m. with 45 metres. The messages will be the Morse letters C Q during a space of five minutes. For the next forty minutes the station will listen-in for replies.

Broadcasting in Russia.

The following are the new arrangements for Moscow and Nijni Novgorod stations. Moscow head-station, R D W, will use 12 kilowatts on a 1,450 metres wave-length daily from 11.30 a.m. to 1.30 p.m., and from 6.55 p.m. to 7.50 p.m. Moscow subsidiary station, with 3 kilowatts, will transmit news and concert programmes on a 1,010 metres wave-length. Nijni Novgorod, with 1 kilowatt, will use the wave-length 100 metres, and Leningrad, with 2 kilowatts, the length 940 metres.

Italian Government's Radio.

Radio has been installed in the Italian Senate. The speeches from the Government bench will be heard in the ante-rooms, and notices broadcast throughout the building indicating the beginning of each speech, with the subject and name of the speaker.

German Radio Exhibition.

The German radio exhibition, which opened on the fourth and remains open till the thirteenth of this month, is proving a great success. The German Post Office has rigged up a full sending station which is at the disposal of visitors, and on which they may try their 'prentice hand. The Union of Radio Users shows a very interesting collection of self-constructed sets, and the Berliner Funkstunde transmits concert programmes in the afternoon, operas and chamber music at night. The number of visitors during the first three days has been nearly double the number on the corresponding days last year.

German Station Developments.

It is announced that the Hamburg, Munich, Breslau and Frankfurt stations, that at present use 1.5 kilowatt, will within the next few weeks increase their power to 10 kilowatts.

A new relay station will be opened early next month at Gleiwitz, and in November it is proposed that Kiel be used as relaying station for Hamburg and Stettin for Berlin. Elberfeld will relay the Munster programmes every afternoon; on Thursdays and Fridays from 2 to 3 p.m., and on the other days from 1.15 to 2.30 p.m.

The new Frankfurt station at Heiligenstock will, it is now stated, be opened in November. It will serve a radius of from 125 to 200 miles.

French Radio Exhibition.

The attention of firms selling wireless apparatus and accessories, of inventors and of amateurs is specially called to an important radio exhibition which will be held in Saint-Etienne, in the heart of one of France's most peopled manufacturing districts, from September 27th to October 18th.

Radio is making rapid progress in this part of France and it is stated that some interesting novelties will be exhibited, while leading firms in France and other Continental countries are exhibiting.

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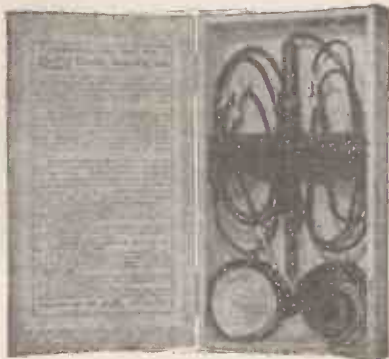
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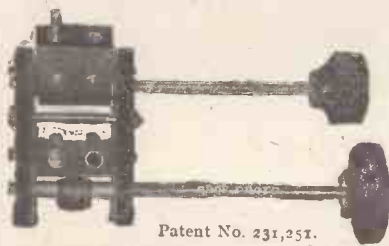
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TECHNICAL NOTES.

(Continued from page 340.)

Corroded Terminals.

A tight or corroded nut on an accumulator terminal is sometimes very aggravating. This corrosion would not occur if the terminal were kept well smeared with vaseline both outside and on the threads. But if corrosion has taken place and the nut is fast, do not use undue force, or you will wrench the lug from the lead plate and land yourself in for an awkward repair. The best thing to do in such circumstances, before resorting to force, is to heat the terminal nut, at first gently by means of a soldering iron, and if that does not permit the nut being turned with pliers, apply a flame very carefully to the nut. The latter course is not recommended, especially in view of the danger of setting fire to the celluloid of the case. Usually the application of a very hot soldering iron to the nut, whilst the pliers are brought into action, will do what is necessary. Once you have the nut removed, carefully clean the threads of the terminal and cover with vaseline. This will not (contrary to popular impression) interfere with good electrical contact being subsequently made between the terminal and the attached wire.

Experiments have been made on this point by a well-known scientist and he found that vaseline was almost unique in that respect, namely, that it did not seem to prevent good electrical contact being made between surfaces upon which it was freely smeared.

Faulty Variable Condensers.

Another annoying little thing is a variable condenser which does not turn smoothly. Unfortunately, many of the variable condensers on the market do not turn smoothly before they are mounted in the panel, so they cannot very well be expected to do so after mounting. The first thing is to see that the condenser works smoothly before mounting. If it does not, it may be due to the fact that the end-plates are pulled up too tightly. Having got the condenser working properly when removed from the panel, if the working is less smooth after mounting, it probably means that the positions of the drillings for the condenser are not true, or else that the hole for the shaft is too small, but most probably the former. In any case, a slight enlarging of the drilling for the condenser shaft will usually right matters.

If a condenser turns too loosely, so that the movable set of vanes wanders away from the setting, it is a good plan to introduce a tiny disc of felt between the shoulder of the shaft and the frame of the instrument. This acts as a friction device, keeping the condenser to any setting whilst not interfering with the smooth working of the same. Many commercial variable condensers make use of this little device.

Should Rheostats be Used?

My references to the practice of dispensing with rheostats for 2-volt valves have brought many letters from readers, some stating that they have found it much safer to use rheostats as suggested, namely, for gradually turning on the heating current up to the maximum, but not as regulators, and others stating that they have never used rheostats

(Continued on page 387.)

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TECHNICAL NOTES

(Continued from page 386.)

at all with their 2-volt valves, working on a single accumulator, and have never had the least trouble. Of course, a good deal depends upon the valve, that is, upon the type of filament. I was referring, in particular, to the Cossor type, which, as everyone knows, has a filament of special shape. The Cossor filament, owing to its roughly semi-circular shape, is largely free from strains which are so often fatal to the straight type of filament.

In this connection, it is interesting to note that the emission from a filament in some cases is not at all critical with temperature, or, in other words, with applied voltage. I am informed by the Cossor people that the curve of emission with temperature for their filaments (dull emitters) shows that a considerable reduction of the voltage from the rated 2 volts may be made without any appreciable falling-off of the emission. This is not accidental, but has been specially sought in order to allow for the falling-off of battery voltage, especially where dry cells are used.

Ratio Problems.

What is the best ratio of low-frequency transformer to use for a particular circuit or part of a circuit? This is one of those everlasting questions which seem never to be settled. The fact is, of course, that whilst there are certain well-known theoretical considerations which might seem to govern the proper ratio for any given circumstances, other factors enter into the problem in practice which it is difficult, if not impossible, to take into account in the calculations and consequently the theoretical predictions are not always fulfilled in practice.

Speaking generally, it is held by some authorities that the best conditions are obtained when the impedance of the winding of the transformer is equal to the impedance of the valve to which it is coupled: for example, an intervalve transformer coupling the plate circuit of one valve with the grid circuit of the next ought, according to certain theoretical considerations, to have its primary impedance equal to the filament-plate impedance of the first valve and its secondary impedance equal to the filament-grid impedance of the second valve.

The plate and grid impedances of valves vary considerably even amongst valves of the same type: consequently, it is impossible to say that a certain transformer will function best in a given situation.

Interesting Results.

Whilst on this subject, I might mention that the ratio of turns of a transformer is by no means a true indication of the "amplification ratio" in any useful sense of the phrase. Merely high ratio of turns does not necessarily mean (and frequently does not mean) high amplification. This is why you will often find that a comparatively low ratio transformer will give much better results in actual practice than the one specified in the book. There is a great tendency, in my opinion, to overestimate the importance of a high turn ratio in a low-frequency transformer; I have found that in the great majority of cases anything above about 4 to 1 was of no real advantage, and frequently 3 to 1 and 2 to 1 were much superior to 4 to 1.

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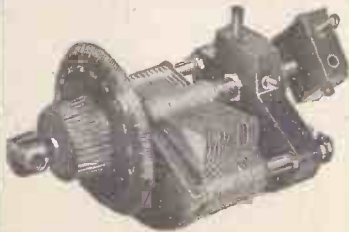
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SERIES OR PARALLEL?

By J. R.

To the radio amateur who has built his own set, or sets, the question of "series and parallel" may seem to be somewhat elementary, but it is surprising how many newcomers to the art—and newcomers are continually joining the ranks—are confused as to the proper place for the aerial condenser, series or parallel.

The aerial, if connected directly to earth, forms an oscillatory electrical circuit and will respond to incoming ether waves more vigorously the nearer the frequency of these waves coincides with what is called the "natural frequency" of the aerial-earth system.

A Mechanical Analogy.

Now the natural frequency of an electrical circuit depends upon its inductance and capacity; all readers are aware that inductance is something commonly associated with coils of wire, and capacity something commonly associated with an electrical condenser. We may understand better the influence of inductance and capacity upon the natural frequency of an electrical circuit if we compare it for a moment with an ordinary mechanical oscillatory system.

For example, let us consider a weight hanging from a vertical spiral spring. This is a mechanical oscillatory system, for if the weight be set into vibration up and down, it will continue to oscillate, with a frequency which depends, in this case, upon the weight—or "mass"—of the weight, so to speak, and upon the flexibility or "softness" of the spring. The greater the mass of the weight, the slower will be the oscillations, and the greater the flexibility of the spring the slower will be the oscillations.

In a wireless circuit, the inductance corresponds to the mass of the weight, and the capacity corresponds to the flexibility of the spring. The greater the inductance in the circuit, the greater the time of an oscillation, and the greater the capacity, the slower the oscillations also. And just as we can regulate the frequency of oscillation of the spring-and-weight system by varying either the weight or the flexibility of the spring, so we can control the natural frequency of oscillation of the wireless circuit by varying the inductance or the capacity, or both.

Large Inductance Preferable.

If an aerial were connected directly to earth—that is, without the detector in circuit—the natural "tune" of the aerial would depend upon its natural inductance and capacity, and as these would both usually be very small, the natural frequency would be high—that is, the wave-length to which it was naturally tuned would be very short. It should be remembered that for inductance it is not necessary to have a coil of wire: a straight piece of wire possesses inductance, although it is true that the inductance is greatly increased by winding a number of turns of wire into a coil. Similarly, the aerial

(Continued on page 339.)

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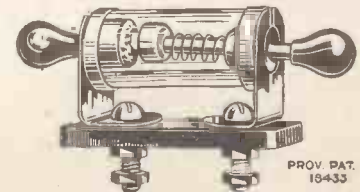
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SERIES OR PARALLEL?

(Continued from page 388.)

system, as mentioned above, will have capacity, even though there be no condensers (as such) in circuit. The aerial forms, in fact, a condenser with the earth, the aerial proper being one "plate" and the earth the other "plate." The natural capacity of an ordinary receiving aerial is usually somewhere about .0003 mfd.

Now let us suppose we connect in circuit the receiving apparatus, with its added inductance coils and condensers. The question is, What is going to be the natural frequency—or wave-length—of the system now? This all depends upon how the relation of inductance and capacity in the simple circuit is affected by the addition of the extra inductance and capacity brought in with the receiving set. It is essential to have an added inductance coil; for it is only by this means that we are able to tap off energy into the detector.

Decreasing the Wave-length.

Suffice it to say that it is convenient to introduce an inductance coil whose inductance is large compared with that of the rest of the aerial circuit, so that, for practical purposes, we may regard all the inductance of the aerial circuit as being concentrated in the actual inductance coil.

Having got this "weight" into the circuit, we have to adjust the "flexibility" until the frequency of the circuit is right for the wave-length we wish to receive. If the capacity in the circuit, represented by the natural capacity of the aerial and leads, and the capacity of the coil—for the coil has also a certain amount of capacity—is too large, we shall have to reduce it. One way to do this would be by cutting off a piece of the aerial. But the more convenient way is by introducing a condenser in series with it—for, as you know, the effect of putting two condensers in series is to diminish the capacity. Thus, when the capacity is too great—that is, the wave-length too long—we have to put the aerial condenser in series. If, however, the wave-length of the system—in the absence of any aerial condenser—be too short, we have to increase the capacity, and this we do by putting the aerial condenser in parallel with the aerial inductance—that is, the terminals of the condenser connected across the ends of the coil.

Useful Arrangements.

There are many ingenious designs of small switches called "series-parallel" switches, which permit the ready change-over of the aerial condenser from the one mode of connection to the other. These are useful when the amateur wishes to receive stations whose wave-lengths vary considerably.

In simple crystal circuits, sometimes an aerial condenser is not used at all, merely an adjustable inductance coil, or a variometer—which is practically the same thing. But the aerial tuning condenser, or variable condenser, has another practical advantage. Usually the aerial inductance can only be varied by single turns—if of the "slider" variety—so that the finest adjustment is not obtainable, but if the variable condenser is used as well, the jumps or discontinuities in the coil adjustment may be compensated by slight adjustments of the condenser.

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BOWYER LOWE.—H.P. Transformers, 7/-; Ant. Pong V.H., 3/-; Var. Condensers, with 5,000, 19/-; 9,000, 20/-; Eow Loss Coil Former, 5/-; BURNETT.—Rheostats, 5/-; Dual, 7/6; Detector, 4/-; L.F. 24/-; Potentiometer, 7/6; Anti-Phonic, 5/-. Colls from 3/-. CRYSTALS.—Neutro, 1/6; List No. 1/6. Uranium, 1/3; Shaw's Genuine Hertzite (Sealed), 1/-. Silverex, 2/8; COLLINSONS.—Selector Low Loss Geared Variable, .0003, 20/-; .0005, 21/-; Vernier, 2/6; Neurodyne, 3/6; DUBILLIER.—.0001 to .0005, each 2/6; .001 to .006, 3/6; each. Grid Leaks, 2/6; each. Type 610, fixed, 3/-; 3/6, 4/-; 4-8 Anode, 7/0, 100,000, each, 5/6 on stand. Mansbridge Variometer, 300/1,800.—2/5; DORWOOD.—.001 to .0005, 3/- each; .001, 3/6; .0003 (with grid leak clip), 2/6; EUREKA.—Concert Grand, 25/-; 2nd Stage, 21/-; Baby Rheostat, 3/6; Gravity Detector, 8/6; ENERGO H.F.—B.B.C., 3/11; Daventry 4/6; EDISON-BELL PARTS.—Variometer for B.B.C. or 5 X X, 15/6; Grav. Detector, 10/-; Fixed Condenser .001, .0001 to .0005, each 1/3; .002 to .006, each 2/6; .0003, with grid leak, 3/6; Shaped Plus, 2/6; 2 for 2/6; Loud Speaker, 42/-; Dulcevox, 42/-; GOSWELL GADALITY (RADIO). Coils, mounted 25, 1/6; 35, 1/8; 50, 2/-; 75, 2/3; 100, 2/9; 150, 3/6; 200, 3/9; 250, 5/3; 300, 6/-; Valve Holders, Legless, 1/3; Sub-Panell, 1/3; 4-Valve Sockets, 1/-; Coil Stands Panel—2-way, 3/-; 3-way, 5/-; Cam Operated, 2-way, 9/-; 3-way, 12/6; GAMBELL.—L.F., 1st or 2nd Stage, 27/6 each; 2-way Anti Cap Switch, 7/-; 4-way, 8/6; Neurodyne Condens., 12/6; Coils all sizes. H.T.C. VALVE HOLDERS.—"A" or "B," 1/8; C. 1/8; H.T. BATTERIES.—B.B.C., 30/-; 6/3; 40/-, 8/6; 10/6; Ever-ready 66v., 12/6; 108v., 20/-; 60v., best made, 9/11; 45, 5/6; 6/- dozen. HEADPHONES.—BRITISH 4,000 OHMS.—B.T.H., Browns, Brandes, 20/- pair; Sterling, English Ericson, 22/6 pair. Bowerman's 8 up r C Philips, 12/6; P.A.T. HEADPHONES. GENUINE 4,000 OHMS.—Dr. Nesper Adjustable, 18/11; Telefunken Adjustable, 18/6; N and K Stamped on back, 14/11; Brunet, new model, 14/11; IGRANIC.—L.F., 1st, Stage, 21/-; 2nd Stage, 19/6; Coils, Ultrinic, 9/-; Uniline, Major, 9/-; Minor, 7/6; Honeycomb, 25, 35, 4/3; 50, 4/6; 75, 4/10; 100, 6/3; 150, 7/-; 200, 8/-; 250, 8/6; 300, 9/-; 400, 10/-; 500, 10/3; 600, 12/-; 750, 12/6; 1,250, 15/6; 1,500, 17/6; Rheostats, 3/6, 5/6; Variometers, 10/-, 12/6; Potentiometer, 5/6; H.R., 8/6; Variable Grid Leak, 2/6; Muller Square Law Varia. Condensers, .001, 27/6; .0005, 24/-; .0003, 21/-; "KAY RAY" DETECTORS.—Enclosed nickel fittings, trigger movement, 2/6; Permanent, 2/-; Do, one-hole fixing, 2/6.

OPEN DAILY 9 a.m. to 8 p.m. ALL DAY SATURDAY. SUNDAYS 11 to 1.

UNDYNE THORPE K.4.—Bower Electric Genuine only Thorpe K.4 5-Pin Valve, 14/-; 5-Pin Holders, 1/3; Sets of Parts, one Valve, 4/6; two Valve, 6/6 (excl. incl. box and panel, but including valves). WATMEL.—Variable Grid Leak, 2/8; Anode, 3/6; Green Knob, 3/6; Fixed Condensers, 2/6, 3/6 (all sizes). WOODHALL PARTS.—L.F. Transformer, 23/6; Vernier Rheostat 7 ohms, 2/6; 30, 3/6; 2-way, 10/6; "WONDER" AERIAL.—Multi 49 Strand, Phosphor. Bronze, Indoor, Outdoor, Frame Aerial, 100ft., 3/8; SUNDRIES.—COIL STANDS.—2-way Standard, 2/8; Cam V., 4/6; Geared, 5/6; 6/-; 3-way Standard, 5/6; Cam, 6/6; Geared, 7/11; COIL PLUGS (Ebonite).—Ritied Filtr., 1/6; pair. Shaped, Brass sides pair. Standard, 1/6; pair. Panel Mfg., 1/6; pair. ACCUMULATORS.—2 v. 40 amps., 9/6; 10/6; 4 v. 40 amps., 15/11; 17/6; 4 v. 60 amps., 22/6, 23/11; 4 v. 80 amps., 25/-; 26/-; 6 v. 60 amps., 30/-; 33/-; 6 v. 100 amps., 45/-; 160 amp. cell, Rotax, etc., etc. ATROL VALVE HOLDERS.—1/3; Aermonic, 1/8; A.B.C. Wavetrap former, 3/6; TERMINALS.—Complete, per dozen.—Ormond, W.O. and Pillar, generous size, 2/-; Standard do., 1/3; Nickel, 8d. dozen extra. Phone, 1d. Screw Pins or Screws, 1d. Dozen or Black, 1/8; Nickelized Tags, 6d. Brass Tags (3 dozen), 6d. Flush Panel Sockets, 1/- dozen. REEOSTATS.—Raymond, 1/6; Extra quality with Dial, 2/6; Peerless, 6 or 30 ohms, 2/6 each; 6 or 30 ohms wound on china former, 2/- each; Ormond, 2/-; Ormond Nickel, 2/6; AERIAL WIRE (100 feet).—Heavy, 7/22, 2/6; Ribbon (Tape), 2/6; FLEX (Twin), etc. (any length cut).—Red and Black, 12 yds., 1/-; Miniature, Silk, 12 yds., 1/6; Rubber Lead-in 10 yds., 1/8; Extra heavy, 4/- doz. Insulating Hooks, 1/8; doz. Empire Tape, 1/-; 12 yds., 1/-; TOOLS.—Soldering Irons, 1/-; Set of high-class drills, 1/6; 4 Taps, 0, 2, 4, 6, B.A. 2/6 set. Cutting Pliers, 1/8; PHONE CORDS.—Cut to size, 1d. per square inch, 3/16; 1d. for 1 in. Post extra. VARIOMETERS.—Standard Former Ball Tor, 4/6; Inside wound (similar to Edison Bell, etc.), 8/11; Complete with Knob and Dial. PANEL SWITCHES Nickel SPDT, 1/-; DPDT 1/3; VALVES, Marconi, Osram, Muller, Ediswan, Cosor Bright, etc.; D.E.R., 14/-; .06, 16/6; Power, 18/6, 22/6.

COLUMNS

RAYMOND VARIABLE CONDENSERS SQUARE LAW LOW LOSS. One hole Fixing. Ebonite Ends. With Vernier .001 ... 8/6 .0005 ... 7/6 .0003 ... 7/6 Without Vernier .001 ... 7/6 .0005 ... 5/3 .0003 ... 5/3 Knob & Dial FREE. Post 3d. ORMOND "LOW LOSS" AMERICAN TYPE Skeleton Ends. .001 ... 9/6 .0003 ... 7/6 Knob and Dial. .0005 ... 8/- .00025 ... 6/6 (With Vernier, 1/6 each extra) J. B. JACKSON BROS.—Square Law—.001, 9/6; .0005, 8/-; .0003, 6/6; .0002, 6/6; .0001, 5/6; .0002, 5/6; Square Law with Vernier—.001, 15/6; .0005, 12/6; .0003, 11/6. GEARED MODELS SPECIALLY SECOND-HAND GOODS PATRONISE THE LIVE FIRM! I will accept in part payment for new goods (or purchase if so desired) any articles you have no use for. POST CUSTOMERS Please write first. Callers can bring goods. VALVES 1 Burn-out VALVE bought by me for each New British Valve you purchase here. Prices given from 1/- to 4/- according to Valve — you take. ALSO USABLE VALVES taken in part exchange. Customers purchasing 25 worth of our OWN goods at full prices presented with a first class pair of HEADPHONES, 4,000 OHMS. DR. NESPER OR GENUINE N & K Or, alternatively, if you buy 25/- worth of our OWN goods you can purchase a good pair of HEADPHONES for 4/- extra. OUR SELECTION. Or HAVE YOUR PANEL DRILLED FREE This offer is limited to one offer per order. Prices and offer subject to being cancelled without notice. BRETWOOD Grid-leak and Condenser. 50,000 ohms to 15 meg. Ohms. Guaranteed. Price 4/8. Variable grid-leak 3/- Anode Resistance 3/-

7 GRAPE STREET Shaftesbury Avenue, W.C.2. NEW OXFORD STREET END (Phone: Gerrard 2281.) THIS ADDRESS IS:—Back of Prince's Theatre, 1 min. Tottenham Court Road Tube, 1 min. Museum Tube, 3 mins. Holborn Tube, 2 mins. Palace Theatre.

ALL ORDERS SENT IN STRICT ROTATION, ACCEPTED ON THOSE CONDITIONS. Send Postcard for Illustrated Folder

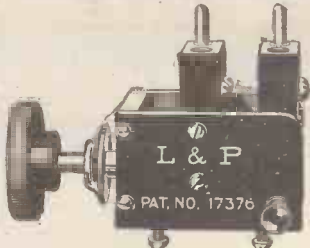


Soft and Silky Movement

brought about by a worm and pinion action, together with a compensating spring to take the weight of the moving coil makes the L. & P. coil holder the finest on the market.
That fraction of a movement so needful for logging distant stations can be given to your coil with this infinitely fine tuning device.
Do not buy a coil holder of any description until you have sent for our Booklet.

From all Good Dealers or Write at once for list. Sent free on request.

LONDON & PROVINCIAL RADIO COMPANY, LTD.,
35, Colne Lane, Colne, Lancs.



Other leading "Ellanpee" Lines.

L. & P. Valve Windows enhance the appearance of any set. Small size 2/6 each. Large size 3/6 each.
L. & P. Miniature Switches, D.P.D.T., 1/6 each.
L. & P. Pull and Push Switch—positive action, positive satisfaction—only 1/6 each.



RADIO "CROXSONIA" PANELS

Money back guarantee that each and all Panels are free from surface leakage, Meggar 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/-; 14" x 10", 3/5; 14" x 12", 4/-; 7" x 5", 1/- thick. Post Free.
Callers, cut any size, and quote by Post.
Sample, and prices, post free to the Trade.

CROXSONIA CO., 10, South St., MOORGATE, E.C.2

DULL EMITTERS REPAIRED

Each concert tested, 7/6. .06 Valves, 9/6. Bright, 4/9. Guaranteed quick delivery. Send remittance with valve to W. G. Eames, 15, Red Lion St., London, W.C.1. 'Phone: Chancery 7750.

WIRELESS

MIRACLE

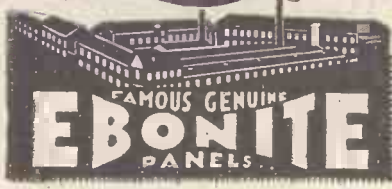
Two-valve set regularly receives stations over 400 miles distant on the Loud Speaker. 72/6 plus Royalties. A Two-Valve Set with the Power and Range of 4 valves.

Special Discounts. LIST FREE.
WORLD'S WIRELESS STORES,
WALLINGTON.

AGENTS WANTED.

Either sex, to sell Private Christmas Cards. No outlay. Big commission. Sample book free and post paid. No experience required. £1,000 given away in prizes. For full particulars write to J. Renshaw & Sons (Dept. R.74), Climax Works, Accrington.

EARN
£10
IN SPARE
TIME



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.

REFLEX v. STRAIGHT CIRCUITS.

The Editor, POPULAR WIRELESS.
Dear Sir,—I have read your article on "Reflex Circuits v. Straight Circuits" ("P.W." No. 173), and I do not think the writer, or Capt. Eckersley, do the reflex justice.

What we are aiming at is efficiency and economy, and there are, unfortunately, many people in this country to whom the upkeep of multi-valve sets is impossible.

I consider that the one valve reflex is the most economical one-valve set, and that it is better, and more pleasant to handle, and will give more satisfactory all-round results than any other single-valve circuit. I use it between 180 and 2,600 metres, and can get most of the stations in Europe on the one valve.

I see that an imaginary bogey has again been set up to be knocked down—that is, that the H.F. valve will not stand negative grid bias, and that the valve will oscillate if negative grid bias is given. This is not true, as I and my friends have used 3 to 4 volts negative on an R. Valve Reflex for years, with excellent results.

On the one hand we are told that the reflex is not selective; and on the other that bias makes it oscillate. The truth is that you can use bias and have the reflex valve under perfect control.

An ordinary low resistance galena or similar low resistance crystal will not readily oscillate, and full bias can be given. As it does not oscillate readily, selectivity is not obtained very well with a single circuit tuner, but all the selectivity required can be obtained with the reflex by adding an aperiodic aerial coil and using the number of turns as required.

I find that 20 aperiodic coil will give all the selectivity required on 2 L O, but if power is required, 30 is better, and is still selective.

A fact which does not seem to be appreciated is that an H.F. valve in front of a crystal is the most satisfactory way of using H.F., as the crystal supplies the right amount of damping and neutrodyne arrangements are not required for damping by grid bias.

The H.F. valve should not be judged by its effects with a valve detector.

I find that a power valve can be used with most satisfactory results on a single-valve reflex, which is against theory.

I may say that I can switch over from single-valve reflex to H.F. and crystal, so know that there is no question that the dual gives infinitely the better result, either for distant or near stations, even though I have only home-made transformers.

I do not think that the reflex followed by another L.F. valve is often found satisfactory, but this is due to the two transformers used; and I think that unless the utmost care is taken in the choice of the two transformers, and the two valves, good results are difficult to obtain with any circuit, straight or reflex. It is easy to get plenty of noise, but most difficult to get music.

A more satisfactory way is to have another stage of H.F., and here a good neutrodyne arrangement is wanted.

I have several times tried using two valves—H.F. crystal and L.F. in place of the single-valve reflex and can find no improvement in two valves. I have also most carefully tried a big range of H.T. on an H.F. and crystal, and corresponding grid bias, and find no loss of sensitivity with high value of H.T. and grid bias.

I am, Yours faithfully,
ALFRED W. BOOTHROYD.

Colne Lodge, Lexden,
Colchester.

AN ULTRA-UNIDYNE.

The Editor, POPULAR WIRELESS.

Dear Sir,—As I have just constructed the "P.W." Ultra-Crystal set, and have included in the circuit one stage of "Unidyne" L.F. amplification, I feel I must write to say that it beats all other crystal sets I have heard, in fact, it is as good as any one-valver, and when I switch in the L.F. amplifier the volume is so great, makes it a set that anyone could be proud of, Daventry coming in good, while Newcastle comes in with great strength. I am using a Thorpe K4 valve and a Brunet Transformer, so I feel I must thank the Technical Staff, also Messrs. Dowding and Rogers, for such fine circuits, also wishing "P.W." continued success in the future.

Yours sincerely,
THOS. MULLEN.

65, Viceroy Street,
Seaham Harbour.
P.S.—My next set will either be a three or four-valve Unidyne.

MORE UNIDYNE RESULTS.

The Editor, POPULAR WIRELESS.
Dear Sir,—Some time ago I became a subscriber to your paper and I must say I am very much pleased with the publication on the whole; it is really a first-

class paper for those situated like myself far from the society of any who might be able to give any information on matters relating to wireless and, seeing so many letters praising the Unidyne, I decided to build one-valve according to the instructions you gave lately.—I am pleased to say it's highly successful—reception is strong from Belfast, Glasgow and often Manchester. Newcastle comes in with the same volume as Belfast.

Recently there being a lull in the Belfast studio, I had Toulouse quite strong and distinct. The announcer called in fair articulation: "We are here in Toulouse. Band will play fox trot by Morris Evans." Then the "Savoy Orpheans" came along and, of course, you know what happens.

It remains for me to thank the inventors, Messrs. Rogers and Dowding, for the production of the Unidyne. I shall be pleased to let anyone interested hear the set.

I use Brown A 'phones.
Yours faithfully,
Aughmacloy,
Co. Tyrone.
PATRICK SPEER.

CRYSTAL RECTIFICATION.

The Editor, POPULAR WIRELESS.
Dear Sir,—Reading page 152 of "P.W." September 19th, re crystal rectification, I think it may interest your readers to know that I can any time receive the local transmission on a simple crystal set quite loud by placing a strip of metal and carefully adjusting it across the aerial and 'phone terminals, without any crystal or the cat's-whisker in contact with anything at all. I can also get quite good results by bringing the cat's-whisker into contact with the aerial—of course, the crystal out of action altogether—the contact between aerial and cat's-whisker giving the rectification.

Yours sincerely,
Westwood,
Heaton, Bradford.
E. TURNER.

MORE UNIDYNE RESULTS.

The Editor, POPULAR WIRELESS.
Dear Sir,—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.

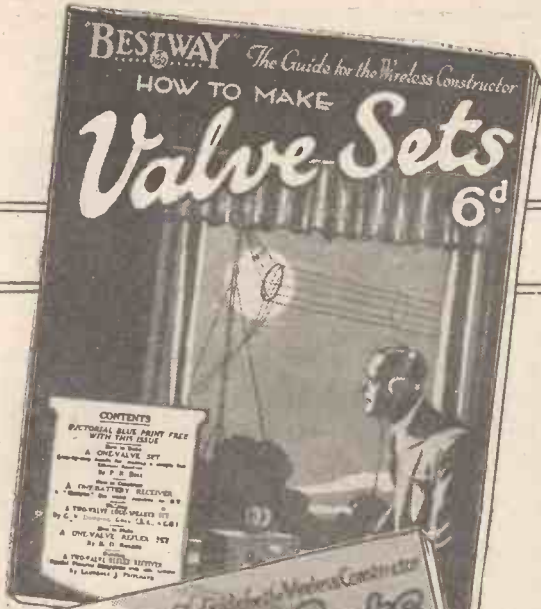
Yours sincerely,
Burnley.
H. Lewis.

H & H Tubular Galvanized Steel Telescope WIRELESS MAST
(Patent applied for)
35 ft. HIGH.
Complete with base plate, ground pegs, stay wires, straining screws, pulley and cleat.
Price £2:17:6 complete
25 ft. Rigid Masts, 20/-
HILDICK & HILDICK, Pleck Rd., Walsall.

'PHONES REMAGNETIZED FREE
ALL MAKES REWOUND, 4,000 ohms, 5/-.
'Phones Rewound are Remagnetized Free.
Remagnetizing only 2/- Loud Speakers from 3/6.
Transformers from 5/-. Post extra.
The H.R.P. Co., 46, St. Mary's Road, Leyton, E.10

MAKE YOUR OWN ELECTRIC LIGHT 5/6
These wonderful Dynamos light brilliantly 4-6v. lamps and are very easy to work. "De-Luxe" model 5/6, post 6d. (usual price 7/6). List free.—GREENS (Dept. E.C.2), 65, Long Acre, London, W.C.2.

W. R. & S. BROADCASTING GOOD VALUE.
WIRELESS "R" MODEL 44 ins. high
CABINET No. 1 20 " wide
8 " deep
30/- Carr. Paid
Gt. Britain.
Top compartment 15 ins. high, enclosed with two doors Under divisions 8½ ins. and 12 ins. high. Made of choice timber, stained and varnished light, medium, or dark oak. Build your set in this cabinet and you will be delighted. LARGER SIZES same height.
23" wide 35/- 23" wide 40/- Two doors to 4/6
10" deep 13" deep bottom shelves, extra
Wm. RICBY & SONS, 4, Kendal St., PRESTON



BESTWAY

WIRELESS GUIDES

FOUR NUMBERS
NOW ON SALE

THE aim of the BEST WAY Wireless Series is to put before the new constructor details for the building of wireless sets and components in such an explicit and minute way that there can be no possible chance for even a beginner to go wrong. All articles, diagrams and photographs are of the highest possible standard, and the books represent the biggest value ever offered in wireless publications.

Ask for "BEST WAY"

**CRYSTAL SETS
VALVE SETS
WIRELESS COILS
SPECIAL SETS**

6^d each.

The cover features the title 'BESTWAY The Guide for the Wireless Constructor HOW TO MAKE SPECIAL SETS 6d'. Below the title is an illustration of several different wireless set enclosures.

THE "P.W." RADIO SOUNDS COMPETITION

First £250 Prize

Second £100 Prize

Over 200 Consolation Prizes

Friday, October 16th, 1925

IN co-operation with the British Broadcasting Company we have been able to arrange a splendid novelty in the way of competitions. Nothing quite like it has ever been done before, and when the great night comes you will find it easy and amusing, and in addition you have an opportunity of winning one of the fine prizes we are offering.

THE object, apart from entertaining POPULAR WIRELESS readers, is to find out how far certain sounds are recognisable by wireless. So at 7.50 o'clock in the evening of FRIDAY, the 16th OCTOBER, you will have an exciting half-hour during which the B.B.C. will transmit twenty ordinary, well-known sounds—which you have to identify.

ALL YOU HAVE TO DO

is to listen carefully to each sound and then write what you think it is on the form which we are giving you on the right, here.

THE B.B.C. announcer will give the number of each sound before its transmission, and you should immediately note the corresponding number on the form, so that you enter your solution in the proper space. In some cases spoken clues will be given before the sounds, which will make your task easier.

HERE we may include a word of advice as regards the use of the form. It would be as well to provide yourself beforehand with some scrap paper, so that should you be in doubt at the time about any particular sound, you can make notes and decide on your solution later, rather than put a hasty answer on your form only to spoil it afterwards by alterations.

ANOTHER point—the form must be written out IN INK.

WHEN all the sounds have been sent, listen for any remarks or directions which the announcer may be giving, then complete your form, sign and address the coupon properly, and send it to:

"Radio Sounds" Competition,
c/o POPULAR WIRELESS,
Gough House, Gough Square,
London, E.C.4. (Comp.)

ALL entries must reach this address by TUESDAY, the 20th OCTOBER. Efforts arriving thereafter will be disqualified.

RULES

THE First Prize will be awarded to the competitor whose solution is correct or most nearly correct, and the other prizes will follow in order of merit. The Editor reserves the right to divide the prizes, or their value, should it be necessary.

Any number of attempts may be sent in, but each attempt must be quite distinct from any other attempt, and must be made out on a proper form as published here. All entries must be made out IN INK. Entry forms must not be mutilated or bear alterations or alternative solutions of any kind. No responsibility can be accepted for any efforts lost, mislaid or delayed.

The Editor's decision will be final and legally binding throughout this contest, and acceptance of this rule is a distinct condition of entry.

No one connected in any way with the proprietors of POPULAR WIRELESS or with the B.B.C. may compete.

The British Broadcasting Company have deposited with us, under seal, the correct solutions of all the "Sounds" to be given. All the solutions can be expressed in very few words, and it is particularly requested, therefore, that none of your answers should exceed FOUR WORDS.

"Radio Sounds" Coupon

Please Write Plainly in INK

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Closing date, Tuesday, 20th October, 1925.
In entering the "P.W." "Radio Sounds" Competition, I agree to accept the Editor's decision as absolutely final and binding.

NAME

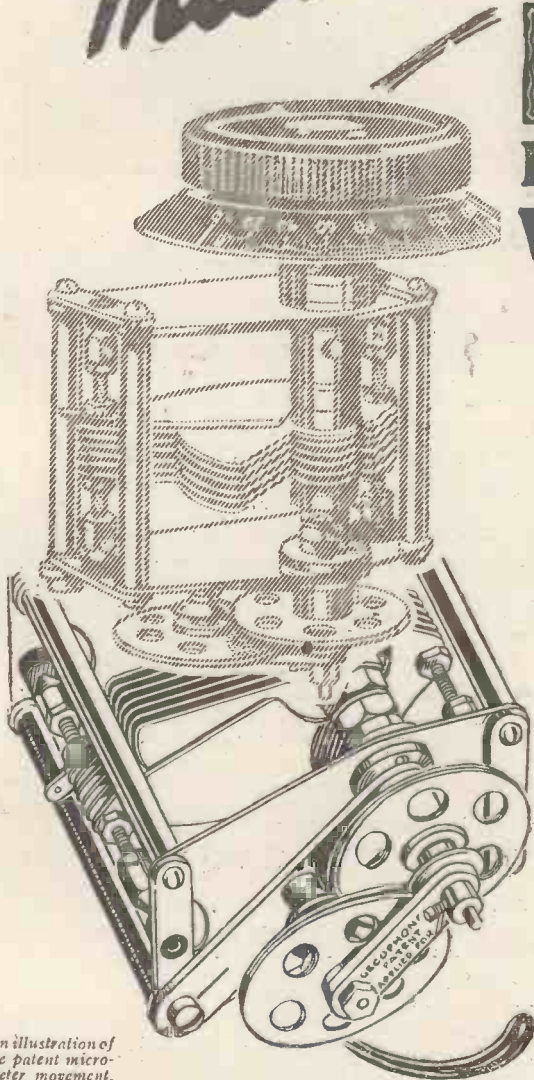
ADDRESS

Unique Micrometer Adjustment

The third of a series of advertisements illustrating the advantages of the GECOPHONE Low-Loss Slow Motion Variable Condenser.

GECOPHONE

LOW LOSS-SLOW MOTION VARIABLE CONDENSER



An illustration of the patent micrometer movement.

Minutely delicate tuning, delightful velvety smoothness in operation, entire absence of backlash—these are three of the many advantages that incessant experiment and research have given to the cause of wireless progress in the new GECOPHONE Low-Loss Slow-Motion Variable Condenser.

They are a result of the patent micrometer mechanism; a unique and exclusive feature—banishing toothed gears—that has given a new meaning to condenser tuning.

Here are other important features:

The large control knob assists the micrometer movement in providing fine tuning.

Insulation of fixed plates outside electrostatic field ensures the smallest dielectric losses.

Minimum capacity is lower than in any other type.

Hand-capacity is eliminated.

The condenser is adapted for one-hole fixing, and can be mounted on a metal panel without insulation.

PRICES:

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

Full particulars of GECOPHONE components are given in Booklet B.C. 3759—of GECOPHONE receiving sets in Booklet B.C. 3772. Ask your dealer.

Built into your set, this new GECOPHONE condenser—with its sound and signal advancements in design—will provide an absolute perfection of tuning that the old-type condenser could never give.

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

LISSENIUM

STABILITY

IN H.F. CIRCUITS



The elimination of losses in H.F. couplings results in greater efficiency, but as the efficiency is increased so also is the tendency to self-oscillation.

In practically all circuits embodying two stages of H.F., it has been necessary to overcome the tendency towards self-oscillation by the introduction of damping and any attempt to increase efficiency by the use of low-loss inductances was largely counteracted by the excessive damping necessary to maintain stability.

The remarkable stability of receivers built with LISSEN NEUTRALISED TRANSFORMERS is not obtained by damping, and there is no sacrifice of their high efficiency.

Stability in the LISSEN NEUTRALISED TRANSFORMERS is due to their design and shape and the arrangement of the coils, so that external fields are practically eliminated.

The use of LISSEN NEUTRALISED TRANSFORMERS overcomes the big disadvantage of having to use stabilising condensers, with their difficulties of adjustment and re-adjustment whenever a valve is changed or wave-length range altered. Stability is not obtained by taking a tapping from the coils as in the Hazeltine type of transformers and wiring is consequently greatly simplified.

Unlike the American type of Neutrodyne Receiver, in which the wave-length range is usually limited, the set built with LISSEN NEUTRALISED TRANSFORMERS can be used for the reception of any wave-length between 260 and 3,300 metres. The transformers can be changed as easily and quickly as plug-in coils.

LISSEN NEUTRALISED TRANSFORMERS are made in sets of three and in five ranges. No. 1 Transformer of each set is an aperiodic aerial coupler and the remaining two are special H.F. inter-stage transformers.

EACH SET IS PERFECTLY MATCHED.

The receiver built with LISSEN NEUTRALISED TRANSFORMERS is remarkable for its extreme selectivity—stations separated by only a few metres can be received without any trace of interference.

The receiver is particularly easy to operate and once a station has been logged it can always be picked up again by setting the condensers to the appropriate scale readings.

A	Range (A1, A2, A3)	260 to 500 metres.
B	" (B1, B2, B3)	420 to 740 "
C	" (C1, C2, C3)	720 to 1,300 "
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POPULAR WIRELESS

No. 177. Vol. VIII.
October 17th, 1925.

and Wireless Review

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and

THE "P.W." TWO-VALVE AMPLIFIER.

L.F. Amplification in Reflex
Sets.

General Hints for New
Amateurs.

Home-made Plugs and
Jacks.

The Ultra-Audion as an
H.F. Amplifier.

Another Article by Gerald Marcuse.

A field wireless station in operation during the recent
army manoeuvres is shown in the above
photograph.

The Key to Better Wireless Reception



SPECIAL FREE OFFER

The OSRAM VALVE Indicator is an exceedingly useful novelty which shows the correct type of OSRAM VALVE for any working condition, merely by revolving the back of the card in the manner shown in the illustration. It definitely eliminates all guesswork or uncertainty in the selection of valves, ensuring for the user *perfect radio reception* at the lowest possible running cost.

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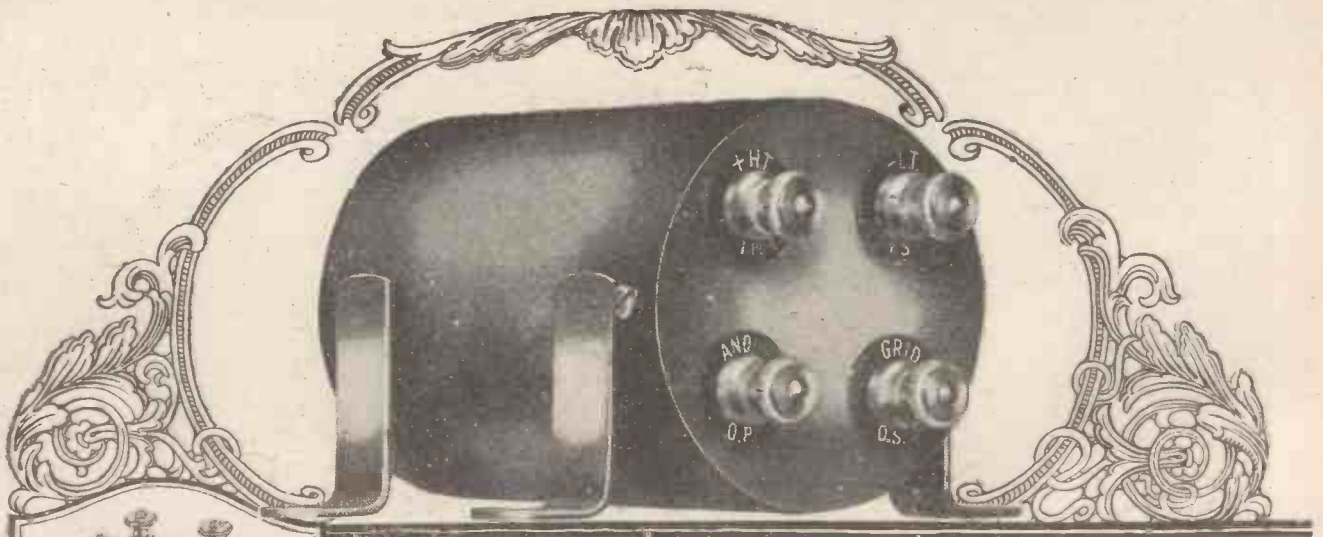
Standing 15 inches high and fitted with the standard Brown tuned reed movement, this new H3 will give an exceptionally generous volume of tone. Owing to its greater sensitiveness it will give much louder results than any other Loud Speaker of equal size. In resistances of 2,000 or 4,000 ohms

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After two whole years Eureka supremacy is still unchallenged

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Transformer is to your Set what an engine is to a motor car. You may select the finest looking car—its appearance may be most impressive. But if its power unit is inefficient, your money will have been wasted. So with your Set. You may spend pounds on the other components—you may choose the most expensive panel, yet if your L.F. Transformer is inferior, the whole of your expenditure will be prejudiced. Any Eureka Transformer is a veritable key to melody. Such purity of tone and volume as was never before believed possible is now within the reach of everyone. With its five distinct models there is now a Eureka to fit every need at a price within the reach of the most modest experimenter.

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The usual transformer is not pre-eminently suitable for reflex circuits. Special qualifications are needed, and here is the first Reflex Transformer built to measure up to true Eureka standards of quality and to conform to reflex requirements. Each .. 15/-

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For those whose purpose does not render the superlative Concert Grand a necessity, we can now offer the Eureka Baby Grand Nos. 1 and 2 for second stage. Incorporating all the recognised Eureka principles of design. Each .. 15/-

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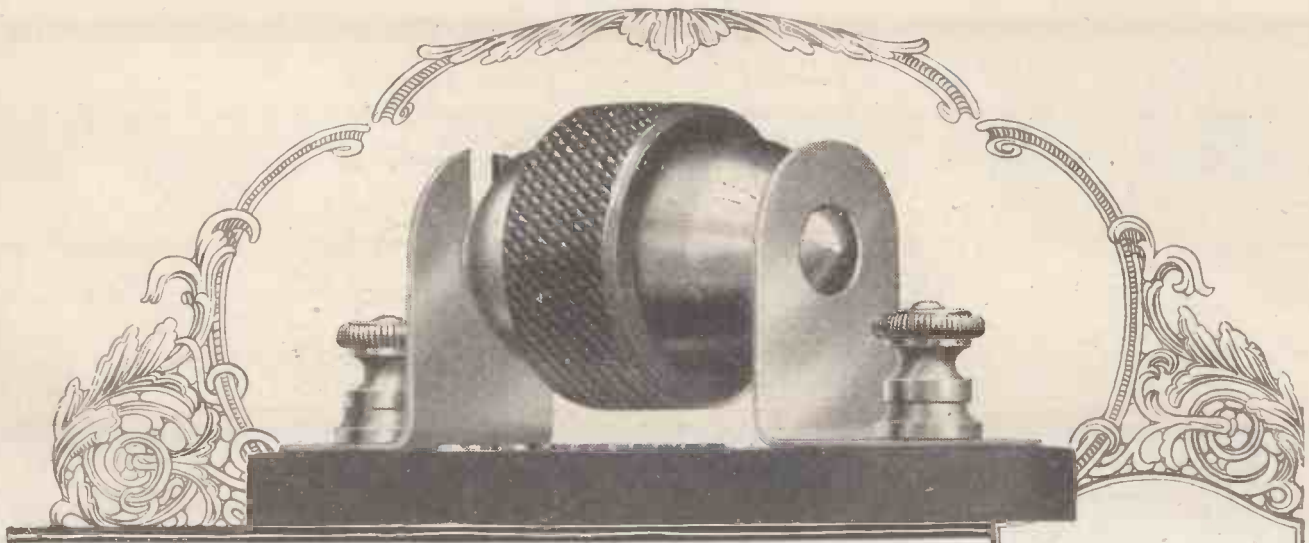
RADIO

Portable Utilities Co., Ltd.

EUREKA

PRODUCTS

Fisher St., London, W.C.1



Why the new Eureka Rotary is the last word in Detectors

A permanent Detector is convenient but comparatively insensitive.

A catwhisker Detector is supersensitive but troublesome.

The Eureka Detector combines all the advantages of both and possesses the disadvantages of neither.

FOR three years the world has been waiting for a Crystal Detector so foolproof that it can be set in the dark. One that is really sensitive to weak signals. One that is thoroughly adjustable. One that will never wear out. One that can be reloaded with a new piece of crystal in a moment. One that is proof against damage. One that will receive any type of Crystal. Many Crystal Detectors on the market will measure up to one or two of these requirements, but until the Eureka Rotary appeared none could measure up to all.

The Eureka Rotary is totally enclosed, dustproof, and employs entirely new principles. It makes use of a series of phosphor bronze contact points made to rise and fall in contact with the Crystal by

means of a rotary cam operated by an external ebonite ring. The pressure of the point on the crystal can be varied from a gentle touch to a firm grip.

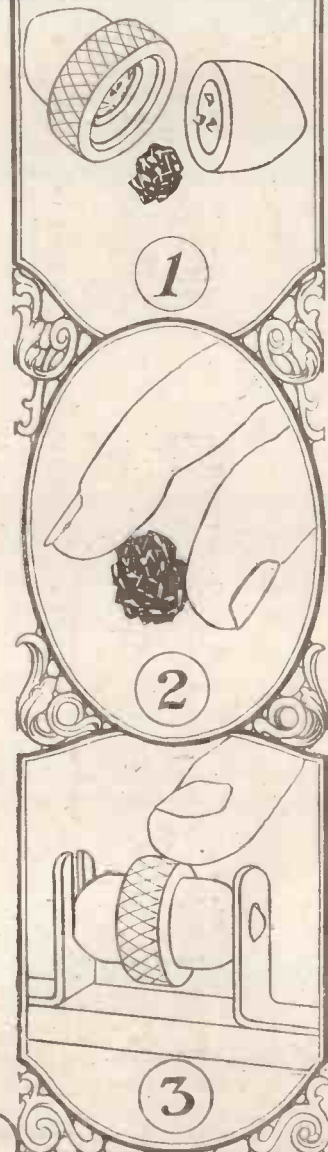
THREE EUREKA EXCLUSIVE FEATURES.

1. Merely remove the Eureka Rotary Detector from its clips and it falls apart and releases the crystal for a complete change of facets. No unscrewing or troublesome fitting.
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3. Rotate the Eureka and you bring into operation a succession of sensitive spots. Stop rotating when you have obtained the loudest signals and adjust for pressure of contact.

From all Dealers.

Everyone knows that the fixed Detector—after a brief spell of fame—is falling rapidly out of serious consideration. No Crystal can remain sensitive in one spot for long. And a permanent Crystal Detector when insensitive must be thrown away. The Eureka lasts for ever. You can use any new crystal that is placed on the market. It is a handsome component which will enhance the appearance of any Receiver. If required it can be mounted direct on the panel by using the

5/6 template. Every instrument is covered by the generous Eureka guarantee.



RADIO

EUREKA

PRODUCTS

Portable Utilities Co., Ltd.,

Fisher St., London, W.C.1.

Gilbert Ad. 347



“Trip the light fantastic toe”—

FOR Radio Dance music you need volume—as much as the Loud Speaker can possibly provide without distortion. This means obviously the use of a Loud Speaker Valve—and here is where the Cossor W.3 is winning unstinted praise from Dull Emitter users throughout the country.

The old idea that a power valve meant extravagant and costly high tension voltage and excessive filament current was rudely dispelled when the Cossor W.3 Valve was placed upon the market.

You do not need to rebuild half your set to get real volume if you use a W.3. Provided your set is already equipped with a first-class L.F. Transformer and that you can add grid bias if required, and that your L.F. valve can receive a greater anode voltage than the Detector or H.F. valves, all you need to do is to take out your existing valve and insert a W.3.

The increase in volume and the wonderful mellowness of tone will amaze you. And it will be entirely due to two distinct points of superiority. The Wuncell filament and the

famous electron-retaining Cossor principles of design. The Wuncell filament is manufactured under a process known only to Cossor, whereby it is built up layer upon layer—the only filament in the world to be made under this method. Whereas other valves obtain low current consumption by the use of fragile and whittled-down thoriated filaments, the Cossor uses one as stout as that used in a bright emitter valve, but which gives off a prolific stream of electrons at a *dull red glow*. A real, long-life filament, in fact. Couple such a filament to the efficient hood-shaped anode and grid, and obviously you'll obtain an exceptional degree of efficiency.

If you would know more about the unique Wuncell—how it will save its entire cost of 14/- in accumulator recharging within a few months—how its almost unbreakable filament is securely anchored in three distinct places—how the same valve can be used with either a 2-, 4- or 6-volt accumulator without alteration to your Receiving Set, go to your Dealer and ask for some of the new Cossor Folders free of charge—they are well worth reading.



The Cossor W.3
Loud Speaker Valve

A new power Valve
for use with Wuncells
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RADIO NOTES AND NEWS.

European Broadcasting—Too Many Stations?—Extra Dance Music—“P.W.” Great Competition—“Broomstick” Aerials—A Good Half-crown’s-worth—Reaching Out at Keston.

Developments in Ireland.

THE Irish Free State Government has been advertising for a station director, musical director, and engineer for the new Dublin broadcasting station. It has even been reported that the station will be testing within the next three weeks; but according to the Irish “Radio Journal” the latest information can be summed up in the following words: “It is expected to have the Dublin station ready for opening on December 1st.”

“Tests will probably take place in mid-November.”

“At least one other station, probably Cork, will quickly follow.”

I hear that Mr. Reith, of the B.B.C., and Sir Hamilton Harty, conductor of the Hallé Orchestra, Manchester, have been appointed to the Free State Selection Committee.

New Programmes.

PLENTY of other new broadcasting stations are being planned for the near future. Persia is to have one main station (Teheran) and six relays; Kovno (Lithuania) is already on the air with test programmes; whilst a private company in New Zealand has agreed to erect stations at Auckland, Wellington, Christchurch, and Dunedin.

Too Many Stations?

SINCE Captain Ekersley’s frank statement that there are already too many broadcasting stations in Europe, rumours of the imminent closing of this or that station have been the order of the day. Most of the relay stations have been gloomily regarded by the pessimists, and I have already had letters from Sheffield and Plymouth asking if these stations will be closed by the B.B.C. in the near future? So far as can be ascertained there is no intention of anything of the sort at present, and in any case the chief engineer has promised that nobody will be worse off as a result of future changes.

European Broadcasting.

THE present broadcasting situation in Europe is rather uncertain, but recently it was ably outlined by a writer in the “Daily Telegraph,” who stated “Europe has more broadcast stations than it can conveniently or successfully operate. The only solution of the problem is to get rid of some of them. This does not mean that each country is to be asked to close down two or three of its stations immediately. Such an idea is unthinkable. Broadcasting has only just commenced, and services must be extended and not

been received by surprised neighbours, who could recognise the voices. Following complaints, I understand that the matter is being inquired into by the Superintendent of Telephones for the district.

2 L O Incident.

TALKING of unintentional broadcasting, rather an amusing case occurred some weeks ago at 2 L O. It was at the conclusion of the Easthope Martin programme, when the composer had been conducting his own compositions, which, incidentally, had been very enjoyable. But his most carefully rehearsed performance failed to make listeners sit up and take notice in the way they did when the microphone switch was accidentally left on for a moment, and somebody in the studio said heartily to somebody else, “Well, good-night, gov’nor!”

A Suggestion.

WHY don’t announcers speak more clearly when giving out the name of a station? At this time of the year thousands of people are reaching out with new sets and trying to tune in weak stations, but in the majority of cases they are disappointed because announcers mumble the name of their station as though they were ashamed of it. A little care

in giving the call-sign and name clearly and frequently would be an untold boon to long-distance listeners, and it would stop the disappointment which will always be felt whilst stations remain incognito for hours on end. Let us hope that this winter will see the end of “Mumble-mumble Calling.”

Congesting the Ether.

WHILST the Geneva Conference is complaining that there are too many stations in Europe, America—where they are far more numerous—is still
(Continued on page 398.)

TWO IMPORTANT POINTS TO REMEMBER

TOMORROW, Friday, October 16th, is the date of the great “P.W.” “Radio Sounds” Competition. It will be S.B. to all stations except 5XX. Turn to the last page for full details for winning £250 and other valuable prizes.

FRIDAY, October 23rd, is another important day—the date of the 3rd Great “P.W.” Meeting, at the Central Hall, Westminster. Nearly every free ticket has been disposed of, but some tickets at 3/6, 2/4 and 1/2 can still be obtained. Full particulars will be found on page 437.

curtailed.” Another meeting of the experts will take place at Geneva in December, and in the meantime the permanent staff there is busily engaged in sifting results and preparing plans to clear up the clash in the ether.

P.O. Leakages.

LISTENERS at Shoeburyness have recently been regaled with local items consisting of scraps of conversation between telephone subscribers in the neighbourhood. In some mysterious way these private conversations have found their way from the P.O. lines and have

NOTES AND NEWS.

(Continued from page 397.)

busily making confusion worse confounded by erecting new transmitters. I see that New York's ether has just been further congested by the erection of W K B K, a station which transmits upon 209 metres, and glories in the name of "Shirley Katz." As one American writer says, "Surely cats aren't in it with New York's ether?"

Extra Dance Music.

THERE will be no lack of late dance music this winter, for starting on November 2nd, this feature is to be a regular part of the Daventry programmes. Every night (except Sundays) the transmission from 5 X X will be extended after the ordinary hours till midnight. Not only the Savoy and studio bands, but various outside broadcasts will help in this effort to brighten up the British ether.

Quality First.

BRITAIN is not generally credited with being an intensely musical nation, but it is certain that no other country has contributed so ably towards the perfection of radio music. "Quality First" has been the B.B.C.'s endeavour throughout. Not only can Britain claim all the credit for the introduction of the Round-Sykes microphone and its application to loud-speaker work, but studio acoustics are continually being bettered in this country. The studio Military Tattoo, which will be S.B. on November 3rd, is one example of the progress that is being made, for it is an exceptionally difficult subject to execute in a studio or to reproduce "on the air."

P.W.'s Great Competition.

IT is this technical excellence that is going to make the "P.W." Radio Sounds Competition one of the greatest successes that the B.B.C. has ever broadcast. The noises will come over unexpectedly, and listeners will be unable to guess what is coming, except for the slender clues which will precede some of the sounds. The B.B.C. engineers are enthusiastic over the scientific possibilities of the contest; but listeners won't worry about this aspect of the affair—they will be too busy laughing at the buzzes, crackles, splashes, scratches, bumps, rattles, and bangs, which will all have to be identified before that £250 first prize is won to-morrow night!

"Reaching Out" at Keston.

THE new receiving station at Keston (near Hayes, Kent) has recently been "reaching out" in connection with the B.B.C.'s policy of re-transmitting foreign stations to British listeners. Eventually "broomstick" aerials will be erected at Keston for this purpose, but the arrangement at present in use employs two 60-ft. masts 120 ft. apart.

"Broomstick" Aerials.

WHAT the final receiving arrangements at Keston will be it is difficult to say, but probably separate directional "broomstick" aerials will be used for the most popular foreign stations. These would ensure selectivity in the case of the stations chosen, and half a dozen such aerials could easily be erected more or less

permanently. Like a good many other projects, details of this scheme will probably depend largely upon the findings of the next Geneva Conference, which is due to take place in December.

For Music Lovers.

MUSIC-LOVERS everywhere will be greatly interested in the latest exploit of Mr. Percy Pitt, the B.B.C.'s popular musical director. He is editing the new fortnightly "Music Masterpieces," No. 1 of which is now on sale, and his venture promises to be something of a revelation to the music-buying public. I have just seen a copy of No. 1, and it is certainly wonderful value for the money. Five complete pieces selected from the world's most famous operas and musical plays are to be included in each number. None of the pieces could be obtained separately at less than two shillings, so this opportunity of obtaining ten-shillingworth of musical gems for 1s. 3d. is too good to be missed.

SHORT WAVES.

"With loving care, with patience, and infinite knowledge of the 'ways of the beast,' it is possible to coax a noise out of almost any lash-up; but that's not wireless as we see it and as, one day, nearly everyone will see it."—Capt. Bekersley, writing in "Lloyd's Sunday News."

"The friendly wireless, having come into the private sickroom, now comes, quite naturally, to the hospital bedside. The probability is that a few years hence physicians and nurses will be wondering how a ward could ever have been run without it."—"The Times."

"I have not made any experiments in the broadcasting of power myself, but its possibility is undoubted. After all, when one transmits a message by wireless, one is transmitting power, though in a small degree. How long it will take to intensify the amount of power that can be transmitted remains to be seen."—Senator Marconi (in an interview with the "Daily Express.")

"Sootsmen are indignant over the advice of the wireless expert of a daily contemporary to a reader to wash his crystal with alcohol to restore its sensitivity. It certainly does seem wasteful."—"Electrician."

L P's New Transmitter.

THE new German transmitter at Königswusterhausen appears to be putting plenty of "juice" into the aerial, and several readers have reported strong signals during its Sunday morning concert. Toulouse is still coming over splendidly, and reception of this station upon one valve seems to be quite common all over the Midlands and South of England. I am sure that not a little of the success of the French station is due to the announcer, whose "Radio-Toulouse" is a model of clear articulation.

The "Cheapest One-Valver."

ALREADY letters about the "Cheapest One-valve Set" are tumbling in, the first being from a Plymouth reader, who says: "I made your 2/6 one-valver of the 26th September issue, and it is equal to my other one-valver which cost fifty shillings in components only." This reader was surprised and delighted with the set's performance on the local station, using a low aerial in a very congested area. That the set is also capable of long-distance work under good conditions is proved by the next letter, which comes from Southampton.

A Good Half-crown's Worth.

"BOURNEMOUTH, thirty miles distant, is too loud," says the writer (Mr. Denis V. Stevens, 87, Welbeck Avenue, Highfield, Southampton). In his search for a quieter station Mr. Stevens tuned in London, Cardiff, Manchester, Newcastle, Glasgow, Birmingham, Petit-Parisien, and seven unknown stations! Can any other reader beat this "half-crown's worth" of "DX"?

A 2 LO Film

A FULL-LENGTH film of "Radio Radiance" has been taken recently in the London studio, and will be included in the new film-series entitled "Across the Footlights." It will be released to the general public on October 19th, at the Capitol Theatre, Haymarket, and subsequently will be screened throughout the kingdom. This is the first time that the B.B.C. has allowed a film company to take any of their artistes in the studio.

International Broadcasting.

IT has been officially announced that international broadcasting, which began this month, is regarded as an important development in the programmes of the future. Of still greater influence will be the findings of the Broadcasting Committee, which should be getting to work within the next few weeks.

Not only in Britain but all over the world the radio situation seems fluid and full of possibilities, and only a fool or a very wise man would venture to predict the limits to which radio will develop within the next six months.

The "First Set."

WHO stole the first radio-set that was ever made? Mr. G. S. Kemp, who assisted Mr. Marconi in his first experiments, has disclosed the fact that the whereabouts of this unique receiver are unknown, for it disappeared some years ago from the Chelmsford experimental station, where it was in store. The "first set" which was on view at the Albert Hall show was the one used for the first transatlantic messages, but its predecessor has vanished, though fortunately an exact copy had been made, which is now in the G.P.O. museum.

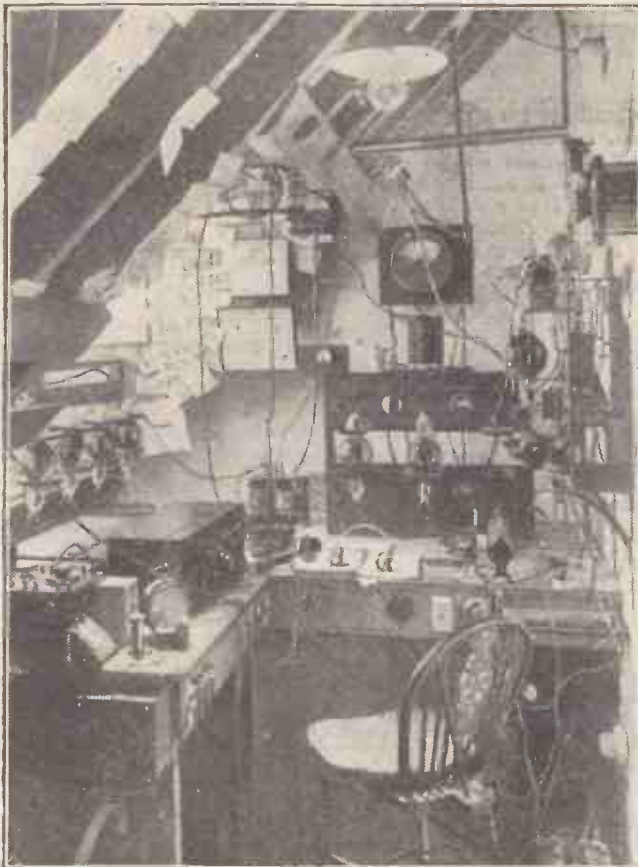
Beam Stations Testing.

I HEAR that a great part of the "beam" service of Empire wireless is likely to be in operation within the next few months. One Canadian station and two in South Africa are almost completed for their tests with Britain. The new beam stations at this end (Bodmin and Bridgwater) are now nearly finished and will participate in these tests.

The Last Chance.

THERE has been a very big rush for the tickets for "P.W.'s" great wireless meeting, to be held at the Central Hall, Westminster, on Friday, October 23rd. At the time of writing only a few of the reserved seats are still available at 3s. 6d. and 2s. 4d., and half a dozen or so of those at 1s. 2d. Full details appear in other columns of "P.W.," but those who hope to be amongst the great audience must make arrangements quickly, or they will be crowded out.

ARIEL.



A corner of the operating room at G 2 N M. The short-wave receiver can be seen on the left.

2 N M CALLING.

AN EXPERIMENTAL STATION.

By GERALD MARCUSE.

In this, his third article of a fortnightly series, the famous British amateur, Mr. Gerald Marcuse, gives a description of his own station, G 2 N M, which is situated at Caterham. Mr. Marcuse was recently in touch by telephony with Kohat, North-west Frontier, India—a new record in amateur wireless work.

of the actual aerial being $22\frac{1}{2}$ metres long, giving me 45 metres on the double wave. As the span of my two masts is about 24 metres, this gives me ample room to get good insulation at either end. The height of the aerial at the free end is 90 ft., and consists of a solid steel lattice mast, 65 ft. high, with a wooden top 25 ft. long.

This system is very suitable when one wants a high antenna and a radio-frequency feeder to work on short waves, as I believe that the height of the aerial is immaterial, though this seems to suit my transmitter admirably. Although I have used a short aerial on the fundamental wave-length, and obtained plenty of amperes into the aerial system, signals did not travel so far and efficiently as when I use a large aerial and a small aerial reading. This, I believe, has been found to be a common experience.

One of the most fascinating little gadgets of the above system is a small lamp inserted in the middle of the antenna which

glows brightly whenever the key is pressed, providing the circuit is in resonance. This acts much more accurately than any aerial ammeter.

I am just wondering what is going to happen when one fine night someone returns home from a party while 2 N M is having one of his many nocturnal festivities and sees the little lamp blinking in the sky.

Raising the Mast.

Before I leave the subject of the antenna, I should like to tell readers that the raising of a mast such as I have was no small job, especially as it weighs over half a ton. One of the secrets is a good anchorage, which, owing to this beautiful climate (we were raising the mast in winter, and, naturally, it poured all day long), we were unable to get until we found some crowbars about 10 ft. long. Then, at last, with the aid of a jury mast and derrick, we managed to raise it.

Much to our surprise, however, when we had got it up, we found that the jointing plates would not meet, so down it came again, to the great uneasiness of 2 N M! This mast stands on a base consisting of six feet of concrete, and although I get numerous inquiries as to whether it is safe from lightning (both my masts being steel),

(Continued on page 400.)

In this article I propose to describe my experimental station which is known to amateurs all over the world as G 2 N M. The prefix G has been allotted to British transmitting amateurs by the Post Office, and similar prefixes in other countries enable one to distinguish the various amateurs in different parts of the world. For instance, the Australians use "A," New Zealanders use "Z," while Americans use "U," and so on, *ad infinitum*.

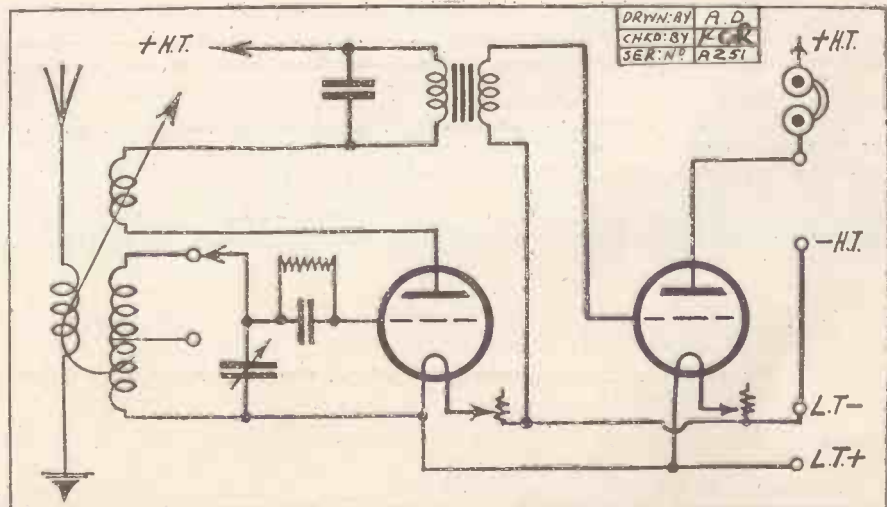
I have been carrying out regular tests recently extending over a period of one week with 3 LO at Sydney (Australia), and in calling that station I call 3 LO AG 2 N M (3 LO Australia called by British 2 N M); and then he calls back 2 N M GA 3 LO.

The foregoing merely illustrates the method of "calling up," and I take this opportunity of explaining it to readers of POPULAR WIRELESS, as I constantly receive requests to give addresses of certain foreign amateurs who have been heard, but who do not give the prefix, without which, of course, it is impossible to identify stations. This is an important point, and I ask readers to pay particular attention to the prefix or identification when logging distant stations.

"Double-Wave" Aerial.

In describing my station, I should like to say at the outset that, although I have tried several antenna systems for the 45-metre wave, the one I have adopted, and which suits my topographical situation best, is the Hertz antenna, which is also known as the Hertzian oscillator.

This is best described as an aerial which works on the double wave, the total length



The theoretical circuit of the short-wave receiver in use at Mr. Marcuse's station, G 2 N M. A small capacity variable condenser is used for tuning and a D E Q valve for detection.

AN EXPERIMENTAL STATION

(Continued from page 399.)

it recently withstood one of the worst storms I have ever experienced in any part of the world.

Personally, I am confident that a well-insulated and earthed aerial system is a safeguard to any house, because it prevents charges accumulating round the building—which, after all, is the whole object of a lightning conductor.

Elaborate Earth System.

With regard to the lead-in from the aerial, this is taken through a specially-built window, shown in the photograph, an insulator being let into the plate-glass. Although two such insulated leads-in can

latter consists of an ex-army Mackie generator run off a motor, which also runs the charging generator for all small accumulators. The high-power generator, which was specially built for me by Messrs. Mortley & Sprague, consists of a direct-coupled set with H.T. generator on one end giving 4,000 volts, and at the other end an exciter, specially designed to give extra power for floating batteries. A one-side commutator (of the H.T. generator type) is also designed so as to give off extra current, in order to use half the voltage, viz., 2,000 volts for the master drive.

The special adjunct to the house had to be erected to house the generators, so that the noise of machines, when running, could not be heard in the house, as, to keep various schedules, one has naturally to be up at all hours of the night. The motor generator rests on coconut mats, and is controlled from the operating-room, all leads being taken

Co. and Messrs. Mullard Radio Valves Co., to whom my best thanks are due. We amateurs could never have carried out experiments on such a scale if we had not received such kind assistance from manufacturers.

At the present moment I am using Marconi Osram T-250 valves as an amplifier, and also as modulators and sub-control, and a Mullard T3A or O-150, for master drive.

The Short-wave Receiver.

The photograph shows more clearly the lay-out of the transmitter; on the left can be seen the modulators, while in the centre are the amplifiers and on the right the master drive. The most important instrument in the whole station can be seen on the extreme left, namely, the heterodyne wave-meter. Near it can also be seen the low-loss short-wave receiver, which for C.W. cannot be beaten. The design

of this receiver (many of which are to-day in use) dates back to my visit to Canada and America last year, when I expressed a wish to take back a memento of my trip in the form of a receiver, so that I might listen to amateurs on board coming home. This receiver, which was constructed in a few hours, and the circuit of which is shown on the previous page, is easy to operate and build, although for long-distance speech it is not so very satisfactory. It is, nevertheless, an ideal receiver for all-round work.

The only receiver which is reliable for short-wave speech is the super-heterodyne, which, at the moment, I am coaxing down to 15 metres, ready for the two-way telephony tests with Australia, India, and New Zealand, all of which I hope to accomplish within the next few months.

I have successfully received KDKA on a two-valve loud-speaker set on 63 metres at very good strength, and speech from Mosul has also been received quite well, as has also telephony from the MacMillan expedition-ship "Peary" on 36 metres; but for reliable reception of telephony on these frequencies very accurate tuning is necessary.

Another of the photographs (that on this page) shows the general receiving and experimental room, and it was from this station that, in 1923, the 200-metre signals were transmitted during the transatlantic tests. These were received in U.S.A. on five nights out of the whole test, and we at that time thought it wonderful. Several relics of former days can also be seen in the shape of the various receivers.

The large receiver on the left is the 8-valve super-heterodyne with which I am still experimenting on short waves.



The general receiving and experimental room at 2 N M. The set on the left is an 8-valve super-heterodyne.

be seen, one is for the counterpoise, which now, however, is not used—another point in favour of the Hertz antenna—thereby enabling one to avoid losses through an earthing or counterpoise scheme, an almost inevitable disadvantage.

A special earthing system was originally installed, consisting of copper strip and copper rods; also, a new water main was laid, and a good-sized cable soldered on. All these, however, have been dispensed with, even for reception, now that we have descended to 45 and 23 metres. I found that by using an earth or counterpoise, even for receiving, I used to get curious induction or ground noises which entirely disappeared when the earth was disconnected.

The power supply at 2 N M is situated in an out-building joining the wall of the house, and consists of a high-power and low-power generator. The

through tubes to the operating room and the H.T. through porcelain insulators. The L.T. accumulators are also kept in a separate house, the top accumulators shown in the photographs being for the modulating valves, while the bottom accumulators are for the oscillators, etc. The total discharge, when running full out at 1 kw. input to the valves, is 50 amperes.

Steady C.W. Obtained.

The transmitter used is of my own special design, using a particular type of master drive. It was some weeks before I could get the master to control the amplifiers at 100 per cent, but now I am able to transmit under all conditions, and reports are always C.W. steady—not an easy state to reach, as we often get a good deal of wind, being 650 ft. above sea-level.

All valves used at 2 N M on the 1 kw. set have been kindly loaned by the Marconi



The "P.W." Selective Crystal Set

IN order that a crystal set may be selective, it is better that the crystal detector and telephones should not be directly connected to the aerial circuit. There are many reasons why it is advantageous to transfer the received signals from the aerial circuit to a secondary circuit, and to connect the detector across this instead of loading the aerial circuit with it.

The result of such an alteration can be

The Set Designed and Constructed
by P. R. BIRD.
Constructional Work by
G. V. COLLE.

as possible, advantage has been taken of the use of two aerial terminals for series-parallel tuning. This method is now well

known to readers of "P.W.", but if the constructor does not happen to be familiar with its advantages, he should refer to the end of this article, where a full description will be found.

Looking at the photograph of the receiver which is shown on the left, it will be seen that in addition to the primary and secondary condensers, coil holder and crystal detector, a switch has been mounted upon the panel.

Across the centre contacts of this switch the crystal and telephones are connected in series with each other, and

into the ordinary one-circuit crystal detector, and when used under these circumstances the secondary coil is inoperative. The advantage of being able to use one coil only in this way is that tuning is simplified and all the signals which are tuned in by the primary condenser will be audible in the telephones.

Cutting Out Interference.

Used in a locality where there is no jamming from ships or other undesired signals, this arrangement will be quite satisfactory for the reception of broadcasting, but as the average station using a spark transmitter for Morse signals is a powerful "jammer," such reception is always liable to be spoiled in this way in localities near the coast.

In such circumstances, by placing the switch in the "Tune" position and retuning the desired signals upon the secondary condenser, it is often possible to eliminate the unwanted interference. The reason for this is, of course, that the primary circuit acts as a kind of filter. In the primary coil, attached as it is to the aerial, all the received impulses induced into the aerial by the transmitting stations are flowing. The secondary coil is not directly connected to the aerial, and the energy flowing therein is controlled completely by its proximity to the primary coil. Moreover, if the circuit is tuned sharply to, say, 360 metres, it will tend to oscillate only at that frequency, especially if the coupling between it and the primary coil is "loose."

The Components Used.

After the panel has been prepared for drilling, this operation can be carried out from the diagram given on page 402. The actual components used are given in the list below, and it will be seen that the crystal detector is of a rather unusual type. In use this model gave excellent results, but, of course, the ordinary cat's-whisker, glass-enclosed, crystal detector can be used instead. Both of the variable condensers used embody the refinement of vernier action, but this is not essential to the success of the receiver, especially in the case of the aerial condenser. Neither is it essential that they should both be of .0005 mfd. capacity, and as the secondary condenser is always "in parallel" a .0003 or even .0002 will cover a wide range of wavelengths.

The two terminals at the right hand of

(Continued on page 402.)



How the Selective Crystal Set looks when completed. The "Output" terminals on the right are for extra 'phones, or amplifier.

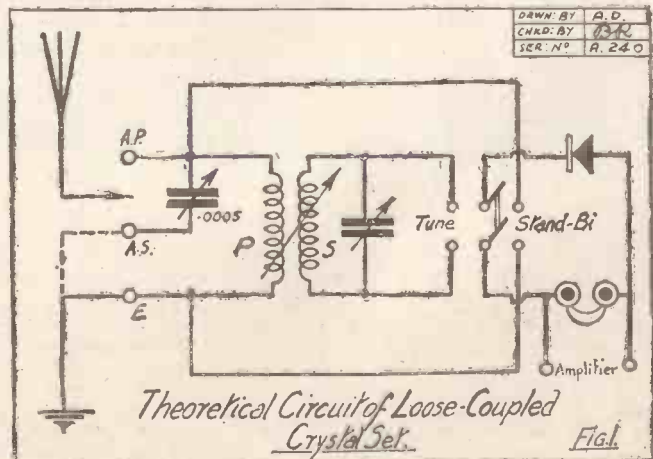
expressed briefly by saying that the use of a secondary coil permits a far greater degree of selectivity, better tuning, and, in some cases, slightly increased signal strength. Against these advantages is the fact that instead of one aerial coil with a condenser to tune it, two coils and two condensers will be necessary. The transfer of signals from the aerial circuit to the primary circuit is accomplished by magnetically coupling two coils together. This coupling should be variable, so that the two coils are best mounted in a two-way coil holder of the type shown in the photographs.

Tuning Arrangements.

In order that the number of coils necessary to cover any given band of wavelengths shall be reduced in number as far

reference to the theoretical diagram (Fig. 1) will show at a glance the purpose of this switch. When in the one position it connects the detector circuit directly across the aerial coil, but, when changed over to the other position, this is connected across the secondary coil.

The former position (which in the diagram is shown as "stand-by"), in effect, converts the receiver



Theoretical Circuit of Loose-Coupled Crystal Set.

Fig. 1

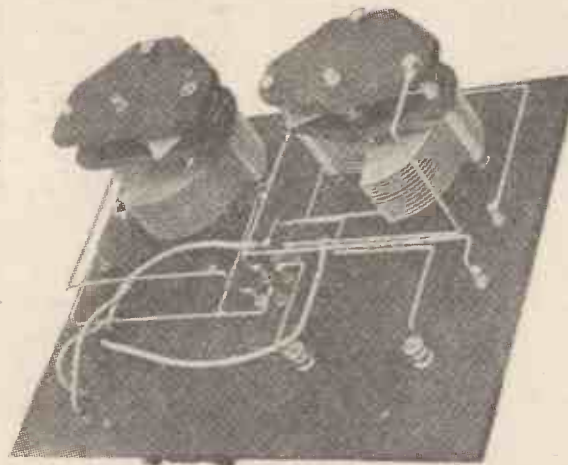
THE "P.W." SELECTIVE CRYSTAL SET.

(Continued from page 401.)

the set labelled "output" or "amplifier" are connected in parallel with the telephone terminals, so a second pair of 'phones may be used here if desired. Alternatively, if the receiver is to be used in conjunction with a low-frequency amplifier, when the telephones are removed from the 'phone terminals, the amplifier's "input" terminals will be more easily connected to the crystal set's "output" than to its "phone" terminals.

The Connections.

When the components have been mounted as shown in the photographs, wiring is carried out with No. 18 gauge tinned copper wire. The position of the various flexible leads is clearly shown, and, after the wiring has been completed, it can be checked from the list of point-to-point connections on page 403. Care should be taken to keep the panel clean and free from filings or flux, and, if this is done, the signals on the secondary coil (tuned position) will be found



This view of the back of the panel clearly shows the wiring of the switch, and should be compared with the photograph on page 403.

to be quite as loud, if not louder, than when the crystal detector is directly connected to the aerial circuit.

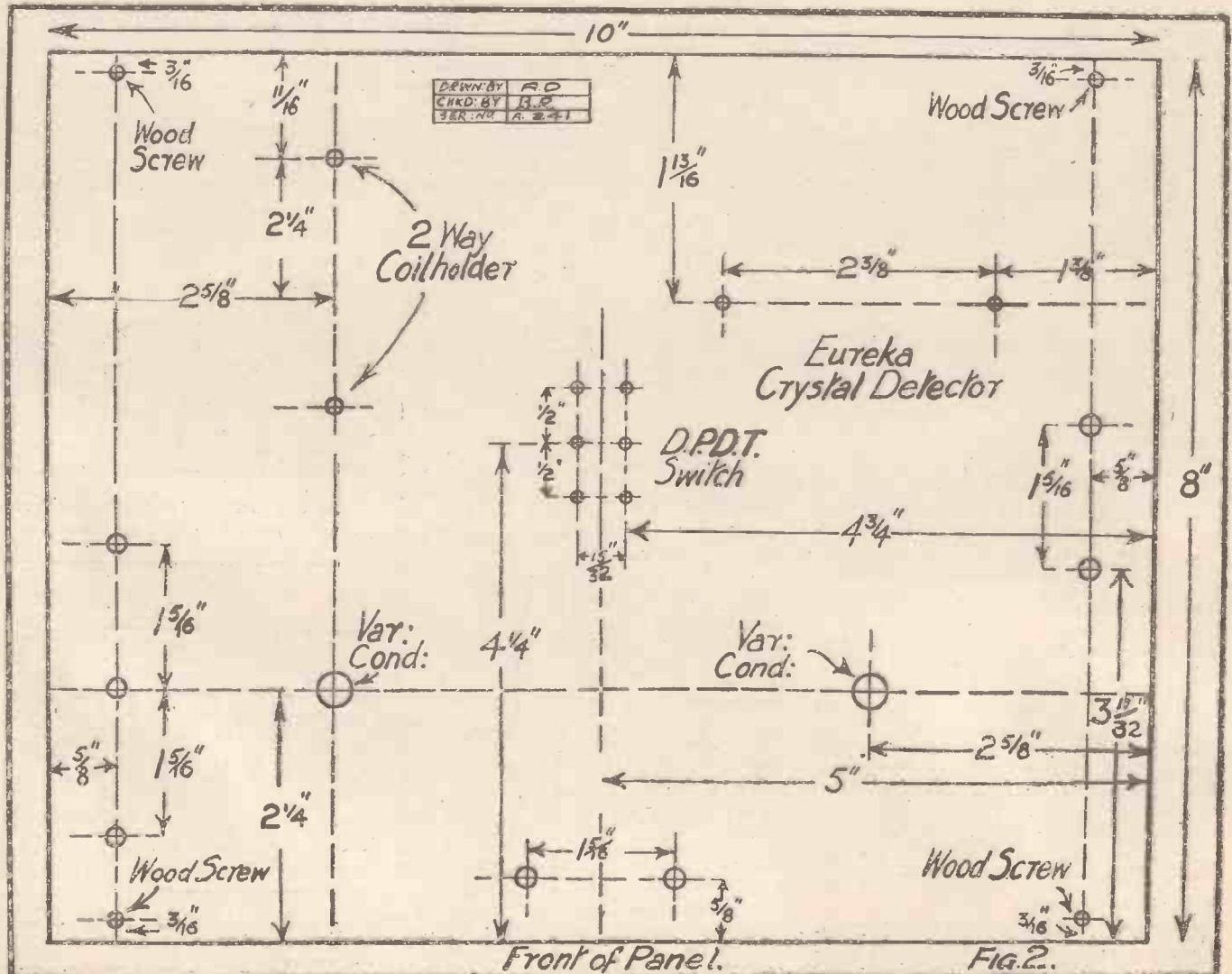
The whole art of obtaining selectivity is quite easily learned if it is remembered that the secret of success lies in the exact degree of coupling between two coils. As the jamming varies, so should the coupling be

altered to meet the new conditions, but, unfortunately, each change of coupling slightly alters the tuning in both circuits and necessitates the re-tuning of both condensers. This, of course, is only important on weak signals, but for those who hope to pick up distant stations when using a crystal set this circuit offers the best chance of success.

For the reception of broadcasting, a 75-turn coil for aerial (in series) and a "50" for secondary will give good results on the wave-lengths used by the majority of the B.B.C. main and relay stations. If desired, a 35-turn coil could be used instead for the aerial, which in such a case would be connected in parallel.

It will be found that by this change from "series" to "parallel" tuning, the same wave-lengths can be covered by coils having a widely different number of turns; or alternatively the wave-lengths covered by any particular coil can be extended over a wide range if it is

(Continued on page 403.)



THE "P.W." SELECTIVE CRYSTAL SET.

(Continued from page 402.)

possible to place its tuning condenser either in series or in parallel (as is the case with this receiver).

"Series" or "Parallel" Tuning.

To connect up with the aerial coil "in series," all that is necessary is to place the aerial lead on the terminal marked "series," and the earth-lead on the earth terminal,

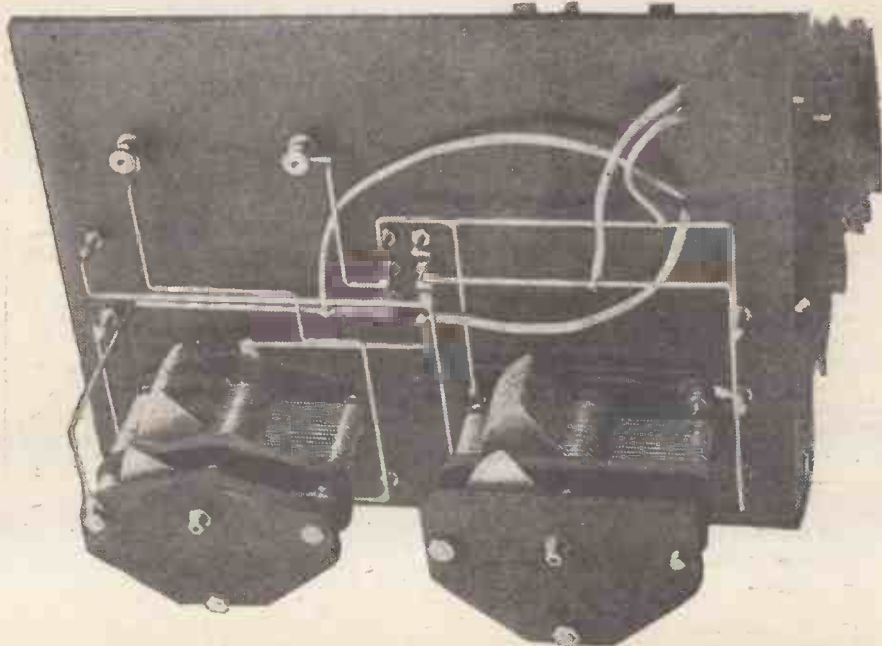
COMPONENTS REQUIRED FOR THE SELECTIVE CRYSTAL SET.

	£	s.	d.
1 panel 10 in. by 8 in. by 1/4 in. and 1 box to fit, 4 1/2 in. deep (Peto-Scott) ..	13	6	
2 variable condensers with verniers (Peto-Scott) ..	1	1	0
1 crystal detector (Eureka) ..	6	6	
1 D.P.D.T. switch (Nesthill) ..	2	0	
1 two-way coil holder, right-hand movement (Peto-Scott) ..	10	6	
7 terminals, W.O. type ..		10	
Wire screws, transfers, etc. ..	1	6	

leaving the "parallel" terminal unconnected.

When it is desired to change to parallel-tuning for the longer waves (or for the same wave-length using a smaller coil), proceed as follows: Disconnect the aerial from "series," and join the latter terminal to the earth terminal by a strip of wire. Then place the aerial-lead upon the terminal marked "parallel," and tune-in as before.

Instead of using a piece of bare wire to short across between the "earth" and "series" terminal when parallel tuning is in use, it is a good plan to make a brass strip, of the type shown in the photograph



Another view of the completed wiring, which can be used by the constructor in conjunction with Fig. 3 as a guide to the connections.

on page 401. This can easily be made the right length, with a hole for the insertion of the shank of the earth terminal, and a slot which permits it to slip under the "series" terminal-head. This little accessory can then be slipped in or out of circuit as required, and the appearance of the set and tidiness of the connections leave nothing to be desired.

The Coils to Use.

Almost any kind of tuning coil will give good results in a receiver of this kind, and home-made basket coils of the single-layer type are exceptionally good. Another type of coil which couples very effectively and tunes sharply is the "Lissenagon." (This

is the type shown in the photograph at the head of this article).

One advantage of the purchased coil as compared with the home-made basket type is its compactness. When the larger coils are used for long waves, for the reception of Daventry, for instance, two 200-coils are necessary. Basket coils of this size are rather unwieldy, but nevertheless they can be used successfully for long as well as short waves.

POINT-TO-POINT CONNECTIONS OF THE SELECTIVE CRYSTAL SET.

(Back of panel with crystal detector at top.)

Aerial parallel terminal to the fixed vanes of the '0005 variable condenser (primary condenser) and to the top left-hand contact of the D.P.D.T. switch.

Aerial series terminal to the moving vanes of the '0005 variable condenser (primary condenser).

Earth terminal to the top right-hand contact of the D.P.D.T. switch.

Right-hand terminal of the crystal detector to the centre left-hand contact of the D.P.D.T. switch.

Top amplifier terminal to centre right-hand contact of the D.P.D.T. switch and to the right-hand 'phone terminal.

Left-hand terminal of the crystal detector to the left-hand 'phone terminal and to the bottom amplifier terminal.

Bottom left-hand contact of the D.P.D.T. switch to the fixed vanes of the 2nd variable condenser (secondary condenser). Bottom right-hand contact of the switch to the moving vanes of the same variable condenser.

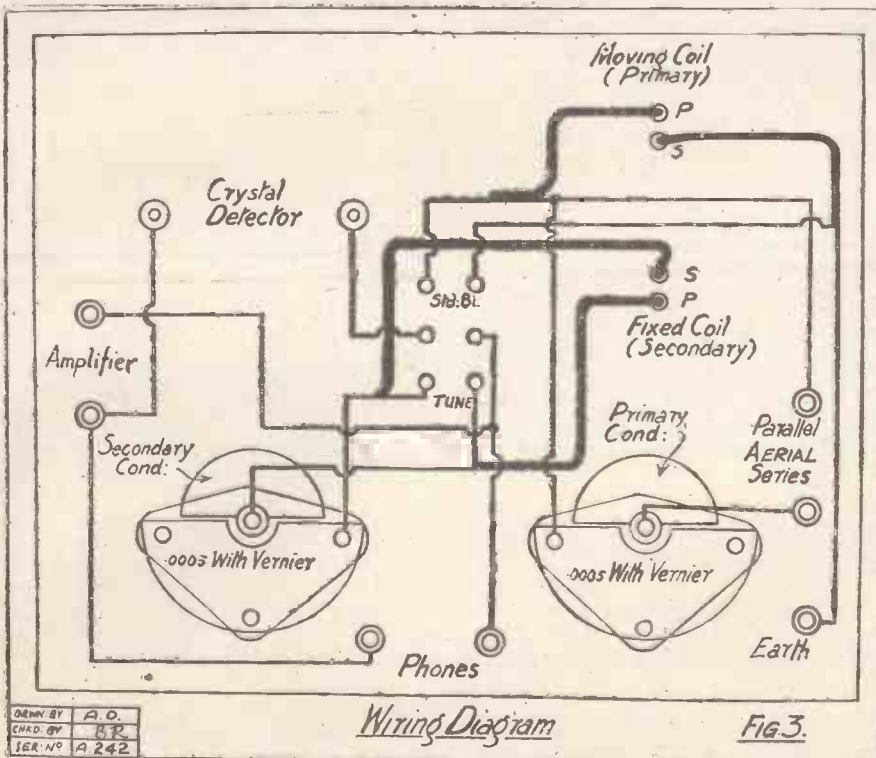
Flexible wires join the following:

Plug side of the moving coil holder (primary) to the aerial parallel terminal lead.

Socket side of the moving coil holder (primary) to the earth terminal lead.

Plug side of the fixed coil holder (secondary) to the moving vanes of the 2nd variable condenser.

Socket side of the fixed coil holder (secondary) to the fixed vanes of the 2nd variable condenser.



DESN. BY A.O.
 CHD. BY B.P.
 SER. NO. A 242

HOME-MADE PLUGS AND JACKS.

By O. J. RANKIN.

ORDINARY plugs and jacks are rather expensive items, and for this reason many home constructors are forced to incorporate cheaper, less convenient, and often unsightly switching devices in their low-frequency amplifying units. It is well known that nothing equals the plug-and-jack switching system in general con-

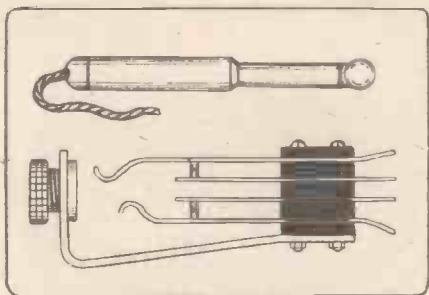


Fig. 1. An ordinary commercial type of plug and jack.

venience and neatness, and where one cannot afford to purchase the commercial article one might do well to consider the making of the simple, cheap, and efficient substitute described in this article.

Two Most Common Arrangements.

What is probably the most useful and most common type of commercial spring-jack is shown in Fig. 1. This, in effect, represents a refined D.P.D.T. switch, the upper and lower clips forming the "arms," which can be "thrown over" to make contact with the two inner clips (normal setting), or with the two contacts on the plug, as desired. Where the device is required to function as a D.P.S.T. switch the two central clips are short circuited (or otherwise joined together), so that the circuit to be controlled is then closed either via the central clips (normally) or via the contacts on the plug. The two arrangements are usually represented in a circuit diagram by the symbols shown in Fig. 2, where A would indicate the D.P.S.T. and B the D.P.D.T. jack, the same type of jack being used to serve either purpose.

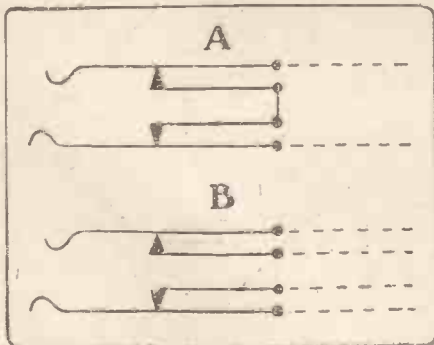


Fig. 2. Symbols for (A) D.P.S.T. and (B) D.P.D.T. jacks.

Coming now to the practical side of the problem, it will be seen from the self-explanatory sketches in Figs. 3 to 6, that by using simple two-pin plugs in conjunction with spring brass clips, both arrangements, A and B, can be effected in a very much cheaper and equally efficient manner, and

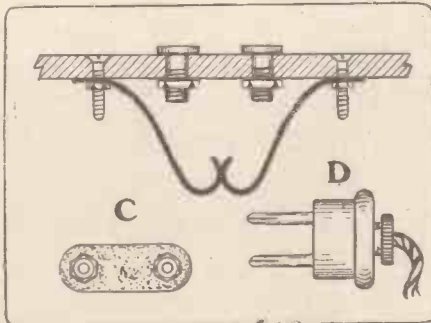


Fig. 3. An effective replacement for A (Fig. 2).

in such a way that even a beginner, with a little patience and a few pieces of scrap material, can easily adopt the idea and so add to the appearance and efficiency of his receiver.

Figs. 3 and 4 show views of a simple switch which effectively replaces the more elaborate spring jack, as shown at A in Fig. 2, and Figs 5 and 6 show views of a similar device, which is designed to serve the same purpose as an ordinary spring-jack arranged as shown at B (Fig. 2).

The plugs may consist of small blocks of ebonite or fibre, about 1 in. long by 3/4 in. wide, which are preferably rounded off at the ends and then fitted with ordinary valve pins. Alternatively commercially

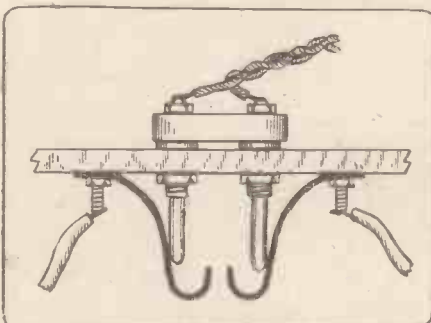


Fig. 4. How the jack operates when the plug is inserted.

made two-pin lamp plugs may be used (see D, Fig. 3), but if the reader undertakes the construction of the "jacks," he will naturally desire to make the plugs also, and so we will assume that the simple valve pin plugs are to be used. A top view of such a plug is shown at C (Fig. 3), and the general arrangement of same is clearly outlined in Figs. 4 or 6.

Making the Clips.

The valve-pins should be placed 1/4 in. apart, but if the reader desires a more compact arrangement (this measurement can be reduced to 3/8 in. without risk of losses, providing of course the device is used only in L.F. circuits), then all other dimensions as given below must be correspondingly modified.

The clips consist of strips of fairly stout spring brass about 1/4 in. wide, those shown

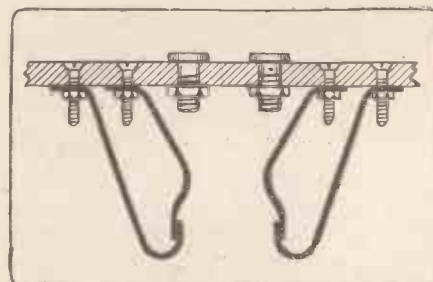


Fig. 5. An efficient home-made substitute for B (Fig. 2).

in Figs. 3-4 being cut about 2 1/2 in. long and then bent to the shape indicated in Fig. 3, so that when they are bolted to the underside of the panel the lower ends are normally pressed together very firmly.

Final Adjustments.

The two inner clips in Figs. 5 and 6 may be of the same length, but the outer clips should be about 3 in. long. The flush-type valve sockets act as panel bushes for the plug pins which, when inserted in same, should separate the clips in the manner shown in Figs. 4 and 6. The sockets, and the small bolts which hold the clips to the panel, should be spaced 1/2 in. apart, and when finally assembling the parts great care should be taken to see that the pins "make and break" quite easily without the necessity of exerting undue pressure on the plug.

A little "tinkering" will be necessary before correct adjustments are obtained, a little more tension here and a shade more pressure there; but once the clips are set to work smoothly and accurately with the plugs no further trouble is likely to occur. If a number of switches are required it is a good plan to practise with some pieces of scrap ebonite and brass, and select the most successful parts as templates, at the same time using the ebonite as a drilling template for the receiver panel.

The design of these switches has, of course, been simplified to a minimum in order that they may appeal to the home constructor with limited workshop equip-

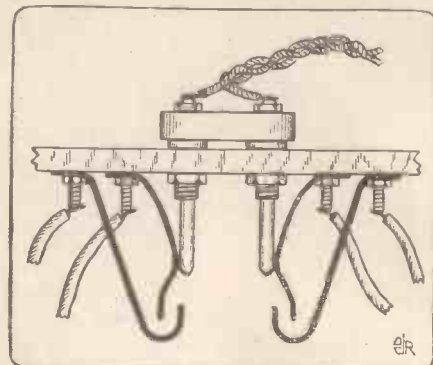


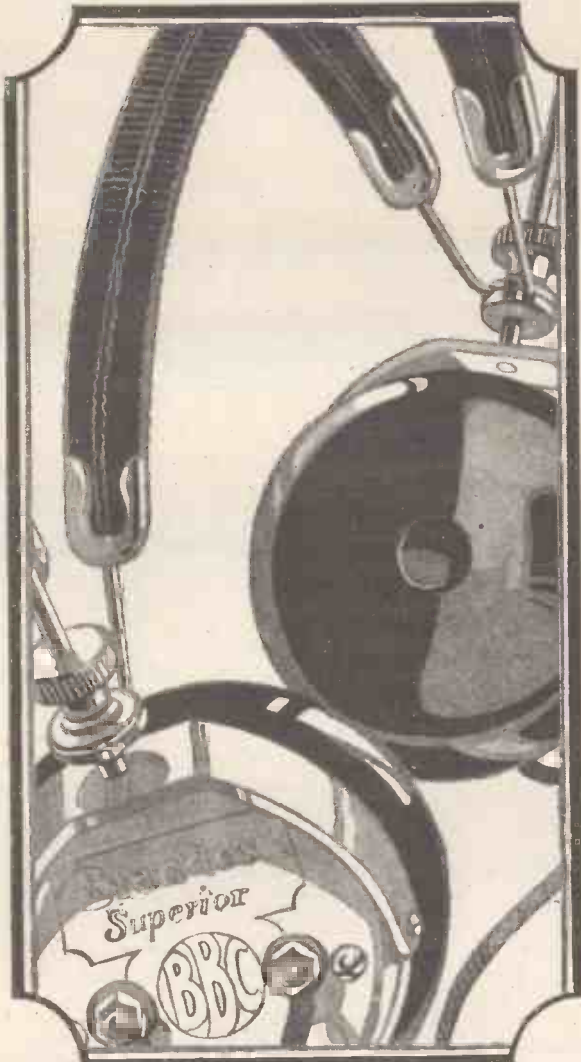
Fig. 6. How the "double-throw" plug and jack operates.

ment; but, at the same time, there is no reason why one should not carry out a few serious experiments along these lines with a view to producing a cheaper commercial article.

If there is anything in these pages that you do not like, please let us know what it is when writing to us.

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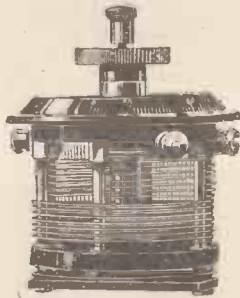
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A Dubilier Variable Condenser giving simultaneous control of two tuned anode circuits. This is a very useful condenser to the experimenter. Capacity of each side 0.0025 mfd. complete with balancing plate

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An aerial adaptor made by Dubilier it is inserted in an electric lamp socket and connected to your set, thus converting your wiring system into an aerial and doing away with outside aerials.

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A new Dubilier device that protects valves from being burnt out by insertion in the holder the wrong way round. Connected in an H.T. lead it is a permanent protection, and is not a fuse.

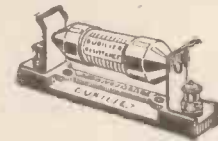
Price 6/-



The Minicap.

A Dubilier Anti-Capacity Switch for use in all types of receiving circuits for switching in and out Valves, Transformers, Series-parallel switching, etc. Soundedly made and thoroughly reliable, it is strongly recommended.

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Anode Resistances and Grid Leaks.

These Dubilier resistances are very carefully made and graded; they can be relied upon to maintain their values indefinitely and are tested on 200 volts D.C. and 100 volts D.C. respectively.

N.B.—They must not be tested at higher voltages.

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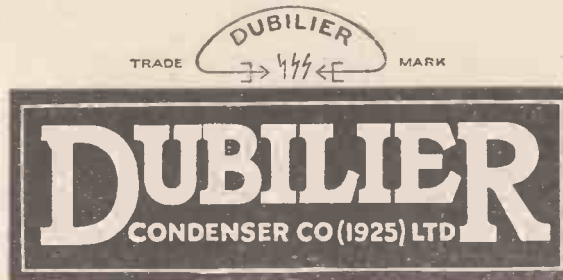
Complete with holder 5/6
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Price 7/6



IT is two years since I sang for the first time in a broadcasting studio; during those years I have done quite a lot of wireless singing, and I find it is intensely interesting, partly, perhaps, because it provides such a strong contrast to the work one does on the operatic stage and concert platform.

When the British Broadcasting Company approached me about singing for them I was nervous, as I did not know how my voice would "record" via wireless, but eventually signed a contract to sing regularly for broadcasting purposes.

During my work for the B.B.C. I have sung from their studio in London, and from other studios in the provinces. Also, I have been "broadcast" from the Royal Opera House, Covent Garden, while an opera season was going on.

"Aida" was the opera selected, and it was relayed from the Opera House to the studio off the Strand, and so sent out to every listener-in all over the country. While this interesting episode was actually happening I'm afraid I forgot all about my invisible audience; I was too much wrapped up in my work, and in the audience sitting beyond the footlights. Only when I got off the stage did I remember that hundreds of thousands of unseen people had been listening!

My debut in broadcasting circles was made during the summer of 1923 on a very hot day.

An Unexpected Ending.

How terribly nervous I was! The weirdness of the studio, with its deadened sounds; the strange way in which the resonance of a voice becomes muffled inside the studio walls—more especially in the case of a singer—struck terror into my heart. I can only describe singing into the microphone as something that makes you feel your voice does not belong to you!—at least, that is how it always strikes me. It seems to be someone else singing; and it is far harder to judge the effect one is making than when singing on the open stage. The only thing to do is to go ahead on the same lines as usual, remembering that, although to one's own ears the studio makes each note sound strange and muffled, the sounds are being heard by listeners outside with perfect clearness.

My first song by wireless was the "Jewel Song" from "Faust." When the announcer had stated I was to sing I took my place in front of the microphone—"Mike," as it is familiarly known in the studio—heard the well-known opening bars on the studio orchestra, and began to sing, trembling with nerves. Being unaccustomed to the conditions of a broadcasting studio, I did not realise that every tiny sound is caught up by the microphone and passed on to a gigantic invisible audience. So as soon as I had finished singing I gave a big sigh of relief, and said quite distinctly, "Thank goodness, that's over!"

Frantic gesticulations on the part of the studio staff made me wonder what I had done; it was only when the studio had been disconnected from the outer world that

BROADCASTING.

From a Vocalist's Standpoint.

By BEATRICE MIRANDA.

Miss Beatrice Miranda, the famous operatic artiste, known to millions of broadcast listeners, contributes this special article to "P.W." and also gives a few hints to would-be "Wireless Singers."

they told me my remark had been heard by every listener-in! And it had; for I got several letters about it, including one from some personal friends of mine, in which they said they had heard me say, "Thank goodness, that's over"—adding in the letter, "and we thought, as we laughed, how exactly like you it was!"

I've learned, now, not to sigh, or whisper, or sneeze, or cough in the studio while con-



MISS BEATRICE MIRANDA.

nection with the outer world is still established. A human cough, through "Mike," sounds exactly like a horse coughing, while a sneeze becomes a sort of explosion.

My wireless work has been chiefly operatic—I think it is best to sing the type of music one feels will be most appreciated by listeners. I am essentially an operatic artiste, and am associated with opera in the minds of the public. So I stick mostly to arias and scenas from well-known operas; and the aria that is my personal favourite for broadcasting is "One Fine Day" from "Madam Butterfly." Judging from the letters people are kind enough to send me, it is very popular with those who listen-in, too.

Opera More Popular.

In my opinion, wireless music is already a tremendous force for good throughout the country. It has brought good music into homes where no music ever penetrated before; it is training people to love music and all it stands for. Particularly in the north, in mining and pottery districts, music through wireless has obtained a

strong hold on the working public, if one may judge by the letters that pour in, many of them from miners straight from the pits.

From my own personal experience, I know that many wireless enthusiasts have become habitual opera-goers, particularly in the provinces, simply through hearing and liking operatic music by wireless. And most of them confess that they had never heard an opera

until they became possessors of wireless sets.

The letters artistes receive from the unseen audience are very helpful and full of interest. On many occasions I arrive at the studio to sing, and find lots of requests waiting for me in enthusiastic letters from unknown friends.

A Vivid Contrast.

When I am asked if I will try to sing such-and-such a number, I always like to do so, if possible. But in many cases I cannot accede to the requests, as it is important that the advertised programme for each day shall be followed.

One of my most amusing experiences in broadcasting happened this summer during the Carl Rosa Opera Season at the Lyceum Theatre. I was asked to help at a big wireless concert promoted by a newspaper in aid of a hospital; the programme was a wonderful collection of stars from the principal London theatres, and, like most of the other artistes, my own appearance had to be fitted in with my work at the theatre.

I found that the only way I could manage to appear would be to get dressed and made-up ready for my first entrance at the Lyceum, hurry over to the studio across the road, and rush back after I had done my turn. So it happened that, dressed and made-up ready to go on the stage as the frivolous Musetta in "La Bohème," I stood in the B.B.C. studio and sang tragic Madam Butterfly's "One Fine Day" and the Love Duet from Wagner's "Tristan and Isolde." The contrast between my gay dress and the music I was singing was tremendous; it was lucky listeners could only hear and not see me, or a lot of the effect might have been lost.

Building Up Atmosphere.

It is quite true that the absence of stage "atmosphere" is very noticeable in wireless work; operatic artistes and stage players must notice it more than concert artistes, I think. In the studio we have to build up our own atmosphere; and in my own case I can truly say that when I face "Mike" and start singing I forget all about my surroundings, the orchestra, the announcer, and the other artistes waiting to do their work, and become utterly lost in my rôle. I feel everything I sing, most deeply; too deeply, almost, for the well-being of my own nerves. I can cry into "Mike," in fact I have cried, just the same as when I am on the stage with scenery, costumes, and lights to build up the illusion for me.

To young vocalists anxious to try broadcasting in a professional sense, I would say: When you are singing by wireless, be very careful not to be too quick. By this I do not

(Continued on page 408.)

BROADCASTING FROM A VOCALIST'S STANDPOINT

(Continued from page 407.)

mean that a song should be dragged out to an absurd extent, but rather that it should be made a shade more emphatic, more deliberate than it would be on a concert platform. Remember that slurred intonations and faulty pronunciation of words will become twice as bad to the ears of people listening-in.

Importance of Diction.

Take great care to sound every consonant, for diction is of extreme importance. Every mistake is caught up and amplified. On the stage a slight blunder can be covered up with a movement, a gesture, and is soon forgotten. By wireless mistakes cannot be corrected or glossed over. They stick in the minds of that invisible audience, in a persistent fashion.

A little exaggeration is permissible for wireless vocalism, provided it can be accomplished without forcing the voice. As soon as a voice is forced it sets "Mike" jingling; the quality of the tone goes at once, and harsh metallic sounds are sent out instead.

I believe that people get nervy, not nervous, in a studio, and with their nervy state comes an astonishing change of voice. It is a well-known fact that voices of a certain *timbre* will not record well by wireless, or on gramophone records.

Enthusiastic Listener.

It is hard to say what quality is bad for recording purposes, since voices of every type may fail at times.

Many good voices are quite useless for broadcasting—perhaps because of the unconscious "forcing" referred to above; while many moderate voices record magnificently. I have heard, myself, voices I know to be thin in quality sound positively full and dramatic through a loud speaker. I don't get much spare time, but when I do I listen-in with enthusiasm, and find myself watching for tone effects and defects by wireless.

Not long ago, when I went to do some broadcasting, I saw at the studio an elderly man going to lecture on some scientific subject, and noticed that he seemed agonisingly nervous, which was not surprising since it was his first shot at broadcasting. I was so sorry for him that I felt I had to do what I could to make things easier.

A Hint for the Nervous.

So I went up and said, "Do excuse me suggesting this to you, but I can see how nervous you are. Don't think you are going to broadcast. Imagine you are just talking in a room—that's all it is, really, you know—and be perfectly natural, only a little slow."

He thanked me, and followed my advice. His lecture was a big success; he received heaps of letters saying how splendidly it had come through, and wrote to me himself, a little later, to thank me for advice which saved him, he assured me, from making a hash of things through nervousness.

A "UNIVERSAL" L.F. TRANSFORMER.

AN INTERESTING NEW DESIGN.

FROM A CORRESPONDENT.

PROBABLY there is no component in a wireless receiving set with regard to which theory and practice seem to be so much at variance as in the case of the intervalve transformer.

Every amateur as well as every manufacturer has his own pet theory as to how the perfect transformer should be made. Some insist that the first-stage transformer should be of high ratio and the second and subsequent stage transformers low ratio, while others again tell us that the low ratio should be in the first stage and the high ratio in the second.

Another point of divided opinion is the best ratio of turns.

According to some, an all-round ratio is about 4 to 1, while others say 2 to 1 in some places and 6 to 1 in others.

Then the experts tell us that the ratio of turns does not matter a bit: it is the ratio of the impedances that matters, and for the best results the impedance of each winding of the transformer should be equal to the impedance of the part of the valve circuit into which it is connected; for example, in an intervalve transformer, the impedance of the primary should be equal to the filament-plate impedance of the first valve, and the impedance of the secondary should be equal to the filament-grid impedance of the second valve.

Questions of resonance, and of high and low tone reproduction, form excellent matter for controversy, whilst the question of open-core and closed-core

merits seems to have gone by the board long ago, current practice apparently ruling that closed-core is the only way.

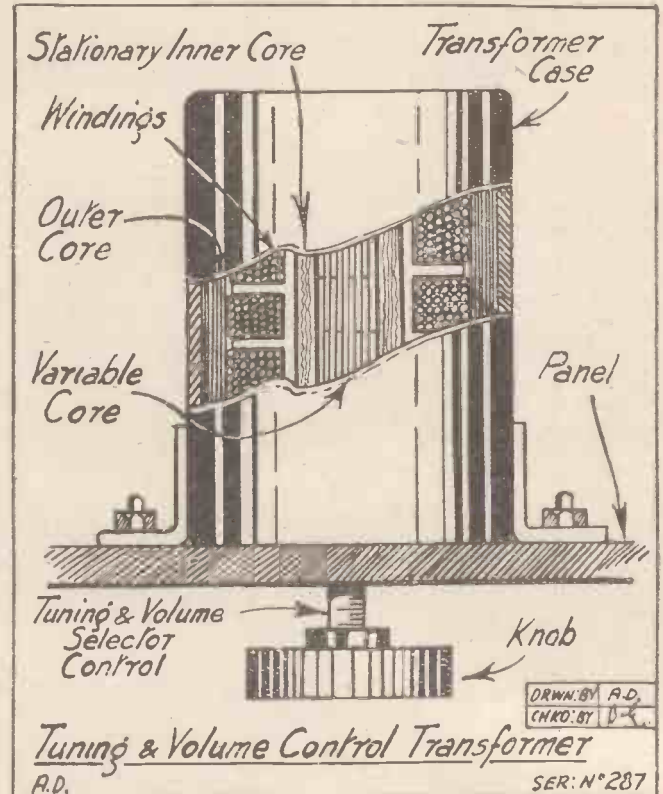
Now it happens to be one of the writer's pet hobbies making up experimental transformers and trying them out, and the more he tries the more he realises how little help theory gives in the matter of speech transformers, particularly intervalve speech transformers.

The reason why theory (that is, the theory so far as it is known, which is not very far) differs so materially from practice is because the conditions in practice are so complicated and the factors involved are so difficult to take full account of in any theory.

The main points in which speech transformers differ from small power transformers are as follows:

- (1) The degree of magnetisation of the iron core is relatively small.
- (2) Most of the frequencies involved are relatively high.
- (3) The frequency-range is enormous.
- (4) The wave form (which is another way of saying the influence of the overtones) is of vital importance.

Acting on the fact that theory seemed to be of little use, the author proceeded to make up transformers in which all the conditions could be varied as much as possible,



A pictorial diagram showing method of control in the "Universal" L.F. Transformer described in this article.

that is, the ratio of turns, the ratio of impedances, the actual values of both these two quantities, the self-capacity, the tightness of the coupling, and the equivalent air gap—that is, the degree to which the transformer core was "closed."

Some very remarkable results were obtained. It was found, in the first place, that the difference in volume between an open-core and a closed-core transformer (other things being equal), so far from being enormous, as might have been expected, was in fact very little. It was also found that there was very little difference

(Continued on page 446.)

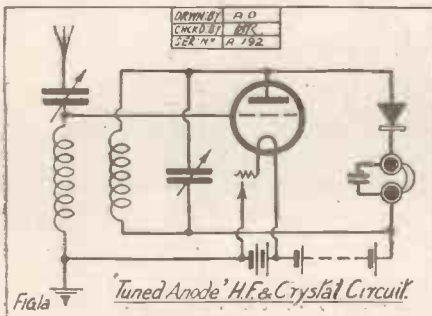
THE ULTRA-AUDION AS AN H.F. AMPLIFIER.

By
Lieut.-Commander
H. W. SHOVE, D.S.O.,
R.N.

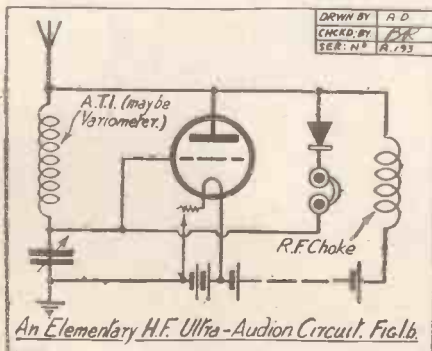


A famous coast station—the Wireless Post at Flamborough Head.

THE simplicity and efficiency of the ultra-audion circuit have brought it into considerable favour with the "one-valve" amateur. Indeed, many of the "stunt" circuits, so constantly produced, amount on analysis to very slight modifications of it. For several of these the present writer can claim the credit, or must shoulder the blame.



At the same time, he has always had a very warm spot in his heart for the crystal as a rectifying device, for he has yet to find a valve—at any rate when "leaky grid" rectification is employed—which will give the same faithful reproduction of tone as a good crystal when used alone or preceded by a properly designed and handled H.F. stage. Experiments have therefore been undertaken with a view to evolving a good combination of the ultra-audion and the crystal rectifier.



The commonest method of coupling a crystal to an H.F. valve is, of course, the "tuned anode" (Fig. 1a). By analogy one should be able to make use of the ultra-audion circuit, as in Fig. 1b. But this arrangement—though it will work—is inefficient and undesirable, because the whole of the crystal and 'phone circuits, being connected above the variable condenser, are kept at an H.F. potential to earth. Consequently, capacity losses through the body of the listener are very troublesome.

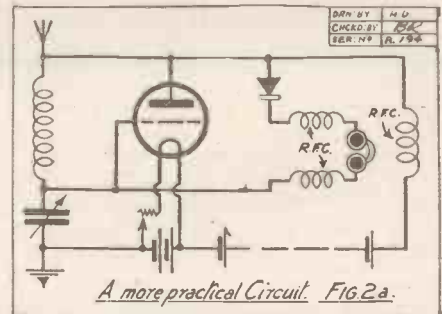
The Use of Chokes.

This difficulty can be overcome to a certain extent by providing H.F. chokes in the 'phone leads, thus isolating the 'phones and cutting off the capacity leakage to earth by way of the wearer's body. This is shown in Fig. 2a, a convenient method of winding the chokes being indicated at Fig. 2b. This arrangement may prove of use where this type of ultra-audion with variometer A.T.I. is in use. To try the circuit with an existing set of this type, it is necessary to provide a crystal detector and pair of chokes—as shown—and to run leads from the two ends of the A.T. variometer. No other structural alterations are required, but when using the crystal the ordinary 'phone terminals must be shorted—or a choke inserted as explained below—and the grid leak removed, a shorting piece being inserted in its place, or in parallel with the grid condenser if the leak went direct to filament.

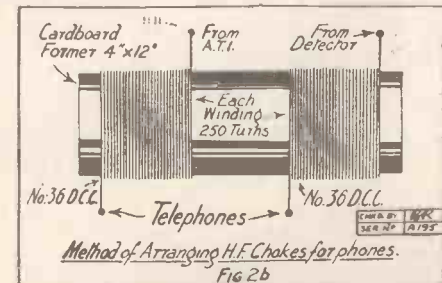
The crystal rectification unit can be made up on a board, as shown in Fig. 3. Tuning is apt to be flat with this arrangement, due to the damping of the crystal directly across the variometer. Two large—250 or more turns—plug-in coils can be substituted for the special chokes.

A Loose-Coupled Arrangement.

Where a plug-in coil is used as the A.T.I., a better arrangement is possible by coupling the crystal circuit magnetically to it, as in Fig. 4, the coils being, of course, mounted in a two-coil holder. The stabilising of this circuit may be carried out in various ways, as discussed in former articles in POPULAR WIRELESS. The value of the R.F. choke



is of importance in this respect. In this, as in the previous circuit, it will probably be found that the shorting of the original 'phone terminals results in poor signal strength. If the original valve rectification circuit was not provided with an R.F. choke—and there are many working quite satisfactorily without one—it will certainly be necessary to provide one now, otherwise all the H.F. components in the anode circuit will pass through the H.T. battery and there will be no "feed back." This choke must be put across the original 'phone terminals instead of shorting them. Alternatively, the 'phones may be left in circuit and a second pair used for listening on the crystal. It



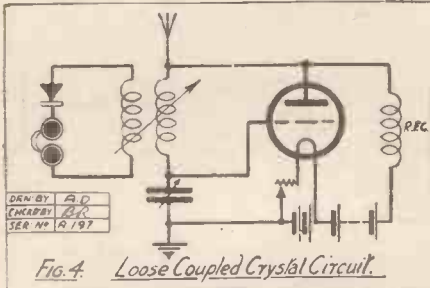
may be remarked here that no ordinary ultra-audion of this type should be provided with a 'phone condenser. Even if there was—as there generally should be—an R.F. choke in the original circuit, it is now very likely too small. Again, this may

(Continued on page 410.)

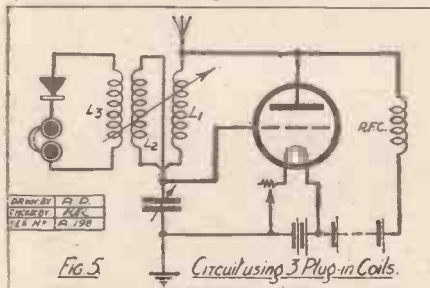
THE ULTRA-AUDION AS AN H.F. AMPLIFIER.

(Continued from page 409.)

be corrected by leaving the 'phones in circuit, providing an extra choke or, of course, substituting a larger one in the old position. The sound winding of a "dud" L.F. transformer is sometimes very effective for this



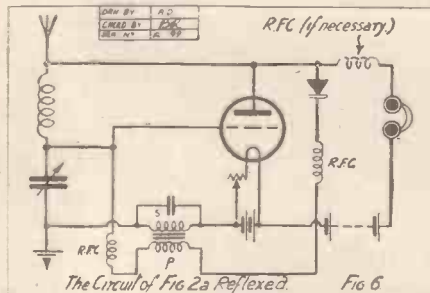
purpose. But some makes are provided with a built-in condenser across the primary, which renders that winding useless for the purpose unless removed. Any coil of about 250 turns or upwards will do as a choke for the "broadcast band." For 5XX



it should not be less than 350, preferably 400 or 500.

Untuned Detector Circuit.

It will be seen that no tuning condenser is shown in the crystal circuit of Fig. 4. Unless it is desired to use the adjustable loose coupling between the coils to obtain extra selectivity, such a condenser is generally unnecessary if a suitable coil be chosen,



for quite fine enough tuning can be obtained by varying the angle of the coils. But a variable condenser is naturally a refinement which will be found very useful, especially if jamming is troublesome.

Fig. 5 shows the circuit with which the writer has obtained the best results. Here a three-coil holder is used, the coils L_1 , L_2 forming the ordinary variometer ultra-audion A.T.I., while L_3 is the inductance of

the crystal circuit. Tuning requires a little practice if good results are to be obtained without a secondary condenser. Signals can, however, be received over a considerable wave-band by varying only the A.T.C. and the coupling of the crystal coil. When so tuned in they are strengthened up by manipulation of the variometer coupling— L_1 to L_2 —and the A.T.C., after which the final touches are given with both coil couplings and the A.T.C.

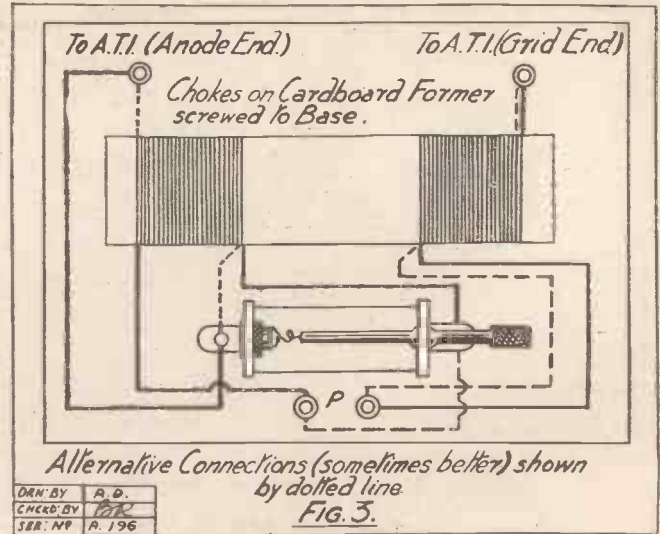
Operating Hints.

As in all ultra-audions, any movement of the coils necessitates an adjustment of the condenser. And in this case—on account of its damping effect—this applies to the secondary—crystal coil—as well as the two A.T.I. coils. Attention should be paid to the regulation of the filament temperature and H.T. voltage, neither of which are likely to be the same for good results when the valve is working as an H.F. amplifier as they were for good detection. Of course, the valve itself should not be a pure detector. It must be fairly hard. The soft Dutch valves—or those of similar type—which give such capital results in the ordinary ultra-audion, will fail conspicuously here. The H.T. voltage will probably require to be increased somewhat.

Reflexing.

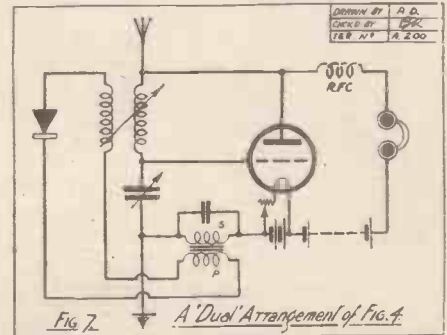
Any of the circuits shown may be "reflexed," as shown in Figs. 6, 7, and 8, the 'phones being now restored to their original position in the plate circuit.

These are powerful circuits, capable of working a small loud speaker at a fair range from a B.B.C. station, the signal strength being generally found markedly superior to that given by an ordinary reflex with "tuned anode" or transformer coupling. They are not recommended for "DX" work, owing to the broadness of their tuning.



EXPERIMENTS WITH KITE AERIALS.

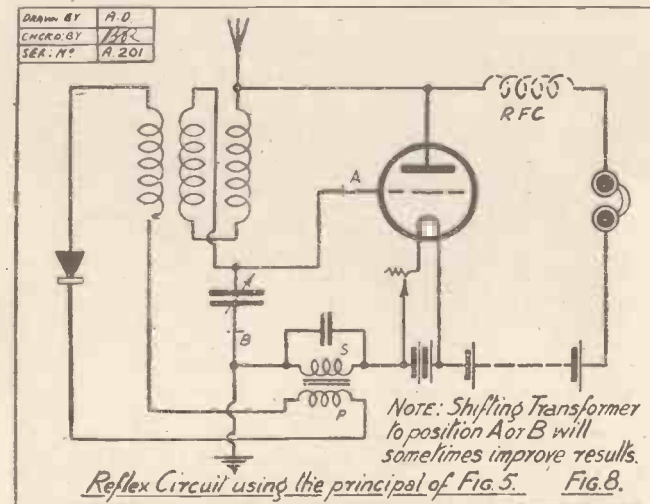
PROBABLY the originator of the idea of kite aerials was the famous philosopher Benjamin Franklin, who drew electricity from the air by means of a wet kite-string and first investigated the elec-



trical state of the atmosphere during a thunderstorm.

Since that time similar experiments have frequently been made, and latterly the kite has been much used as a means of supporting the antenna or aerial for wireless reception. It is easily possible, by means of a kite, to raise the end of an aerial wire to a height of 200 ft. or more, which is a considerably greater height than can conveniently be obtained by ordinary means.

In some experiments of this kind, a cloth-covered bow-kite, six feet in height and $4\frac{1}{2}$ feet in breadth at the broadest part, easily supported a fairly stout aerial wire up to a height of 200 ft. Experiments of this sort usually require the use of a portable receiving set, as it is more convenient.





GENERAL HINTS FOR NEW AMATEURS.

A SPECIAL ARTICLE BY

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

NO longer is radio firstly and lastly a means of communication expediency, it has now become one of the social amenities of life. The primary result is that a citizen's right to obscure the skyscape with poles and wires has been established, and the secondary result that thousands of people are nightly manipulating radio receivers and getting results therefrom that they should not be getting. Lest this sounds confusing, let me explain.

To "hook up" a wireless set, turn the various knobs more or less as per much more-or-less (generally less) directions, and produce sounds, is not a difficult operation, but time and quality are two factors that require close consideration before broadcasting can be fully enjoyed. For instance, broadcast items are not repeated and good things can be completely missed unless the listener is able to "switch on" at a moment's notice and not have to juggle about with dials and controls for long periods. Having "switched on," if signals are very, very weak or badly distorted, or both, then he might just as well "switch off" again.

Concerning a Receiver's Controls.

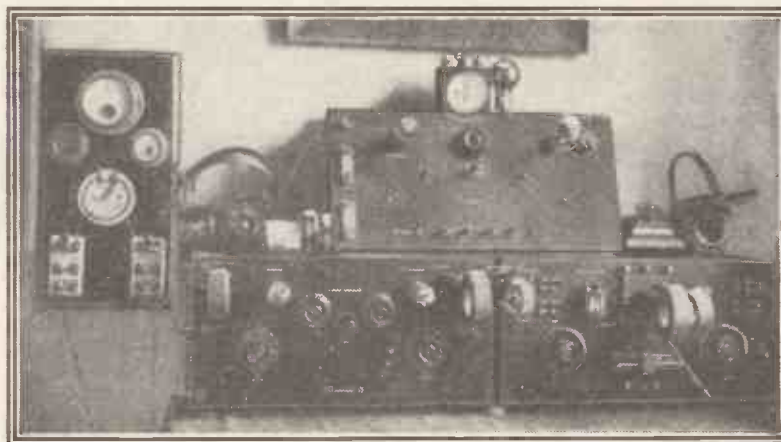
Now, contrary to frequently expressed opinions, wireless sets obey certain fixed laws and regulations. At least there are definite controls and adjustments on a receiver which do definite jobs. If it has one dial and two knobs, then in order to tune in a certain broadcasting station those three controls must be placed in certain positions, just as the combination on a safe has to be set before the safe can be opened. I am really sure that some people believe that such dials and knobs must be simultaneously and haphazardly twiddled about until, by luck, the required combination of adjustments is discovered.

Up to a certain point, perhaps they are

justified in so believing, because until dial settings for various stations are "logged," the "combination" is to some extent an unknown quantity.

Searching and Tuning.

However, unlike the combination lock of a safe, when the "key" is missing, a



Receiving apparatus constructed by Mr. C. V. Carpenter, 126, Nansen Road, Alum Rock, B'ham.

well-defined method for "searching" for the right adjustment of a wireless set exists. It is known as "tuning." Without adopting the proper method, a listener can twiddle his way through his wireless life without learning in twenty years the correct way to tune a set. Further, to know what one is doing is to make that doing interesting might be an old tag, but none the less applicable to the case under discussion; it is moreover, and perhaps more importantly, distinctly useful.

Theory we can leave to the amateur and experimenter—it hardly concerns the average listener—and with no more knowledge of electric science than he now possesses he can approach his set and handle it with the assurance of an expert if he will note the following remarks.

First of all, it must be ascertained that there is something to tune in. If the broadcasting stations are not working there is nothing "in the air" to engage attention,

but we will take it for granted that it is 9.15 p.m. and that the evening's etheric performance of the B.B.C. is well under way.

We will further take it for granted that there is a station within range—and let me just remind listeners that because a certain box filled with peculiar bits of gear and labelled "Wireless Set" is attached to a length of suspended wire, it does not follow that it is capable of receiving music from Manchester, speeches from Stockholm, talks from Toulouse, etc., etc., to order. All wireless sets, even those using eight or nine valves, have their limits, and, of course, in the case of crystal and one-valve sets, such limits are more confined.

Again, we must take it for granted that the aerial and earth connections are good. Height, of course, is the main factor to study in the case of an aerial, while shortness and thickness are the characteristics of an effective earth lead.

A six-foot length of stout wire soldered to a main waterpipe is as good an earth connection as a listener could desire.

"Wave-length" Adjustment.

Supposing a crystal set is connected to the aerial, this latter has every available inch of height, being suspended between a 35-ft.-high chimney stack and a 25-ft.-high tree, and consists of a 60-ft.-length of good aerial wire with nice large insulators at each end. Carrying our supposititious case through, the down lead, which is a continuation of the 60-ft. length, is at the extreme end nearer the house, and this is nearer the broadcasting station. Had this latter been in exactly the opposite direction, the down lead would not have been taken from the other end of the aerial, but from the exact centre, as this would be more convenient, but it should be noted that only three positions for down lead

(Continued on page 412.)

GENERAL HINTS FOR NEW AMATEURS.

(Continued from page 411).

"tappings" are allowed. A main broadcasting station such as 2 L O (London) or 2 Z Y (Manchester) is within a distance of 15 to 20 miles, or 5 X X is only at most 75 to 100 miles away, or a relay station such as 5 P Y is but two or three miles distant.

The crystal set itself is quite a standard type with one tuning knob or dial, an adjustable crystal detector, and a good pair of telephone receivers. Music or speech, in view of all the above favourable conditions, should be available, and although the receiver is not tuned or adjusted, only a few seconds delay should occur before it is being employed and enjoyed.

Wave-length tuning has nothing at all to do with the distance away of a broadcasting station; it is a definite dial or knob adjustment, and if a tuning dial marked in degrees is used, or a pointer knob with a panel scale, then one "reading" and one "reading" only will indicate the correct adjustment for one particular broadcasting station. Unless the aerial or earth is materially altered, or unless the broadcasting station changes its wave-length, that dial or knob can remain permanently "set" for the local station or Daventry, as the case may be, if such are within comfortable range.

Tuning a Valve Set.

In order to obtain the required setting with a minimum of delay it should be remembered that signal strength will weaken when the knob or dial is twisted either way from the correct point.

After the above rather lengthy prelude we are now fully prepared to tackle the task of "getting through" to quick time.

First of all the crystal detector is roughly adjusted and the knob or dial rotated fairly rapidly until music or speech is heard. The dial or knob must then be turned as far as possible in one direction and then slowly turned in the other until that point where loudest signal occur is reached. The "setting" should be noted and then the dial again turned until signals are *hardly audible*. The crystal detector can then be carefully adjusted until under those conditions loudest signals are obtained.

Finally the knob or dial is brought back to the previously noted "setting" and the receiver can be left to do its work and the listener can sit back and enjoy the concert. The foregoing may sound an involved and lengthy operation, but once the actions have been memorised and are performed in order it will be discovered that they only take a few seconds to carry out.

Distortion is not a trouble that at any time seriously affects crystal-set users, but it is a problem that will at one time or another have to be dealt with by all possessors of valve sets. It is a trouble, too, that can be due to many causes, some, especially to the listener, being particularly elusive.

Tuning a valve set is by no means an easy operation; even a one-valve receiver presents difficulties—that is, if by "tuning" we mean getting good results expeditiously, and not fiddling and wangling about with this and that knob until something that might be called broadcasting is received.

Practically everything on a valve set capable of adjustment is an important control, and one that will require careful handling. The adjustments of a valve set can be divided roughly into two classes, i.e. primary and secondary controls. By this, I mean that one group of adjustments is essential to the *reception* of signals while the other group is essential to the *quality* of signals.

Condensers and Coils:

Before reception is at all possible, the receiver must be tuned to something approximating the wave-length of the desired station.

The controls with which this is generally accomplished consist of



A handsome cabinet set built by Mr. G. H. B. Yoxon, 197, Antrobus Road, Handsworth, Birmingham.

what are known as a variable condenser and "tuning coils." Wave-length tuning is quite straightforward. Two items can increase or decrease the wave-length to which a set is tuned, and both do it in quite a sensible manner. The larger the coil used, or the greater the amount of a coil which is divided into sections or "tappings" that is used, or the larger the variable condenser, or the greater the intersection of its two sets of plates, the greater the wave-length and vice versa.

Dial Figure Indications.

A condenser dial is generally marked in figures between 0 and 180 or 0 and 360, or 0 and some other number. These figures have no direct bearing on wave-length. They are merely indications so that particular settings can be remembered or recorded. Nevertheless, if London, which as most listeners know has a wave-length of 365 metres, is tuned in on a condenser dial reading of, say, 50, then another station working with a 400-metre wave-length will "come in" at some slightly higher point—perhaps around about 70.

Therefore, condenser-dial figures are working indications, and can be used as such. Variable condensers cover only restricted ranges of tuning—200 or some tres—and the

coil is the "big noise." This latter determines the limits of a wireless set's range of wave-length. Thus a small coil will perhaps cover, with the assistance of a variable condenser, a wave-length range of from 300 to 500 metres, but for 5 X X, Daventry, which works on 1,600 metres, a much larger coil would be necessary, but it must be noted that the same variable condenser will serve.

Therefore, before attempting to tune a valve set in, it should be ascertained that the correct coil is in use for the required station, and also which of the dials and knobs controls the variable condenser. Valve sets employing a number of valves may have two or even three variable condensers, but they all control "tuning" in a more or less similar fashion.

The batteries, aerial and earth leads, and 'phones or loud speaker, must be carefully connected up, and the valves "lighted" by turning on what the man who sold the set might have described as filament resistances or filament rheostats. Here a word of warning might not be out of place. In order to obtain long valve life—and valves are expensive to replace—they should always be run at as dull a point as possible. The knobs that control the brightness of a valve's filament should always be slowly turned, and after those points have been reached when no additional strength of signals result, then the process should cease or even be reversed slightly until the filaments' brightnesses are reduced as far as possible compatible with clear, undistorted music or speech.

The Reaction Control.

The outstanding fact is that above a certain brightness—which in the case of what are known as dull emitter valves is at best quite a dullness!—no further increase of a filament's heat will increase signal strength. It even, at times, considerably reduces it. This is a point well worth remembering.

The reaction control, which might be labelled "Reac," "Intensifier," or even "Tuner" (the last is really a most misleading title) should be set at "zero" in the first instance. If two coils, one fixed and one movable, are employed, the movable one will, without much doubt, be the reaction coil, and "zero" in this case will be reached when these two coils are separated by the greatest possible distance.

Tuning will then more or less follow the same procedure as crystal set tuning, the reaction being ignored and only the variable condenser being adjusted and slight variations in filament brightness being made in accordance with the above.

If an H.T. battery with several sockets is employed, this, too, should be varied until loudest and purest reception results. Finally, the reaction can be resorted to in order to obtain increased volume. This control should be handled carefully, for, if it be mishandled, interference with other listeners can be caused. A very slight readjustment of the tuning condenser will then complete the process.

Distortion very frequently occurs through a receiver being "pushed"; that is, when a listener attempts to squeeze the absolute limit of noise from a set. A receiver should never be "pushed," and if the required volume cannot be obtained without doing so, then it is an indication that another valve is required.

(Continued on page 446.)



Prof. A. M. Low on "The Possibility of Television."

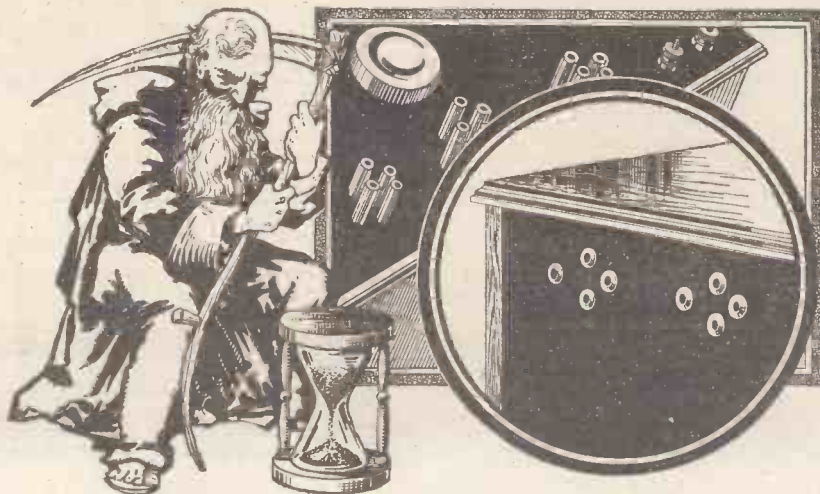
W. B. Medlam, B.Sc., A.M.I.E.E. on "Building a Super-heterodyne."

Articles on "Building a Wireless Set," "Upkeep of a Crystal Set," "Those Microphonic Noises," "Dodging the Aerial," and many others.

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"Times change"

What was right last year is old-fashioned this year, and next year will be obsolete. The wonderful progress made by wireless is built up of many small but important improvements in the design of component parts.

FOR EFFICIENCY'S SAKE, KEEP UP-TO-DATE.

Take for example Valve Sockets. The old fashioned Valve Socket was a crude rough barrel projecting an inch from the panel. The sockets were seldom quite parallel, making it difficult to insert a valve. Being of bare metal, accidental burning-out of the valve frequently occurred. Being solid they transmitted every mechanical shock direct to the valve filament.

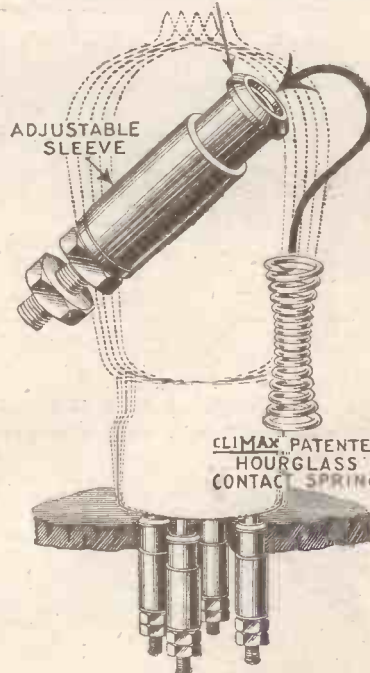
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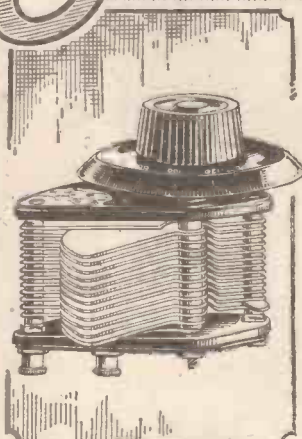
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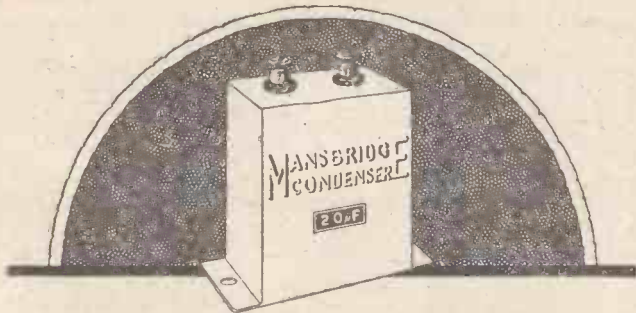
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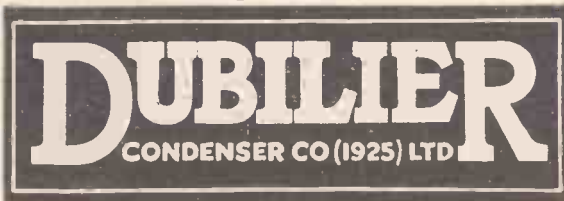
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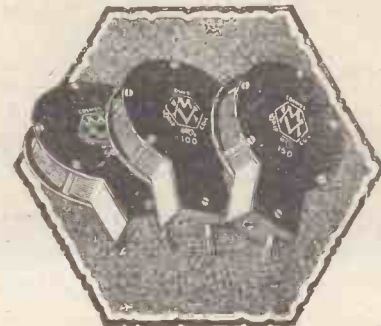
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20	12.5	9	70	150	210	3 6
25	25	9	100	215	300	3 6
35	50	10	145	300	425	3 6
40	100	10	200	425	600	3 6
50	150	10	245	520	735	3 6
75	300	10	340	740	1040	3 9
100	700	11	530	1130	1590	4 8
150	1000	16	640	1360	1900	4 8
175	1400	18	765	1610	2250	4 8
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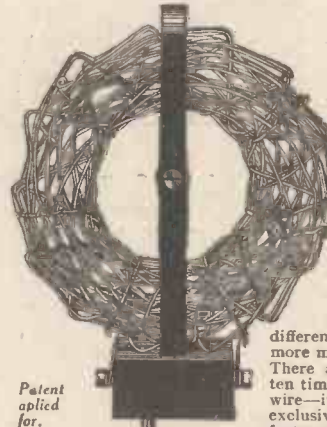
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200	8/0	1,450 ,, 2,300 ,,
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The Set Designed and Described by
G. V. DOWDING, Grad.I.E.E.,
 and
P. R. BIRD.
 Constructional Work by
G. V. COLLE.

IN order to operate a loud speaker, a certain amount of low-frequency amplification is essential. Generally speaking, at least two stages of this are necessary to bring the signals received on a crystal set up to the requisite strength, and in order to obtain really comfortable loud-speaker volume a 2-valve amplifier is to be advised, in

the energy that normally passes through these, amplifies it and brings it up to a greater strength.

It will be seen, therefore, that it is what might be called automatic in action, and no tuning adjustments are employed. For this reason the addition of an L.F. amplifier to a crystal set, for instance, is quite a simple business, and results in no undue complications. It is a most stable device, and once connected up and the valves turned on, it can be left to operate as long as the batteries last, without readjustments being necessary.

board diagram, details, dimensions and measurements can exactly be followed.

Drilling the panel is the first necessary operation, and this should be carried out in accordance with Fig. 2. Little comment is needed, as it is by no means a difficult task even with a small hand-drill, although, of course, metal working drills are essential.

Connecting up the Components.

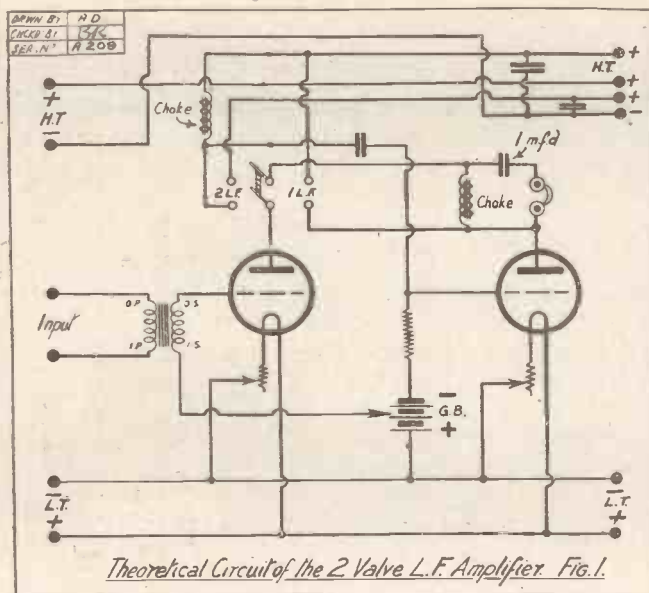
The holes for the D.P.D.T. switch require to be centred very accurately if that component is to present a neat appearance and work smoothly and efficiently, therefore just a little extra care will be needed at this point.

Having drilled the panel, the terminals, filament resistances and switch can be mounted and the panel itself fixed on the baseboard.

The mounting of the baseboard components can then follow, but the choke-coupling unit should be left until the switch wiring has been accomplished; otherwise some difficulty might be experienced owing to the close proximity of these two items.

The wiring connections are very clearly shown in Fig. 4, and as a check upon these a list of point-to-point connections is given separately. Studying the photographs will very materially assist the constructor, more especially in respect of the direction and length of leads and the points at which it is recommended that cross connections should be made.

Great care should be taken to see that the transformer and choke units are connected up exactly as indicated in Fig. 4.



Theoretical Circuit of the 2 Valve L.F. Amplifier Fig. 1.

conjunction even with a valve set not already employing L.F. amplification.

Nevertheless, a 2-valve amplifier should be provided with means to eliminate one of the valves so that it can be used as a 1-valve amplifier when desired, for in certain circumstances it may prove unnecessary and wasteful to use both, such as, for instance, when the instrument is employed to magnify moderately weak signals to enable comfortable telephone receiver reception to be obtained.

An Efficient Instrument.

The above requirement has not been overlooked in the 2-valve amplifier to be described; in fact, this interesting piece of apparatus incorporates as many refinements as is necessary for it to represent the highest possible standard of modern practice in such a manner that it will prove possible for even the inexpert constructor to tackle it with success.

It must be understood that low-frequency amplification is a function subsequent to rectification. In other words, a low-frequency amplifier takes the place of the telephone receivers on a set and, handling

over switch, which enables either one or two valves to be brought into use, is so arranged that the H.T. remains unaffected. Grid bias can be applied to both valves.

A complete list of the parts and materials required is given separately.

The case and panel can be purchased complete. It is advisable to adhere to the specified components mentioned; a "Eureka" L.F. transformer, for instance, is not one of the cheaper makes, but it is well worth the money asked for it. If the constructor desires to make his amplifier a really first-class instrument, he should not hesitate to expend the odd extra shilling here and there and buy components of reputable make.

Adhering to the list provided will render the work easier, as then the panel and base-



As will be seen from this photograph, the 2-valve amplifier has a neat and business-like appearance.

This diagram, by the way, represents the panel (top half) and baseboard "flattened out," and corresponds directly with the back-of-panel photographs. Square section wire should be used throughout for the

(Continued on page 418.)

A "P.W." 2-VALVE AMPLIFIER.

(Continued from page 417.)

wiring, with the exception of the grid bias leads. These should consist of rubber-covered flex and wander plugs should be attached to their ends. Soldering is advised in all cases.

A final clean-up with a soft rag will complete the back of panel operations. Every trace of flux and dust must be removed and also any beads of solder that might have strayed under or around components. Needless to say, it must be ascertained, too, that no lead is liable to

POINT-TO-POINT CONNECTIONS.

(Looking at back of panel.)

The - L.T. terminal on right-hand side of panel to one side of each filament rheostat and to the - L.T. terminal on the left-hand side of panel. The positive grid bias plug joins the left-hand - L.T. terminal by means of a flexible wire.

One filament leg of each valve holder to the other side of each filament rheostat.

The other filament legs of valve holders joined together and taken to the + L.T. lead which runs from the + L.T. terminal on the right of the panel to the + L.T. terminal on the left of the panel.

The - H.T. terminal on the right-hand side of panel to the - H.T. terminal on the left-hand side.

One tag of each .5 mfd. fixed condenser joined together and connected to the - H.T. lead.

I.P. and O.P. of the Eureka Concert Grand L.F. transformer to the top and bottom input terminals respectively.

The + H.T. terminal on the right of the panel to the + H.T. terminal on the left-hand side of panel nearest the - H.T. terminal.

O.S. of the L.F. transformer (Eureka Concert Grand) to the grid leg of the 1st valve holder. I.S. is joined to one negative grid bias plug by means of a flexible wire.

Plate leg of the 1st valve holder to centre right-hand contact of the D.P.D.T. switch. Top right-hand contact of switch to the "P" terminal on the A.J.S. choke coupling unit.

Bottom right-hand contact of switch to one loud-speaker terminal, to plate leg of the 2nd valve holder, and to the "P" terminal on the A.J.S. L.F. choke.

Centre left-hand contact of switch to the + H.T. terminal on the A.J.S. L.F. choke and to one tag of the 1 mfd. fixed condenser.

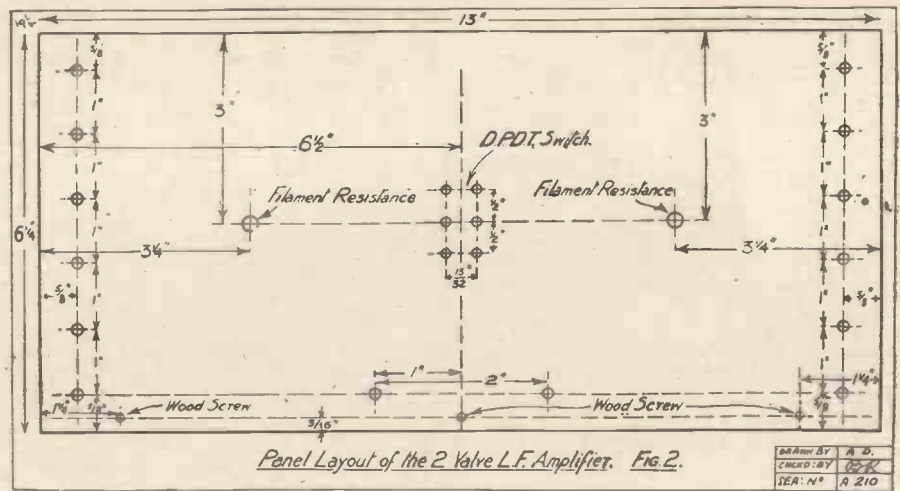
Bottom left-hand contact of switch to the centre + H.T. terminal on the left of the panel, to the + H.T. terminal on the A.J.S. choke coupling unit and to the other contact of the L.H. .5 mfd. fixed condenser.

Top left-hand contact of switch to the other contact of the R.H. .5 mfd. fixed condenser and to the bottom + H.T. terminal on the left-hand side of panel.

Other loud-speaker terminal to the other side of the 1 mfd. fixed condenser.

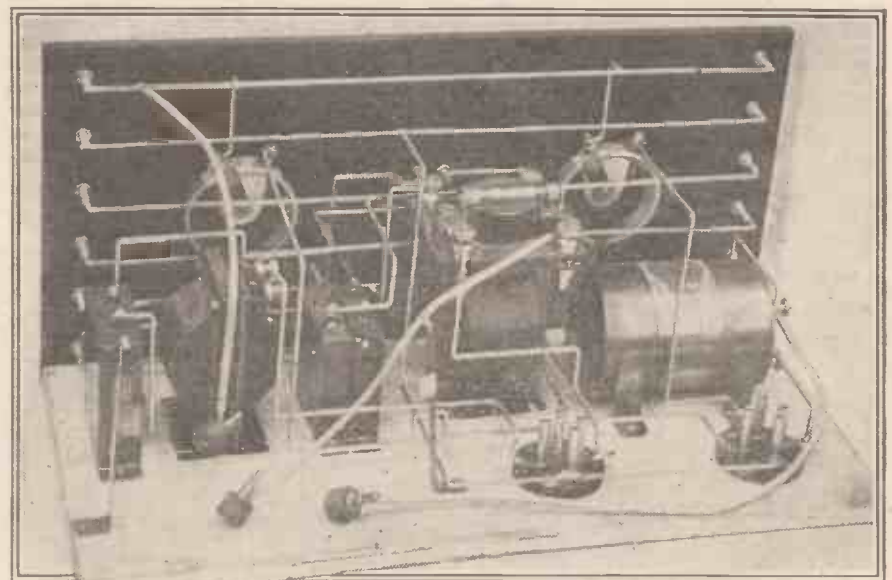
"G" terminal on the A.J.S. choke coupling unit to the grid leg of the 2nd valve holder.

The "- L.T." terminal on the A.J.S. choke coupling unit is then joined to a 2nd negative grid bias plug by means of a flexible wire. The 1st negative grid bias plug is tapped into the grid bias battery at 1½ or 3 volts (counting from the positive G.B. tapping) and the 2nd into 7½ or 9 volts.



"foul" any other one, or come into contact with the components, and that ample clearance is allowed for the valves and grid bias battery. The two clips provided for

cut out of fairly thin, springy sheet brass to a size suitable for the type of battery purchased, and screwed down into the indicated positions. (See Fig. 3.)

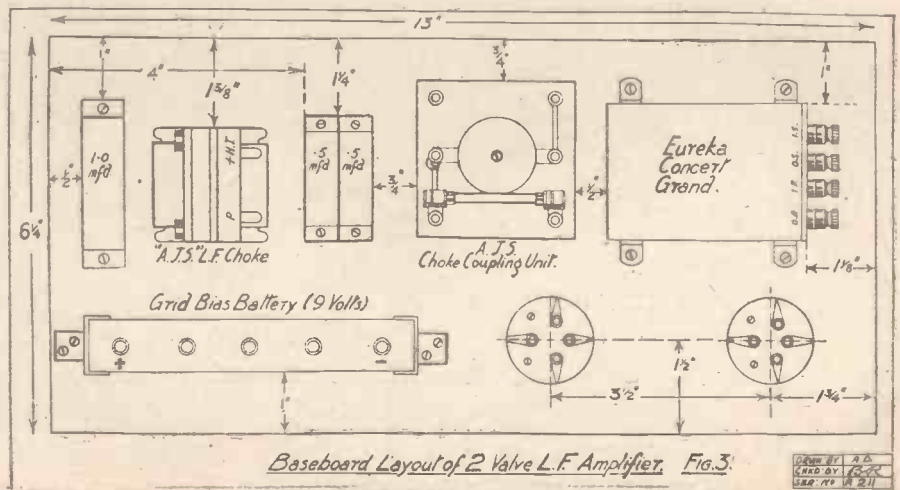


A view of the interior of the set taken after the wiring had been completed but before the grid bias battery was placed in position.

holding this latter, and which can be clearly seen in some of the photographs, are not essential, but advisable if a thorough job is to be made of the amplifier. They can be

Transfers will give a professional appearance to the front of the panel, and are very easy to fix.

(Continued on page 419.)



A "P.W." 2 VALVE AMPLIFIER.

(Continued from page 418.)

Now, with regard to the use of the instrument, the constructor is requested to note carefully the following remarks:

The most suitable valves to use are a Marconi R.5V. for the first position and a D.E.5 for the second, using a 6-volt accumulator and 80 and 120 or so volts respectively. The centre H.T. plus terminal is for the first valve, and the bottom one for the second. The same H.T. battery can, of course, be used, providing it is fitted with tapping sockets, as the "minus" tapping is common to both valves.

External Connections.

The top H.T. plus terminal has no internal connection in the amplifier; it is merely a duplication of the bottom H.T. terminal on the left of the panel. It is used for carrying through the H.T. + from a valve set when such is used, and thereby permits a suitable "tapping" of H.T. to be obtained. Therefore, when the amplifier follows a valve set, the input terminals are connected to the latter instrument's 'phone terminals and the left-hand battery terminals of the amplifier connected to the valve set's battery terminals. The batteries are then

connected to the right-hand amplifier terminals and thus serve both instruments. When a crystal set precedes the amplifier only, the two lower H.T. plus terminals are used and, of course, all the left-hand battery terminals are ignored.

COMPONENTS REQUIRED.

	£	s.	d.
1 panel 13" x 6 1/2" x 1/2" (Peto-Scott)			
1 cabinet with baseboard	1	5	9
2 filament rheostats (Peerless Junior), 30 ohms each	0	5	0
1 L.F. transformer (Eureka Concert Grand)	1	10	0
2 valve holders (baseboard type, Burwood)	0	2	6
1 choke coupling unit (A.J.S.) for second stage	1	0	0
1 L.F. choke (A.J.S.)	0	15	0
2 .5 mfd. fixed condensers (T.C.C.)	0	7	0
1 1 mfd. " " "	0	4	0
14 terminals W.O. type " "	0	1	9
1 D.P.D.T. switch (Westhill)	0	2	0
1 grid bias battery (Hellesen or Siemens)	0	2	6
Wire, screws, nuts, transfers, etc.	0	3	6

It must be remembered, however, that there is no internal connection in the amplifier between H.T. minus and L.T., therefore when it is attached to a crystal set a short piece of wire should be employed to connect H.T. minus to L.T. minus. This could be done on the left-hand terminals,

thus giving two of them something to do, as it were. (See photograph.) *This is only necessary when a crystal set is used.*

The Correct Valves to Use.

In this last-mentioned case, too, it may prove unnecessary to employ grid bias on the first valve, in which case the flexible lead used for that purpose can be connected direct to L.T. minus. A great deal depends upon the type of valve used, and a little bias is frequently advantageous on a first stage.

If the amplifier is attached to a set already employing one stage of L.F. amplification, then an increased value of grid bias will prove necessary on both valves. It is difficult to give definite values, but it is an easy matter to try various bias battery adjustments. Of course it will vary greatly with different types of valves. The reader is recommended to study the valve guide in "P.W.'s" free book, "The Valve Experimenter's Handbook."

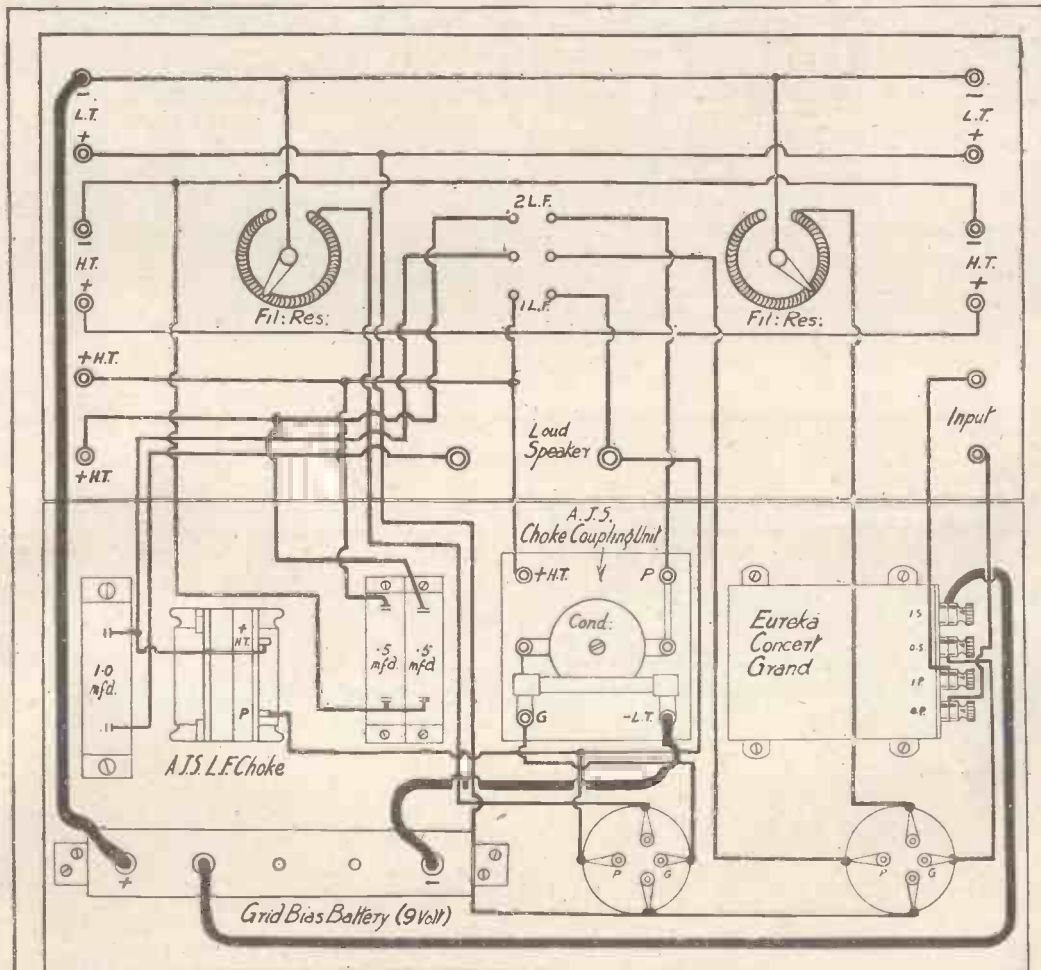
This guide gives full details about the various valves on the market, classifying them into groups according to their specified uses and qualities. For instance, in the case of the amplifier the reader will have to look down the section of the valve guide entitled "Valves specially designed for L.F. work, including Power Valves." Here he will find a number of valves listed in groups according to their current and voltage ratings.

Suppose he wishes to use a dull emitter valve that will only take .25 of an ampere, owing to the fact that he cannot get his accumulator charged very frequently. He will find in this section two kinds of valves: those taking six volts and those taking two. If he has an accumulator on hand having either of these voltages he will be able to choose his valve accordingly, referring to the last column in the tables.

A Useful Book.

Similarly if a 4-volt valve is required, he will find it listed in the tables, or if those needing only .06 amp. each are desired, these are also classified in a group, though the choice here is not so varied. We then recommend very strongly that the reader possess himself of a copy of this handbook, which was given away free with the issue of "P.W." dated October 10th (last week), for he will find it will solve a great many of his valve problems.

Finally, we are sure that every constructor who builds this 2-valve amplifier will find it to be satisfactory in operation for whatever purpose it is employed. As before mentioned, it incorporates everything necessary for the development of pure, undistorted loud-speaker volume, and if it is carefully handled and used with suitable accessories and a good loud speaker, then the real value of low-frequency amplification will be fully appreciated.



DRAWN BY A.D.
 CHECKED BY B.K.
 SER. NO. A 212

Wiring Diagram of the 2 Valve L.F. Amplifier.

FIG. 4.

THREE HINTS FOR AMATEURS.

YOU know how anxiously you insert the valves into your new set after you have just finished the last of the back-of-panel wiring? You are wondering whether the connections are all right, or whether you have the H.T. crossed on to the L.T. leads. Well, all anxiety may be set at rest by the simple expedient of going over the sockets first with a small tester. The latter consists simply of a pea-lamp (such as are used for flashlights, and obtainable for about twopence each), mounted into a suitable holder. For the holder, it is convenient to use a four-pin base, either the remains of an old valve, or else a special holder made out of ebonite for the purpose. All you have to do is to solder fine wire leads to the two connections of the lamp and again to the two filament pins of the holder, and then to fill up the holder (if it is made from the base of an old valve) with molten wax—sealing-wax does well.

Having connected your batteries up to the set, you simply plug-in this "tester" into the different valve holders, in place of the valve. If all is well with the tester, you may then safely put in the valves. If anything is wrong, the pea-lamp will be burnt out and you have learned wisdom at the price of twopence, instead of losing, perhaps, a fifteen-shilling valve to try the experiment.

Multi-Valve Receivers.

Multi-valve receivers in which the controls are cut down to the simplest possible are generally provided with an untuned H.F. transformer. The latter functions as a self-regulating tuner, that is, it operates throughout the broadcast band

with a good average efficiency at all frequencies. This so-called self-tuning effect is obtained by a special method of winding, and also by using a certain amount of iron in the core. The inductance of the coil then depends upon the frequency of the current in the windings, and the coil acts in somewhat the same way as a variable condenser. The efficiency, of course, is not quite uni-

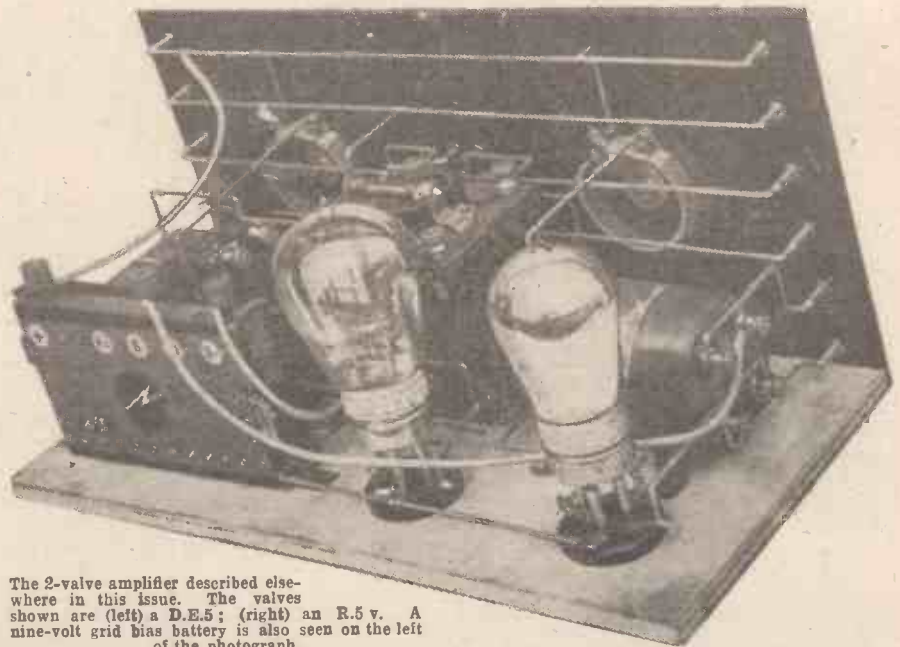
form, particularly towards the ends of the frequency range.

In this type of circuit a potentiometer is necessary to control oscillation.

The H.F. transformer has the advantage of being small and compact and requiring little space in the set. Due to this circumstance, a set of this type can be made quite compact, because the transformers can be well separated without unduly increasing the size of the cabinet.

Valve Detectors.

The detector valve acts in the same way as the crystal, that is, it allows current to pass in one direction but very little in the other direction. If this mere rectification were all that we required, we could use the original type of 2-electrode valve. But when the three-electrode valve is used as a detector, we have an amplifying



The 2-valve amplifier described elsewhere in this issue. The valves shown are (left) a D.E.5; (right) an R.5 v. A nine-volt grid bias battery is also seen on the left of the photograph.

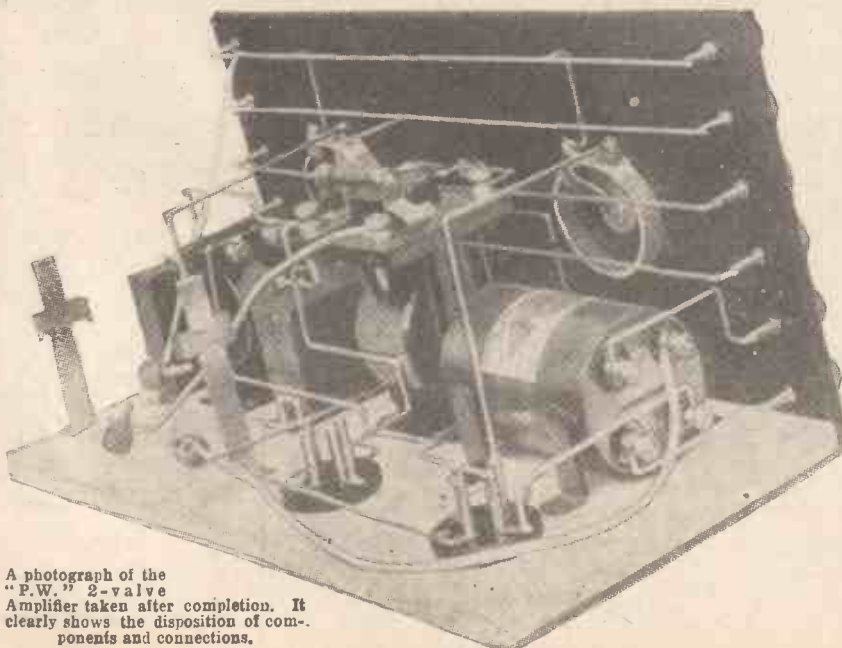
effect as well as mere detection. The signal currents pass to the grid and there they control the energy in the plate circuit, which gives much larger effects than could be obtained by the signal currents alone. In order to make the valve detect, we insert in the grid circuit a small fixed condenser, bridged by a grid leak.

Obtaining Reaction.

For the purpose of obtaining reaction, or regeneration as it is sometimes called, however, we usually employ one of two methods. The first is to run the plate current through a coil, called the reaction coil, inductively coupled to the coil in the grid circuit. The second is to tune the plate circuit, usually by inserting a variometer in it. The amount of the regeneration is controlled in the first case by varying the coupling between the reaction coil and the grid coil, and in the second case by adjusting the variometer.

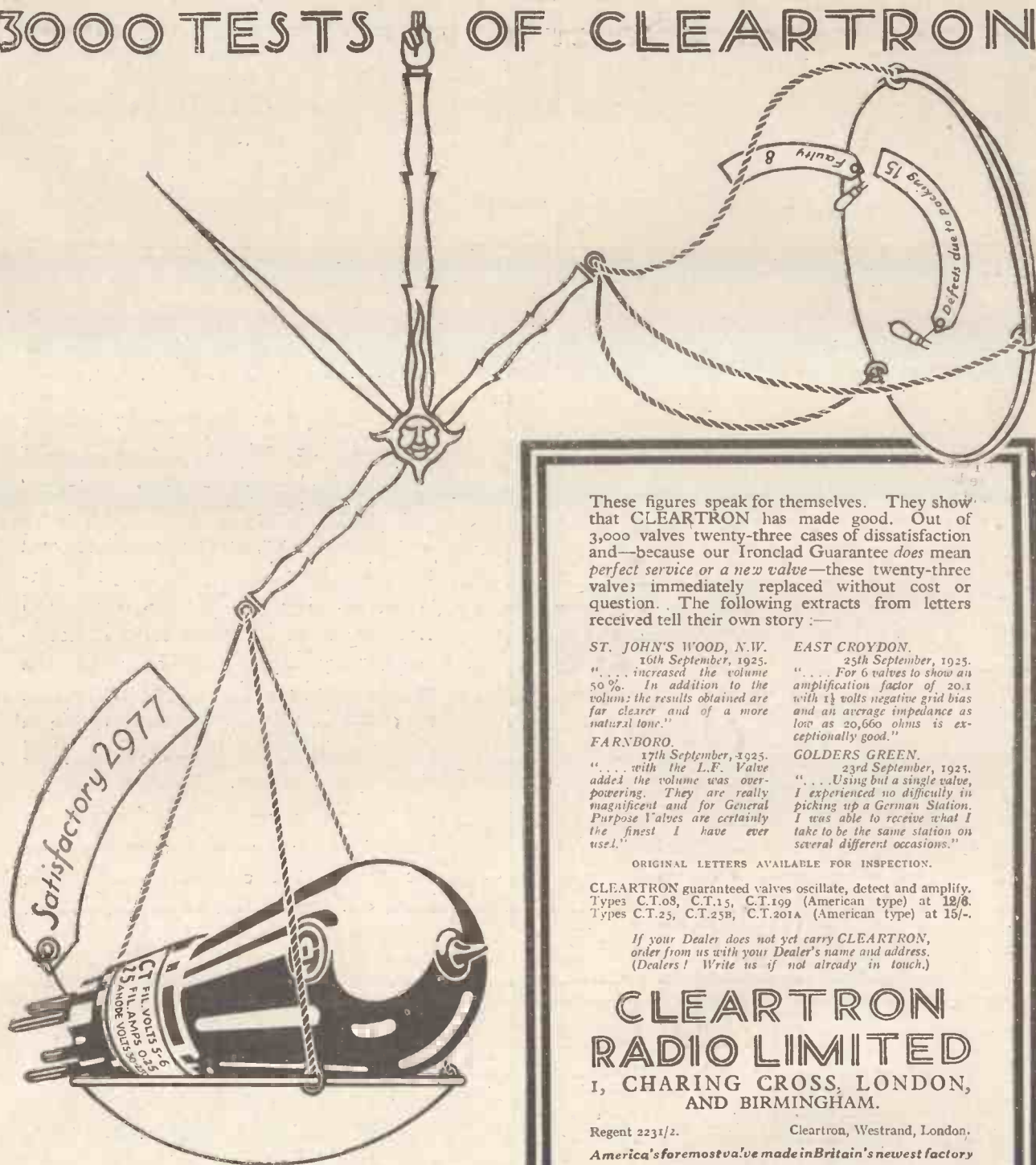
PHOTOGRAPHS.

Readers are invited to submit photographs of wireless interest for publication in "Popular Wireless." Every photograph accepted and published will be paid for at the rate of 10/6 per copy.



A photograph of the "P.W." 2-valve Amplifier taken after completion. It clearly shows the disposition of components and connections.

3000 TESTS OF CLEARTRON



<i>Satisfactory</i>	2977
* <i>Faulty</i>	8
* <i>Defects due to packing</i>	15
<i>Total tested</i>	3000

* Instantly replaced without cost or question.

These figures speak for themselves. They show that CLEARTRON has made good. Out of 3,000 valves twenty-three cases of dissatisfaction and—because our Ironclad Guarantee *does* mean perfect service or a new valve—these twenty-three valves immediately replaced without cost or question. The following extracts from letters received tell their own story:—

ST. JOHN'S WOOD, N.W.

16th September, 1925.
"... increased the volume 50%. In addition to the volume; the results obtained are far clearer and of a more natural tone."

FARNBORO.

17th September, 1925.
"... with the L.F. Valve added the volume was overpowering. They are really magnificent and for General Purpose Valves are certainly the finest I have ever used."

EAST CROYDON.

25th September, 1925.
"... For 6 valves to show an amplification factor of 20.1 with 1½ volts negative grid bias and an average impedance as low as 20,660 ohms is exceptionally good."

GOLDERS GREEN.

23rd September, 1925.
"... Using but a single valve, I experienced no difficulty in picking up a German Station. I was able to receive what I take to be the same station on several different occasions."

ORIGINAL LETTERS AVAILABLE FOR INSPECTION.

CLEARTRON guaranteed valves oscillate, detect and amplify. Types C.T.08, C.T.15, C.T.109 (American type) at 12/6. Types C.T.25, C.T.25B, C.T.201A (American type) at 15/-.

If your Dealer does not yet carry CLEARTRON, order from us with your Dealer's name and address. (Dealers! Write us if not already in touch.)

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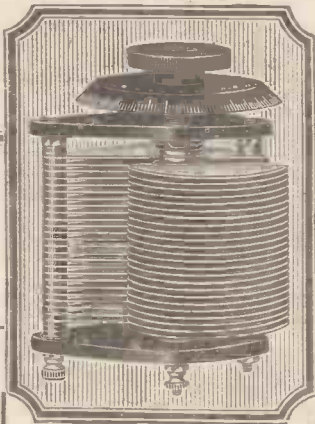
Father: "660 all out, that wants some beating."
 Son: "Yes, Dad. Like the Six-Sixty Valve!"

Outstanding in performance because of its remarkable MOLYBDENUM Thorium Covered Filament

Filament volts 1.5-2.
 Filament current 0.3 amps.
 British Made. Stamped B.B.C.

If you have any difficulty in obtaining send direct to us.
 Our interesting descriptive folders await your request.

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 London, W.1 'Phone: Regent 5336.



SQUARE LAW	
.001	9/6
.00075	9/-
.0005	8/-
.0003	6/9
.00025	6/9
.0002	5/6
.0001	5/3
Vernier	4/6

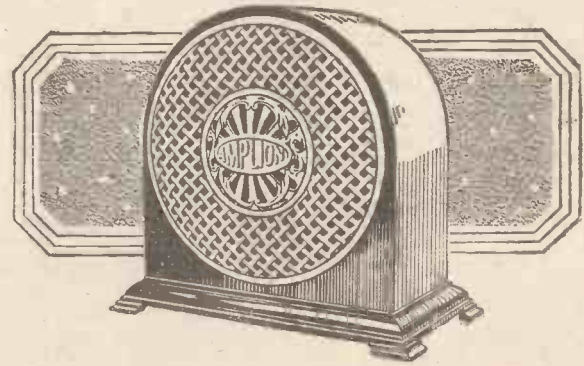
STANDARD	
.001	8/6
.00075	8/-
.0005	7/-
.0003	5/9
.00025	5/9
.0002	5/-
.0001	4/9
Vernier	4/-

J.B. SQUARE LAW WITH VERNIER	
.001	14/-
.0005	12/6
.0003	11/3
.00025	11/3

Post: One, 6d. Two, 9d. Three, 1/-.

Conserving Signal Strength

RECENT experiments have shown that there is no great advantage in tuning the primary circuit. It has also been demonstrated that in consideration of losses and resistance in the aerial system itself, losses in the primary circuit do not seriously affect signal strength. But losses are of great importance in the secondary circuit—that is in the grid circuit of the first valve. There it is important that inductances and condensers should be low loss. Quantitative experiments prove that low loss in the circuit can increase signal strength as much as 30 per cent. Therefore the implication is obvious—incorporate low loss condensers. Tune the primary—it helps selectivity—but be zealous about the condenser tuning the secondary. See it bears the mark J.B. and you will secure the utmost signal strength.



A Revelation in Radio Reproduction

THIS New Radiolux Amplion presents an outstanding triumph in the art of Loud-Speaker design, being totally different in appearance, in construction and in results.

Louder, clearer, more sensitive and realistic in tone than any contemporary instrument, the RADIOLUX AMPLION is a revelation in every essential loud-speaker quality. Not only is the spoken word and the song of the vocalist true to life, but instrumental music is almost indistinguishable from the original studio performance.

Outwardly resembling the English bracket clock—in itself a standard to the world—the cabinets possess that beauty of form and superlative finish which denote the masterpiece.

The illustration above depicts Model RS1.M with mahogany cabinet and oxidised silver grille. Price 8 Gns.

The RADIOLUX AMPLION is also available in a smaller size and in metal, oak and de-luxe finish at prices from £4 15s. 0d.

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Technical Notes

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

FOLLOWING my remarks in these Notes recently on the subject of Synclastic crystals. I have received a considerable number of inquiries from readers stating that they have been unable to obtain them. The explanation, I find, is that they are not sold through the trade, but only direct by post. I am informed by the makers that for a period of one month they are giving away, by way of advertisement, samples of the two extra crystals, the Synclastic Straight "B" and the Synclastic Reflex, with each regular Straight "A" crystal.

Personally, as already stated, I formed a very high opinion of these crystals, but readers must judge for themselves. Please note that inquiries should not be addressed to this journal, but direct to the Synclastic Crystal Co., 34, Hatton Garden, E.C. The price is 1s. 6d. for the set of three.

Talking about crystals, it is curious how opinions differ on some of the elementary points with regard to their treatment. It is commonly supposed, for example, that it is fatal—or, at any rate, highly deleterious—to allow the crystal to become covered with a film of oil or grease. On this account the amateur is continually advised, even warned, not on any account to allow the crystal to be touched with the fingers. Tweezers, according to the experts, should always be used for the handling of crystals.

Following Ideas Automatically.

On the other hand, many people maintain that a crystal will work perfectly well when actually immersed in oil—or, indeed, in many other liquids—which would seem to knock the ground away from all the above-mentioned advice.

Again, some prefer the holding of the crystals in the crystal cups by means of a screw, rather than by the use of Wood's metal or such other low-melting-point alloy, owing to the need for heating the crystal when running in the alloy. It is maintained by many that the slightest heating of the crystal has the effect of diminishing its sensitivity as a detector.

I do not say that I agree entirely with either of these two "schools of thought" (if one may use so ponderous a phrase in regard to so simple a matter), but the fact that the two should exist is clear proof that the matter is not so definite as it might have appeared.

Probably the truth is, in this as in so many other matters, that someone starts an idea and everyone else follows, with increasing fervour; so the idea becomes a conviction, and the conviction a creed.

Anyway, if in a moment of awful forgetfulness you find

yourself touching the crystal with naked fingers, you need not be afflicted with horror and mortification, as, in the first place, it probably does not make the least difference, and, in the second place, even if it does, you can remedy the damage by the simple expedient of applying methylated spirit or benzene.

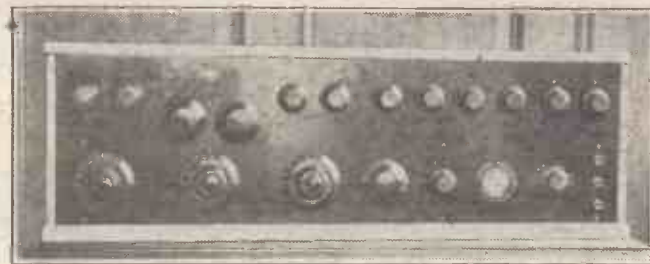
Another excellent example of the habit of following an idea automatically is furnished by the constantly reiterated advice, in regard to accumulators, always to rely upon the hydrometer test of the specific gravity of the acid in order to tell the electrical condition of the cell.

The Real Test.

As a matter of fact, nothing could be further from the truth. The real test of

the condition of an accumulator (as regards charge or discharge) is the voltage at the terminals. The specific gravity test, as I have remarked before in these columns, is entirely unreliable, for several reasons. In the first place, it is assumed that the specific gravity was correct when the acid was first put into the cell, and usually this is not at all a justifiable assumption. When the acid and water are mixed together (if the experimenter does the mixing himself) care should be taken that the mixing is complete before the test of the specific gravity is made.

In the second place, evaporation, frothing, spilling, and other causes, and the means employed to remedy them, all have an effect—usually entirely indeterminate—upon the ultimate specific gravity of the



A super-heterodyne receiver of German design.

electrolyte when the cell is in any given condition.

And thirdly, the hydrometer is an instrument of very much less precision than the voltmeter. The fact is that the taking of a hydrometer reading is a procedure which must be described as rough-and-ready in the extreme when carried out by the average amateur with the average appliance.

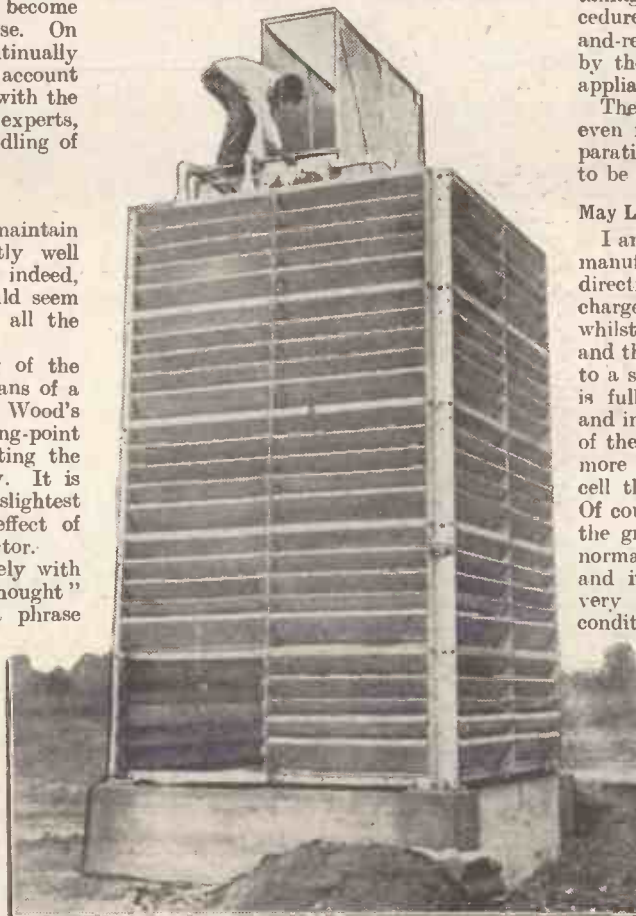
The voltmeter test, on the other hand, even in unskilled hands and with a comparatively inferior instrument, is not likely to be in error to any great percentage.

May Lead to Trouble.

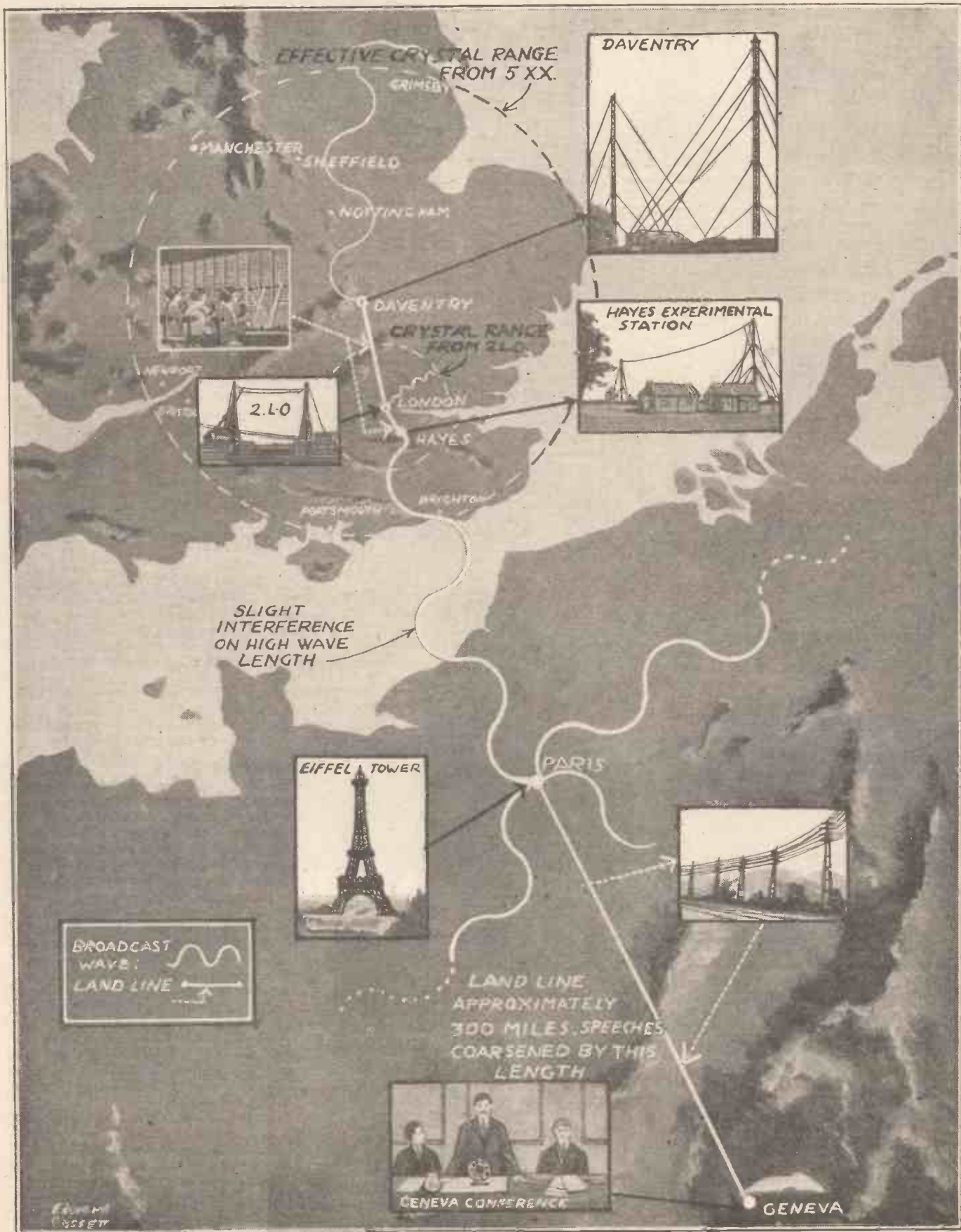
I am glad to see that at least one battery manufacturer—the Oldham Co.—now gives directions that the battery should be charged until the voltage of each cell, whilst on charge, reads 2.5 to 2.6 volts, and then the electrolyte should be *adjusted* to a specific gravity of 1.250 when the cell is fully charged. This is proper advice, and indicates clearly that in the experience of the makers the terminal voltage is a far more reliable indication of the state of the cell than the specific gravity of the acid. Of course, with proper care and treatment, the gravity of the acid will return to the normal value when the cell is fully charged, and it should never be allowed to vary very much from that value under those conditions. But mere reliance upon the hydrometer, without the use of the voltmeter, may lead to serious mistakes.

I have referred again to this subject at some little length because, on the previous occasion when I mentioned it, the advice I then gave was so contrary to popular belief that a great many readers wrote to me asking whether they had correctly understood me. However, I hope the matter will now be clear.

(Continued on page 453.)



The water-cooling tower which will be used with W J 2's new 50 kw. Broadcasting plant.



This pictorial diagram, specially drawn by our staff artist, will give the reader a good idea of the procedure adopted by the B.B.C. in relaying a speech or concert from the Continent. Our artist has taken as an example the relaying of M. Painlevé's speech from Geneva recently.

L.F. AMPLIFICATION IN REFLEX SETS.

A Practical Article. By G. MARCUS



IN spite of the popularity of the reflex set there is still a strong prejudice in some quarters against it on the grounds of distorted reception. People at all musically inclined are naturally reluctant to instal a receiver which is likely to spoil a fine concert. Because of this common opinion dual amplification is by many regarded with suspicion.

But dual amplification does not necessarily involve distorted reception, it is

Curiously enough, few amateurs realise the true cause of the trouble. Lift the cat's-whisker from the crystal, and the signals are still there. Many are surprised at the effect, but few seem to know that it is the valve which is rectifying. But if the valve is rectifying it is fairly clear that it cannot be giving pure amplification. In other words, it is operating off the straight portion of its characteristic curve, and amplification is consequently distorted.

Hence the first thing to do is to put a stop to this double rectification. Switch off the crystal. Raise the anode potential to about 100 volts. Place one or two dry cells between the filament and the secondary of the L.F. transformer in order to provide a negative bias (Fig. 2). Adjust the anode and grid batteries until the valve is working upon the straight portion of its characteristic curve.

Good Components Necessary.

The double rectification will then cease, and while the crystal is cut out of the circuit no signals will be heard.

On switching in the crystal detector once more the owner will find that his set is greatly improved. Signals will be heard against a background of dead silence; there will be no unwanted noises, and no tendency to oscillate. Excellent loud-speaker strength is obtainable within a range of 30 or so miles.

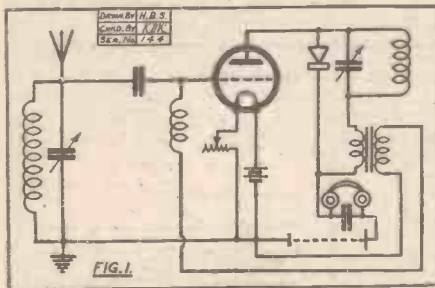
Even the larger reflex sets can be made to give absolutely pure reception if proper care is exercised. Components of course, must be of the highest quality. The L.F. transformer in particular must be of the best and latest design. The smaller and cheaper types must be avoided for dual amplification. Amateurs are recommended to buy one of the large, heavily wound variety; the cost of these will be nearly double that of the cheaper kinds, but subsequent results will more than repay the extra expense.

A Neurodyne Reflex.

Fig. 3 represents one of the latest two-valve reflex circuits. The H.F. amplification is unusually high, owing to the neurodyne system. Grid cells and a large H.T. battery are necessary if the quality of the music is to be absolutely faithful. The method of adjusting the valves is similar to that previously mentioned.

This particular circuit makes use of the first valve as a double amplifier and the second as a rectifier. Hence precautions must be taken to see that each valve carries out its own duty; the distortion so common in this class of circuit is due to rectification on the part of the first valve. The remedy is the same as in the simpler reflex set previously described; the detector valve

(Continued on page 426.)

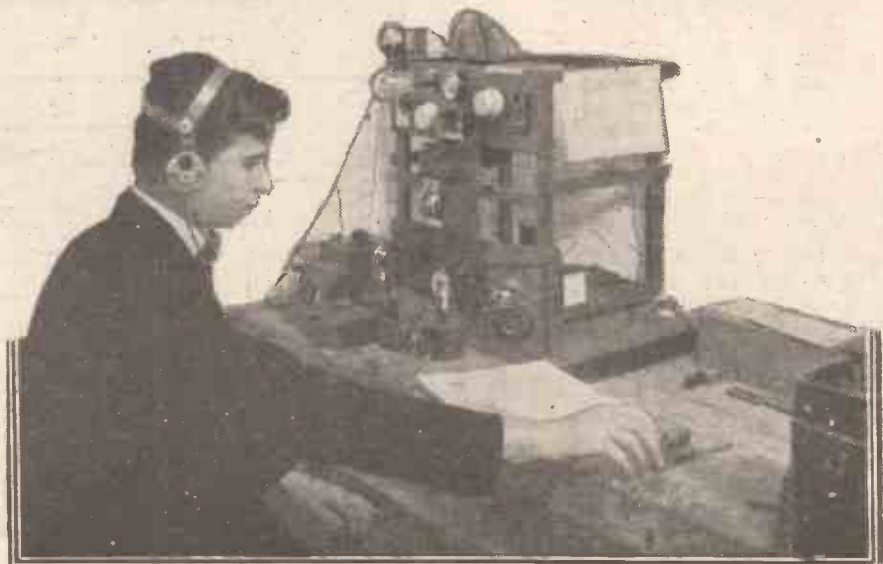


merely a case of taking the proper precautions, and then signals will be quite as pure as with the straightest of "straight" circuits.

The real cause of the trouble should be obvious enough to all experimenters. In ordinary sets employing L.F. magnification most careful precautions are taken to avoid "tinniness" and distortion generally. Grid bias, resistances, and large fixed condensers across the loud speaker terminals are but a few of the safeguards against bad reproduction. Whereas in reflex sets many amateurs forget the L.F. side of the circuit and make few adjustments to correct the natural tendency of note magnifiers to distort.

Double Rectification.

Consider the circuit represented in Fig. 1. It is well known to all experimenters, and has been in general use for the last two years or more. The single valve and crystal if carefully adjusted will give the reception of an ordinary "straight" two-valve receiver. But the quality of the music and speech frequently leaves a good deal to be desired. There is a strong tendency to resonance, certain notes are very much too prominent and the general effect is harsh and unpleasant. After a few weeks the owner will often decide that the extra volume and range are not worth the distortion, and will scrap the set.



Mr. E. Megaw, of 3, Fortwilliam Drive, Belfast, who has recently commenced transmission tests. His station is registered under the call sign G 6 M U.

MAKING YOUR OWN ACCUMULATOR PLATES.

FROM A CORRESPONDENT.

MANY experimenters nowadays make up their own H.T. accumulators by the simple process of taking a number of small jars or bottles and fitting them each with the necessary two lead plates, the one pasted up with the lead peroxide, and the other with spongy lead—these may be cut from old accumulator plates of larger size.

One often sees in technical journals instructions for making up an accumulator by immersing two strips of lead in sulphuric acid and charging first one way, then the other way, and so on, until the plates are "formed." This is perfectly sound, but unfortunately the cell when thus made has a very small "capacity," that is, when fully charged, it only requires a small discharge, in ampere-hours, to run it completely down. The beginner sometimes wonders why this should be so, and why the commercial storage battery plate has such a large capacity. The reason is to be found in the quantity of active matter (lead peroxide and spongy lead) which is deposited on the plates.

Depends on Chemical Action.

A storage battery, when on discharge, is an ordinary chemical battery, that is to say, it delivers current by reason of the fact that there are certain chemical relations between the materials of the plates and the electrolyte, and during the process of discharge, the composition of one plate is altered, and the electrolyte also suffers a change: this is so with the lead-acid accumulator precisely as it is with the Leclanché cell.

The difference, however, is that in the case of the "primary" cell the chemical actions which have taken place are not reversible, whereas in the case of the lead-acid cell the passage of a current through the cell in the opposite direction happens to have the effect of bringing about chemical changes just the reverse of those originally taking place, and the cell can be restored finally to its original condition. But it is none the less a chemical cell, and therefore its capacity for electrical output depends upon the quantity of the active matter in the plate which is available for chemical reaction.

Small Capacity Inevitable.

Now when two simple lead strips are immersed in sulphuric acid and a current passed through the cell, lead peroxide is produced on the strip where the current enters: it is this lead peroxide which gives to the strip its chocolate-brown colour. The coating of oxide gradually increases in thickness until it is perhaps a hundredth of an inch thick, and then it begins to fall off in small particles, so that from that time onwards all you are doing in further charging is to disintegrate the "positive" plate. Evidently the positive plate can only hold a small quantity of active matter. If it is to have a larger capacity, some method must

be found for enabling it to hold a larger quantity of the lead peroxide.

It is for this reason that modern accumulator plates are stamped out with cavities in their surfaces, and in these cavities the lead peroxide and the spongy (or finely divided) lead are deposited, making the positive and negative plates respectively. This process is known as "pasting" the plates, and all sorts of different methods

have been proposed and used by different makers for ensuring that the active material pasted into the depressions in the plates shall not fall out after months or years of use.

This, then, is the secret of the large capacity of the commercial accumulator as compared with the accumulator that you can make by following the simple instructions in the technical papers and "forming" the two simple lead strips.

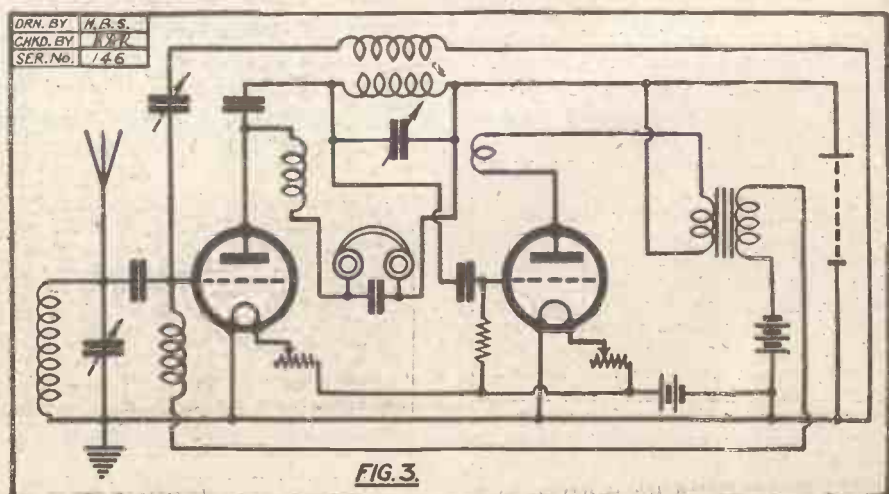
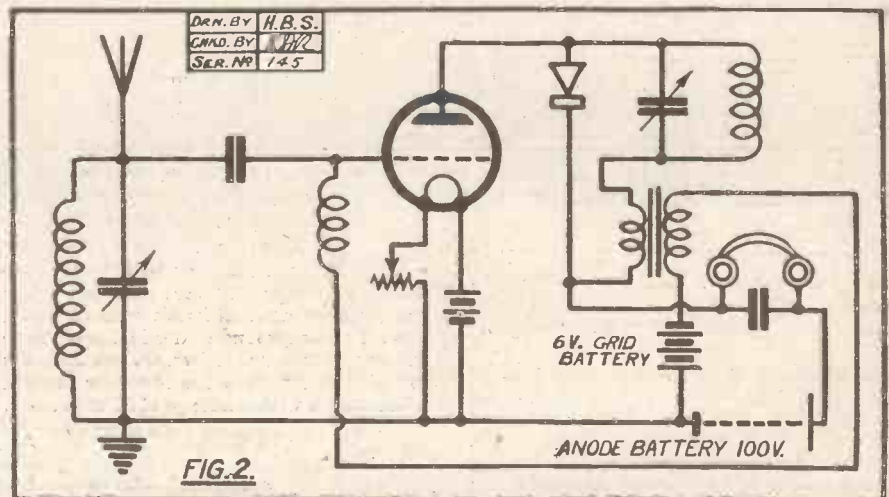
Actually in commercial accumulators the positive plates are made of lead and strengthened with antimony, the paste being made up with lead peroxide and sulphuric acid, and pressed into the plates under pressure. Other binding substances are sometimes included so that the bought accumulator has every advantage over the home-made one. Taking everything into consideration, unless old "formed" plates can be used, it is usually far better to buy an accumulator than to attempt to make one.

L.F. AMPLIFICATION IN REFLEX SETS

(Continued from page 425.)

must be switched off and the anode and grid voltages adjusted until signals disappear. On switching on once more the owner will find that all distortion has been cut out.

To put the whole case as briefly as possible, purity of reproduction is largely a matter of adjustment and no reflex set should therefore be discarded until this adjustment has first been tried.



BROADCAST NOTES.

By O. H. M.

Mr. Hoover and Broadcasting—National Psychology and Development—
"Leaping into the Ether"—The Geneva Wave-length Conference—Sacrificing
the Relay Stations.

BOTH the United States Government and the broadcasting companies of that country are devoting a good deal of attention just now to the various broadcasting systems in other parts of the world.

In recent years the word "observer" has become almost an essential part of the tradition of American contact with other countries both official and unofficial.

Ever since the United States Government turned down the Treaty of Versailles and the League of Nations, they have been particularly sensitive in committing themselves to any kind of organisation with foreign powers. This, curiously enough, extends also to unofficial activity, and even to broadcasting itself. On the other hand, our American cousins are quite keen enough to realise that there might perhaps be some benefit to themselves in gaining an accurate knowledge of what other countries have achieved in the organisation and development of wireless broadcasting.

National Characteristics.

Mr. Hoover, the United States Secretary for Commerce, is gravely perplexed about the problem of introducing some measure of order and uniformity into the chaotic conditions which now prevail in America.

The practical result of his anxiety is seen in the succession of observers who have been examining conditions on this side of the Atlantic, presumably on their own initiative and to satisfy their own curiosity.

The most recent of these visitors, and certainly the most eminent, is Mr. J. Maxfield of the American Telephone and Telegraph Co., allied to the Western Electric Co.

Mr. Maxfield's report on his return to America is likely to have a considerable influence on the future organisation of broadcasting throughout the States.

I had the privilege of a most interesting conversation with Mr. Maxfield on the conclusion of his investigations. He is not one of those who assert that the Americans have nothing to learn from other broadcasting systems abroad. On the contrary, he is full of admiration for the British system, and he thinks that on the whole this is considerably in advance of the American system.

Mr. Maxfield believes that the manner in which the two countries developed their broadcasting was typical of their national psychology.

Unified Control Necessary.

The Americans made a sudden leap into the ether and attempted to develop a system with the whole of their amazing ingenuity and energy. They wanted immediate results on a big scale, and to get these results they sacrificed large considerations of uniformity and general organisation.

We, on the other hand, with characteristic British caution, started from the other end of the scale and determined to have a sound

organisation and not to run the risk of chaos even if our results in the early stages were not so immediately satisfactory.

The Americans are now in the position where they must accommodate themselves to a measure of unified control.

Mr. Maxfield points out that while it is true that New York enjoys a greater variety of programmes than does London, for instance, this advantage is gravely prejudiced by the curse of heterodyning and interference, which in present circumstances completely ruins many of the excellent programmes provided by New York stations.

The Americans are now forced to retreat after their first exultant and reckless leap into the ether.

Agreeably Surprised.

According to Mr. Maxfield they must endeavour at least to establish systematic unified control on the technical side, and they will seek also a measure of uniformity on the programme side.

So far as we are concerned, Mr. Maxfield believes that he discerns a tendency towards a little more flexibility on the programme side. He admitted that with many of his countrymen he had laboured under the delusion that the whole of the British Isles had to put up with the London programme.

He was amazed to find that we had 21 stations in full operation and that a larger portion of the population of the country can receive a good programme with crystal apparatus than is the case in any other country.

He did point out, however, that although we are nearer the ideal than are the

Americans, we should endeavour to devolve more responsibility upon provincial stations, so that they might develop their characteristics with greater effect than has been the case hitherto.

He has no fault to find with the essentials of our services. His criticisms are reserved more for details. For instance, he is inclined to the view that our broadcasters do not handle the gaps in the programmes quite as adroitly as they should. He admits the Americans overdo the "patter," but here again he thinks that there is an ideally middle course which should be adopted on both sides of the Atlantic.

He was particularly interested in the B.B.C. scheme for character programmes as distinct from the uncorrelated and conglomerate variety of items which too frequently constitute American programmes.

Fewer British Stations?

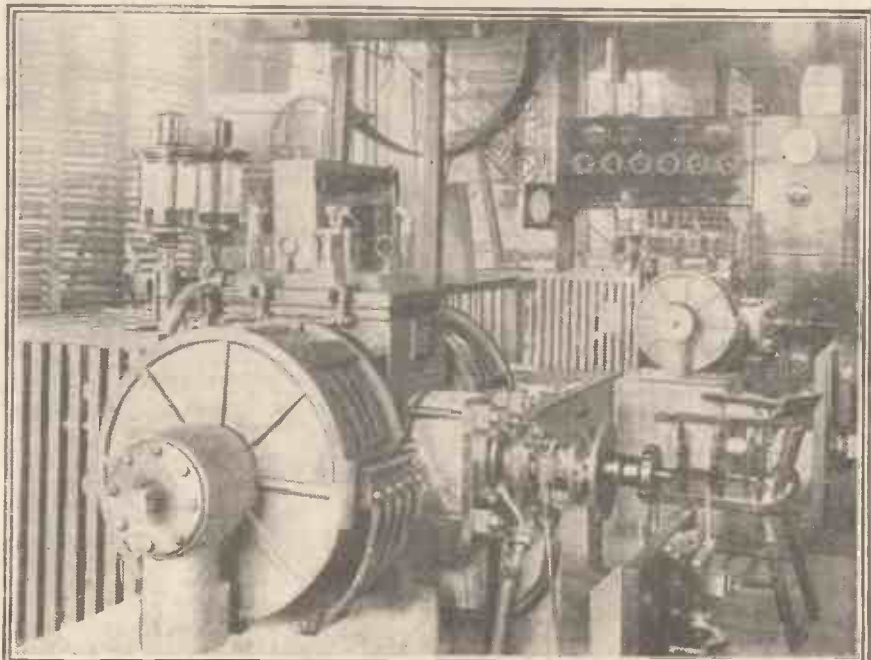
Captain Eckersley's broadcast account of the decisions of the last Geneva conference on wave-lengths has created a good deal of agitation in parts of the country, where it is imagined that listeners will be adversely affected by the institution of the new scheme.

The present alarm in places like Hull and Swansea is premature, because no decision has so far been taken. Moreover, it is a pre-requisite condition of the washing out of any British stations that at least equivalent facilities shall be provided by increasing the power of main stations.

The whole problem is obviously one of considerable difficulty. But certain basic facts must be faced.

If the international era of broadcasting means anything, it will be necessary for certain sacrifices to be made by all countries participating in the scheme.

If we in Great Britain are adamant, and ask that all the sacrifices be confined to other countries, it follows inevitably that no working scheme will be introduced, and that the present grave difficulty will be considerably accentuated.



Listeners who experience interference from the station at Northolt will be interested in this photograph, of the cause of their troubles, the immense transmitting arcs.

FOREIGN RADIO NEWS.

FROM OUR OWN CORRESPONDENTS.

THE mayors of Marseilles and Toulouse have just taken steps to enlist radio in the war they are waging against the steadily and rapidly rising cost of living.

Experts are agreed that one of the reasons for the present price inflation is the number and the greed of middlemen who handle foodstuffs after it leaves the farmers and importers, and before it reaches the housewives doing their shopping.

The Marseilles and Toulouse stations will, in future, broadcast daily the wholesale current prices of fruit, vegetables, meat and the like in the country districts feeding the cities, and of colonial produce landing at the ports. This, it is felt, will enable the consumer to see at a glance whether he is being defrauded by the retailer, and will cause the latter to hesitate before putting up his prices at a figure showing profiteering profit on the commodities he sells.

New Station for Paris.

The recently formed committee known as the "Comité d'Action et de Propagande de la Radiophonie Française" is planning to erect in Paris a new and powerful broadcasting station. It is at present on the lookout for a suitable location. The studio will be in the same building as the transmitting apparatus, and will also contain a large hall which will be used for concerts, lectures, and public meetings.

Radio Progress in Sweden.

Official statistics show that during 1925, radio in Sweden has progressed at a startlingly rapid rate.

The number of official licences for receiving sets granted in Sweden on January 1st of this year was 39,800. This, by August 1st, had jumped to 102,500. During July the increase was over 3,400.



The studio at the Petit-Parisien Station, Paris.

That Indiscreet Microphone!

Members of the staff of the French delegation at the League of Nations assembly at Geneva who have come back here, report an incident at one of the League meetings in which Mr. Austen Chamberlain was concerned.

At a breakfast offered by the international journalists present at Geneva to the various statesmen assembled there, — Vandervelde, M. Painlevé, Señor Quinones de Leon and others made various interesting and chatty statements to their hosts. Mr. Austen Chamberlain, however, was conspicuously silent. One of the journalists tackled him, but the British Foreign Secretary just shook his head and smiled, as he pointed to a radio apparatus on the table in front of him:

"I would gladly tell you many things, gentlemen," he said, "for I have every confidence in the discretion of your profession. But—I have grave doubts about this instrument here. It has not learned discretion."

The Government's decision to reduce the fee for the licence from 12 to 10 kroner takes effect on January 1st of next year, and is expected to lead to a further increase in the number of Swedish radio amateurs.

Esthonia Fixes Wave-length.

The first Esthonian broadcasting station, at Reval, is now open, and has fixed its wave-length at 350 metres.

Finnish Amateur Call-signs.

The Finnish amateur radio operators at a meeting held here this week, decided to adopt the call-letters SZ for all private stations in Finland.

Financial Difficulties in Spain.

Up till now, the Spanish Government has granted 26 licences for public broadcasting stations, of which no less than seven are in or near Madrid itself.

This picture of radio activity has its dark side, however, only eleven of the stations

(Continued on page 451.)



POWER and STRENGTH!

One year ago

—as the result of extensive experience and research—the Mullard Radio Valve Co., Ltd., placed on the British Radio market **WONDERFUL SINGLE RING H.F. and L.F. VALVES.**

The striking departure of these remarkable bright filament valves from the usual commonplace design and performance immediately claimed the public attention.

A year of heavy tribute has been paid to the

1. Robust Construction
2. Increased Volume
3. Purer Tone
4. Greater Range

OF

MULLARD SINGLE RING MASTER VALVES

NOW ONLY

8/- each.

Note.—Red Ring for H.F. AMPLIFICATION.
Green Ring for L.F. AMPLIFICATION.

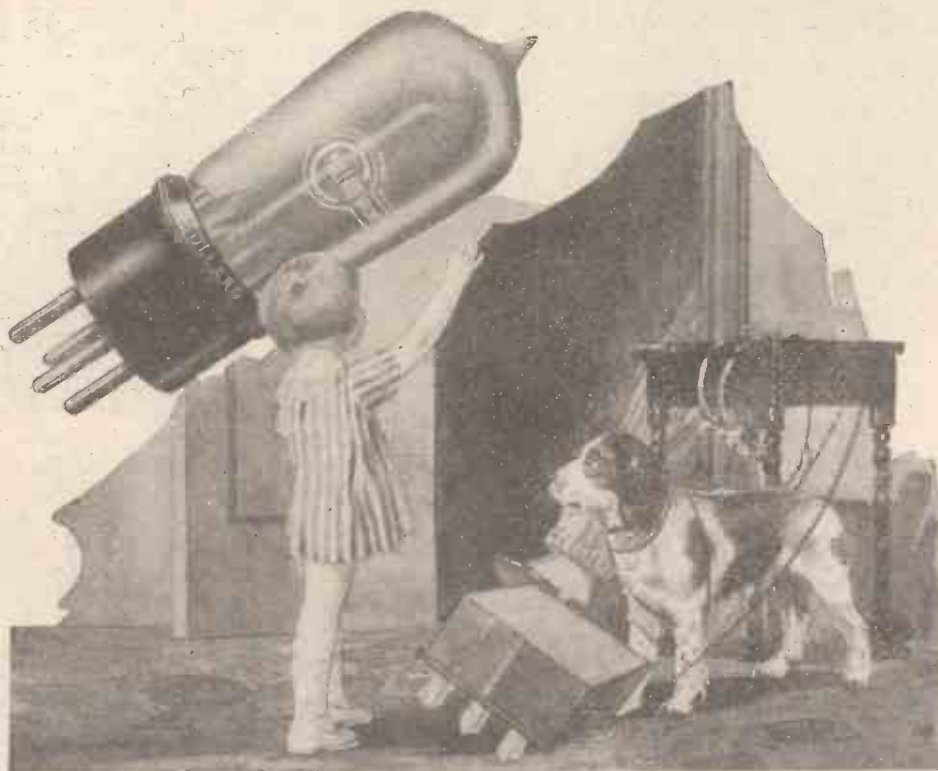


These Valves only require a 4-volt Accumulator.
ASK ANY DEALER FOR LEAFLET V.R.26

Mullard

THE MASTER VALVE

Advt.—The Mullard Wireless Service Co., Ltd.,
Nightingale Lane, Balham, London, S.W.12.



“Daddy—your Valves!”

“A COMPLETE valve set at St. Leonards-on-Sea was recently hurled to the floor by a spaniel that got caught in one of the connections.

The owner in distress rushed to the scene of disaster to find his set upside down, supported on his UNBROKEN valves.

Upon testing his set to ascertain the damage, he was surprised to find everything intact, including

the Mullard Valves which had taken the full brunt of the shock.”

The above incident is but one of many where the misfortune of an accident has revealed the marvellous strength of Mullard Master Valves to their satisfied users.

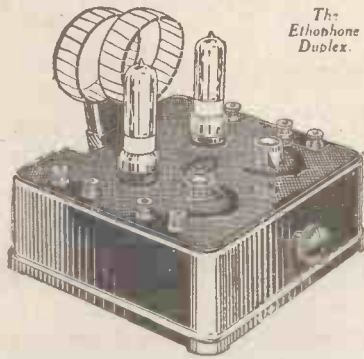
Accidents happen every day. Protect yourself against loss by securing the best. For robust construction, pure amplification and economical running you cannot do better than demand

Mullard

THE MASTER VALVE

Adv. The Mullard Wireless Service Co., Ltd., Nightingale Lane, Balham, London, S.W.12.

A two-valve Loud Speaker Installation £12 complete



The Ethophone Duplex.

You can have this equipment working within a few hours of purchase.

THIS guaranteed Burndeft equipment gives loud speaker reception 20 to 25 miles from a main broadcast station and about 100 miles from Daventry. The installation and operation of this equipment calls for no special knowledge and the results give every satisfaction. The volume of sound is ample for average requirements and the tone is good.

This equipment at the price of £12 is remarkable value and deserves the keenest attention of those who desire inexpensive but good loud speaker reception. Demonstrations can be arranged. Send the coupon for full particulars.

The Burndeft Range includes everything for radio reception from components to complete installations.



HEAD OFFICE :
Aldine House, Bedford St., Strand, London, W.C.2.
Branches and Agents Everywhere.

The price of £12 includes:
Ethophone - Duplex Receiver, with two bright Burndeft Super Valves and coils for 300-500 metres (£5.5.0), Licence (25/-), Ethovox Junior Loud Speaker (£2.2.0), 6-volt 30 ampere Accumulator (£2.2.0), 60-volt High Tension Battery (13/6), and complete aerial equipment (12/6).



The Ethovox Junior Loud Speaker.

CUT HERE

To BURNDEPT WIRELESS Ltd.,
Aldine House, Bedford Street,
Strand, London, W.C. 2.

Please send me a free copy of
Publication No. 272.

NAME

ADDRESS

DATE

Popular Wireless, 17-10-25.

UNEQUALLED for EFFICIENCY.

The CURRY is strong and robustly constructed of special transformer iron, with completely impregnated windings, and is suitable for all stages of amplification. Transforms inaudible signals into clear, resonant notes, and gives perfect reproduction, remarkably free from noise.

Special attention has been paid to the design, and every Curry Metal Shrouded Transformer is rigorously tested before issue.

There is nothing better made, and every instrument is backed by our 41 years' reputation

Send for complete catalogue
Everything for the Wireless
Enthusiast.

DEPOTS IN 125 TOWNS.



15! **Currys** 15!
THE CYCLE PEOPLE

24, 26, 28, GOSWELL ROAD, LONDON, E.C.1

"Let who will use valves"

There's a lot to be said in favour of crystal reception. Especially reception with the "Brownie" Wireless. So clear and strong is reproduction that all "Brownie" users would heartily endorse the Rev. A. G. Haste's remark: "Let who will use valves, give me my crystal set for clearness and absence of noise." For trouble-free, pleasurable enjoyment of broadcasting get a "Brownie." The "Brownie" Wireless Model No. 2 embodies all the features of the Standard "Brownie" Receiver. It is capable of resisting extreme climatic

conditions. The outer casing is hydraulically moulded under a pressure of 60 tons, forming a pleasing and substantially designed piece of apparatus. The receiver has a natural wave-length up to 600 metres and a standard plug and socket coil attachment is provided, which, with the aid of a special coil (price 2/9 extra) makes the set adaptable to 5 X X.

Complete, including the famous D.L.5 Crystal and Palladium Catwhisker.

PRICE
10/6



The Standard "Brownie." Just as good as ever, 7/6
but now complete with ebonite base 2/.

THE BROWNIE WIRELESS CO. (of Great Britain), LTD.,
(Incorporating the J.W.B. Wireless Co.),
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Phone: Museum 3747.

THE WAVE-LENGTHS OF COILS.

A VALUABLE "READY RECKONER" FOR WIRELESS CONSTRUCTORS.

Compiled by C. E. FIELD, B.Sc.
 ("P.W." Staff Consultant.)

This table gives the maximum wave-lengths obtainable with single layer cylindrical coils of various sizes and wound with various kinds and gauges of wire. Having chosen a suitable maximum, tuning to the lower wave-lengths can be accomplished by means of a slider or tappings. Values given are with an average sized aerial and no variable condenser.

Number of Turns.	Gauge Wire S.W.G.	Length of Winding in inches.			2-inch diam.			2½-inch diam.			3-inch diam.			3½-inch diam.			4-inch diam.			5-inch diam.			6-inch diam.		
		Enamel Covered.	Double Silk Covered.	Double Cotton Covered.	Enamel Covered.	Double Silk Covered.	Double Cotton Covered.	Enamel Covered.	Double Silk Covered.	Double Cotton Covered.	Enamel Covered.	Double Silk Covered.	Double Cotton Covered.	Enamel Covered.	Double Silk Covered.	Double Cotton Covered.	Enamel Covered.	Double Silk Covered.	Double Cotton Covered.	Enamel Covered.	Double Silk Covered.	Double Cotton Covered.	Enamel Covered.	Double Silk Covered.	Double Cotton Covered.
20	20	0.77	0.79	0.92	167	166	162	186	185	180	201	202	198	222	220	216	238	236	232	276	274	268	300	298	290
	22	0.6	0.63	0.76	173	171	167	192	190	185	212	210	204	230	228	223	247	245	238	282	280	272	315	310	300
	24	0.48	0.5	0.64	178	176	171	198	196	190	218	216	203	236	233	227	254	251	245	289	287	278	320	315	308
	26	0.4	0.42	0.56	183	181	174	204	202	195	225	222	213	242	240	232	262	260	250	296	294	284	325	320	315
	28	0.32	0.36	0.52	188	186	176	209	207	200	230	228	218	249	247	236	265	266	256	300	298	290	330	325	320
	30	0.27	0.3	0.45	192	190	180	214	212	210	235	232	222	255	252	242	271	270	260	305	300	295	335	330	325
30	20	1.15	1.2	1.4	207	204	196	235	232	224	263	260	252	290	287	278	315	310	300	365	360	350	405	400	390
	22	0.9	0.94	1.14	215	212	205	245	242	234	275	272	262	300	297	288	335	330	320	380	375	365	420	415	405
	24	0.71	0.75	0.96	225	222	212	255	252	244	280	283	272	315	310	303	345	340	335	395	390	375	435	430	415
	26	0.59	0.63	0.84	232	230	218	265	262	254	296	293	280	325	320	310	355	350	335	405	400	385	445	440	425
	28	0.49	0.54	0.78	240	237	222	275	272	262	305	300	288	335	330	315	365	360	340	415	410	395	455	450	435
	30	0.41	0.45	0.67	248	245	227	285	282	260	315	310	295	345	340	320	375	370	345	425	420	400	465	460	445
40	20	1.53	1.58	1.84	240	237	228	278	275	266	315	310	300	350	345	335	385	380	370	450	445	430	510	505	490
	22	1.2	1.26	1.52	255	252	240	294	290	279	335	330	315	370	365	350	405	400	385	470	465	445	530	525	505
	24	0.95	1.0	1.28	270	267	251	310	305	292	355	345	330	390	385	365	425	420	400	490	485	460	550	545	520
	26	0.79	0.84	1.12	280	276	258	325	320	300	365	360	340	405	400	375	440	435	410	510	505	475	570	565	535
	28	0.65	0.71	1.03	290	285	264	335	330	305	380	375	350	420	415	385	455	450	420	525	520	485	590	585	550
	30	0.55	0.6	0.9	300	295	270	345	340	315	390	385	355	430	425	390	470	465	430	540	535	500	600	595	565
50	20	1.91	1.98	2.3	275	270	255	320	315	305	365	360	345	410	405	390	450	445	430	530	525	490	600	595	575
	22	1.5	1.57	1.9	290	285	270	340	335	320	390	385	365	435	430	410	475	470	450	555	550	515	630	625	600
	24	1.19	1.25	1.60	305	300	285	360	355	335	410	405	380	455	450	425	500	495	470	580	575	540	650	645	620
	26	0.99	1.05	1.40	320	315	295	380	375	345	430	425	395	475	470	440	520	515	485	600	600	560	680	675	650
	28	0.82	0.89	1.29	335	330	305	395	390	355	445	440	405	495	490	450	540	535	495	625	620	575	710	700	680
	30	0.68	0.75	1.1	350	345	315	410	405	365	460	455	415	510	505	460	560	555	505	645	640	590	730	720	695
60	20	2.3	2.4	2.8	300	295	285	355	350	335	410	405	390	460	455	440	510	505	485	600	600	575	690	685	655
	22	1.8	1.9	2.3	325	320	300	380	375	355	440	435	410	490	485	465	545	540	510	645	645	615	730	725	695
	24	1.4	1.5	1.9	350	345	315	405	400	375	465	460	445	520	515	485	575	570	535	670	665	625	760	750	715
	26	1.2	1.3	1.7	370	365	330	430	425	390	485	480	465	545	540	500	600	595	555	695	690	645	790	780	740
	28	0.98	1.1	1.6	385	380	340	450	440	405	505	495	460	565	565	515	625	615	575	720	710	665	820	810	760
	30	0.82	0.9	1.3	400	390	350	470	460	420	525	515	475	585	575	530	645	635	590	745	735	685	850	840	780
70	20	2.7	2.8	3.2	325	320	310	390	385	370	455	450	425	510	505	490	570	565	530	675	665	640	770	760	735
	22	2.1	2.2	2.7	355	350	330	420	415	395	480	485	455	545	540	510	605	595	560	715	705	670	815	805	770
	24	1.7	1.8	2.2	380	375	350	445	440	415	520	515	480	580	570	540	640	630	590	750	740	700	860	850	805
	26	1.4	1.5	2.0	405	395	365	470	460	430	550	540	500	610	600	565	670	660	615	785	775	730	895	885	835
	28	1.1	1.25	1.8	425	415	380	495	485	445	575	565	515	640	630	585	700	690	635	815	805	755	930	920	860
	30	0.96	1.1	1.6	445	435	395	520	510	460	600	590	530	665	655	600	725	715	655	845	835	775	965	950	885
80	20	3.1	3.2	3.7	350	345	330	425	420	400	495	490	465	555	550	525	620	615	585	740	730	700	850	840	805
	22	2.4	2.5	3.0	385	375	355	460	450	430	535	525	495	600	590	555	655	650	620	790	780	735	905	895	845
	24	1.9	2.0	2.6	415	405	375	495	485	455	570	560	520	640	630	585	705	695	650	835	825	770	955	945	885
	26	1.6	1.7	2.2	440	430	395	520	510	475	600	590	545	675	665	610	745	735	675	870	860	800	995	985	920
	28	1.3	1.4	2.1	465	455	410	545	535	490	630	620	565	705	695	635	780	770	700	910	900	825	1030	1015	950
	30	1.1	1.2	1.8	490	480	425	570	560	505	655	645	580	735	725	655	805	795	720	935	925	845	1065	1050	975
90	20	3.5	3.6	4.2	380	375	355	455	445	425	530	520	495	600	590	565	670	660	630	800	790	755	920	910	875
	22	2.7	2.8	3.4	415	405	380	495	485	455	575	565	530	650	640	605	720	710	670	830	820	780	990	980	925
	24	2.1	2.3	3.2	450	440	400	530	520	485	615	605	560	695	685	640	770	760	705	910	900	840	1050	1040	970
	26	1.8	1.9	2.5	480	470	420	565	555	510	650	640	585	735	725	670	815	805	735	955	940	875	1100	1085	1010
	28	1.5	1.6	2.3	505	495	435	595	585	525	685	670	605	770	755	695	855	840	760	995	980	905	1140	1130	1045
	30	1.2	1.3	2.0	525	515	450	620	605	540	715	700	625	800	785	710	885	870	780	1045	1025	925	1185	1165	1070
100	20	3.8	4.0	4.6	400	395	375	485	475	450	565	555	525	645	635	600	720	710	675	860	850	810	990	980	940
	22	3.0	3.1	3.8	440	430	405	530	520	485	615	605	565	700	690	645	780	770	725	930	920	865	1070	1055	1000
	24	2.4	2.5	3.2	475	465	430	570	560	515	660	650	600	750	740	685	830	815	770	990	975	915	1140	1125	1055
	26	2.0	2.1	2.8	505	495	455	605	595	540	700	690	630	790	780	720	875	860	805	1040	1025	960	1195	1175	1100
	28	1.6	1.8	2.6	530	520	475	635	620	565	740	725	655	830	815	750	915	895	830	1030	1010	940	1240	1215	1135
	30	1.4	1.5	2.2	555	545	490	665	650	585	775	760	675	865	845	775	955	935	855	1115	1095	1020	1280	1255	1165
120	20	4.6	4.75	5.5	445	435	410	540	530	500	630	620	590	720	710	670	805	795	750	935	925	910	1125	1110	1060
	22	3.6	3.8	4.6	490	480	445	590	575	540	655	640	605	740	730	685	820	810	760	955	945	915	1220	1200	1130
	24	2.9																							

TABLE GIVING WAVE-LENGTH OF SINGLE-LAYER CYLINDRICAL COILS (Continued from page 431.)

Table with columns: Number of Turns, Gauge Wire S.W.G., Length of Winding in inches (Enamel covered, Double Silk Covered, Double Cotton Covered), and diameters from 2-inch to 6-inch. Rows are grouped by turns (180, 200, 220, 240, 260, 280, 300, 320, 340, 360, 380, 400, 450, 500).

A New Wireless Loud speaker

A NEW invention of the Western Electric Company that will revolutionise loud-speaker reproduction.

The "Kone" Loud Speaker, as its name implies, has been evolved by the Scientific application of two cones, with the result that absolutely faithful reproduction is assured of every musical note, and complete freedom from the objectionable guttural tones associated with most Loud Speakers of the horn type.

ORDER YOURS NOW AND SAVE DISAPPOINTMENT.

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Central 7345 (10 lines.)

WORKS: North Woolwich, New Southgate, Bexley Heath, and Hendon. BRANCHES: Glasgow, Leeds, Birmingham, Manchester, Newcastle, Cardiff, Southampton, Liverpool, Dublin, etc.



SIDE VIEW.



FACE VIEW.



SIDE VIEW.

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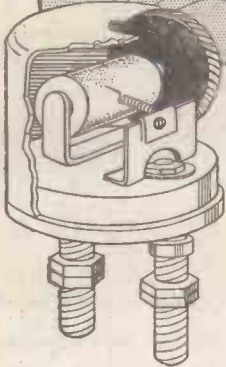
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PRICE £6 - 6 - 0

Unrivalled
Tone



Perfect
Reproduction



The CAT'S WHISKER

is still the best method of receiving wireless signals with purity—but the nerve-racking business of "crystal-tickling" is quite out of date.

The HARLIE-DETECTOR is the modern method. It has the most sensitive crystal yet produced, and also provides a continuous contact that is perfect in every detail. No delicate adjustment is needed—just a turn of the knob. It can be done as easily in the dark as in the light. Vibration—even hard knocks—cannot disturb the contact, which is always at the exact delicate tension required for perfect reception.

Harlie SUPER-SENSITIVE DETECTOR

5/6
COMPLETE WITH CRYSTAL

Officially adopted for use on Lifeboats and in the Mercantile Marine.

There is no substitute.

No crystal or reflex circuit is complete without a "HARLIE."
If your dealer cannot supply, fill in the coupon below and post to us with P.O. for 5/6.
If you are not delighted with it your money will be refunded without question.



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Dear Sirs,
I enclose herewith 5/6 for one HARLIE-DETECTOR to be sent to me post free on the understanding that my money will be refunded, without question, if I return the Detector undamaged within ten days.

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ADDRESS.....

14

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The Best Transformer at the Lowest Price

The KING SUPER TRANSFORMER is Good and also Cheap because a Patent Improved Method of Winding the Cotton Covering on the Enamelled Wire increases efficiency and cheapens and quickens production. Self-Capacity and Inter-Action are totally eliminated and absolute clarity of reproduction, free from noise, is assured. Safe for High Voltage and Heavy Loading.



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TRANSFORMER

Sold through the usual channels or POST FREE direct.

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THE G.576 VALVE HOLDER

Prevents accidental Short-Circuits. The Plate Socket is indicated by Red and is shorter than the others. With terminals for surface wiring. Price **2/3** Without terminals for surface wiring 1/6



THE E.L.S. VALVE FUSE

Protects your Valves from being burnt out. Blue Fuse 0.3 amp. Red " 0.5 " Green " 0.75 " Black " 1.0 Price **1/6**



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Why 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

Standard capacities. Any other size can be supplied at short notice.

GRID CONDENSER.

'0005 }
'0001 } 2/6
'0002 }
'0003 } each.
'0004 }
'0025 }
'0005 }

STANDARD FIXED CONDENSER.

'002 } 2/6 each.
'001 }
'0025 } 3/6 each.
'006 }

COMBINED GRID LEAK & CONDENSER

3/-



FIXED CONDENSERS. Guaranteed Correct Within 5 per cent.

THE WATMEL WIRELESS CO. LTD.
332a, Goswell Rd., London, E.C.1. Tel: Clerkenwell 7993

Visit Stand No. 54, The Wireless Exhibition, Royal Horticultural Hall.

"RECTALLOY."

An Important Discovery.

THE ACCUMULATOR CHARGING PROBLEM SOLVED FOR AMATEURS.

By GEORGE HARLAND.

We are pleased to publish in this issue of "Popular Wireless" the first of a short series of practical articles dealing with the home charging of batteries. Thanks to the discovery of "Rectalloy," a special rectifying metal, it is now possible for readers of this journal to build themselves a "trickle charger" (to work off A.C. mains), at the low cost of about 30/-. We feel sure that these articles will be widely welcomed among hundreds and thousands of amateurs in this country.—THE EDITOR.

WHAT is the greatest bugbear in wireless? Getting your accumulators recharged, undoubtedly.

At present there are only two alternatives open to you for the charging of your accumulators. The first is to haul them round to the garage, and to pay stiffly for the pleasure of doing so, the pleasure being repeated about once a week or once a fortnight. The second is to buy a battery charger, the mere mention of which conjures up suggestions of about five or six pounds out of pocket!

But what if you could make a battery charger on an entirely new principle for a small cost?

Four Advantages.

In the first place, the great discovery underlying this entirely new system is the very simple fact that there are 24 hours in a day. This might seem at first sight to be rather obvious, but like many obvious facts, it has up to now escaped notice. There are 24 hours a day in battery charging as in everything else.

If you use your set for, say, four hours a night, you have 20 hours before the next night in which to recharge it. Suppose you have taken four ampere hours out of it during the evening, then you have four ampere hours to put back during the next 20 hours, which means an average charging current of $\frac{1}{5}$ th of an ampere.

Now here is the point. Ask yourself the question: Why do I require a large accumulator of perhaps 60 amp. hrs. capacity, or 100 amp. hrs. capacity? The reason is because, owing to the trouble of having it recharged, I want it to last a long time between charges. Therefore I choose a large accumulator, which costs a correspondingly high price.

Again, if I have a battery charger, why do I have to pay five or six pounds for it? Because I want to recharge the battery in a single night, at a heavy current of perhaps three or four amperes, necessitating a large step-down transformer and a large rectifier.

But suppose, instead of charging my battery at a large current for a short time, I make use of time (which costs nothing), and instead I charge the battery at a small current for a long time. I achieve exactly the same result at the end of the week, but I have achieved it with a small battery charger, capable of giving $\frac{1}{5}$ or $\frac{1}{10}$ amp. at most, and costing correspondingly less to make. In the same way, since my battery is never required to deliver more than perhaps 6 ampere hours at a time without recharging,

I can use a small (and correspondingly less costly) battery.

To sum up, what sense is there in letting your big battery run down and down for a week or a fortnight, and then going and giving it a huge charge, when you could do just as well (and better, as will be shown presently) by putting back into the battery every day what you have taken out of it the previous evening?

This new system may be called "trickle charging." It means that you have a small charger constantly at work giving a trickle of current, and whenever your battery is not operating the set it is back on the charger, receiving its trickle of charge.

There are four outstanding advantages of this system, which will readily be appreciated, as follows:

(1.) Owing to the fact that the charging current is extremely small (from 0.1 to 0.3 amp.), the charger can be a very small one, the cost of making being correspondingly small.

(2.) It is well known that the absolutely ideal way to charge a battery is with a very small current for a long time, rather than with a heavy current for a short time. This is the perfect method, and makes for long life of the battery plates. Rapid charging disintegrates the plates and destroys the battery.

(3.) By this continuous trickle-charge method the battery is *always* fully charged, and never lets you down.

(4.) A very small battery (5 or 10 amp. hr. cap.) does absolutely all the work required.

Little Expense

There is thus a great saving in the cost of the charger and the cost of the battery; absolute convenience is assured, the life of the battery is enormously lengthened, and your filament supply is always up to "concert pitch." I feel sure readers of this article will agree, then, that this is the ideal system for filament heating.

Full details of the system will be given presently, but briefly it is simply this. A small battery charger is connected permanently to the A.C. electric-light mains, and the low-tension rectified current from it passes to a double-pole double-throw switch, the battery being connected to the central poles of the switch, the set to one end of the switch, and the charger to the other end.

When the switch is thrown over to the set, the filament supply is "on," and when the switch is thrown over the other way, the set

is "off," and the battery is on "trickle charge." Thus the battery is either "on set" and "off charge," or "on charge" and "off set."

Tappings are arranged on the charger, and you choose a rate of charge (say 0.1 amp. or 0.2 amp.) which just about averages out to the same amount in the course of a week as you find you use. In any case, overcharging is trifling.

And now we come to the important point about the charger.

It is evident that the charger has to be working practically all the time, 20 hours a day. This at once rules out all types of rectifier except the electrolytic. There are several kinds of rectifier available, namely, the rotating commutator, the vibrating reed, the vacuum tube, and the electrolytic cell.

Does Not Corrode

The rotating commutator would be useless, as it would rapidly wear out, and, moreover, energy is necessary for keeping it in motion, which would mean serious wattage consumption in the course of a month. Furthermore, it would cause interference in the wireless receiver.

The vibrating reed would be entirely useless, as it is noisy, liable to stick and run down the battery, wears out rapidly, requires energy for its motion, and interferes badly with the wireless receiver.

The vacuum tube rectifier is silent, and has much to recommend it, but it requires a large filament-heating current, which would render its use entirely out of the question for a trickle charger.

Finally there is the electrolytic rectifier. This is silent, does not require any upkeep, is permanent, involves no energy for motion or filament heating, and causes no interference with the receiver. It is the ideal rectifier for the purpose.

The usual electrolytic rectifier, known to most amateurs, is the aluminium and lead type. This, however, is very unsatisfactory, as it gets hot, varies in its current output, is messy, requires constant renewal of the aluminium, and is generally unsatisfactory.

But a remarkable rectifying metal has now been discovered, which has been temporarily christened "Rectalloy," which marks an entire revolution in electrolytic rectifiers. It is clean, never corrodes away, no matter how long it is used, and works in any electrolyte, but particularly well in ordinary battery acid (sulphuric acid, sp. gr. 1.250).

The resistance of the rectifying cell is so low that there is no heating and no loss of energy in the cell; a tiny cell no bigger than a small cup is sufficient to pass a direct rectified current up to half an ampere without the slightest heating. A very small piece of the new rectalloy metal is sufficient to last for years. It seems, in fact, to be the *ne plus ultra* as a valve metal or rectifying metal.

A large number of most interesting experiments have been carried out with this metal, which will be described in future articles.

The complete battery charger consists of a small step-down transformer (for use on alternating mains) and the small rectifier, the latter containing battery acid, and three electrodes, one of lead and the other two of rectalloy.

In the next issue instructions will be given for making your own battery charger for thirty shillings, using rectalloy electrodes.

CURRENT TOPICS.

By THE EDITOR.

Too Many Stations?—The High-Power System and a Storm in a Tea-cup—B.B.C. Wave Lengths—The "Radio Sounds" Competition and The Central Hall Meeting.

THE suggestion that the number of broadcasting stations in this country be reduced in favour of a few high-power stations is a commendable one.

The high-power station is generally more effective in overcoming atmospheric and other disturbances, and, further, the problem of ether congestion and wave-length interference might be reduced.

We noticed in a recent issue of the "Daily Telegraph" that it has been calculated that in the United States twelve high-power broadcasting stations alone are sufficient to serve forty-three per cent of the wireless population—roughly, some thirteen millions of people—each station having an approximate range of 100 miles.

It would seem that in the very much smaller area of Great Britain, the high-power station suggestion would work out very well in practice, although, as far as we are aware, no really satisfactory scheme for erecting a limited number of high-power stations to serve all districts in the United Kingdom has yet been announced.

The high-power station system is, of course, very closely linked up with the important problems of propagation, wave forms, etc., but 5 X X has already demonstrated the efficacy of signals at a distance for crystal reception.

There are still large areas in this country which are by no means satisfactorily served as regards broadcasting, and the suggestion that more local stations should be erected, if put into practice, would only tend to increase interference and to create further congestion in the ether.

Super Stations.

The day of the low-power and relay station is, we think, already over. They have served their purpose but should now make way for a limited number of super stations each capable of serving crystal users within a radius of at least one hundred miles. Five or six such stations should be able to deal very effectively with the wireless population of this country. We understand that this question of a limited number of high-power stations in place of the already numerous local and relay stations is receiving very serious consideration.

It will, doubtless, be dealt with by the Government Wireless Committee in November, and it is to be hoped that in the near future a decision will be made to adopt the policy of the high-power station system.

Listeners have been mildly amused of late at a storm in a tea-cup brought about by discrepancies in the official wave-length figures of the various B.B.C. stations. We ourselves noted a few discrepancies some time ago when carrying out certain calibration tests, and as a matter of policy telephoned the B.B.C. immediately.

We received what we considered, and still consider, to be a perfectly satisfactory reply, namely, that although the officially published wave-lengths are adhered to as

closely as possible, if a foreign or other station begins to interfere, the wave-length of the particular B.B.C. station concerned is shifted a little to get clear of the interference.

In any case, this "shifting" is very small, and as the B.B.C. do not transmit solely for the benefit of experimenters, but for the purpose of giving hundreds of thousands of people uninterrupted entertainment, their policy is undoubtedly correct.

If the B.B.C. adopted the obstinate policy of sticking to a particular wave-length irrespective of interferences from other stations when by shifting a metre or so they could "get clear," we should feel justified in accusing them of being, to put it bluntly, pig-headed.

A Question of Metres.

And, what is more, thousands of listeners would find their programmes considerably mutilated and generally interfered with. The B.B.C. have no need to be so deadly accurate; listeners cannot complain of serious inconvenience because 2 L O's wave-length varies a few metres now and then. Even if it varied a few metres every night in order to give an uninterrupted transmission, the B.B.C. would be perfectly justified. The listener can correct his receiver adjustment in less time than it takes to grumble at the B.B.C.

The B.B.C., however, in order to meet

finicking criticism (which they must always be prepared for) would be wise to publish in their official organ the fact that they reserve the right to vary their wave-lengths by a few metres as occasion demands.

Two Things to Remember.

This issue of POPULAR WIRELESS will be on sale one day before the broadcasting of our great "Radio Sounds" Competition—an "S.B." feature of unusual interest for Friday, October 16th.

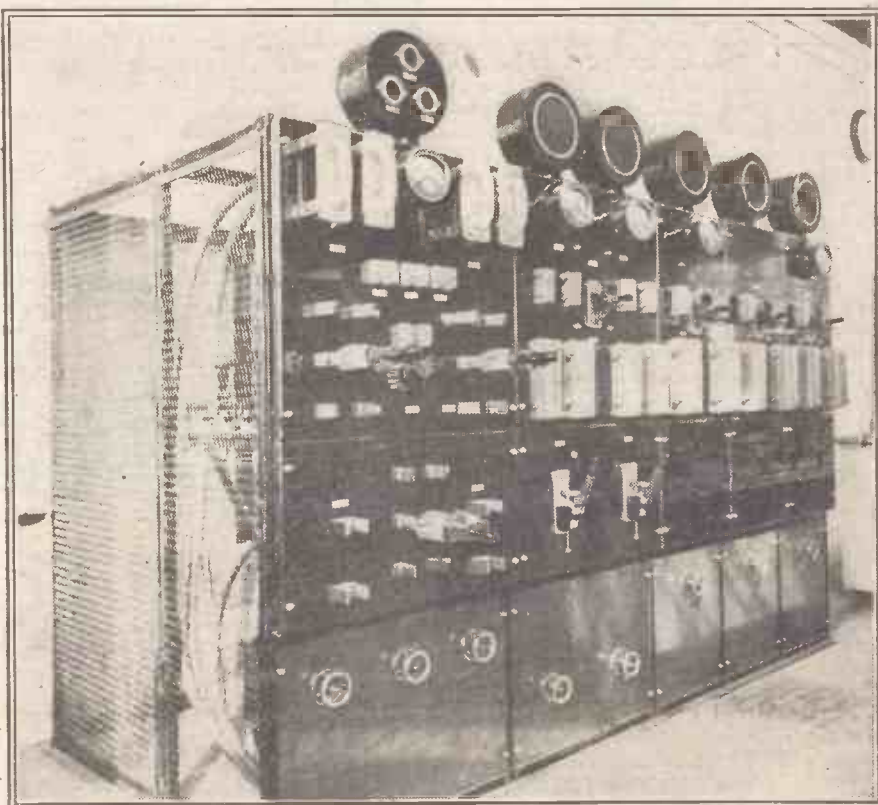
We would remind readers for the last time that the official coupon on the back page must be used if entrants desire to compete for the prizes we are offering.

Don't use it until you have jotted down your solutions to the broadcast sounds on scrap paper—then copy out your answers, in ink, on the official form.

It but remains for us to wish our readers good luck, and to hope that our "Radio Sounds" Competition will not only prove an entertainment but of value to the B.B.C.

Practically all the free seats for our third great wireless meeting at the Central Hall, Westminster, on Friday, October 23rd, have been allotted. Hundreds of applications have also been dealt with for the seats at 3/6, 2/4 and 1/2, but we are informed by the official in charge of the box office arrangements for the meeting that there are still seats available, close to the platform, at 3/6, and that a few at 2/4 and 1/2 may be had on application to "R.G.T.," c/o POPULAR WIRELESS, Fleetway House, Farringdon Street, E.C.4.

We would urge readers who have not yet obtained seats to do so at once, as we anticipate an extra demand in view of the fact that Viscount Wolmer, M.P., has agreed to speak at the meeting, and that Senatore Marconi has promised to be present, engagements permitting.



The High Tension Switchboard at the B.B.C. high-power station at Daventry.

The 3rd GREAT "P.W." WIRELESS MEETING

AT THE
CENTRAL HALL, WESTMINSTER
On Friday, October 23rd, at 7.30 p.m.

A FEW SEATS at 3/6, 2/4 and 1/2 AVAILABLE

"POPULAR WIRELESS" has organised another great wireless meeting, to be held on the evening of Friday, October 23rd, at the Central Hall, Westminster, London. Arrangements have been made for the following well-known gentlemen to deliver short lectures of interest to all wireless amateurs.

Sir OLIVER LODGE, D.Sc., LL.D., F.R.S.
(Scientific Adviser to "Popular Wireless").

Lt.-Comdr. The Hon. J. M. KENWORTHY, R.N., M.P.
(Vice-President, The Radio Association).

Major RAYMOND PHILLIPS, I.O.M.
(The Well-known Authority on Wireless Control).

Captain P. P. ECKERSLEY, M.I.E.E.
(Chief Engineer, The B.B.C.).

GERALD MARCUSE, Esq.
(The Famous British Amateur).

Mr. J. C. W. REITH, M.Sc. (Managing Director of the B.B.C.), will be present to give away the First and Second Prizes for our Great "RADIO SOUNDS" Competition, and Viscount WOLMER M.P. (Assistant Postmaster General), will also deliver a short address of interest to all listeners.

His engagements permitting, Senatore Marconi has promised to attend the Meeting and to say a few words.

TICKETS

A limited number of free seats are still available. Early application should be made on the attached coupon. A stamped addressed envelope must accompany all applications.

"P.W." MEETING COUPON.

CENTRAL HALL, WESTMINSTER, October 23rd.

To "R.G.T.," "POPULAR WIRELESS,"
FLEETWAY HOUSE, FARRINGTON ST.,

Sir, LONDON, E.C.4

Please reserve me $\frac{\text{one}}{\text{two}}$ FREE SEATS for the

"P.W." Meeting on October 23rd.

I enclose a stamped and addressed envelope.

Signed (in ink).....

Address.....

RESERVED SEATS

Specially reserved seats close to the platform may be obtained at 3/6 and 2/4. A few other reserved seats, in good positions, at 1/2.

Readers are advised to make immediate application as we anticipate being "sold out" before the end of the week.



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

VARIABLE condensers are receiving the close attention of manufacturers' designers these days, and new models are continually being placed before the public. One of rather more than usual interest is the Lamplugh Square Law, a sample of which was recently to hand from Messrs. S. A. Lamplugh Ltd., King's Road, Tyeley, Birmingham.

Its outstanding features are a large milled dial knob which greatly facilitates close adjustments and uniquely shaped vanes which provide straight line tuning. It has a very low minimum of capacity and long "leakage" paths reduce losses to a point that approaches the ideal.

On a wave-meter test a range of 310 to 675 metres was covered with an almost imperceptible deviation from the straight. Mechanically the Lamplugh condenser is

well up to first-class standard. Its movement is smooth, positive, and without "backlash." The vanes are stout and rigidly secured.

Two models are available, one at 9/6, 9/6 and 10/- for .0002 mfd., .0003 mfd. and .0005 mfd. respectively, and the other at 11/-, 11/6 and 12/- for similar values. Although the cheaper model is a very excellent piece of work, we should advise constructors who can afford to do so to purchase the dearer model as a variable condenser cannot be too good. The chief difference between the two models is that one is provided with metal end plates and the other with ebonite end plates and a ball-bearing vane adjustment. Needless to say, the latter is the dearer.

A number of readers have written to us

for an opinion in respect of the new Western Electric "Kone" type loud speaker, but so far we have been unable to obtain one for testing purposes. In answer to our request the Western Electric Co. informed us that they were unable to loan us one as their initial output is allocated. They have, however, promised to send us one when further supplies are available, so until then we must ask our readers to allow us to reserve our judgment.

Messrs. The Telegraph Condenser Co., Ltd., have arranged for one of their technical staff to be in attendance at their Royal Horticultural Hall Exhibition stand for the purpose of testing and calibrating any type or make of fixed condenser. This service is to be rendered absolutely free and without obligation to any visitor who desires to take advantage of the generous offer. Such an opportunity is one that none of our readers who possess doubtful components of this nature should miss.

(Continued on page 440.)



The new Sangamo mica fixed condenser.

I am still here

after 25 years of hard work AND SUCCESS.

WHY? Because I have helped thousands of people to better their positions socially and financially. I am assisted by a large and expert staff, and the advice we give is sound. If we cannot help you we will say so; if we can we will tell you how.

We have **FREE** booklets setting out the possibilities in connection with each of the subjects shown in the lists; send for the one in which you are interested, or ask for **MY PRIVATE ADVICE**, which is also free. You incur no obligation.

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COIL HOLDERS.

Vernier model with patent friction drive to take 2 coils

10/6

GRID CONDENSER AND LEAK.

Condenser values .0001 to .0005 mfd.	each	1/3
Grid Leaks, 1, 2, 3, 4 and 5 megohms	1/6	(clips 3d. extra).

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PETO CONCERT COILS.

No. 1	290 — 390 metres	2/-
No. 2	340 — 470 ..	2/6
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MAX-AMP TRANSFORMERS.

Famous for two years. Fully guaranteed. In metal shrouded case

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H.F. TRANSFORMERS.

Thoroughly well made. Most efficient design.

- No. 1. 300 to 600 metres
- No. 2. 500 to 900 metres
- No. 3. 900 to 1500 mtrs.
- No. 4. 1200 to 2300 mtrs.
- No. 5. 2200 to 7000 mtrs.

10/- each

MULTI-WAVE AMPLIFIER.

To plug into Set in place of H.F. Transformer, and to amplify over all wave-lengths above 1,000 metres. Ideal for Daventry and Radiola

8/6

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Branches: 63, High Holborn, London, W.C.1. **WALTHAMSTOW**—320, Wood St. **PLYMOUTH**—4, Bank of England Place. **LIVERPOOL**—4, Manchester St. **P.S. 3752**

The All-Important Variable Condenser

And the Prestige behind the "Polar"

Not all variable condensers can be judged by appearance and price alone. It is unlikely that the condensers produced by any but long-established Radio Engineers can be fully efficient.

The "Polar" Junior Condenser.



5/6

All Capacities.

Possesses all the characteristics of the well-known Polar "Straight-line-Frequency" condenser. Gives a straight line of frequencies, with an approximately even movement of dial in relation to change of wavelength. Low minimum self-capacity; one-hole fixing; 350 degrees dial; perfectly screened; remarkably compact; occupying minimum space behind panel.



The 'Polar' Cam-Vernier Variable Condenser.

Compensated square-law design of vanes; this means that the Condenser functions in the square-law manner, not on the bench, but on your set. Its shape of vanes compensates for the inherent self-capacity of your coils and aerial, with the result that the figures on the dial indicate definite wavelengths. You can recognise the Cam-Vernier Variable Condenser, if by nothing else, by the specially engraved dial which commences at "26"—recognising that no aerial tuning system can have a zero capacity. It embodies the well-known Cam-Vernier device, giving no degrees of vernier movement in any position; and the vernier readings register on the dial.

Prices:

- 0003 - - - 10/6
- 0005 - - - 11/6
- 001 - - - 12/6

It is, further, unlikely that nondescript, cheaply-assembled condensers will carry anything like the UNCONDITIONAL written GUARANTEE enclosed with every "Polar" Condenser. It is a guarantee against original defects, as well as against breakdown or the development of faults in ordinary use—for a period of ONE YEAR.

All constructors of Radio Sets have an appreciation of quality in appearance, as well as of quality in performance; yet not all are equally able to indulge in the expensive class of components. For this reason we have introduced the "Polar" Junior Condenser, at a price of 5/6 for all capacities—putting a product of high quality (backed by a great reputation) within the reach of all.

Buy the products of well-known Firms—disregard any may-be biased recommendations of "cheap" components—and depend upon the Manufacturers to "see you through."

Polar Components for Sound Design

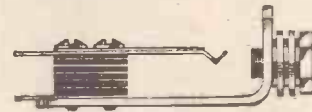
Sold by all reputable Radio Dealers. Ask your Dealer, or write to us, for the Polar Condenser Booklet.

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Ashley Radio JACKS AND JACK SWITCHES

A complete range of Jacks for every purpose. The use of these components saves labour and dispenses with the need for complicated switches.



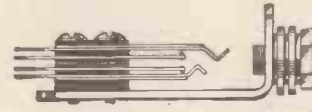
Jack No. 1. Single Circuit (Open)

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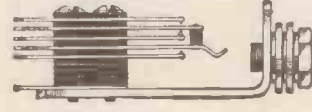
Jack No. 3. Filament Single Control

2/6



Jack No. 4. Double Circuit.

2/6



Jack No. 5. Filament Double Circuit.

3/6



Jack Switch No. 6. Single Pole, Single Throw

2/9



Jack Switch No. 7. Single Pole, Double Throw

3/6



Jack Switch No. 8. Double Pole, Single Throw

3/6



Jack Switch No. 9. Double Pole, Double Throw

4/-



Two-Way Jack Plug.

3/-

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London and Southern Counties:

Peltigrew and Merriman, Ltd., 122, Tooley Street, London, S.E.1.

APPARATUS TESTED.

(Continued from page 438.)

On this page appears a photograph of the new Oldham H.T. accumulator, which is being put on the market at the very reasonable price of 1s. per volt. That one shown complete in case and with leads is therefore priced at £3 12 0.

A cell has been sent us for examination, and on closer inspection reveals nothing for criticism. Stout glass container, strong, thick plates, well fused lugs of comfortable thickness with sockets for wander plugs, the little cell is as excellent in design as it is cheap in price. The plates, too, are of standard "Oldham" quality and manufactured under the now famous "special activation" process.

H.T. accumulators have many advantages and very few disadvantages, and now that a first-class battery of this nature is obtainable at a reasonable price, H.T. batteries of the "dry" primary cell type will have to face a very forbidding rival.

A very interesting instrument has been sent us for test by Mr. J. H. Scott, of 92, Burleigh Road South, Everton, Liverpool. It is called the "Six-in-One" Eliminator, and is retailed at 35s. Provided externally with eight terminals and a variable condenser dial, it is a moderately-sized component rendering available six different types of "wave-trap" and, with the assistance of a crystal detector and a pair of telephone receivers, a crystal set.

Of the six possible arrangements, that referred to as "Type No. 1" on an accompanying list of instructions, was found to be the most useful. Using a three-valve set of ordinary design some mile or so away from 2 L O, that station could be cut completely out and others tuned in with no apparent diminution of signal strength.

The "Six-in-One" is certainly adaptable, although we are inclined to consider that one or two of the methods of use advocated are quite valueless; not *individually* perhaps, but *additionally*.

Anyway, the degree of efficiency displayed by "Type No. 1" is as high, perhaps even higher, than that of any other commercial wave-trap we have examined.

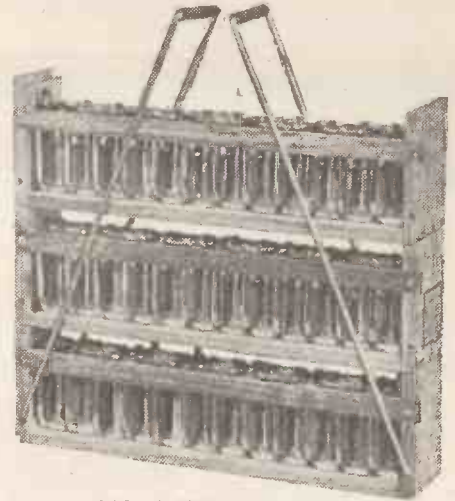
An interesting little book entitled "Wireless Questions and Answers" has been sent us for review. It is published by Messrs. Foulshams at 1/-, and the author is Mr. P. J. Risdon, F.R.S.A. Distinctly new ground is covered by the inclusion of a number of diagrams containing purposely inserted errors. These errors are pointed out clearly in the text, but, of course, the reader is asked to endeavour to discover them before reading the answers.

Personally, we should like to have seen a little more practical and less theoretical matter in the book, but wireless amateurs who wish to polish up their theory will no doubt discover the little volume useful.

Messrs. Bi-Metals, Ltd., Sugar House Lane, London, E.15, have sent us samples of "Britonol" self-fluxing wire solder for test. This material is sold in 6d. and 1/-

coils, and in appearance resembles 16 or so gauge wire. It consists, however, of a solder with a core of "non-acid" flux. How it is made rather puzzles us; anyway, it must involve a very ingenious process or series of processes.

We carried out the wiring of a whole receiver with no other solder or flux but that provided in combination by "Britonol," and not the slightest trouble was experienced. The material ran well even with only moderately clean surfaces. Soldering was reduced from an art to a purely mechanical operation. "Britonol" is certainly to be recommended to the notice of wireless constructors.



A 72-volt Oldham H.T. accumulator.



The improved T.C.C. Mansbridge

THE new T.C.C. Mansbridge Condenser—the famous Condenser in the green metal case preferred by radio technicians for its accuracy and constancy—is now fitted with Duplex (patent applied for) terminals. Soldering is optional. If you want to use a quick "hook up" for experimental work you can use the milled heads, and obtain perfect electrical contact. The top of every T.C.C. Mansbridge is now all-metal and is, of course, quite impervious to the heat of the soldering iron or the action of the atmosphere.

T.C.C. Mansbridge Condensers have been made by the million, everywhere they are recognised as the standard fixed condenser for wireless use where a large capacity is required within a small compass.

T.C.C. genuine Mansbridge Condensers

THE PANEL DE LUXE



THE advantage that a Radion Panel confers on a Receiving Set is much more than merely adding a gold case to a watch. Rather, is it comparable to the addition of that delicate compensating balance wheel mechanism which ensures split-second accuracy. If you aim at 100 per cent. efficiency for your Set you'll naturally start with a Radion Panel. With dials to match.

Radion is available in 21 different sizes in black and mahogany. Radion can also be supplied in any special size. Black 1d. per square inch, mahogany 1½d. per square inch.

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Head Office: 13a Fore Street, London, E.C. 2
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Our Weekly Constructors' Kits

No. 5. The "P.W." 2-Valve Amplifier.
 No. 6. The "P.W." Selective Crystal Set.

Both described in this issue.

"P.W." Selective Crystal Set.

2 Peto-Scott Square Law Condensers, .0005 with vernier	£ 1 10
1 Eureka Gravit Crystal Detector	5 6
1 Miniature D.P.D.T. Switch	2 0
1 Peto-Scott Vernier Friction Drive 2 coil-holder (R.H.)	10 6
7 Mark III terminals	1 2
Wire, screws, nuts, etc.	10
1 Panel of "Red Triangle" ebonite, 10"x8"x ¼" cut dead square and matted ready for use.	5 0
1 Polished Mahogany Cabinet to fit	8 6
1 Packet of panel transfers	6
Total	£2 15 0

ACCESSORIES REQUIRED:

100 ft. 7/22 aerial wire, 6 yds. heavy rubber covered wire, 4 Insulators and 1 Simplex Lead-in	8 0
1 pair of M.E.L. 'phones	15 0

Delivery of all parts guaranteed by return.

"P.W." 2-Valve Amplifier.

2 C.E. Precision Rheo-stats, 30 ohms	£ 6 0
1 Eureka Concert Grand L.F. Transformer	1 5 0
2 Peto-Scott Type "A" valve holders	2 6
1 A.J.S. Choke Coupling Unit (second stage)	1 0 0
1 A.J.S. L.F. Choke	15 0
2 T.C.C. Mansbridge Condensers .5 mfd.	6 8
1 Do., do. 1 mfd.	3 10
14 Mark III terminals	2 4
1 D.P.D.T. Nesthill Switch	2 0
1 Hellesen's 9-volt Grid Bias battery	2 3
12 2 ft. lengths busbar, 1 packet panel transfers, necessary fixing screws, nuts, etc.	1 11
1 Panel of "Red Triangle" ebonite, 13"x6½"x¼" cut dead square and matted	5 0
1 Polished Mahogany cabinet with baseboard	1 1 0
Total	£5 13 6

ROYALTY: Where the complete kit of components is purchased with panel & Marconi Royalty of 25/- must be added to the prices quoted above.

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 If unobtainable locally, send 1/6 and Dealer's Name and Address, when the Crystal will be sent by return post.

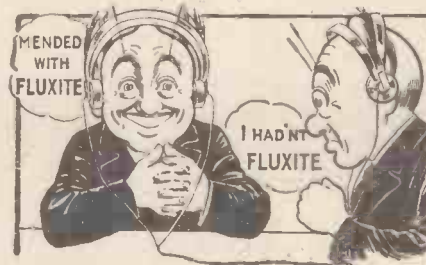
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It is perfectly simple to use, and will last for years in constant use. It contains a special "small space" Soldering Iron with non-heating metal handle, a Pocket Blow-lamp, FLUXITE, solder, etc., and full instructions. Price 7/6. Write to us should you be unable to obtain it.

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ANOTHER USE FOR FLUXITE. Hardening Tools & Case Hardening. ASK FOR LEAFLET on improved methods.

RADIOTORIAL

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

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

PATENT ADVICE FOR READERS.
The Editor will be very pleased to recommend readers of POPULAR WIRELESS who have any inventions to patent, or who desire advice on patent questions, to our patent agent. Letters dealing with patent questions, if sent to the Editor, will be forwarded to our own patent advisers, where every facility and help will be afforded to readers.

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 point-to-point wiring is required an additional fee of 1/- must be enclosed.

Wiring diagrams of commercial apparatus, such as

sets of any particular manufacture, etc., cannot be supplied. (Such particulars can only be obtained from the makers.)

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

No questions can be answered by 'phone. Remittances should be in the form of Postal Orders.

Questions and Answers

WIRING DIAGRAMS.

"BEGINNER" (Leeds).—I have spoilt a wiring diagram that I had in a copy of POPULAR WIRELESS, and I am wondering if you could tell me whether it is possible for me to obtain a copy direct from you, as my local newsagent does not seem very keen about getting single copies.

Yes, back numbers of POPULAR WIRELESS can be obtained from the Back Number Dept., The Amalgamated Press (1923), Ltd., Farringdon Street, E.C.4. (Price 4d. post free.)

POWER VALVES AND H.T.

R. E. A. (Spalding).—When using my four-valve set (H.F., Det., and 2 L.F.), the 2 L.F. stages being transformer coupled (using power valves), I find that the ordinary type of H.T. battery last only a few weeks. Is this correct?

When employing power valves it will be found that these take twice or three times the current from the H.T. battery that the ordinary type takes, and hence the H.T. battery must not be expected to last as long using power valves. It is advisable to obtain a

(Continued on page 444.)



BONTONE

HELLO! HELLO!!

Let it be known that a progressive English firm now offer their ALL BRITISH HEADPHONES at prices and quality that will compete with any other 'Phones on the world's market, be they of British or foreign manufacture.

"Bontone" Originals - 11/6 ea.
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We guarantee to forward by return of post. We guarantee to replace if 'phones do not give entire satisfaction and same are returned to us within 10 days' of purchase, undamaged.

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Remember that behind this offer is the name of BONTONE, with a sale exceeding 100,000 'Phones. Better value than the above cannot be obtained at double their purchase price.

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Select your audio-frequency transformers from the IGRANIC range.



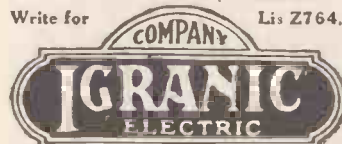
"E" Type (Patent No. 205013).
 The latest Igranic model embodying many valuable improvements. It may be relied upon to give extremely high and uniform amplification with a complete absence of distortion.

Prices :
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The Yesly Combined Grid Leak and Condenser . . .

"As silent and sure in operation as the British Navy"

THIS was the spontaneous opinion of a keen radio amateur who purchased and tested the New Yesly Combined Grid Leak and Condenser.

The undoubted value of a *really* efficient grid leak and condenser unit cannot be over-rated when you want the very best results from your set. The Yesly combined component is specially designed for efficiency together with economy of panel space while both condenser and resistance are of guaranteed values.

Both components are mounted between substantial spring clips which allow of the rapid change of either for the comparison of results.

The grid leak is absolutely silent in operation and both this and the condenser are of excellent workmanship. There is little doubt that this novel type of combined component will eventually displace the older patterns.

Tubular Grid Leak (2 megs.) and Condenser (.0003) complete. **3/9** each

Other Values to Specification.

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Obtainable from your local dealer. If you have any difficulty write to—
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10 ft. Coils
1/2 Per Coil
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2ft. lengths
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RADIOTORIAL QUESTIONS & ANSWERS.

(Continued from page 442.)

triple capacity H.T. battery such as is now manufactured by nearly all the well-known makers. The wastage of current can be greatly minimised by providing the correct values of negative grid bias for the L.F. valves.

TUNING COIL'S WAVE-LENGTH.

R. W. B. (Nailsea, Somerset).—I have a '0003 mfd. variable condenser to tune a No. 35 Igranic coil in parallel in the aerial circuit. Using a standard P.M.G. aerial, will the coil cover the wave-length of Cardiff (351 metres), or shall I need to add a '0002 mfd. fixed condenser in parallel with the '0003 to make the capacity up to the conventional '0005 mfd.?

It will not be necessary to add the '0002 mfd. fixed condenser as the coil tuned by the '0003 mfd. variable condenser should cover wave-lengths from 225 to 407 metres, using the standard P.M.G. aerial. The maximum wave-length is made up as follows: Natural wave-length of the aerial approximately 135 metres, wave-length of coil when condenser is in parallel and full-in 272 metres— $135 + 272 = 407$ metres. The natural wave-length of the coil when in-tuned and without the aerial is 90 metres. Its minimum wave-length is therefore $90 + 135 = 225$ metres.

INCREASING WAVE-LENGTH.

A. G. D. (Bournemouth).—Can I connect a 75 turn coil in series with a 25 turn coil so as to obtain the equivalent of a 100 turns or more?

Yes, but if coupled it is essential that the coils are both wound in the same direction, i.e. the two together form one continuous coil.

EARTHING SWITCH.

N. E. G. (Swansea).—How can I fix a D.P.D.T. switch so that both my aerial and earth terminal leads are broken when the switch is earthed?

The left-hand middle contact should be joined to earth, and the right-hand middle contact to aerial. The top right-hand contact joined to the A on set, and the top left-hand joined to E on set. The bottom two contacts should then be shortened together.

INCREASING CAPACITY.

"CAPACITY" (Glasgow).—I have a '0005 variable condenser, but I wish to employ this

THE "P.W." TECHNICAL ASSISTANCE DEPT.

Personal Help for Amateurs
in Trouble With Their Sets.

DURING the autumn months, and until further notice, readers of "Popular Wireless" may obtain personal interviews with the Queries Editor or one of his staff on Mondays, Wednesdays and Fridays.

Just as a patient may talk over his troubles with a medical specialist, so it is now possible for readers to make an appointment with a "P.W." radio specialist and, on advance payment of a fee of 2/6, have a ten minutes' interview in order to discuss troubles verbally—a much more satisfactory and expeditious method than asking for assistance by post. Also, in special cases, and on payment of a fee of 10/6, plus all expenses, a member of the "P.W." Queries Staff will visit the home of any reader of "P.W." within a radius of twenty miles of London, and will give advice on wireless sets already installed, or on the installation of receivers, aerials, etc., etc. Hours of visit can be obtained on written application to the Queries Editor.

Readers also desirous of having their sets completely overhauled, tested, and certificated by "P.W.," according to merit, may on application, and by forwarding a fee of 10/6, send their receivers to the "P.W." Testing Room.

In the latter case sets must be brought by readers and taken away again after test. Sets cannot be received by post.

All queries in connection with this new "P.W." Technical Assistance Dept. should be addressed to the Queries Editor, "Popular Wireless," Fleetway House, Farringdon Street, London, E.C.4. Appointments and testing of readers' sets will be dealt with in strict rotation.

so that it can be used from '0005-001. Is it possible to add a fixed condenser in such a way that the maximum capacity of the variable condenser is '001?

Yes, by connecting a '0005 fixed condenser in parallel with the variable condenser.

SOLDERING NICKEL TERMINALS.

"POSEN" (St. Ives).—Why is it that when I employ nickel-plated terminals for my set that I find that on testing the set the number of bad joints are more frequent than when using brass terminals?

This is due to the fact that when the terminals are being plated a small film of grease or dirt has been present on the base of the terminal, and has prevented the film of nickel from adhering properly. When the terminal is heated the solder adheres to the nickel film and breaks this, but this film itself is not making good contact with the terminal owing to the dirty surface of the metal underneath. It is therefore advisable to file off all the nickel plating at the bottom of the terminal before soldering.

RECIPROCAL VALUES.

C. W. H. and R. R. G. (Bournemouth).—In answer to a recent query regarding condensers in parallel it was stated that "The reciprocal of a value is that value divided by one." Surely this is incorrect, as the division by one would leave the number unaltered?

Yes, the statement is incorrect as printed. Instead of reading "The reciprocal of a value is that value divided by one," it should read, "The reciprocal of a value is one divided by that value." For instance, the reciprocal of 2 is $\frac{1}{2}$, and the reciprocal of 50 is $\frac{1}{50}$.

CHEAPEST ONE-VALVE SET.

A. D. R. (Waltham Abbey).—I have constructed the cheapest one-valve set ("P.W." 174), but am not quite certain of the coil connections. Should one moving and one fixed coil be used for the aerial tuning and the other moving coil for reaction, or is the fixed coil the large reaction coil?

Two adjacent coils (i.e. one moving and one fixed) are used for the aerial tuning, and the other moving coil is for reaction.



Where there's a child there should be cocoa

CHILDREN are brain-workers and manual workers too, and many overgrow their strength at school and play. Now Cocoa is food, and gives the children extra strength to keep pace with their growing bodies. It is the children's idea of a really delicious drink for breakfast and supper.

"Keep fit
on cocoa"

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Every one of these
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instruments is
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GUARANTEED**

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THE H.T. BATTERY THAT WON'T LET YOU DOWN

AVOID DISAPPOINTMENT by procuring your H.T. by post from our depot. We are Sole Agents for the most efficient dry batteries ever placed upon the market. Made by manufacturers of 25 years' experience, and insulated throughout with the highest dielectric, viz.:—**White Paraffin Wax**, thus ensuring long life.

9 volts, grid bias, tap every 1½ volts, 1/9 each	90 volts, tap every 6 volts, 18/6 each
36 volts, tap every 3 volts, 8/- each	100 volts, tap every 6 volts, 19/- each
60 volts, tap every 3 volts, 10/9 each	Wander-plugs, 6d. per pair.

All batteries guaranteed to show full voltage.

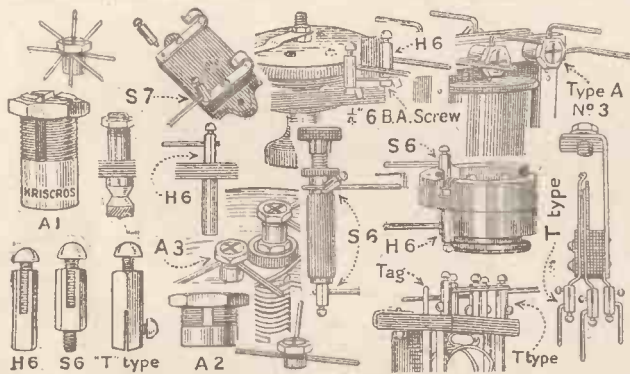
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A REVOLUTION IN CONSTRUCTION —SOLDERED JOINTS SUPERSEDED!

Complete range of combined Nut-Connectors for easy and quick wiring-up of any set.

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SIMPLE, NEAT. BETTER RESULTS SECURED THAN WITH SOLDERING.

A CONNECTOR FOR EVERY CONTACT, FOR EVERY COMPONENT AND EVERY PURPOSE.

From 1/- per doz. 2nd p.c. for list.

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The New MAXEL Accumulator

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GUARANTEED TWELVE MONTHS. If you live too far away to call and see the Battery Mail your Order to us for the size you want. We will willingly return your money if you are disappointed. Now fitted with NON-CORROSIVE Wander-plug Terminal.

	AMPS.			
	40	60	80	110
2 VOLT ..	7/6	9/6	11/9	14/6
4 VOLT ..	15/-	19/-	22/6	26/6
6 VOLT ..	22/6	27/9	33/6	39/-

Packing 1/- extra per battery.

H.T. BATTERIES 60 VOLT 7/6 post free

MAXEL ELECTRICAL CO. 28, Clipstone Street, Great Portland Street, W.1.
Telephone: MUSEUM 708.

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the wonderful new insulating material

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SAXON GUIDE TO WIRELESS

THIS IS THE BEST BOOK OBTAINABLE, AND ENABLES ANYONE WITHOUT PREVIOUS EXPERIENCE TO MAKE WIRELESS SETS WHICH ARE UNEQUALLED IN PRICE, QUALITY, OR EFFICIENCY.

Everything connected with Wireless is clearly and simply explained, and full instructions, WITH CLEAR WIRING DIAGRAMS, are given for making: TWO SUPER EFFICIENT CRYSTAL SETS, ONE AND TWO-VALVE DUAL AMPLIFICATION RECEIVERS, ONE AND TWO-VALVE AMPLIFIERS; ALSO THE VERY LATEST TYPES OF TWO, THREE, FOUR AND FIVE-VALVE TUNED ANODE RECEIVING SETS.

THE CHAPTER ON TESTING WIRELESS COMPONENTS IS ALONE WORTH THE PRICE OF THE BOOK.

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Satisfaction guaranteed or money refunded.

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PRICE
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Compare the price with any other British-made High-Grade-Valves. Have you seen the curves in our booklet?

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A user writes: "I am really amazed at the result, they are the best valves I have yet come across. Let me thank you for executing my order so quickly, and when I require any more valves I will certainly send to Radions, Ltd."

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VALVE HOLDER

Made of the finest low loss ebonite, is neat and well finished. Countersunk sockets provide ABSOLUTE SAFETY against burning out. Cap specially constructed to serve as drilling Template. Valve legs always make good contacts. Just the thing for experimenters as well as the amateur. Above all it's cheap, as well as good. Each one on card with instructions for simple fixing.

Export enquiries invited.

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Phone: TOTTENHAM 178.

Postage, one or two val., three or more post free.

1/3

The Finest Valve Holder Ever Produced!

GENERAL HINTS TO THE NEW AMATEUR.

(Continued from page 412.)

Given a good standard type of set, fitted with suitable accessories, appreciable distortion can be avoided by the above simple rules.

When Grid Bias is Essential.

Listeners should see that when valve replacements become necessary suitable valves are purchased, and here, by the way, it is worth mentioning that frequently it happens in multi-valve sets that the changing of the positions of the valves provides an improvement in reception. In practically every case when a medium-sized or large loud speaker is employed, what is known as grid bias is essential to pure reproduction of music. It takes the form of a small dry battery of 4½ to 9 volts, and if the listener cannot trace it in his set he should endeavour to get the advice of a knowledgeable friend on the subject. No wireless set employing two or more valves for low-frequency amplifying should be unprovided with a grid-bias battery.

The accumulator employed for lighting the valves must be very carefully used. It should never be allowed to run down to a point where it cannot operate efficiently. Even when not in use it should be charged at least once a month.

There are all sorts of other things a listener should do to maintain his set in

good order and to obtain comfortable undistorted reception; but in the space of this single article it is unfortunately impossible to detail them all.

In Conclusion.

A wireless set, from a practical point of view, is not a very involved piece of apparatus, and for the most part everything connected with it is perfectly logical and obeys definite laws. It is therefore possible for a listener to find out a great deal for himself if he will take an intelligent interest in the subject.

Nowadays the adjustments and controls on a set are reduced to an absolute minimum, and nothing is introduced that has not a definite purpose and a direct bearing on reception. The listener who can honestly say that he knows the effect of each variation of everything adjustable and can co-ordinate such controls—for some are very definitely interlinked with others—has gone a long way towards mastering his equipment. When he can use every control and adjustment correctly, delicately and expeditiously, then he will have achieved that goal at which every listener should aim. A wireless receiver is not like a gramophone to be "turned on" with standard results at any time, it is a scientific piece of apparatus that even in these "easy" wireless days requires kindly attention and careful understanding.

PHOTOGRAPHS.

Readers are invited to submit photographs of wireless interest for publication in "Popular Wireless." Every photograph accepted and published will be paid for at the rate of 10/6 per photo.

A UNIVERSAL L.F. TRANSFORMER.

(Continued from page 408.)

in the effect of a small air gap and a large one in the magnetic core.

But an open-core, or semi-open-core transformer gave a very much clearer and purer reproduction than an entirely closed one—of this there was no doubt at all.

Transformers were made with portions of the magnetic core hinged, others in which portions of the iron could be withdrawn, others again in which the laminations closed or linked together like the vanes of a variable condenser, and many other forms.

Tapped Windings No Advantage.

Tapped windings were of course tried frequently, but the advantage of the tappings was not very great, and moreover the tapped windings were extremely troublesome and expensive to make. It was found that all the good effects could be obtained quite apart from tappings.

The two windings were arranged so that their positions relative to one another and to the core could be varied at will, and special means were used for varying the impedances separately and independently of the coupling.

It would take too long to describe in detail all these experiments, but the results obtained are important and should prove valuable to amateurs and constructors.

(Continued on page 450.)

If Valves could only Speak
THEY WOULD DEMAND



GECOPHONE

Super Capacity High Tension RADIO BATTERIES because these new batteries, by virtue of their

LARGE CAPACITY, SILENCE IN USE, MINIMUM INTERNAL RESISTANCE, and LONG LIFE,

make such an immense improvement in radio reception.

These Batteries are the latest development in BRITISH battery manufacture and their merits are so outstanding that they are rapidly becoming the Standard H. T. Batteries for Radio work.

GECOPHONE

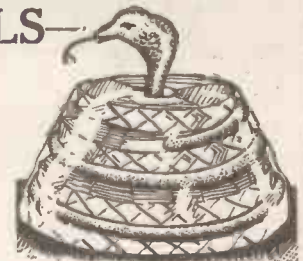
Super Capacity High Tension RADIO BATTERIES Sold by Wireless and Electrical Dealers everywhere.

Prices from 7/6 to 27/6

Manufacturers: The General Electric Co., Ltd., Magnet House, Kingsway, W.C.

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Coils with a guaranteed wave-length. A perfect and efficient coil with no loose ends to interfere with reception. Each wire is air-tight—giving low self-capacity and low absorption factor. Highest possible efficiency at a reasonable price.



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EVERY COIL GUARANTEED

Wave-lengths with '0005 mfd., Condenser in Parallel. Passed and approved by National Physical Laboratory.

If your dealer does not stock, a complete set of five coils will be sent, post free, for 5/6.

Special Daventry Aerial coils, 1,600 metres, 2/-.

Ditto, Reaction, 2/6

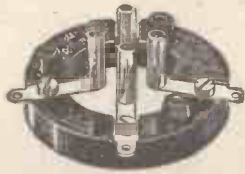
Snake Adapters, 1/6 each; 3/- per pair.

Manufactured by THE LONDON WIRELESS CO., London Road, LIVERPOOL. Trade enquiries invited

No. of Turns	Min.	Max.
35	115	to 475 metres
56	250	.. 700 ..
80	400	.. 1,000 ..
92	625	.. 1,450 ..
105	950	.. 2,300 ..

These Wave-lengths are Guaranteed.

For more and better Music



By reducing losses to the minimum this Valve Holder puts more energy into your valves. Distant stations are heard more clearly, nearer stations yield rich, pure signals free from distortion. Airseparation of valvelegs prevents inter-electrode capacities, Phosphor bronze springs save all your valves from accidental shocks and prevent Dull Emitters from humming. Antipong is a life insurance for valves.

Instal it in every set you make. The fitting is universal, all screws are provided. The Bakelite Ring will not melt undersoldering iron. Price complete

3/-

BOWYER-LOWE

ANTIPONG LOW LOSS SHOCK ABSORBING VALVE HOLDERS

Buy them from your dealer or direct from the Bowyer-Lowe Co., Ltd., Letchworth.

FLETCHER

VALVES REPAIRED

FROM
DULL **7/6** EMITTERS
BRIGHT **4/6** FILAMENTS

Don't scrap an expensive valve because the filament has burnt out. Let us repair it equal to new!

FULLY GUARANTEED. QUICK DELIVERY. TRADE ENQUIRIES INVITED.

The ALLEN-BELL Radio Valve Repairing Co.,
Well Lane Works, Earl Street, SHEFFIELD.



Adding to Time!

When you become a user of the famous "ELKA" Batteries you add to the time of your enjoyment of listening-in. Long life, capacity, silent working, and minimum internal resistance. Demand "ELKA" from your dealer.

60 v. H.T. Bty. 2/6
100 v. H.T. Bty. 12/6
9 v. Grid Bias 2/-
4 1/2 v. P.L. Bty. 6d.

L. KREMNER

Trade Prices on Application. 49a, Shudehill, Manchester

W.J.H.

25% saved

Western Electric LOUD SPEAKERS

Here is an opportunity you surely must not miss.

We have acquired the whole available stock of these standard Western Electric Loud-Speakers and are able to offer them more than 43% cheaper than you can obtain them elsewhere.

You have long wanted a really good Loud Speaker, not a toy, but prices have been too high.

57/6
full size
Speaker

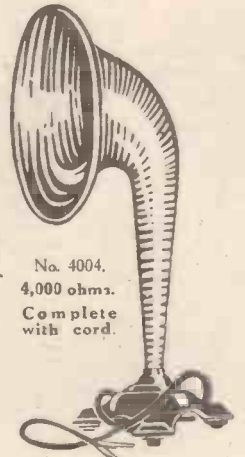
Here is your chance to get a really efficient instrument, admittedly one of the finest ever placed on the market by The Western Electric Company Limited, giving full volume of tone, of excellent quality, and at a price that you can afford.

The non-sonorous trumpet avoids all metallic twang, whilst the large diaphragm with adjustable air gap gives ample margin for modulation.

Guaranteed by Western Electric Co., Ltd., to be of their manufacture, fully tested and not despatched unless in perfect order.

Send remittance 32/6 with order, plus 1/3 for carriage and Speaker will be sent at once.

These Loud Speakers have never previously been offered at less than 57/6 each.



No. 4004.
4,000 ohms.
Complete with cord.

This is absolutely a genuine offer

AND CANNOT BE REPEATED

RADIO DISTRIBUTORS,
(Dept. P.W.), 34, MARK LANE, LONDON, E.C.

for 32/6

The Improved and Cheaper Coil Plug

SAVE 25%

Get your COIL PLUGS for 5/6 per doz. (4/6 gross lots).

Made of best tested materials throughout, these Plugs offer the advantages of nickel-plated side plate contacts, having patent lip. Send 6d. to cover postage upon sample dozen orders.



CECIL RIDLEY
35 & 37 DUNDAS MEWS
MIDDLESBROUGH



Fig. 24. The potentiometer panel.

THE panel shown in Fig. 24, which is 6 in. long by 3 in. wide, is fitted with a rheostat-type potentiometer and a two-coil holder, the ends of the potentiometer resistance helix being connected to the two outside terminals in the top row of three, and the arm to the centre terminal in the usual way. If a smaller component, such

as a crystal detector, a choke coil, or a small vernier condenser is fitted in place of the two-coil holder, a simple cut-out switch might be included, this being connected in series with one side of the potentiometer helix so that it could be conveniently switched out of circuit when not required.

Figs. 25 and 26 show front and side views of an L.F. transformer panel which is fitted with a "Success" super transformer and also an ordinary L.F. choke coil. Special clips are clamped under the shoulders of the transformer terminals to take the fixed condensers, these strips being cut out from sheet spring brass as shown at A, Fig. 27, and then bent to

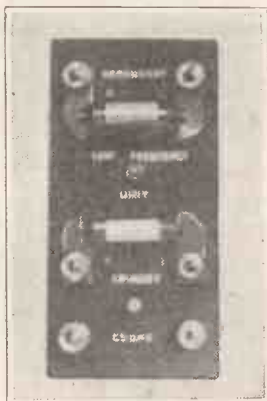


Fig. 25. Front view of the transformer unit.

form angle clips as indicated at B. The lower portion of the clips should be about 1 1/4 in. long, and the uprights about 3/4 in. long with slots cut to a depth of 3/8 in. The clips are fitted to both primary and secondary terminals, since it is often necessary to place a small condenser across both windings of the transformer when trying out reflex circuits.

AN EXPERIMENTAL SYSTEM.

Part IV.

By O. J. RANKIN.

If desired, the clips attached to the secondary terminals may also be arranged to accommodate fixed resistances. This panel is 6 in. long by 3 in. wide, as is also the panel shown in Fig. 28, where a D.P.S.T. knife switch is arranged to control the L.T. supply to the system, the accumulator being connected to the two terminals in contact with the arms (see diagram in Fig. 29) and the circuit connections made from the terminals on the bus bars. The other half of the panel is fitted with an ordinary D.P.D.T. change-over switch, which, of course, can be made to serve a variety of useful purposes, such as a cell resting switch for dry cells used for filament lighting, trying out different

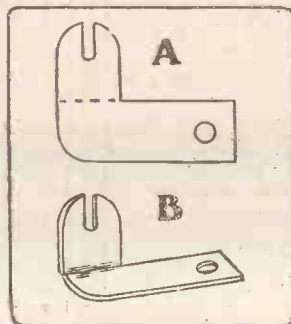


Fig. 27. Shows the method of bending the condenser clips.



Fig. 28. The L.T. control panel.

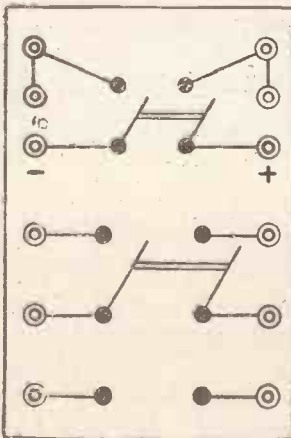


Fig. 29. The circuit of the L.T. panel.

tuning devices, crystal detectors, etc. switching H.F. or L.F. valves in or out of circuit, and many other different changes.

The introduction of this type of switch does not signify that the contacts may be placed very close together in order to economise in panel space and provide room for, say, three or four switches on a panel measuring 6 in. by 3 in.; the reader should not lose sight of the fact that the greater the space between contacts the more efficient is the switch, and that it is always better to sacrifice a little space or appearance for the sake of efficiency. A cramped switch can only result in serious losses due to capacity effects, and therefore one should exercise the greatest care when laying out even the most simple switch.

Final Requirements.

Fig. 30 shows the telephone panel which also carries the H.T. negative and positive bus bars and terminals, and a 2-mfd. Mansbridge fixed condenser which is connected across them under the panel. The panel measures 6 in. by 2 1/2 in., and can be arranged as shown or modified in any way desired.

The fixing tag on the condenser is simply clamped under any one of the H.T. terminal nuts, and the 'phone bus bars are fitted with multiple terminal pillars and clips to take "K" type fixed condensers, these being carefully soldered in the approximate positions shown.

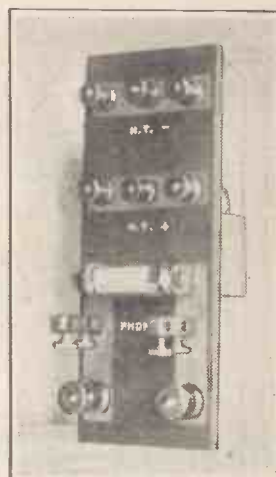


Fig. 30. A useful unit for H.T. and 'phone connections.

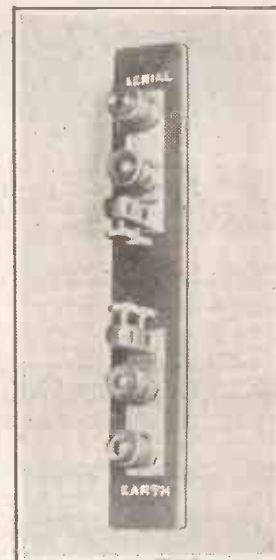


Fig. 31. An extra terminal block.

The smallest panels used in the system are 6 in. long by 1 in. wide, these being arranged as simple terminal blocks to be slipped into the frame at any point to avoid the overloading of component terminals. One of these is shown in Fig. 31, this particular one being placed against the three-coil holder to relieve the coil terminals when working with complicated super circuits. The multiple pillar terminals are soldered to the bus bars to permit the use of emergency aerial and earth leads.

(To be concluded.)

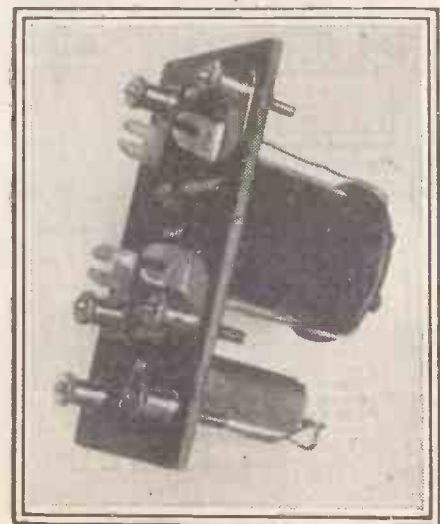
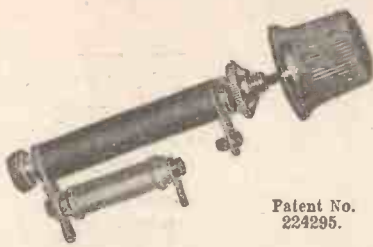


Fig. 26. The transformer and choke are clearly seen above.



Patent No. 224295.

A Silent Background

is essential if long distance reception is desired. The usual grid leak containing carbon in some form or other is totally unsuitable. The physical properties of carbon do not allow of passing a small current without variation or interruption. The use of a grid leak containing carbon is bound to produce a noisy background. In a variable grid leak, especially, the resistance material used must be constant in use.

Such a variable grid leak is the "BRETWOOD" VARIABLE GRID LEAK.

The mastic is perfectly uniform and its action does not depend upon compression of its particles or vary with atmospheric conditions. Positive control of grid potential is ensured by its use.

The "Bretwood" gives accurate readings consistently from 10,000 ohms to 100,000 ohms. Fit a "Bretwood" and improve your receiver. Bretwood Grid Leaks are obtainable from all Wireless Dealers. PRICE 3/-, Post free 3/2. With Condenser, as illustrated, 4/6, Post free 4/9.

We are shortly pulling on the market the following new and interesting Bretwood products:

- Bretwood Super-Het. Transformer (Tunable).
- Bretwood Super-Het. Oscillator.
- Bretwood Variable Low Loss Condenser.
- Bretwood Variable Low Loss Condenser (Geared).

BRETWOOD LTD.,
12-18, London Mews, Maple St., LONDON, W.

Ask your dealer also for

The BRETWOOD ANTI-CAPACITY SWITCH—and the new BRETWOOD FILAMENT RESISTANCE for Bright or Dull Emitter Valves.

Or write for details—
The BRETWOOD ANTI-CAPACITY VALVE HOLDER
(Patent No. 31371/24).

A valve holder constructed on new and scientific lines, combining the following advantages: Easy to fix—no capacity—no leakage—always perfect contact. Saves panel space—back or front of panel mounting. No soldering necessary.

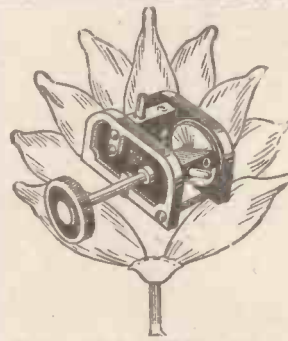
PRICE - - 1/8



FIT THE

"LOTUS" COIL-HOLDER

and Realise what Perfect Reception means



Moving Block CANNOT FALL
Made from Bakelite Mouldings with Nickel-Plated Parts

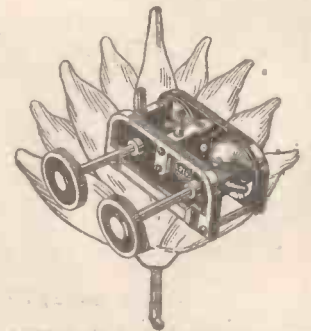
Retail Selling Prices:

Two-way - 7/-

Three-way - 10/6

With six-inch handle for inside mounting.

Two-way 1/- extra.
Three-way 2/- extra.



THE "LOTUS" cut-gear Vernier Coil-Holders are fitted with Vernier movement actuated by three sets of encased precision-cut gears representing a reduction of 8 to 1.

GARNETT, WHITELEY & Co., Ltd.,
Lotus Works, Broadgreen Rd., LIVERPOOL

"Slow-dead slow!"

An ordinary Capacity Handle—PLUS
The "COMBINE" ANTI-CAPACITY ATTACHMENT

Incorporates a small rotating knob at the extreme end of the handle, which gives a final "dead slow" turn to your condenser. Tuning to a minute fraction of a degree is thus obtained. In fact, the "COMBINE" makes any condenser a sharply adjusted instrument of unusually fine tuning. You can quickly fit a "COMBINE" ATTACHMENT to the condensers in your set. Do so to-day and add to the efficiency and appearance of your receiver.



With fine tune knob or handle as sketch.

Price 5/9 Post free

Made of first-class materials throughout by expert workmen. List post free. Send remittance to-day to

THE WIRELESS DEN,
56, LUDGATE HILL, LONDON, E.C.4.

ANSWERS' GREAT NEW COMPETITION

"MISSING WORDS"

TEN THOUSAND POUNDS (£10,000) FIRST PRIZE

A simple and fascinating contest with NO ENTRANCE FEE and a fortune for the winner! Full particulars in this week's

ANSWERS

Now on Sale 2d. Buy your copy at once.

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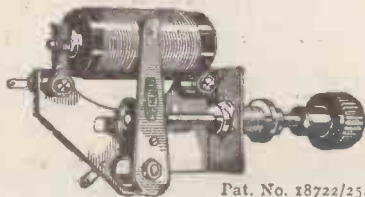
JOHN H. LILE LTD.

4 Ludgate Circus London, E.C.4.

'Phone No.: CITY 7261



ASK YOUR DEALER FOR THESE



Pat. No. 18722/25.



MICROMETER RHEOSTAT

The Service Micrometer Rheostat represents a complete departure in Rheostat design and adopts an entirely new principle of working.

Owing to the fact that 10 turns of the control knob are required to cause the contact arm to travel over the range of the resistance bobbin, the variation of current is gradual and smooth, thus assisting the life of the valve.

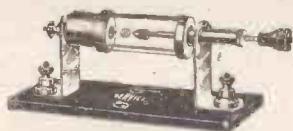
Resistance bobbins of different values to suit either Dull Emitter or Bright Emitter valves can be readily interchanged without in any way disturbing soldered connections.

This Rheostat, which is one-hole fixing and requires the small panel space of 1 1/2 by 1/2 in. is mechanically robust, and has no rotating lock nuts to work loose.

Retail prices: 6 ohms	3	9
" " 30	4	0
Interchangeable bobbins, 6 ohms.	1	6
" " 30 ohms.	1	9

THE SERVICE POTENTIOMETER.

400 ohms	5	0
----------	---	---



CRYSTAL DETECTOR

This well-known Detector, which probably enjoys the largest demand in the market, is glass enclosed, and thereby dustproof. It is not affected by vibration, and by means of a patented micrometer adjustment, the pressure of the catwhisker on the crystal can be regulated as required.

The crystal can be replaced in a few seconds, no solder or plastic metal being required.

These Detectors have a highly polished nickel-plated finish and are supplied complete with a free sample of the famous Service Crystal.

Retail prices: Panel mounting	2	6
" " Mounted on Ebonite base	2	9
Glass Tubes for Service Detectors, 2d. each.		

Write for fully illustrated Price List of all SERVICE Products.

SOLE PRODUCERS: THE SERVICE RADIO CO., Ltd., 67, Church Street, Stoke Newington, LONDON, N.16

'Phone: CLISSOLD 4934.

A UNIVERSAL L.F. TRANSFORMER.

(Continued from page 446.)

In one model the author had four separate knobs and control shafts projecting from the transformer, and with this transformer it was possible to get every conceivable type of variation. The transformer could be adjusted to suit any valve, or any pair of valves, in any stage and for any type of reception.

Useful Tone Control.

One simple but most striking and useful result of this variation was that the volume could be controlled without the need for detuning on the aerial, which is, of course, very undesirable with a long-range sharply tuned set.

Another most interesting effect is that the character of the transformer can be varied, whilst the set is in operation, to suit the nature of the signals; for example, a clear and pure tone can be introduced for violin and soprano work and so on, whilst for deep bass instruments, the transformer can instantly be adapted for a loud, deep and resonant tone.

It is difficult accurately to describe these effects; they need to be heard to be appreciated.

Adaptable to Any Stage.

In the accompanying illustration is shown one form of universal transformer which the author has used, adapted for front-of-panel control. It will be seen that a small control shaft projects through the panel, with graduations for re-setting.

Lack of space prevents further information at present, but the author has no hesitation in describing this as a universal transformer, adaptable to any stage, first, second or third, whilst as a volume and "quality" control its effect is most remarkable.

Attention is directed to the fact that these various models are the subjects of patents or applications for patents, but if a sufficient number of inquiries are received from readers, full particulars and directions for making or adapting transformers with these new features will be given in a future issue.



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.

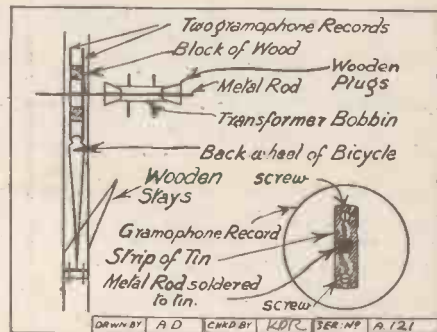
HOME-MADE TRANSFORMERS.

The Editor, POPULAR WIRELESS.
Dear Sir,—Most wireless amateurs at some time or other feel that they would like to make a transformer, but they put it off because of the difficulty of winding such a great number of turns.

I have just been very successful, using a bicycle in the following way. It is most easily shown by diagrams.

The gramophone records were the small type about 7 in. diameter. They were separated by two pieces of wood 1/2 in. thick, and secured to the pieces of wood. The rod is fixed to the record by soldering it to a piece of tin that is screwed on to the record. Fig. II.

The transformer bobbin is then secured to the rod by means of two round wedges of wood, which fit tightly on the rod.



The two wooden stays which hold the records in place are securely lashed to the forks of the bicycle, or to the carrier supports.

The number of turns can be calculated by the number of times that the pedal is turned around.

Of course the bicycle is upside down, and the pedal can be turned with one hand, and the wire guided on with the other. Hoping that this will be of some use for your valuable paper.

Yours truly,

F. COLENSO.

"Avonlia," Rudgwick, Sussex.

"P.W." 3-VALVE SET.

The Editor, POPULAR WIRELESS.

Dear Sir,—Perhaps your readers would be interested to know of the results I have obtained from my home-made "straight" "P.W." 3-valver (H.F., Det., L.F.).

I have an indoor aerial in the same room as the set, and an earth lead of 35½ feet to a water-pipe (the nearest (?) I could find). I am on the second floor of the house.

The following is the list of stations, which I think is as good as anything I have read of up to now, under similar conditions:

London, Bournemouth, Daventry, Cardiff, Birmingham, Manchester, Newcastle, Glasgow, Aberdeen, Belfast, Nottingham, Leeds, Swansea, Sheffield, Plymouth, Liverpool, Dundee—Radio Iberica, R. Catalana, Oslo, Hilsversum, Rome, Radiola, School of Posts, Petit-Parisien, Brussels, Union Radio Madrid, Radio-Toulouse, Munster, Leipzig, Frankfurt, Königswusterhausen, San Sebastian, and also four other Continental stations I have yet to identify.

I may say that it is my invariable rule never to log a station until the announcer's words are too clear to permit of a mistake.

All the above stations (without exception) have been heard at one time or another by my friends, who can vouch for the authenticity of the list.

I do not wish to take up too much space, but it has often struck me how much time and trouble listeners of my acquaintance would spare themselves if they would only keep a calibration chart. I have mine ruled up as follows, with two examples:

Station	Tuning Coils				Remarks
	W.L.	A.T.C.	H.F.C.	Aer. Rec. Ade	
2 L.O	363.5	20	42	50 100 75	
B'mouth	387	24	53	" " "	

Wishing your paper every success (I have a pile of "P.W.'s" nearly 3 feet high).

Yours faithfully,

H. MURGATROYD FARRAR.

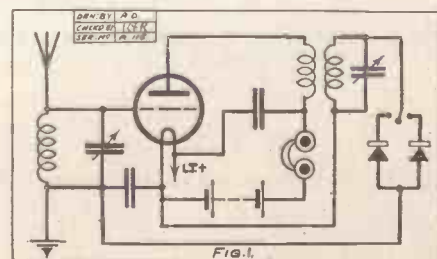
41, York Road, Hove, Sussex.

A CORRECTED CIRCUIT.

The Editor, POPULAR WIRELESS.

Dear Sir,—Recently I happened to glance at "P.W." of July, 18th, and noted on page 18 a very "distorted" and unworkable version of one of the dual circuits I first published in 1921.

I enclose herewith the corrected version.



I trust you will give the corrected circuit the same publicity which you gave to the faulty one.

Yours faithfully,

P. G. A. H. VOIGT, B.Sc.

"Bowden Mount," 121, Honor Oak Park, S.E.24.

FOREIGN RADIO NEWS.

(Continued from page 428.)

are actually working, and of these several are contemplating closing down, while all of them, with possibly two exceptions, are in financial difficulty.

Belgium's Poetic Radio Competition.

The Belgian radio organisers have hit on a novel, and, judging from the number of entries, unexpectedly popular scheme.

The review "La Thyse," in conjunction with the Radio-Belgique station, has offered a prize of 200 francs for the best poem suitable for "reading" by radio. The competition is open only to Belgians, and the poem may be in regular or in free verse, and must not take longer than five minutes to read out.

Broadcasting Cartoons and Drawings.

A very popular plan has been put into effect by Radio-Barcelona broadcasting stations. Subscribers are supplied with special paper, ruled in very small cross-numbered squares. Directions are then broadcast according to which, by means of a pencil, the listener-in can, with the aid of the numbered squares, trace out the drawing indicated.

Cartoons, humorous drawings, astronomical charts, maps to illustrate war news from the Riff, cross-word and picture-puzzles are some of the uses to which this method has been put.

Subscribers report that the plan is meeting with very keen appreciation, adding, as it does, an element of novelty to listening-in.

German South American Radio Contracts.

The German radio press points with considerable pride to the success met with by the Telefunken people in tenders for the erection of public radio stations in Latin-America.

The latest successes reported are the stations at Manita and Quito, which are said to be giving every satisfaction, as also that, somewhat older, at Guayaquil. The last station to be put up by Telefunken in Latin America is that at Bahía de Carequez, in Ecuador, which has just been put into service.

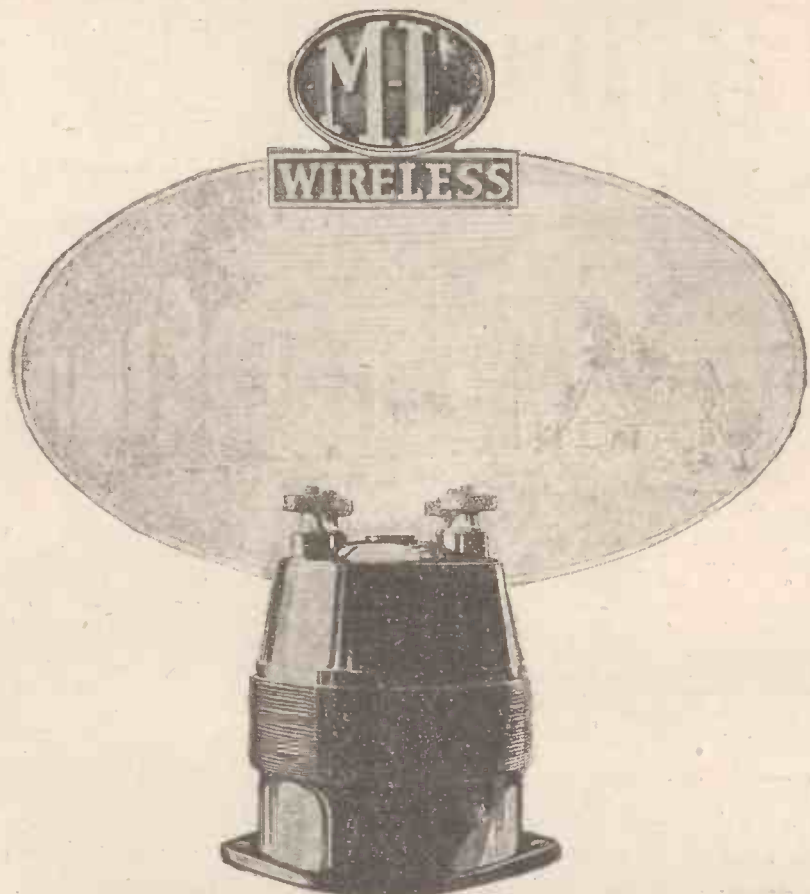
Interesting Barcelonian Development.

The station Radio-Barcelona has signed a contract with the well-known Grand Theatre du Lycée. For the sum of \$5,000 (or 1,000 pounds sterling), it has acquired the right to broadcast all operas, concerts or other performances given in the theatre during the winter season 1925-26.

Contracts have also been signed with leading Madrid and Barcelona music-halls to broadcast the songs of prominent music-hall stars appearing there during the season. These will, in view of the international character of the vaudeville programmes, not all be in Spanish, but will include items in English and in French.

Toulouse Broadcasts Hospital Appeal.

The Toulouse station has broadcast an appeal for money to provide hospitals throughout South-Western France with radio sets and loud speakers. The appeal has so far met with a very generous response, and already the leading wards in Toulouse hospitals have been thus fitted out.



What Others Think.



It would be easy for us to write an advertisement telling you all about the sterling merits of the M.L. Transformer.

We think it is the best transformer that has ever been placed on the British market. Perhaps that is only natural since we are so interested in it. But here is what someone thinks who has no interest in the M.L. transformer, other than that of a satisfied user.

His testimonial is entirely unsolicited. Here is what he says:—

"As you are aware, I have tried out practically every make of L.F. Transformer available to the amateur, and, in my considered opinion your latest production is superior to anything I have previously tested."

The 1:6 ratio is used for amplification after a crystal rectifier. The 1:4 ratio is used for single stage L-F Amplification. The 1:2-6 and 1:4 ratios are used respectively in the first and second stages of two-stage amplification.

Price 25/-

S. SMITH & SONS (M.A) LTD.
179-185 Great Portland Street, London, W.1
Telephone: Langham 2323 Telegrams: "Speedomet, Telew. London"
Also at Birmingham, Manchester, Glasgow and Belfast.

S. SMITH & SONS (M.A) LTD



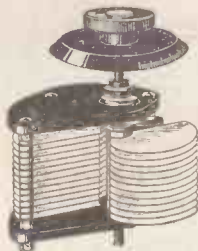
NO NEED TO PAY MORE

We told you this in 1924, and the reduction of high prices proves we were right. We are telling you again!

HERE ARE THE RESULTS OF MODERN METHODS IN PRODUCTION:

THE STELLA SQUARE LAW CONDENSER

The Stella Variable Square Law Condenser is a masterpiece of modern methods applied to the production of quality components. Moulded ebonite end plates—one-hole fixing—unbreakable bakelite knob and dial—rigid construction, straight line tuning. No finer value on the Radio Market to-day.



0005 mfd.
6/-

0003 mfd. 5/9
0001 mfd. 7/6

THE WEMBLEY LOUD SPEAKER

This marvellous speaker has received praise from all parts of the world, and only needs hearing to prove its value. It has a 3 1/2" diaphragm and a real loud-speaker unit. Every detail of manufacture has been studied. Repeat orders prove its worth.



PRICE
20/-

In crystallised black finish.

STELLA HEADPHONES

Stella 'phones are guaranteed. They have achieved a world-wide reputation for better and louder reproduction than any other 'phones on the market at the same price.



Stella 'Phones 15/-
Wembley 'Phones 14/6

SEND FOR OUR LISTS

MONEY REFUNDED IF NOT SATISFIED
VISIT STAND No. 8, HORTICULTURAL HALL, OCTOBER 10 to 16.

STELLA-PRODUCTS

31-37, Wybert St., London, N.W.1.

Telephone Nos.—Museum 8390 & 962.

GOOD AND BAD COILS FOR RECEPTION.

PROBABLY there is no part of a wireless receiver that has been the subject of more attention and experiment than the high-frequency coils. Great improvements have been made in these during the past two years, but there is still plenty of room for further experiment by amateurs and for further improvement.

Need for Low Capacity.

Everyone knows that for best efficiency, the coil should have low distributed capacity and low resistance. Unfortunately, many of the methods which have been adopted for securing low distributed capacity have at the same time had the effect of increasing the resistance, so that what has been gained in the one way has, to some extent, been lost in the other.

The resistance of a coil and condenser, for example, may be, say, 15 ohms, of which the condenser may account for 2 ohms and the coil for the rest. The resistance losses of condensers have been made the subject of a good deal of comment, but if the resistance of the coil is some eight or ten times that of the condenser, it is evident that the first place to attend to the question of resistance is in the coil and not in the condenser.

The capacity of a coil arises from the fact that the successive turns are placed close to one another and approximately parallel. Consequently, attempts to reduce the self-capacity have been directed mainly to spacing the coils out as much as possible and to the avoidance of parallelling. In practically all modern coils of the commercial type, the windings are laid over one another in such a way that they are not parallel, but cross at points.

Solenoid Coils Best?

Another important factor is the question of the insulating or binding material which is applied sometimes to a coil, after it has been formed, to keep the turns in place. Shellac varnish is a favourite material for this purpose, celluloid varnish is another. It goes without saying that the less varnish that is used the better: best of all is to use none at all. The varnish increases the capacity effect by reason of its relatively high dielectric constant (several times that of air), and also by the fact that it absorbs moisture and so introduces direct leakage losses.

According to the experiments of a well-known manufacturer of H.F. wireless coils, it was found that the best coil was one wound upon a good dry cardboard cylinder, the turns being spaced apart a distance not less than one and a half times the diameter of the wire. Such a coil, however, proved to be too large for ordinary commercial purposes, and so the more conventional types of commercial coil had to be reverted to, special precautions being taken to allow for the various considerations alluded to above. But for amateur construction work, the coil wound on a former of the cylinder type has much to recommend it.

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TECHNICAL NOTES.

(Continued from page 423.)

Although most experimenters are not content with only one receiving set, and usually possess most of their components also in duplicate, or even "in triplicate" (to use a Service phrase, well-remembered), few appear to allow themselves the luxury or the indulgence of more than one aerial.

But there are a great many interesting comparative tests which can best be made by the aid of two or more aeriels.

A suggested assortment of aeriels for experimental work is a set of three, of lengths approximately 100 ft., 60 ft., and 30 ft. These may be arranged either parallel to one another or running off in different directions. The down leads from the different aeriels may be run to a multi-point selector switch, but care must be taken about the question of "absorption," and the aeriels not in use must be very carefully insulated from earth, otherwise the aerial which is in use will be badly screened. It is, indeed, in general preferable to have the different aeriels running at an angle to one another rather than parallel.

Some remarkable results may often be obtained by putting one of the aeriels into the place of the "earth," thus using it as a counterpoise, particularly if the aeriels are at different heights. A number of simple experiments of this kind will soon convince you that the theory of aeriels is by no means a simple matter, and that these important items of the receiving system do not always function according to the book.

Concerning Condenser Losses.

Questions are often asked as to the importance of the condenser losses which are so often made the subject of discussion in technical articles. The general question of condenser losses is one of the importance of which (as I have previously pointed out in this journal) is apt to be very much exaggerated. In a well-designed and constructed variable condenser they should be reduced to negligible proportions.

But to come to a detailed analysis of the losses—they fall principally into three classes: resistance losses, eddy-current losses, and dielectric losses.

Resistance losses are the most likely to be serious at radio frequencies. They arise usually from poor contact between plates—that is, plates which are supposed to be in good electrical connection with one another—and from poor bearing contacts. The plates of a set (fixed or movable) should be properly connected together, either by soldering or secure bolting. As for the bearing contact, all good condensers now have the coiled spring form of connection to the moving set of vanes.

Eddy-current losses occur in metal end-plates, and in the condenser vanes themselves. Whilst these are not so serious as resistance losses, they increase with the frequency, and it is important, therefore, having regard to the high frequencies dealt with in radio work, to keep them as low as possible.

Dielectric losses are due to the absorption of energy by the insulating materials used in the construction of the instrument. These

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TECHNICAL NOTES

(Continued from page 453.)

losses decrease as the frequency rises, and are therefore usually of comparatively minor importance. Nevertheless, the use of metal end-plates in a variable condenser for the alleged purpose of reducing dielectric losses is generally to be deprecated, as such plates are likely to introduce losses of other kinds greater than those they are intended to overcome.

Cotton Covered Wire Efficiency.

Just as stranded wire is found more efficient for aerials, so it has much to recommend it for the winding of H.F. coils, and for this purpose is now coming more and more into vogue. The "Mars" coil is an example of a coil formed with this kind of wire.

I notice that the well-known Crosley Co. of America, probably the largest manufacturers of wireless receiving sets in the world, have adopted a special kind of stranded wire for their coils, covered with four layers of cotton insulation. This step is the result of an extended series of tests with various kinds of wire and various kinds and thicknesses of insulating covering. The stranded wire consists of twenty-seven strands of fine copper wire, somewhat similar to electric light flex. Each passage through the covering machines puts two coverings of cotton, and the wires are sent through the machines twice, giving the four coverings mentioned.

Incidentally, the employment of cotton covering for the wires of the H.F. coils confirms the experience of many experimenters that this type of covering gives the greatest efficiency in the finished coils.

Wave-lengths and Frequency.

It has long been felt by scientists and engineers that the system of designating the transmission from a station by wave-length was much less convenient than that of frequency. In practically all other branches of science where the propagation of waves is dealt with, the waves are designated by frequency rather than wave-length, and since the frequency may be the same for different wave-lengths, it is evident that the frequency is the more reliable quantity.

When I say that the frequency may vary for a given wave-length, I refer to the passage of the waves through a heterogeneous medium—that is, a medium in which the velocity of the waves is not the same at all parts. For a given frequency, the wave-length will evidently be proportional to the velocity of the waves in the medium. In the case of wireless waves, this variation is not likely to be serious, since for the major part of their journey the waves travel through the atmosphere, in which the velocity is practically the same as in the free ether. At any rate, at the place where they are received (that is, at the receiving set) they are travelling in the atmosphere, and so their wave-length will be the same as when they were emitted from the transmitter.

In the case of light-waves, however, the velocity varies very considerably with the nature of the medium through which they travel, and this is the reason why some substances have the power of refracting light rays: it is upon this phenomenon of refraction that the whole of the science of geometrical optics depends.

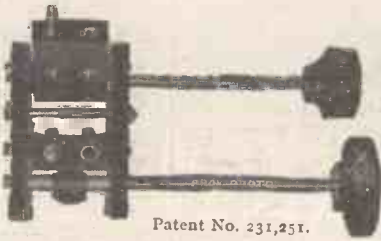
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THE object, apart from entertaining POPULAR WIRELESS readers, is to find out how far certain sounds are recognisable by wireless. So at 7.50 o'clock in the evening of FRIDAY, the 16th OCTOBER, you will have an exciting half-hour during which the B.B.C. will transmit twenty ordinary, well-known sounds—which you have to identify.

ALL YOU HAVE TO DO

is to listen carefully to each sound and then write what you think it is on the form which we are giving you on the right, here.

THE B.B.C. announcer will give the number of each sound before its transmission, and you should immediately note the corresponding number on the form, so that you enter your solution in the proper space. In some cases spoken clues will be given before the sounds, which will make your task easier.

HERE we may include a word of advice as regards the use of the form. It would be as well to provide yourself beforehand with some scrap paper, so that should you be in doubt at the time about any particular sound, you can make notes and decide on your solution later, rather than put a hasty answer on your form only to spoil it afterwards by alterations.

ANOTHER point—the form must be written out IN INK.

WHEN all the sounds have been given, listen for any remarks or directions which the announcer may be giving, then complete your form, sign and address the coupon properly, and send it to :

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ALL entries must reach this address by TUESDAY, the 20th OCTOBER. Efforts arriving thereafter will be disqualified.

RULES

THE First Prize will be awarded to the competitor whose solution is correct or most nearly correct, and the other prizes will follow in order of merit. The Editor reserves the right to divide the prizes, or their value, should it be necessary.

Any number of attempts may be sent in, but each attempt must be quite distinct from any other attempt, and must be made out on a proper form as published here. All entries must be made out IN INK. Entry forms must not be mutilated or bear alterations or alternative solutions of any kind. No responsibility can be accepted for any efforts lost, mislaid or delayed.

The Editor's decision will be final and legally binding throughout this contest, and acceptance of this rule is a distinct condition of entry.

No one connected in any way with the proprietors of POPULAR WIRELESS or with the B.B.C. may compete.

The British Broadcasting Company have deposited with us, under seal, the correct solutions of all the "Sounds" to be given. All the solutions can be expressed in very few words, and it is particularly requested, therefore, that none of your answers should exceed FOUR WORDS.

"Radio Sounds" Coupon

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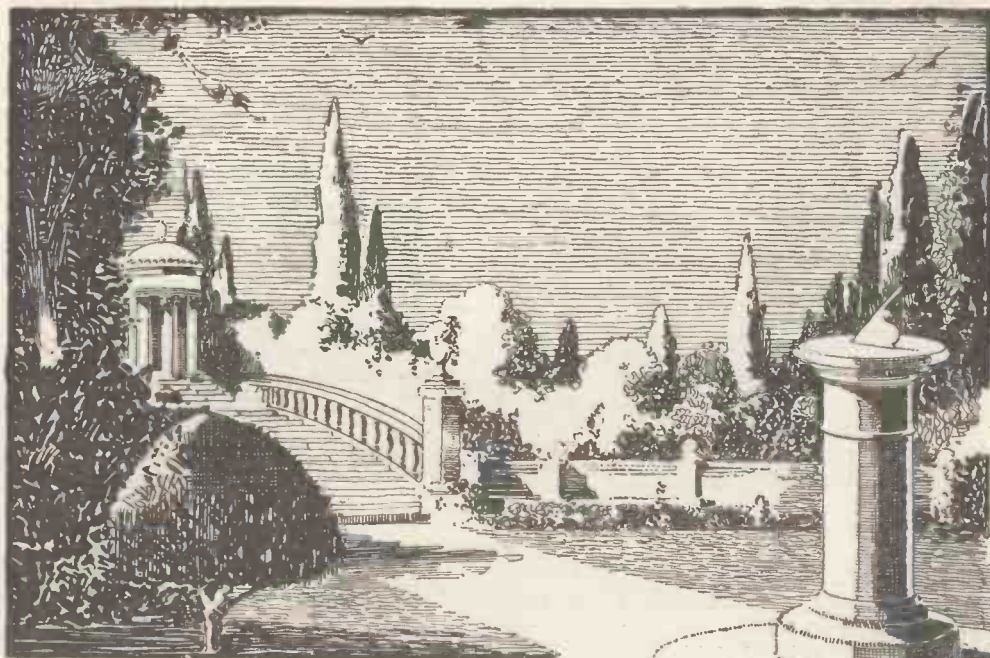
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Closing date, Tuesday, 20th October, 1925.

In entering the "P.W." "Radio Sounds" Competition, I agree to accept the Editor's decision as absolutely final and binding.

NAME

ADDRESS



LIGHT & SHADE

A REAL PICTURE—the rays of the setting sun softened by the shadows, the wonderful colourings, and the contrasts of light and shade all combine to give the picture a touch of real beauty.

And it is just the same with music. Although we may admire wonderful technique, we would never confuse music with the really beautiful, if it were soulless and stripped of those delicate overtones which add light and shade, and portray the real personality of the artist.

Now, these overtones vary in frequency from one thousand to several thousand cycles per second, whereas the frequency of the fundamental notes generally varies between 250-1,200 cycles per second, which means that the Radio Transformer is faced with the problem of responding equally to vibrations whose frequencies differ so widely. The R.I. Transformer reproduces faithfully the fundamental notes while it loses none of those precious overtones, with the result that it gives **PERFECT MUSICAL RECEPTION.**

This problem of perfect amplification calls for years of research and careful experiment. Any Transformer will give you electrical amplification. It takes the R.I. Transformer with 25 years experience behind it to give True Musical Amplification.

Write for the new R.I. blue and gold Catalogue free on application.



❖ THE MARK OF BETTER RADIO ❖

When buying R.I. Transformers see that they are contained in the R.I. standard sealed boxes.



LISSENIUM

Coils that catch signals—

COILS which are just wastes of wire may be good enough for some sort of reception from right-on-top-of-you stations, but they are hopelessly inadequate for distant ones.

For sensitive work your coils must pick up *minute energy . . . and not waste it.*

Put a micro-ammeter in series with the telephones of a crystal set—test your usual coils one by one—watch the delicate needle flickering as each coil passes on—then note the greater deflection of the needle when you put on LISSENAGON coils, indicating greater signal strength and **PRONOUNCED SUITABILITY FOR SENSITIVE WORK.**

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No. 25	4/10
30	4/10
35	4/10
40	4/10
50	5/-
60	5/4
75	5/4
100	6/9
150	7/7
200	8/5
250	8/9
300	9/2

Ultra selectivity—



LISSENAGON "X" COILS.

No. 50	6/-
60	6/4
75	6/4
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There are also LISSENAGON "X" Coils—a series introduced where very fine tuning is desired. When stations three metres apart have to be separated, you can do it with the appropriate LISSENAGON "X" type.

Tune your inductance with the LISSEN MICA VARIABLE CONDENSER. Capacity negligible min. to .001 maximum in the same condenser—two revolutions of the pointer, giving exceedingly open scale. Price **17/6**

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46 Brad (19)

IMPORTANT UNIDYNE ANNOUNCEMENT

POPULAR WIRELESS

No. 178 Vol. VIII.
October 24th, 1925.

and *Wireless Review*

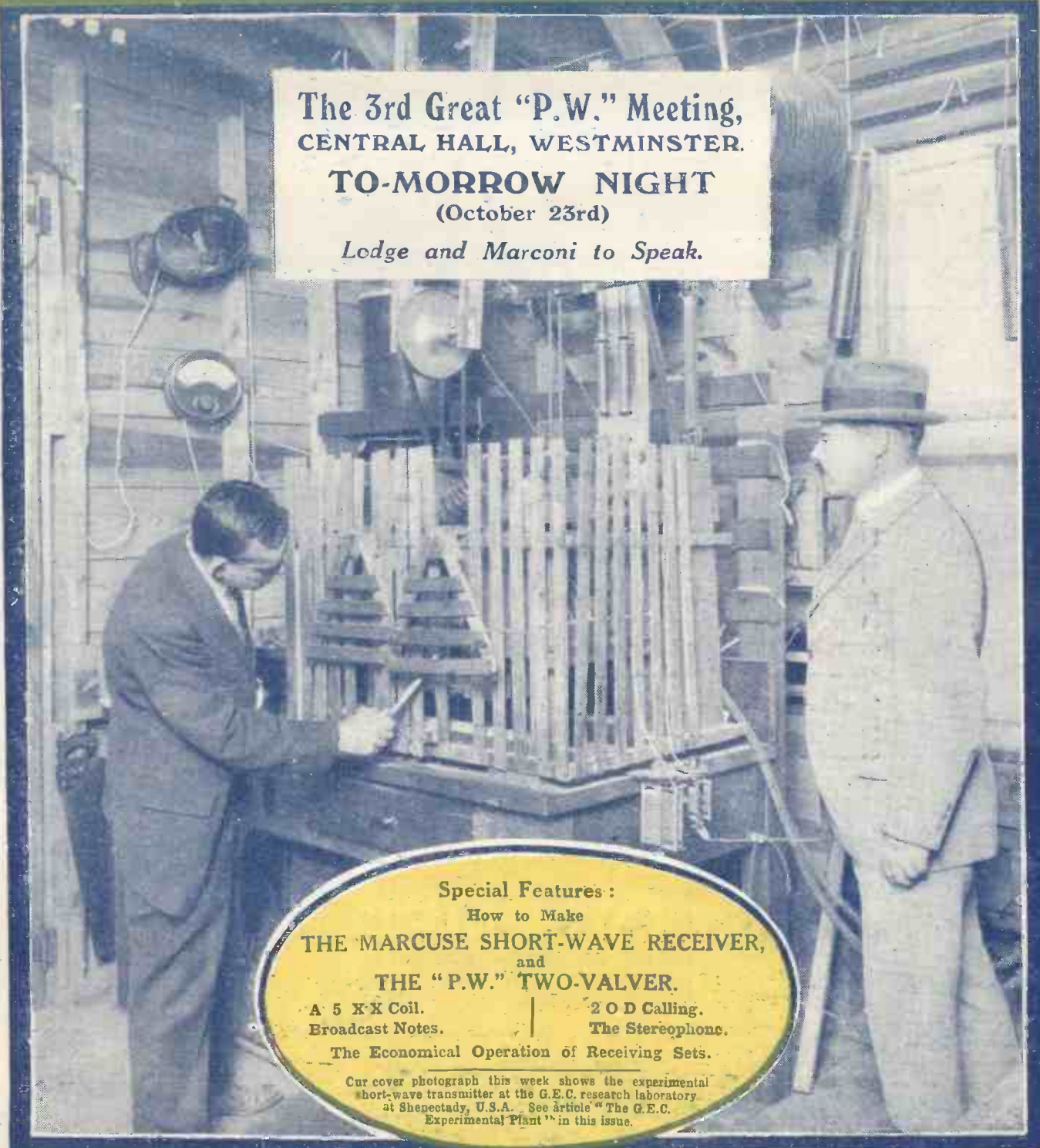
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(October 23rd)

Lodge and Marconi to Speak.

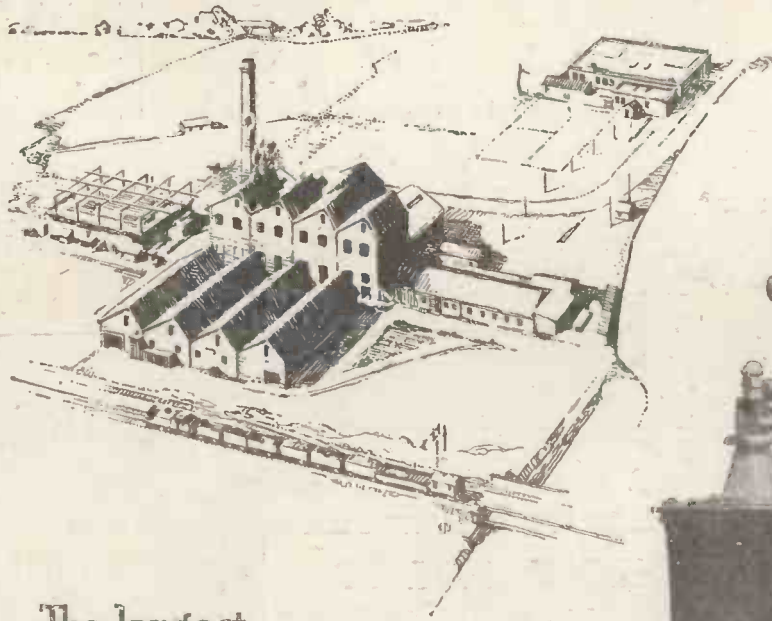


Special Features:
How to Make
THE MARCUSE SHORT-WAVE RECEIVER,
and
THE "P.W." TWO-VALVER.

A 5 K X Coil.	2 O D Calling.
Broadcast Notes.	The Stereophone.

The Economical Operation of Receiving Sets.

Our cover photograph this week shows the experimental short-wave transmitter at the G.E.C. research laboratory at Shenectady, U.S.A. See article "The G.E.C. Experimental Plant" in this issue.



The largest
in the world



THE Dubilier Condenser Co. (1925) Ltd. manufactures the largest condensers in the world, using the best dielectric in the world (*i.e.*, Mica) in the largest Condenser factory in the World.

Our factory at Acton is illustrated above, together with the largest Condenser in the world, which was manufactured entirely by us at our works.

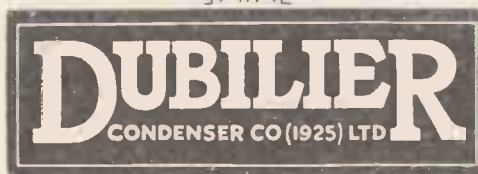
The fact that we produced the first practicable mica condenser is evidence of our ability as experimenters and

pioneers, while the further fact that we are to-day, after twelve years of development, the largest manufacturers of wireless condensers in the world is evidence of the outstanding quality of our products.

The Dubilier Condenser Co. (1925) Ltd., manufactures:—Fixed Mica Condensers, Variable Air Condensers, Anode Resistances, Grid Leaks, the Dubrescon Valve Protector, the Ducon Aerial Adaptor, the Minicap Switch, and the Mansbridge Variometer. The Company are also sole concessionaires for the Mansbridge Condenser.

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

Specify Dubilier.



THE FIRST WIRELESS LOUD SPEAKER WAS A BROWN



Greater volume and better tone than many costing twice as much.

TO those who have been accustomed to believing that a miniature Loud Speaker must, of necessity, be productive of little more than a whisper, this wonderful new Brown H.4 comes as a revelation.

Its generous volume and its unsurpassed purity of tone are due solely to the application of the famous Brown tuned reed principles of reproduction. Super-sensitive to a degree, it is the only miniature Loud Speaker capable of giving, at a comfortable strength, perfect reproduction at a price within the reach of all. The Brown H.4 will, for example, give a volume of sound adequate for the average small room from any 2-valve Receiver within 15 to 20 miles from a B.B.C. Station.

Although its price is so low, the H.4 is manufactured to conform to typical Brown standards of accuracy. Its handsome symmetrical appearance and its solidity of construction bespeak the quality product. Your Dealer can show you a complete range of the new Brown Loud Speakers at prices to suit all pockets—ask him for a demonstration. Afterwards you'll agree that the superb Brown has no competitor.

The new H.4

A miniature Loud Speaker 20 inches high. Finished in a rich brown colour and fitted with standard Brown tuned reed movement. Plated fittings. Resistance of 2000 ohms—

If the Trade have difficulty in obtaining Brown Wireless Instruments they should write to us without delay.

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THROUGHOUT



Doing one thing ... and doing it well

A BASIC essential of fine craftsmanship is the whole-hearted concentration upon one special task. Those fine old craftsmen of the Middle Ages devoted their whole lives to the betterment of their craft. They possessed the right spirit.

The same understanding can be observed among the ivory carvers of Japan, the metal workers of India, and the watch-makers of Switzerland. They all carry on the traditions of their fathers for generation after generation. Truly they realise that doing one thing and doing it well inevitably spells success. Among wireless enthusiasts throughout the country the name Cossor has also been associated with the basic idea of doing one job and doing it well.

Cossor Valves are the *only* contribution to the wireless industry by A. C. Cossor, Ltd. And here again specialisation has brought success. For many years Cossor has been making valves—always experimenting, always aiming to effect

improvements. Each year has seen the standard of performance slowly—but surely—raised. Each year finds Cossor more determined to remain true to its self-imposed task.

Three years ago the research work on the Cossor hood-shaped Anode and Grid and the arched filament was completed. Its inventors were fully convinced that for increased sensitiveness, durability and tonal purity these principles possessed immense possibilities. And they resolved to concentrate upon their development.

What has happened has been wireless history. From a new valve with a sale of a few hundreds a week, the wireless industry has watched Cossor sales leap upward until today it enjoys the distinction of being by far the most popular British Valve.

Once again it has been proved that the public is always ready to recognise an honestly made article—and, once having recognised it, loyally continues its support.



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 22/6

Cossor

Popular Wireless



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Grad.I.E.E.

Assistant Technical
Editors :
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P. R. BIRD.

RADIO NOTES AND NEWS.

Increased Power Tests—Radio in the Bush—Two-Valve Results—Queer Reception—Tracing Stations—Another Record—Northolt Noises.

Increased Power Tests.

HAve you heard the new tests upon increased power which the B.B.C. engineers are carrying out? Both the Broadcasting Company and the Post Office engineers have been very reticent upon the subject, but a series of telephony tests has been arranged, using a power of ten kilowatts. Two objects are being kept in view—the possibility of increased crystal range for existing stations, and the development of a broadcasting link with the Dominions.

A "Box of Tricks."

As a means of speeding-up the programmes and smoothing-out unnecessary intervals, a new "box-of-tricks" is being installed at the London station. It takes the form of a cabinet in which the dramatic producer sits, controlling the microphones in three studios. He can switch smoothly over from one to the other, or by means of a fourth switch interpose his own voice. In this way he can announce one item, while the band which played the last is leaving one studio and the next instrumentalist is tuning-in ready to start.

Radio in the Bush.

WILL wireless conquer the Australian bush? Experimental stations are now being erected in remote parts of the Continent to link up settlers and cattle-stations with civilisation. Stations have been erected at Wavehill and Camoo-weal (Northern Territory), and it is expected that privately owned sets will co-operate with these. Such a system would spread a wireless-web over districts which at present are only served by a once-in-six-weeks' mail.

Two-Valve Results.

SINCE I mentioned the results obtained by Mr. Mayer, of Earlstown, Lanes., with a Unidyne set, I have received numbers of letters on the subject of two-

valve reception. One of these, written from Cury Vicarage, Cury, Cornwall, tells of the results obtained at Clevedon, Somerset, with an aerial only 20 ft. high, and a two-valve set (Det. and L.F., with H.T.). The writer is Mr. Lindsay F. Coursey, and his "bag" included the following: Nine main British stations and five relays, Radio-Toulouse, Petit-Parisien, Ecole Supérieure, Hamburg, Munich, Berlin, Madrid, Brussels and Oslo. In addition five unidentified stations were tuned in at one three-hour sitting, and not

Apart from the five-mile stretch of wire acting as an aerial, and an ordinary telephone receiver, there is absolutely nothing wireless about the equipment, but the programmes can be heard by anyone placing the receiver to the ear!

Music for Listeners.

THE new fortnightly publication, "Music Masterpieces"—No. 1 of which is now on sale—has come as a great boon to the broadcasting public. It is to be completed in about 30 parts, each one of which will contain five gems, chosen from the world's finest music by Mr. Percy Pitt (Music Director, Covent Garden and the B.B.C.). Handsomely produced in full music size, this collection of old and new melodies is just what listeners have been looking for.

Old Apparatus.

I HAVE pleasure in bringing the following appeal to the notice of readers who are turning out their junk boxes: "It is desired to install a wireless set in the men's clubroom connected with the United Methodist Church, Clapton. Several of the members are good mechanics and could repair obsolete or damaged apparatus that others might think useless." Any such apparatus will be gratefully received by Mr. F. Lea, 6, Ferron Road, Clapton, E.5.

Tracing Stations.

DOZENS of letters are now reaching me from readers who require my aid, or that of "P.W.," in tracing the whereabouts of stations. I know how tantalising it is to hear a new foreign station's programme without being able to tell where it is coming from; but, generally speaking, if you miss the call sign and don't know the wave-length to within one or two metres, you might just as well look for a needle in a
(Continued on page 460.)

DEVELOPMENTS IN THE "UNIDYNE."

IMPROVED CIRCUITS FOR OUR READERS.

NEXT WEEK'S NEW SERIES FOR CONSTRUCTORS.

WE are pleased to be able to announce in this issue that the inventors of the famous Unidyne, or H.T.-less method of reception, which was very favourably reported on by Sir Oliver Lodge, Senatore Marconi, and others, have evolved new circuits in connection with the Unidyne which represent a very considerable advance even on the highly satisfactory circuits originally published in this journal a year ago.

THE inventors, Messrs. Dowding and Rogers, will commence in next week's issue the first of a new series of Unidyne articles for constructors.

IN the last twelve months the popularity of the Unidyne has exceeded all expectations. Letters expressing the greatest approval of the Unidyne have been received from all parts of the world, and there is no doubt that the improved and modernised Unidyne Circuits to be published in future issues will create a widespread interest.

content with these Mr. Coursey sat up and received one American station at 3.27 a.m. ! Cornish listeners will be interested in the postscript of this letter, which says that in the writer's opinion "Reception in Cornwall is absolutely a wash-out."

Queer Reception.

A VERY queer case of freak radio reception is reported by the "New York World," which gives an account of regular long-distance programmes being received *without a wireless receiver!* For the past two years, the night-staff at Brandamore station have been hearing European programmes by listening-in at one of the ordinary railway-telephones.

NOTES AND NEWS.

(Continued from page 459.)

haystack, as try to find out who was sending a particular item. The best plan is to carefully note all the adjustments, and try again to-morrow!

2 L O's "Punch."

HAVE you noticed what a powerful "punch" 2 L O has developed recently? Occasionally signals are a little below par but, generally speaking, the Oxford Street electrons seem to be full of pep, and apparently complaints about the transmissions have fizzled right out. Daventry also is doing well these days, and I have heard plenty of appreciation of those new morning concerts.

5 X X Not to Blame.

THE Mayor of Chelmsford has been taking up the cudgels on behalf of crystal-users, and a heated controversy is now raging with regard to the broadcasting service in the Chelmsford area. Post Office representatives have called upon listeners there who complained that they could not receive Daventry on a crystal set. Exhaustive tests were made, both on the listener's crystal set and upon standard P.O. models, and the Postmaster-General says that it is either the aeriols or the receiving sets at fault and not the Daventry transmission.

A Hopeless Task.

THIS is denied by plenty of people in and around Chelmsford, who have tried everything to get good reception on a crystal from 5 X X. The most hopeful sign of the whole affair is the new attitude to wireless shown by the P.O. of late. This investigation of complaints by means of a crystal set, for instance, and the recent threat to "pirates," are welcome signs of official watchfulness over broadcasting. It is significant, too, that Lord Wolmer, Asst.-Postmaster-General, hopes to speak at the "P.W." Meeting to-morrow night, from the same platform as Sir Oliver Lodge, and Senatore Marconi!

Heterodyning 2 L O.

WHICH of the European stations has been heterodyning London lately? After several tries I gave up trying to trace the offender, but apparently there were plenty of complaints, for 2 L O's wavelength was altered to avoid the whistle. It is in such circumstances that the direction-finding apparatus which is to be installed at Keston will be useful, when the new B.B.C. station there settles down to its duties as ether-patrol.

Preventing Interference.

THE new agreement which has just been enforced by the British, Canadian and American Governments should go a long way towards preventing broadcast programmes from being interfered with by Morse from ships. It was agreed that from October 1st no merchant ship belonging to these countries should transmit messages on a wave-length between 300 and 450 metres, when within 250 miles of the coasts of Britain, Canada, or the United States.

Another 2 N M Record.

ANOTHER splendid long-distance record has fallen to 2 N M, the well-known British amateur station operated by Mr. Gerald Marcuse, of Caterham, Surrey. Mr. Marcuse tells me that at 7.25 a.m. on October 9th, he succeeded in establishing two-way communication with A 7 J B, which is a famous Tasmanian station owned by Mr. Brooks, of Hobart. This is the first time that Tasmania, or indeed any station in the Australian 7th division, has been in direct touch with an amateur in this country.

Future Tests.

THERE was a good deal of interference from other stations, but despite this Mr. Brooks was able to hear the Surrey speech perfectly. He was even able to criticise the modulation, which he said was "good." A regular schedule of future tests was fixed up on the spot, and Mr. Marcuse now hopes to talk to Tasmania more or less regularly, when he feels inclined!

SHORT WAVES.

"The 'wireless' has already become a commonplace—so soon do we make ordinary the miracles of God."—Dr. F. W. Norwood, in the "Christian World."

"The Postmaster-General trusts that any persons who have failed hitherto to take out licences will do so at once; and he thinks it right to repeat that he proposes in future to institute proceedings in cases coming to his knowledge in which wireless sets are installed or used without licences.—Extract from a recent official notice.

"The art of radio-communication is now undergoing a complete process of evolution, the effects of which are still difficult to foresee."—Senatore Marconi.

A Long Cruise.

I HEAR that Elizabeth and Blanche will leave London at the end of this month for a trip round the world, taking a wireless set to relieve the monotony of the long journey. In case you don't happen to know "Elizabeth and Blanche," perhaps I ought to explain that she is a 40-foot lifeboat, in which Captain G. E. Hitchens and four companions are setting out on a 38,000 mile voyage. The object is to demonstrate in a practical way how a lifeboat can be fitted for a long cruise without involving the crew in serious hardships, and all who remember the "Trevassa" disaster will be interested in the tests.

5 G B.

"WHO is 5 G B?" is a question that is being raised by listeners in the South of England, who have heard this station testing after hours. As signals are reported to be very strong in Essex, I think that this will prove to be one of the Marconi Co.'s experimental stations in the neighbourhood of Chelmsford. If so, it is likely that the station will disclose its own identity, as reports from listeners would be of valuable assistance in whatever tests may be conducted.

Northolt Noises.

"SOMEONE gargling," "rubbing sandpapers together," "accelerating tramway-car," and "the dying wheezes of a spent H.T. battery," are some

of the descriptions applied by listeners to the broadcast noises due to interference from the Northolt station! These descriptions were collected by the "Daily Mail," which states that Northolt has been definitely identified as the offender by wireless engineers. The Post Office engineers have already tackled a similar problem successfully at the Leaffield station, and Middlesex listeners are hoping that Northolt's noises and "mush" will be eliminated in the same way.

A Neat Retort.

THE mention of Leaffield's late misbehaviour reminds me of a neat retort, attributed to a P.O. official whose duty it was to report upon the interference caused by that station. There had been complaints because his reports were too long and detailed, so when he received the telegraphed inquiry "10.00 a.m.; how is mush?" he replied "10.05 am. Mush better." P.O. headquarters are still wondering exactly what he meant by that!

2 U A, Manchester.

EXPERIMENTERS who listen in to amateur-telephony should make a note of the correct address of 2 U A. This station is still frequently listed under its old address in North London, but the call sign has now been allotted to Mr. E. Woods, 190, Liverpool Road, Irlam, near Manchester. Listeners picking up this station will be interested to know that Mr. Woods is working on grid-control at present, and uses a motor-generator for his power supply.

Radio and the Cable.

WILL radio eventually merge with the cables to provide a cheap world-wide telegraphic service? The question is prompted by the fact that when the eleventh International Telegraphic Conference assembled at Paris recently, Senatore Marconi presided at the dinner given by the foreign wireless companies. He referred generously to the wonderful progress in wireless communication made possible by the patient work of a host of investigators and experimenters the world over. Amongst an appreciative audience of telegraph administrators there was a big sprinkling of wireless celebrities, including M. Edouard Branley, the great French radio pioneer.

Unidyne Developments.

I NOTICE an air of suppressed excitement in the technical department, which I attribute to the new Unidyne developments that are announced on the preceding page. I haven't been able to try out any of the new circuits yet, but I am getting anxious to do so, for they are evidently a great success.

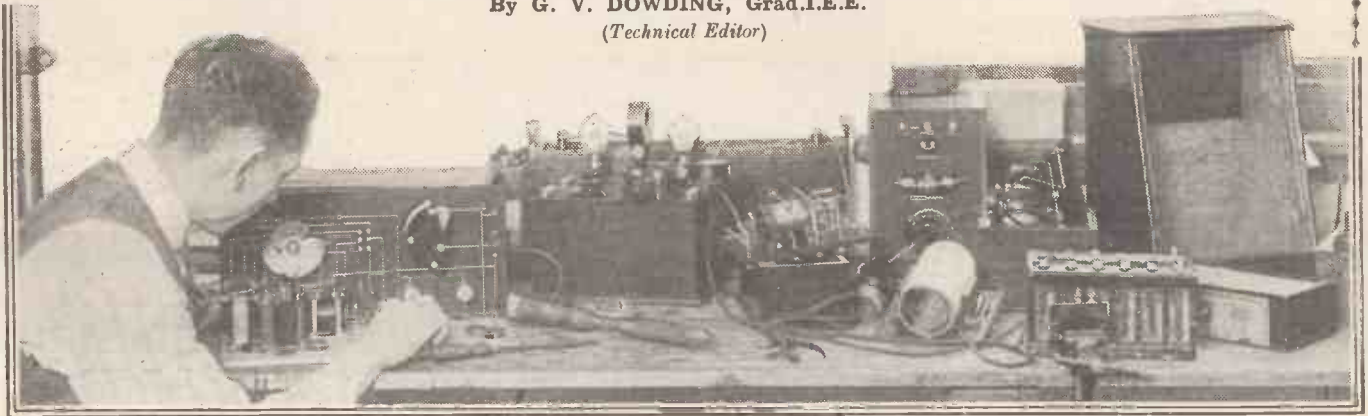
To-Morrow's Historic Gathering.

PREPARATIONS for the great Wireless Meeting at Central Hall, Westminster, are now complete. Readers will be delighted to know that in addition to Sir Oliver Lodge, Senatore Marconi will be upon the platform. He could not promise this at first, but has now notified the Editor that he will be present. "P.W.'s" audience will thus have an opportunity of seeing and hearing the greatest living pioneers of Radio—a wonderful wireless chance!

ARIEL.

THE ECONOMICAL OPERATION OF RECEIVING SETS.

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



FOR the energy that is poured into a valve set or a valve amplifier attached to a crystal set, very little is returned in the way of telephone receiver or loud-speaker "noise." The actual energy necessary to vibrate a loud-speaker diaphragm is, comparatively speaking, exceedingly small, and some thousands of times its value is purely incidental, as it were, to its production. Most of it is hardly wastage in the strictest sense of the word, because under present conditions it is quite essential that heavy current payment should be made before the necessary processes involved can be carried out.

Back to "Straight" Circuits.

Endeavours to reduce the above wastage are continually being made, but the problem is being tackled in more than one particular direction. First of all, we have the valve itself, and the development of the dull emitter is a direct and gratifying development of a radio economy crusade. At the moment of writing, (one must cover oneself these progressive days!) there are valves on the market that require only about a thirtieth of the current energy consumed by the greedy bright emitter. The ideal of the inventor is, of course, a valve that will not require any filament current at all, and strenuous efforts are being made to produce one such. Success in this direction will not be easy of attainment, but the faintly promising results achieved with "cold filament" valves of the colloidal fluid type, and the possibilities of the useful employment of some very active radium-like substance, should prove that the future holds forth hope.

Taking the use of a fair amount of energy as being unavoidable when a valve is used, other inventors have endeavoured to make the valve do more work—same wages greater output sort of idea—but broadly speaking or, rather, broadcastingly speaking, not a great deal of reward has so far been obtained. Reflex receivers, super-regenerative, and other "freak," "stunt" and "economy" receivers have proved to be excellent in very many respects, but, nevertheless, the "straight" circuit still more than holds its own. "Super-hets." and neutrodynes are not economy sets, and have never been claimed to be, and, again—

The conservation of energy is the essence of radio economics. This practical article tells you why—and how to operate your set without waste.

at the moment of writing!—it has not been proved to the writer that reflexing "super-hets." is really worth while. It must be added, however, that one valve has been more or less satisfactorily saved for the super-het. "fan" by the combining of two functions in one "stage," but even so, it is not universally agreed that a "separate oscillator" is not advisable. A well-known and most enthusiastic wireless amateur



A new German receiver which, it is claimed, is extremely selective and possesses an outstanding range of reception. It embodies, among other things, the Neutrodyne principle of stabilisation.

spent two years on the super-het. and eventually produced a superb interpretation of that excellent circuit. It gives results far superior to any other receiver I have ever operated or even heard in operation, but it employs eight valves, and is, from a super-het. point of view, eminently "straight."

A Less Obvious Fact.

All my own humble productions, "Undynes" and "Ultras," etc., have either aimed at the expenditure reduction or conservation of energy, and the same can be said of 90 per cent of radio inventions, developments and improvements, from low-loss coils to short-wave transmitters. What

of it? the reader may well ask, and, unless I get down to the real purpose of this article pretty quickly, he will not thank me for wasting space to record obvious facts; he might even accuse me of being uneconomical! Therefore, let me state a less obvious fact, less obvious, that is, to the average listener and one that is, perhaps, not very obvious to the average amateur. Practically every possessor of a valve receiving set in some way or another wastes "juice." Some waste money directly by buying "junkish" gear, but that is quite another matter, and one that has a very simple remedy.

Most Serious Wastage.

The most serious wastage of "juice" occurs when valves are run with excessive filament heat. Never, on any account, err on the side of brightness. That, above a certain point, it is sheer extravagance and dangerous to the life of a valve to increase the current supply to its filament, is a point I and others have brought forward before, but it is well worth repeating.

Again, the elimination of grid bias on a multi-valve set might not affect reproduction to a very great extent but, quite apart from aesthetic reasons,

it is not advisable if economy is the watchword. Correctly applied grid bias can reduce high-tension current expenditure.

The use of 3-volt valves with 4-volt accumulators, 2-volt valves with 4-volt accumulators, 4-volt valves with 6-volt accumulators, etc., are all most uneconomical procedures, and a careful selection of valves and battery is to be strongly recommended to the economical-minded valve man. Supposing we run a 2-volt valve, such as the Cossor "Wuncell," from a 2-volt accumulator, then less than 4 of a watt of electrical power is used, but if we employ a 4-volt accumulator '8 or so of a watt trickles away instead. Because a filament

(Continued on page 462.)

THE ECONOMICAL OPERATION OF RECEIVING SETS.

(Continued from page 461.)

resistance doesn't glow with heat like the filament of a valve, it does not mean to say that it isn't eating "juice." In a most cunningly efficient manner it is absorbing electrical power all the time, and not giving anything at all in return. The filament resistance or rheostat is the "radio vampire," an unfortunately necessary evil. A primary battery with a nicely variable output of a constant nature—variable internal resistance, or something—and a '06 valve also of an efficient and constant nature would solve the problem. But that is hardly within the scope of the average amateur or listener, although he can at least prevent a great deal of wastage by following the right valves, right batteries rule.

Careful Use of H.T.

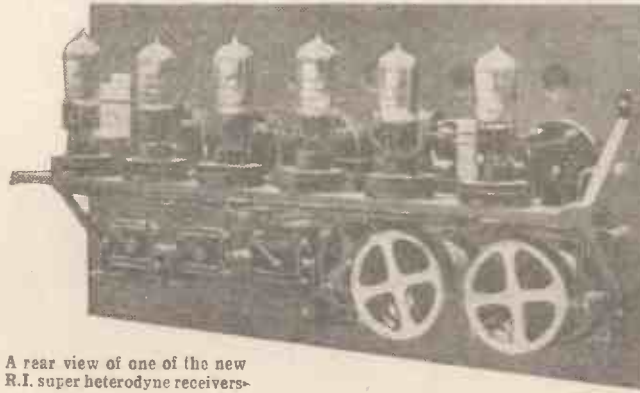
When a multi-valve set is operated with but one high-tension voltage on all its valves, and that one voltage is regulated by one common adjustment, then it can be taken for granted that here again energy is being wasted. Take a 4-valve set (H.F., det., 2 L.F.). In order to obtain comfortable loud-speaker volume under the above conditions, perhaps 75 to 100 volts are used, whereas, without doubt, the H.F. and det. valves would function more efficiently with 50 or less volts, and the 1st L.F. with 60 or so volts on their "plates." The 75-100 is only required by the last valve, and the others are being overfed by the sin of uniformity. Separate H.T. tappings is not merely a refinement, it is a distinctly economical measure.

The high-tension battery can be connected to a receiver permanently, and the set "switched off" by disconnecting the filament battery by placing the filament resistances in "off" positions, and very little wastage of H.T. current results in the case of a carefully-made set constructed with first-class materials and components. Even in such a case, however, a very minute H.T. current will always be flowing, for there is no such thing as a perfect insulator, and leakages across the best insulating materials that can be employed in the building of components and the assembly of a receiver will present paths across which current can flow even although such paths are of immensely high resistance, and the subsequent current flow can be rightly assumed to be negligible.

When Valve Sets Oscillate.

How different matters are when doubtful components and materials are employed, I have proved by measuring the resistance across the high-tension terminals of completely disconnected receivers of cheap and shoddy construction. In some cases it did not exceed the resistance across the plate and filament of a lighted valve by many thousands of ohms, thus showing that the poor H.T. battery was never off duty unless completely disconnected. Although such conditions may be most uncommon, merely as a "safety first" precaution it is always advisable to disconnect H.T. when "switching off." What is gained on the

swings must not, however, be lost on the roundabouts, and the H.T. should be disconnected last and connected first, otherwise there is a risk of causing damage repairable but expensive.



A rear view of one of the new R.I. super heterodyne receivers—

When a valve set oscillates it eats more "juice"—the remedy can be stated in three famous words, "Don't do it," for to refrain from oscillating is not only an economical but a brotherly measure.

To erect an inefficient aerial, to employ inefficient tuning circuits, etc., and to make up for lost electrons by otherwise unnecessary amplification is flagrant waste, but so is the development of distorted volume instead of subdued quality, but then some people will have the former at all costs, and that is an outstanding radio riddle!



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

An Ingenious Condenser Dial.

THE straight-line-wave-length condenser has lately been succeeded by the straight-line-frequency, as everyone knows, and the latter is rapidly finding public favour. I have already mentioned this type of condenser in these notes, and in the course of an article in this Journal; its principal characteristic is that the different stations, by order of their frequencies, are practically evenly spaced around the condenser dial.

If your set happens to be equipped with the former variety of condenser, and you wish to use the straight-line-frequency kind, you are faced with the problem of taking out the old condensers and purchasing the new ones.

But an ingenious inventor has solved the problem, if not of avoiding this expense, at any rate of reducing it, by providing a special type of geared dial, which is fitted to the ordinary condenser in place of the original dial, and which thereafter turns the plates in such a way that the condenser becomes, in effect, a straight-line-frequency one. In other words, the new dial moves equal distances or angles for equal differences of frequency, but the moving set of vanes in the condenser move in a manner appropriate to the variations of capacity required.

This new invention should prove a great boon to those who wish to use the straight-line-frequency condensers, but who do not fancy going to the expense of replacing all their existing condensers by new ones.

Descending Orders of Magnitude.

Talking about wave-lengths and frequencies, I see in looking over the latest number of "Science Progress," just to hand, a review of a book on "Radio:

Beam and Broadcast," by A. H. Morse, in which a rather amusing reference occurs to the system of modulating the carrier wave in broadcast telephony. Or, to be more correct, he is referring to the possibilities of guided broadcast or radiophone transmission, with very high frequency waves to guide the lower frequency carrier, and he paraphrases the well-known rhyme, about descending orders of magnitude in the insect world, thus:

So, Engineers observe—a wave
Hath smaller waves that on him ride,
And these have smaller waves that
ride 'em,
And so proceed *ad infinitum*,

Permanent Electrification.

A Japanese professor of physics has made a discovery which, although there would appear to be no practical use to which it could be put at the present time, is of considerable scientific interest, and may quite possibly find a use in course of time. He has found that certain substances, by special treatment, may be "permanently electrified," in much the same way that iron, or rather steel, may be permanently magnetised.

The substances which show the effect best seem to be waxes, or mixtures of waxes. These are melted in a pot and are then poured into small shallow metal dishes, and allowed to "set" under the influence of a strong electric field, of some thousands of volts per centimetre.

The mixture used in many of the experiments consisted of about equal parts of ordinary rosin and carnauba wax. The electric field is applied whilst the wax is cooling and hardening, by gradually lowering, from above the metal dish, a metal

(Continued on page 504.)

The Marcuse Short-wave Receiver



The set designed and described by **GERALD MARCUSE**.
 Constructional work carried out to Mr. Marcuse's specifications by
P. R. BIRD and K. D. ROGERS.

This set should make an especial appeal to amateurs interested in short-wave reception. It is a set similar to one used by Mr. Marcuse in his experimental laboratory at Caterham.—The Editor.

THE set to be described has been specially designed with a view to obtaining an efficient short-wave receiver that can be constructed from ordinary components. That is, the set makes use of an ordinary four-pin valve and quite normal variable condensers.

It is felt, then, that the importance of the smooth action of the condensers, especially the grid circuit condenser, cannot be over-emphasised, and too much care cannot be spent upon the adjustment of the moving vanes and their bushes.

The valve holder employed in this set is one of the many anti-capacity types on the market, and was still further reduced in internal capacity by the simple expedient of extending the saw cuts between the contacts

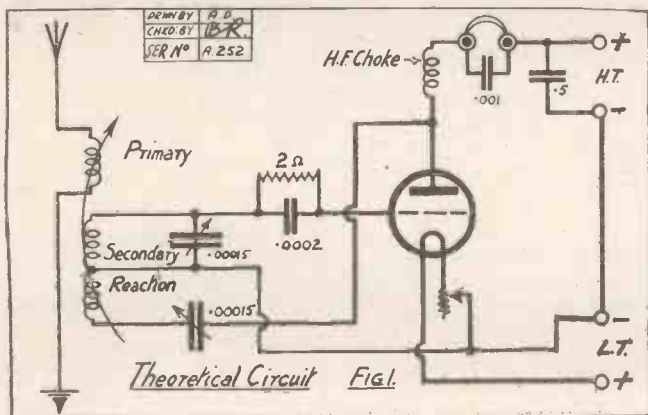
three-quarters of the way down the valve holder. Further, in order to keep the grid and plate leads as well spaced as possible, the valve holder was mounted on a wooden pillar, thus keeping grid-earth and plate-earth capacity leakage at a minimum.

It is important in the construction of short-wave receivers to keep all H.F. circuits as far from earthed objects as is practicable, and so it was decided that not only the valve holder, but the tuning coils, which are of the Reinartz type, should be mounted well above the baseboard of the set. This explains the three pillars towards the back

Mounting the Components.

The main panel consists of a sheet of ebonite 13 in. by 6½ in. thick. This was drilled according to the details given in Fig. 3, all components except the coil holder being of the single hole type. This panel was then fitted to the baseboard, which consisted of a piece of well-dried wood ¾ in. thick and measuring 7¼ in. by 12½ in.

To this baseboard, at a later stage, are fixed two side pieces of ebonite (Fig. 2), one to carry the battery terminals for the set, and the other to provide a mounting for the aerial and earth terminals and the



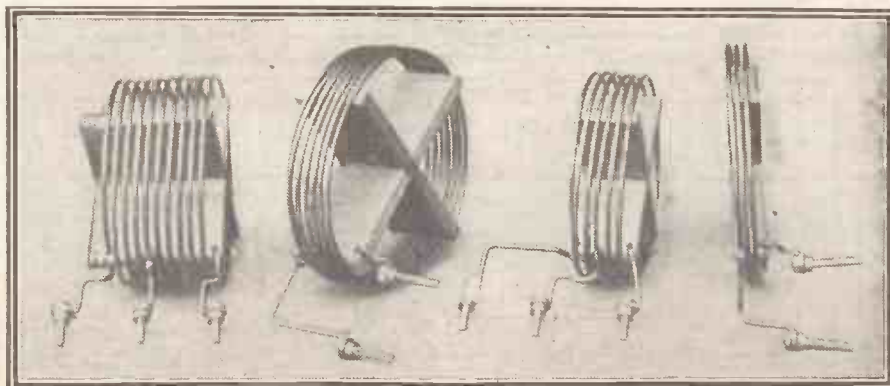
Care had to be taken in the lay-out to cut down unwanted capacity as far as possible, for it must be admitted that the condensers and the valve have not been designed for short-wave work, and all unnecessary loss must be eliminated if good results are to be obtained.

Preliminary Considerations.

It will be seen from the photographs and the list of components that the condensers are of the well-known "square law" type, and have a capacity of about .00015 mfd. each. Low-loss condensers, specially built for short-wave work, can be used if desired, but these are, of course, more expensive, and it was with the idea of keeping the cost of the receiver as low as possible that ordinary square law condensers were used.

It must be understood, however, that if these condensers are employed, anti-capacity handles will have to be used, and great care must be taken in the adjustments of the moving vanes to ensure easy and free running of the spindle without slackness—causing noisy reception—of the bush at either end. Jerky movement of the moving vanes will make tuning of weak signals very difficult, and in many cases impossible.

the valve holder, but the tuning coils, which are of the Reinartz type, should be mounted well above the baseboard of the set. This explains the three pillars towards the back



Four of the coils used with the short-wave set. Nos. 1 and 3 (reading from the left) are the 10 and 6 turn tuning coils, and the other two are aerial coupling coils.

of the baseboard, these pillars giving immunity from earth capacity leakage.

Wood has been largely employed in the construction of the receiver, because it has

aerial coil holder, which must be adjustable. The disposition of the baseboard components can be seen from the photographs

(Continued on page 464.)

THE MARCUSE SHORT-WAVE RECEIVER.
(Continued from page 463.)

and these were next mounted, the .5 condenser on the left close to the H.T. terminals and the valve holder support a little way out from the filament rheostat.

This support consisted of a piece of wooden rod, similar to curtain rod, about 4 in. long, and driven tightly into the base-board. One wood screw was used to hold the valve holder in position.

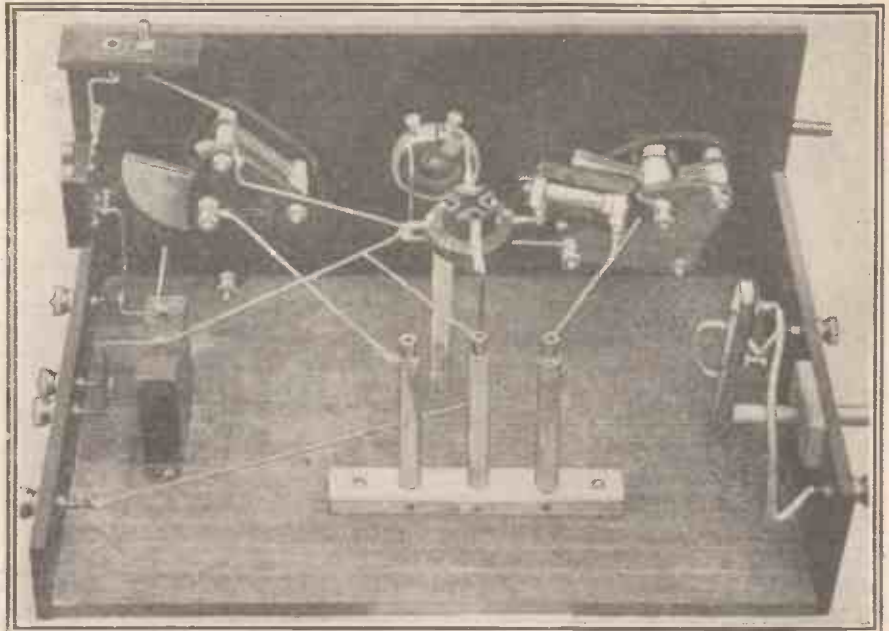
Next, the moving coil holder was constructed. This was commenced by drilling a hole $\frac{1}{2}$ in. in diameter in the larger side piece 2 in. from the rear end and $\frac{1}{4}$ in. from the top. Behind this was mounted a block of wood $1\frac{1}{2}$ in. by 1 in. by $\frac{3}{8}$ in., drilled so that its hole coincided with that in the panel.

Through this hole a piece of rod, of the same diameter as that used for the valve support, with a wooden handle on one end and about 5 in. long, was passed, and on the end of this was driven and then screwed a strip of wood $3\frac{1}{2}$ in. long by $\frac{1}{4}$ in. wide and $\frac{1}{4}$ in. thick.

This was drilled to take two valve sockets spaced $1\frac{1}{2}$ in. apart. The coil handle has to be a close fit in the panel and supporting block, but not so tight as to make the action of turning too stiff. This holder is only used for rough variations of coupling—fine adjustment is not necessary.

Constructing the Coils.

The main coil supports were then constructed from three pieces of wood rod mounted $1\frac{1}{2}$ in. apart (centre to centre) on a wooden base and fixed by a wood screw at the base of each. This wooden block was then mounted on the baseboard in such a position that the three pillars are in line with the moving coil holder handle, their height being adjusted so that the coils when coupled were concentric. Actually the height above the wooden base, which was



This photograph clearly shows the various connections in the short-wave receiver. Note the direct leads and the spacing between components.

$\frac{7}{16}$ in. thick, was 3 in., and to this must be added $\frac{1}{2}$ in. to the tops of the valve sockets which are screwed into the tops of the pillars. These holders are cut down, to reduce capacity losses, to $\frac{1}{2}$ in., so that the height of the supports including wooden base (not the baseboard) was $3\frac{1}{16}$ in.

The next task was to wire up the receiver, using 14 gauge bare (not tinned) copper wire. The diagram shown in Fig. 4 and the photographs give full details of the connections, so that there should be no difficulty in following the actual paths of the wires used in the original set.

All connections were taken as direct as possible, and were well spaced. All joints were firmly soldered, as little flux as possible being used.

After this the construction of the coils was carried out. Of these five were made,

using the 14 gauge wire. Three of the coils were for grid tuning and reaction (the Reinartz method being employed) and the other two for aerial coupling. The smaller

POINT-TO-POINT CONNECTIONS OF THE SHORT-WAVE ONE-VALVE SET.

Aerial and earth terminals joined to the top and bottom sockets of the primary coil holder respectively (by means of flexible wire).

Moving vanes of the secondary .0001 mfd. variable condenser to one side of the grid leak and condenser and to the outside secondary socket (holding the combined secondary and reaction coil).

Other side of the grid leak and condenser to the grid socket of the valve holder.

Filament socket of the valve holder nearest the back of the baseboard to the + L.T. terminal.

- H.T. terminal to the - L.T. terminal, to one tag of the .5 mfd. fixed condenser, to one side of the filament rheostat and to the fixed vanes of the .0001 mfd. secondary variable condenser.

Centre secondary and reaction socket to the - L.T. lead.

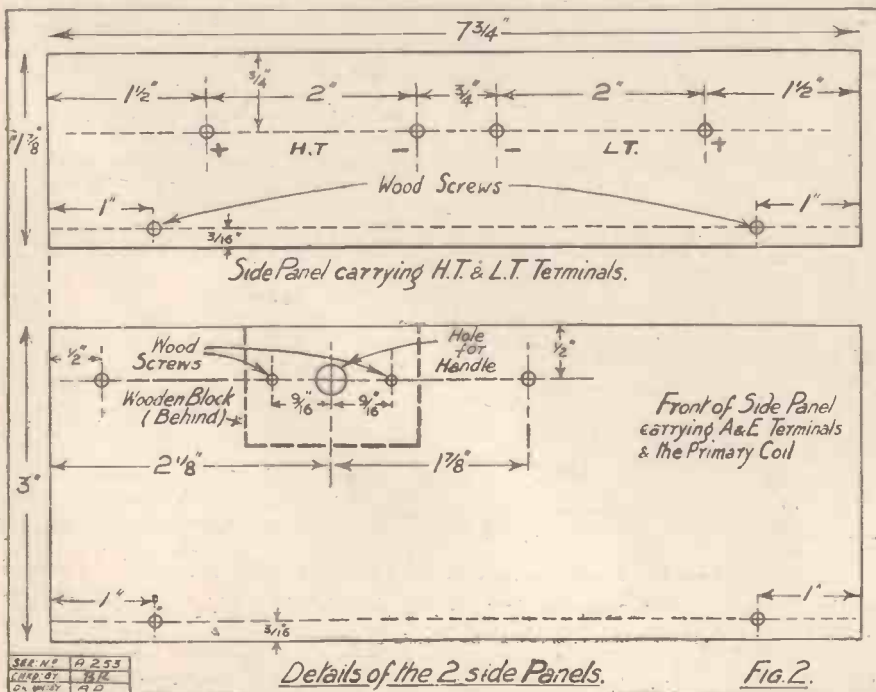
Outside reaction socket to the moving vanes of the reaction .0001 mfd. variable condenser.

Plate socket of the valve holder to the fixed vanes of the reaction .0001 mfd. variable condenser and to the plug side of the choke coil holder.

Socket side of the choke coil holder to the top 'phone terminal. Bottom 'phone terminal to the + H.T. terminal and to the remaining side of the .5 mfd. fixed condenser.

A .001 mfd. fixed condenser is connected across the 'phone terminals.

Remaining filament socket of the valve holder to the remaining side of the filament rheostat.



Details of the 2 side Panels.

FIG. 2.

of these latter consisted of three turns wound round a 3 in. cardboard former, and then sprung off and forced on to a wooden former shaped as shown in the photographs, and grooved with three grooves, the diameter of the wire apart.

(Continued on page 465.)

THE MARCUSE SHORT-WAVE RECEIVER.

(Continued from page 464.)

In all, five formers, or rather supports, were needed, one for each coil, and these were constructed from $\frac{1}{4}$ in. wood, the width being decided by the size of the coil

COMPONENTS REQUIRED FOR THE SHORT-WAVE ONE-VALVE SET.

	s.	d.
2 .0001 mfd. variable condensers with extension handles	10	0
1 filament rheostat (Precision 30 ohms)	3	0
1 .5 mfd. fixed condenser (T.C.C.)	3	0
1 .001 mfd. fixed condenser (Dubilier)	3	0
8 terminals, W.O. type	1	0
1 ebonite panel 13 in. x 6 1/2 in. x 1/4 in. (Peto-Scott)	5	0
1 wooden baseboard 12 1/2 in. x 7 1/2 in. x 3/8 in.	1	0
2 valve sockets (countersunk type) (Peto-Scott)	0	3
2 ft. 1/2 in. diameter wooden rod	0	6
1 low-loss valve holder	0	6
1 grid leak and condenser (Dubilier), .0002 and 2 ohms	5	0
1 lb. coil of No. 14 gauge copper wire	2	0
1 coil holder plug and socket	0	6
1 ebonite panel 7 1/4 in. x 3 in. x 1/4 in. approx.	1	6
1 ebonite panel 7 1/4 in. x 1 1/2 in. x 1/4 in. approx.	1	0

required. Two pieces of wood 3 in. long of the required width and thickness were

used for each holder; these were slotted half-way across in the centre of each strip so that they could be dovetailed together to form a cross. The photograph on the first page shows the coils very clearly.

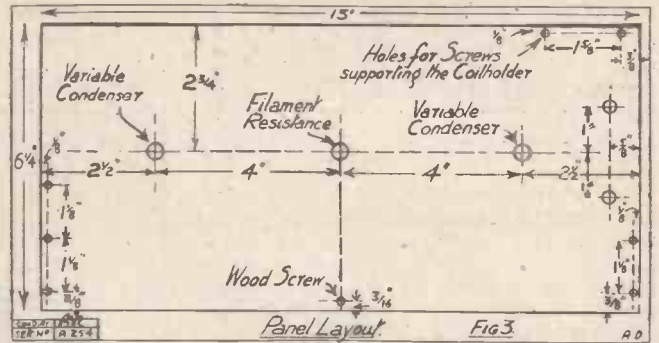
The ends of the two aerial coils, one of three turns and one of seven turns, were brought out to two valve pins and bent

so that they could be plugged into the two sockets on the moving holder. These sockets were then connected to the aerial and earth terminals by two pieces of flex.

The main coils were next made, utilising the same type, and the three coils needed for wave-lengths of from 15 metres to 50 metres or so were of 6, 10 and 18 turns total.

Finding a Suitable Valve.

The word total is used because these coils are tapped near the centre to allow one end to be used as reaction and the other as secondary. It will have been noticed that the grid tuning condenser is connected across the two left-hand sockets on the three pillars, thus tuning only one section of the coil. The six-turn coil is tapped at every three turns, giving a three-turn grid coil and a three-turn reaction. Thus three "ends" were left, the two normal ends and the centre "end" or tapping, and to these were soldered three valve pins, the wires being arranged so that the coil would plug into the three sockets mounted on the wooden supports. The other two coils were tapped at 4 and 9 respectively.



The one tapped at 4 serves a double purpose, for it can be used either way round, giving either a 4-turn grid or a 5-turn grid with a 5-turn or 4-turn reaction respectively.

The following table gives the exact sizes of formers used on the set, whose photographs appear with this article.

Aerial coils	{	3 in. x 1/2 in. x 1/4 in.	3 turns
		3 in. x 1 1/4 in. x 1/4 in.	7 turns
		3 in. x 1 in. x 1/4 in.	6 turns
Grid coils	{	3 in. x 1 1/2 in. x 1/4 in.	10 turns
		3 in. x 3 1/2 in. x 1/4 in.	18 turns

On test the receiver worked exceedingly well, using a 30-turn Lissenagon coil as choke in the coil socket at the back of the panel, and a D.E.II. Cosmos valve as detector. Silent operation was a noticeable feature and the oscillation control was extremely smooth, the valve sliding in and out noiselessly and without lag. A 2-megohm grid leak was used, but this is not very critical, and finally the set was tried with success without grid leak or condenser, though the presence of a grid leak of 4 megohms gave the most silent background.

The best value for this leak has to be found by experiment, and depends upon the actual valve used, so that readers who construct this set should try different values after they have chosen the valve they will use.

Besides the D.E.II. several other valves were tried, the H.F. Cossor Wuncell doing very well, though being a trifle noisy in operation. The valve shown in the photographs also gave good results, being a 4-volt C.A.C. bright emitter. On the whole, the D.E.II. proved the most satisfactory, even beating a D.E. 5b on the actual receiver under test. Other sets will probably have different peculiarities, and all readers who make this set are advised to try as many different valves as possible before making their final choice.

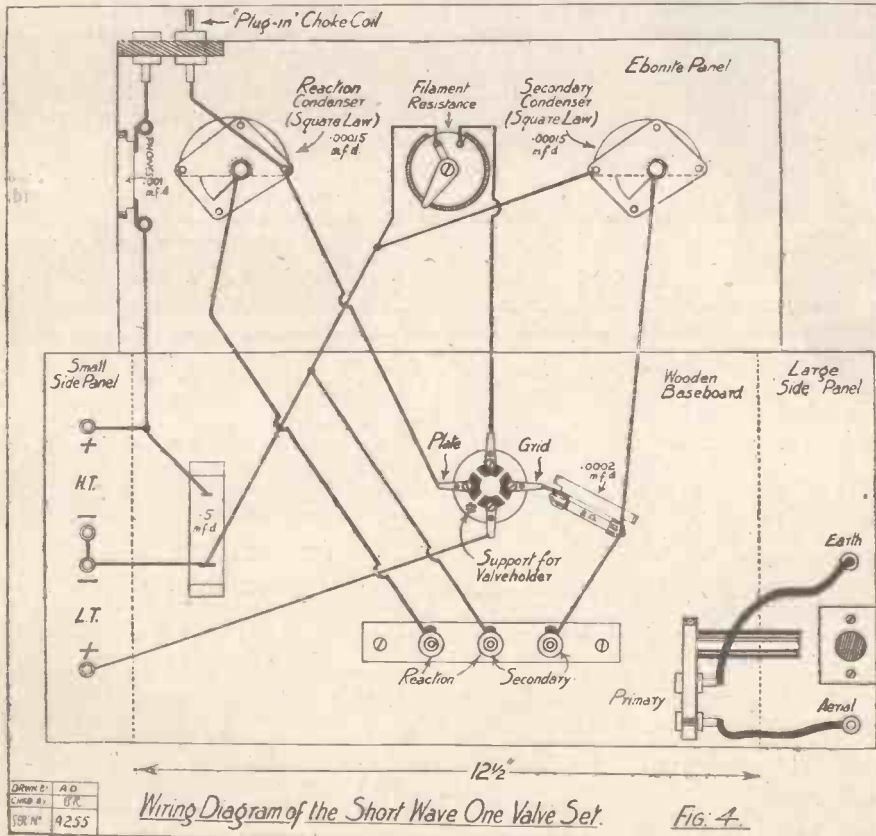
Low H.T. Voltage.

The H.T. voltage used for maximum results was 33 volts, the filament of the valve being a little below maximum brightness. Oscillation was easily controlled by the right-hand condenser, while wave-length variation was carried out by the left-hand condenser.

The maximum wave-length, with the largest coil in position, was just over 50 metres, and the minimum with smallest coil approximately 15 metres. Oscillation was smooth and easily maintained all over that range, though below 25 metres more than 3/4 to 1 of the condenser was found to be necessary.

With the largest coil in use the 7-turn aerial coil can be employed, coupling being

(Continued on page 466.)



Wiring Diagram of the Short Wave One Valve Set.

FIG. 4.

Drawn by: A.D.
Circuit by: G.R.
SER. No: 4255

THE MARCUSE SHORT-WAVE RECEIVER.

(Continued from page 465.)

about 2 in. For the other two tuning coils the 3-turn aerial was used.

Many stations have been heard on the set, including a large number of American amateurs both on 45 and 20-25 metres. An ordinary L.F. amplifier can be added if desired, using the same batteries, and this in conjunction with the one-valve short-wave receiver makes a very efficient set.

Critical Tuning.

As regards aerials almost any small type will do. If vertical or nearly so, so much the better, but indoor aerials have been used with success. The water-pipe or direct earth can be employed, or a counterpoise can be used. As the aerial is untuned, no difficulty in picking up stations should be encountered on the large coil between 8 p.m. and 2 a.m. or later, and on the smaller coils at dawn or sunset. At these latter periods Australia and New Zealand amateurs (call sign prefixes A and Z respectively) can also be heard when the largest coil is in use.

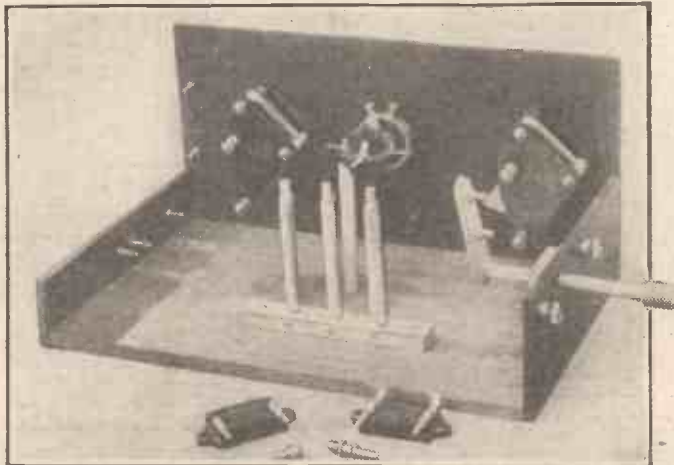
Real "DX" results will not come at once, for tuning is always critical, and until this is mastered many a weak station may be passed

valves, in fact, it is frequently disadvantageous, though as it is an easy matter to arrange it should always be tried.

One word of warning with regard to handling the set should be mentioned here.

of storm afterwards, if desired, but for short-wave work you cannot have it too taut. The next step is to try a shorter aerial. Fifty feet in length is ample, and the horizontal portion should be as small as possible. It has been found in many cases that an aerial tending towards the vertical for the whole of its length is best.

In other words, the aerial would consist of one long lead-in and no horizontal portion at all. This has been found to cut down fading due to aerial sway to a minimum, and even in a fierce storm and with a moderately slack aerial the fading is not troublesome—not sufficient to throw the set in



The short-wave receiver partly constructed. The fixed condensers, grid leak, and choke coil holder have yet to be mounted.

Do NOT OSCILLATE VIOLENTLY. A set is best suited to receive C.W. when it is just oscillating, and if you oscillate violently you only pass over weak signals. Above all, do not swish your condensers while you are oscillating; think of the other fellow. Nothing is more annoying when listening to weak signals than to have someone continually swishing over your carrier. The writer has had reception of American signals completely spoiled by someone swishing condensers about and heterodyning his carrier.

and out of oscillation when near the oscillation point, as is so often done when a horizontal aerial commences to swing.

The earth requires attention also, and the stability and ease of control of the set may depend largely on the earth connection. Gas pipe and similar "earths" should be avoided, and the reader is advised to get right down to the buried earth, 3 ft. or so deep if possible. One of those earth-pins now on the market will be very useful. Failing the direct earth, a main water-pipe should be used, but hot-water pipes and those that go round the house before reaching earth will probably lead to noisy reception due to poor joints in the piping.

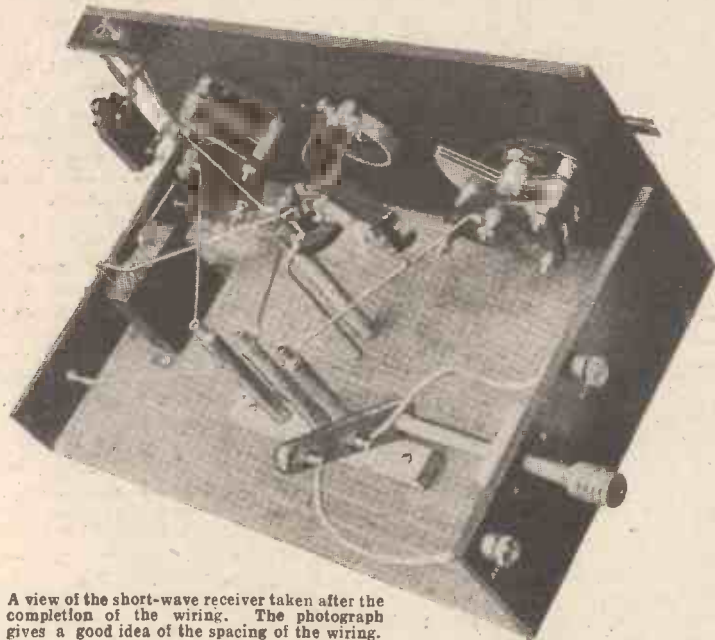
Various sizes of choke coils should be tried in the set, but it will probably be found that larger coils than 75 turns will cause a whistle in the 'phones when the oscillation point is reached. Too much H.T. voltage will have the same effect, and as low a voltage as is consistent with easy and smooth oscillation should be employed.

Low-Capacity Choke.

For those who prefer to wind their own choke about 50 turns of 30-gauge enamelled wire wound slightly spaced upon a 2-in. low-loss former.

With regard to the oscillation control, it was found essential to have both the 'phone condenser and the large one of 1 mfd. across the high-tension terminals. Without these the oscillation was decidedly patchy and it was difficult to make the change from non-oscillation to oscillation smooth; there was a tendency for the circuit to go into oscillation with a "plop" instead of silently. Furthermore, there was a distinct lag when reaction was decreased, the oscillation point being shifted back along the condenser scale about three or five degrees. This is fatal to good reception, and no lag at all must be present if long distance reception of weak signals is to be accomplished. For good operation keep the valve just oscillating, or weak signals will be swamped by the strength of the impulses generated by the valve itself, the grid becoming insensitive to extremely small voltage variations.

(Continued on page 469.)



A view of the short-wave receiver taken after the completion of the wiring. The photograph gives a good idea of the spacing of the wiring.

over unheard, but after some practice it should be easy to log a large number of stations (C.W., of course) during the hours of darkness. The set is not constructed for telephony reception, though this can be carried out on it, but readers will find it even more difficult to tune-in than C.W. and are advised not to expect telephony reception until they are thoroughly conversant with the handling of the receiver.

In the case of some valves it is worth while trying the receiver without either grid leak or condenser and excellent results have been obtained without these components when the set under consideration was tested. It is a matter for individual trial and the removal of the grid leak and condenser does not by any means suit all

valve or a wrong high-tension voltage is being used.

Reverting to the aerial system, it has been remarked that almost any small type will do. This is true, but for serious work it is worth while experimenting a little with the aerial-earth system. Various types and sizes should be tried in order to minimise the "fading" which so often characterises reception on the higher frequencies. A very great deal of this fading can be traced to the swaying of the aerial, or of a tree near the aerial, especially if this latter has a long horizontal portion, or if the down-lead is slack and passes fairly near the gutter of the roof or even the wall of the house.

The first step, then, is to make the aerial taut; it can be slackened off a little in case

READ THESE LETTERS. THE GIFT OF TONGUES.

By

ANTHONY SOMERS.

The following letters are typical of the thousands received from men and women who have learnt French, Italian, Spanish or German by the New Pelman method.

MONTHS EQUAL YEARS.

I have managed, during the past few months, to obtain a better knowledge of colloquial and idiomatic French than I acquired in three years at school. (C. 146)

EIGHT MONTHS EQUAL TO EIGHT YEARS.

This is the easiest and quickest way of learning foreign languages. I was not able to study very regularly, but in the space of EIGHT MONTHS I have learnt as much Spanish as I learnt French in EIGHT YEARS at school. (S.K. 119)

FOUR MONTHS EQUAL FOUR YEARS.

I am delighted with the progress I have made. I have learned more French this last FOUR MONTHS than I did before in FOUR YEARS. I enjoyed the Course thoroughly. (W. 149)

RESULT OF EIGHT WEEKS' STUDY.

I was invited lately to meet a Spanish lady . . . she was filled with genuine surprise and admiration at the amount I had learnt in EIGHT WEEKS. I do most of it in omnibuses and at meals. (S.H. 219)

FRENCH LEARNT IN SIX MONTHS.

After several years' drudgery at school I found myself with scarcely any knowledge of the French language, and certainly without any ability to use the language. I realise now that the method was wrong. After about SIX MONTHS' study by the Pelman method I find I have practically mastered the language. (B. 143)

SPANISH IN SIX MONTHS.

I am very satisfied with the progress I have made. I can read and speak with ease, though it is LESS THAN SIX MONTHS since I began to study Spanish. All the lessons have interested me very much. (S.M. 181)

ASTONISHING PROGRESS.

I am more than satisfied with the progress I have made—I am astonished! It would have taken me AS MANY YEARS to learn by any ordinary system as much as I have learnt in SIX MONTHS by yours. (P. 145)

ONE THIRD THE USUAL TIME.

I have learnt more and better French in the last FOUR MONTHS than previously I had learnt in THRICE THAT PERIOD. (M. 241)

Further letters describing the merits of the new method will be found in the particulars which will be sent free to everyone who uses the Coupon printed on this page to-day.

I have discovered a remarkable method of learning Foreign Languages, a method for which I have been looking all my life. I only wish I had known of it before: what toil, what drudgery, what disappointment I should have been saved!

It has sometimes been said that the British people do not possess the "gift of tongues." Certainly I never possessed that gift. At school I was hopeless. When the subject was French or German, Latin or Greek, I was always somewhere near the bottom of my form. And yet in other subjects—English or History or Mathematics—I held my own quite well. I have now come to the conclusion—my recent experience has convinced me of this—that the reason I failed to learn languages was that the method of teaching was wrong.

Now, although I never could "get on" with Foreign Languages, I have always wanted to know them—especially French. I have wanted to read the great French authors in the original. I have wanted to read Racine and Victor Hugo and Balzac, and that great critic whom Matthew Arnold so much admired, Sainte Beuve, in French, and not merely through the medium of a characterless translation. Besides, I have wanted to spend holidays abroad without being tied to a phrase-book. And so I have often tried to find a method which would really teach me a Foreign Language. And at last I have found it.

How to Learn Languages.

Some time ago I saw an announcement entitled "A New Method of Learning Languages." Of course, I read it, and when I saw that this method was being taught by the well-known Pelman Institute, I wrote for their book, and this so interested me that I enrolled for the Course in FRENCH. Frankly, it has amazed me. Here is the method I have wanted all my life. It is quite unlike anything I have seen or heard of before, and its simplicity and effectiveness are almost startling.

Consider, for example, this question with which the book (which, by the way, can be obtained free of charge) opens.

"Do you think you could pick up a book of 400 pages, written in a language of which you do not know a syllable—say, Spanish, Italian, German or French—and *hôt* containing a single English word, and read it through correctly without referring to a dictionary?"

Most people will say that such a thing is impossible. Yet this is just what the Pelman method of language instruction enables one to do, and so remarkable is this method that I shall be greatly surprised if it doesn't revolutionise the normal method of teaching languages in this and other countries.

The Pelman Language Courses are based upon an original yet perfectly sound principle, and one of

their most striking features is the fact that they are written entirely in the particular language (French, Spanish, Italian or German) concerned. There is not an English word in any of them. Even if you do not know the meaning of a single Foreign word you can study these Courses with ease, and read the lessons without a mistake, and without "looking-up" any words in a French-English, Spanish-English, Italian-English or German-English dictionary. This statement seems an incredible one, yet it is perfectly true, as you will see for yourself when you take the first lesson.

Grammatical Difficulties Overcome.

Another important fact about this new method is that it enables one to read, write, and speak French, Spanish, Italian or German without bothering one's head with complex grammatical rules, or burdening one's memory with the task of learning by heart long vocabularies of Foreign words. And yet, when the student has completed one of the Courses, he or she is able to read Foreign books and newspapers and to write and speak the particular language in question accurately and grammatically, and without that hesitation which comes when a Foreign Language is acquired through the medium of English.

The Pelman method of learning French, Italian, Spanish or German by correspondence is fully explained in four little books (one for each language), and I strongly advise those who are interested, to write for a free copy of one of these books to-day.



Everyone who wishes to learn FRENCH, SPANISH, ITALIAN or GERMAN without difficulty or drudgery should post this Coupon to-day to the Pelman Institute (Languages Dept.), 97, Pelman House, Bloomsbury Street, London, W.C.1. A copy of the particular book desired will be forwarded by return gratis and post-free.

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To the PELMAN INSTITUTE (Languages Dept.)
97, Pelman House, Bloomsbury Street, London, W.C.1.

Please send me a free copy of "HOW TO LEARN SPANISH"—
"HOW TO LEARN GERMAN"—"HOW TO LEARN SPANISH"
—"HOW TO LEARN ITALIAN" (cross out three of these),
together with full particulars of the New Pelman Method of
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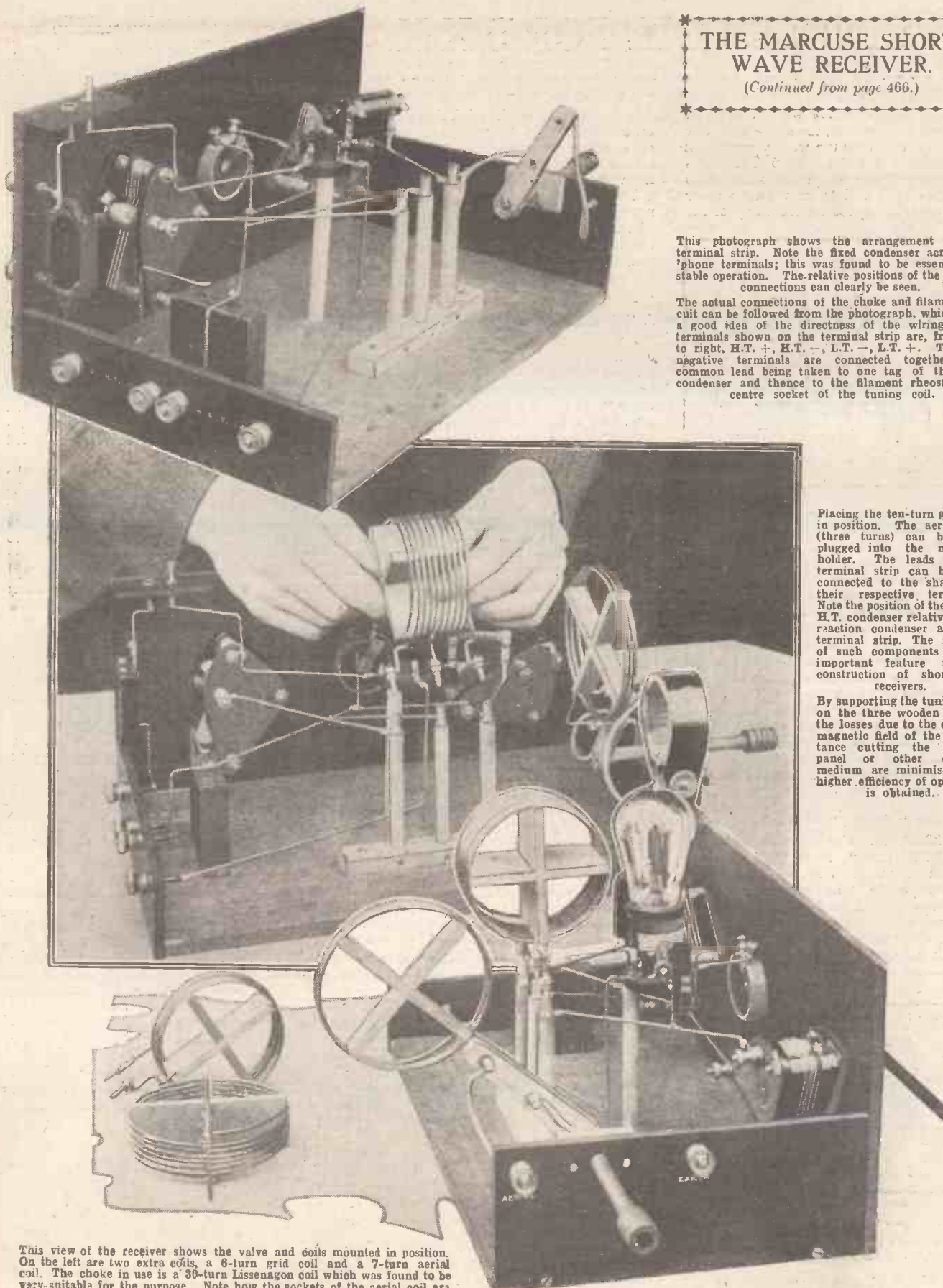
(Continued from page 466.)

This photograph shows the arrangement of the terminal strip. Note the fixed condenser across the 'phone terminals; this was found to be essential for stable operation. The relative positions of the various connections can clearly be seen.

The actual connections of the choke and filament circuit can be followed from the photograph, which gives a good idea of the directness of the wiring. The terminals shown on the terminal strip are, from left to right, H.T. +, H.T. -, L.T. -, L.T. +. The two negative terminals are connected together, the common lead being taken to one tag of the mfd. condenser and thence to the filament rheostat and centre socket of the tuning coil.

Placing the ten-turn grid coil in position. The aerial coil (three turns) can be seen plugged into the movable holder. The leads to the terminal strip can be seen connected to the shanks of their respective terminals. Note the position of the 1 mfd. H.T. condenser relative to the reaction condenser and the terminal strip. The spacing of such components is an important feature in the construction of short-wave receivers.

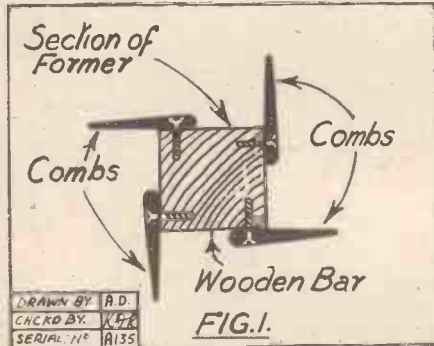
By supporting the tuning coil on the three wooden pillars the losses due to the electromagnetic field of the inductance cutting the ebonite panel or other earthed medium are minimised and higher efficiency of operation is obtained.



This view of the receiver shows the valve and coils mounted in position. On the left are two extra coils, a 6-turn grid coil and a 7-turn aerial coil. The choke in use is a 30-turn Lissenagon coil which was found to be very suitable for the purpose. Note how the sockets of the aerial coil are arranged on the moving arm of the coil control.

A SINGLE COIL FOR 5 X X.

AFTER experimenting with all sorts of coils and formers, the writer has lately made a coil for use with a crystal set at a distance of 90 miles from 5 X X which is so effective and simple that he hopes particulars of it will be of value to other crystal-users living too far from any of the

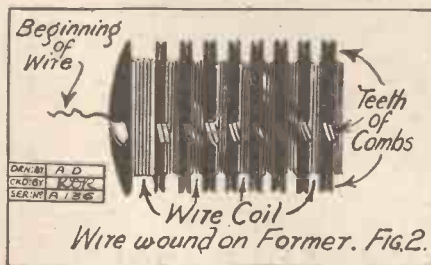


other B.B.C. stations, and therefore only able to "tune" in to Daventry.

The former is made of four threepenny hair combs. These are made of celluloid or some similar substance, and are just under 7 in. in length, having 48 teeth, the latter being of the same size along the whole comb. The four combs are mounted on a square-sided bar of wood $\frac{3}{4}$ in. thick, so that the teeth project over the edges of the bar, as in the sectional drawing (Fig. 1). The material of which the combs are made can easily be drilled for the purpose of taking small countersunk screws. Care should be taken that the base of the teeth is about $\frac{1}{8}$ th of an inch clear of the wood, so that when the wire is wound it clears the wood entirely.

Eliminating "Tuning."

No. 22 D.C.C. wire was used, and 12 ounces of it is sufficient to make the coil, which, in the writer's case, was intended to be wound for a "no-control" set, and therefore to require no "tuning." Starting at the space between the first pair of teeth, about 20 turns were wound in the first slots, then the wire was brought to the space between the third and fourth teeth



(one space, it will be seen, being missed in order to leave two teeth between each set of turns for strengthening purposes), and a similar number of turns wound in the slots, and so on (Fig. 2).

Two teeth were thus left between each set of turns (on each comb), which had the effect of giving additional strength to the former, and of leaving the turns well spaced from their neighbours.

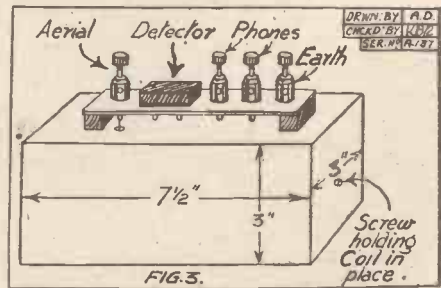
When the end of the 12 ounces of wire was nearly reached, care was taken that only 10 turns were wound between the teeth for the last three or four sets of slots, in order that the coil might be calibrated, or tested, for the particular aerial for which it was required.

A "Trial and Error" Method.

For this purpose the outside turn of wire on the last three "slots" had a small portion scraped clear of the cotton, and whilst the beginning of the coil was joined to the aerial terminal of the set the other end was left free, and a loose bit of wire was fixed to the earth terminal, the other end of the loose wire having a darning needle threaded on to it. This darning needle was brought into contact with the end of the coil, and with each of the bared portions of wire in turn, until the point was found at which signals were strongest. In the author's case it turned out that the coil of 12 ounces was

exactly right, and all that was needed was to mount the coil in a small box and the terminals on a strip of fibre or ebonite on the top, as in Fig. 3.

The case measured $7\frac{1}{2}$ in. by 3 in. by 3 in., which is remarkably neat and compact,



and nothing is required but to join up to the aerial and earth, put on the 'phones, and listen in.

Needless to say, no cat's-whisker is used, the author preferring one of the modern "permanent detectors," such as an R.I. P.M., which is unique in its unobtrusiveness and as efficient as any other fixed detector.

Note that only 20 slots are used in the author's coil out of the 24 possible on the combs; but it is, of course, only a matter of winding a less number of turns in each slot for the whole of the slots available to be utilised, for the sake of symmetry.

NOTES ON THE CARE OF INSULATORS.

THE insulating materials in a wireless set are chosen for their special fitness for the various places in which they are to be used. For example, it is customary to use hard-rubber or ebonite for the panels, although in America bakelite is much more commonly used than here. Ebonite, besides being a good insulator and making a nice finish to the set, also is easy to drill and work, has a low surface-leakage, and does not, by its dielectric constant, introduce any serious losses into the set.

An Important Place.

For the formers of rheostats, ebonite is not always suitable, owing to the fact that it softens at a comparatively low temperature. In the cheaper rheostats, even ebonite is not used, the "former" being made from some cheap composition which softens at a very low temperature. Dials are sometimes made from ebonite, sometimes from celluloid. Here, however, it is a matter of little importance what material is chosen, appearance being the main consideration.

Another important place for the insulating material is in the aerial. Here not only electrical resistivity of the ordinary kind is demanded, but also the aerial insulator

must be mechanically strong in order to withstand the strains to which it is constantly being subjected; it must also have a surface which does not rapidly accumulate dirt, it must not have an undue tendency to condense moisture on its surface, and it must not be attacked by the elements to which it is exposed. Glass, porcelain, ebonite and bakelite are the materials commonly used for aerial insulators.

The aerial insulators require to be cleaned at intervals of every three to six months. A simple way to obviate the need for this cleaning, however, which has lately been introduced, is to fit the "Wind-insulator," which is an insulator with a tiny wind-driven rotor which is continually rotating and so wiping off the dirt which tends to accumulate on the insulator stems.

NEXT WEEK:

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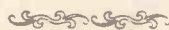
GREAT "P.W." WIRELESS MEETING?

AT THE

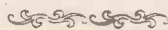
CENTRAL HALL, WESTMINSTER

TO-MORROW NIGHT AT 7.30 P.M.

(Friday, October 23rd.)



Seats can be booked at the Hall To-morrow Night at 3/6, 2/4 and 1/2 (including Tax), or by application to "R.G.T.," c/o "Popular Wireless," Fleetway House, Farringdon St., E.C.4, not later than 3 p.m., October 23rd.



Speakers at the Meeting include :

Sir OLIVER LODGE, D.Sc., LL.D., F.R.S.

(Scientific Adviser to "Popular Wireless").

Lt.-Comdr. The Hon. J. M. KENWORTHY, R.N., M.P.
(Vice-President, The Radio Association).

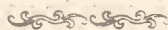
Major RAYMOND PHILLIPS, I.O.M.
(The Well-known Authority on Wireless Control).

Captain P. P. ECKERSLEY, M.I.E.E.
(Chief Engineer, The B.B.C.).

GERALD MARCUSE, Esq.
(The Famous British Amateur).

Mr. J. C. W. REITH, M.Sc. *(Managing Director of the B.B.C.),* will be present to give away the First and Second Prizes for our Great "RADIO SOUNDS" Competition, and Viscount WOLMER, M.P. *(Assistant Postmaster General),* will also deliver a short address of interest to all listeners.

SENATORE MARCONI HAS NOW DEFINITELY PROMISED TO SPEAK AT THE MEETING.



Don't fail to come to the Central Hall on Friday Night. Bring your friends and enjoy the greatest wireless meeting ever organised in this country.

WRITING just before the broadcasting of the "P.W." "Radio Sounds" competition, it is too early to state how many thousands of listeners entered, and how many were successful in detecting all the sounds—if any!

But there is no doubt that this competition has aroused extraordinary interest throughout the country. From the very outset the B.B.C. gave the competition its unqualified support, and I know for a fact that Captain Eckersley and his technical staff were intensely interested in the potential value of this undoubtedly unique effort to assist the B.B.C.

Over 2,500 letters were received at the B.B.C. offices before the date of the competition, and all these letters expressed approval of the idea; ordinary listeners are very much interested in radio effects, and there can be no doubt that the field for improvement in this direction is very vast.

With the spoken word or the singing of a song or the broadcasting of music, there is comparatively little difficulty, but it is another matter when it is a case of more or less inarticulate sounds.

Before next week I shall have more information about the competition and the evidence produced for the B.B.C., and I shall, I hope, be able to place some interesting facts before my readers.

Better Preachers Wanted.

On the whole, the B.B.C. Sunday programmes have been good, and have shown steady improvement. A successful attempt has been made to balance the various denominations so that none is left out in the cold. But I am not sure that this even balancing of denominations is really a wise policy for the future. I am glad to hear, therefore, that, at least so far as London is concerned, the Religious Advisory Committee has sanctioned a change in the principle of selection. While the balancing of denominations is not to be entirely ignored, it is definitely to take second place to personal considerations.

In other words, broadcast preachers are to be chosen primarily on their individual merits and not because of their sectarian allegiance. The adoption of this new principle will make possible a much-needed weeding out of "dud" broadcast preachers.

Experience proves that success in the pulpit is no criterion of success before the microphone. Several of the best preachers in the country are complete "wash-outs" in the studio. Anyway, we shall have much better broadcast services in the future. I hope, too, that when the B.B.C. does find the best half-dozen broadcast preachers it will use them frequently, and not trouble over-much in breaking new ground.

By the way, it is a sign of the importance the B.B.C. attaches to their Sunday services that they have started publishing extracts from sermons in their official organ. The possibility of publication should provide a further stimulus to the divines who brave the ether.

Armistice Service Disappointment.

I hear the Home Secretary has again declined to permit the broadcasting of the Armistice Day service at the Cenotaph. But he has left the matter open for discussion, which means, I suppose, that he

BROADCAST NOTES.

By O. H. M.

Broadcasts Against Communism?—Sunday Programmes—The Armistice Day Service—Emotional Broadcasting—The Fuss About Relay Stations—Broadcasting in India.

will change his mind before next year. I do not profess to know on what grounds this decision is taken.

It would seem a pity that the vast army of listeners should be debarred from participation in what is the most touching religious ceremonial of the year. There are those who perhaps would regard broadcasting such a service as profane. This may be the official view.

Anyway, it is comforting to hear that the B.B.C. will broadcast a special Armistice Day service of its own at 11 o'clock on November 11th. This will be appropriately simple. Details are reserved.

Improvement in Broadcasting.

Do the B.B.C. programmes require more emotional handling? This perennial problem has again come to the fore with the advance of the new season. There is, undoubtedly, a considerable and a very articulate section of opinion which is calling for more informality and more of the intimate touch, both in programme presentation and in the programmes themselves.

Critics of this school admit that artistically the programmes are a great deal better than they were. They also admit the value of the new touch of journalistic showmanship. But they want more blood and feeling. It is common ground for these people to hark back to the strong emotion of Uncle Arthur and De Groot. Now at first glance one might be inclined to agree with this criticism.

But I doubt if it will stand the test of careful examination. There was a time, about eighteen months ago, when informality, chat, and sob-stuff were constantly appearing. But these were symptoms of the immaturity of an art just born.

Broadcasting could not remain long in swaddling clothes. The regime of Uncles, Aunts, Corners, Teenies, and all that amazing vocabulary had to be superseded by a regime of much more dignity and restraint. What was possible with a few thousand listeners still infatuated with the novelty of their new toy was no longer possible when millions of people depended for daily entertainment and instruction on the British broadcasting service.

There may be room for more blood and colour in B.B.C. programmes, but heaven forbid that we should go back to the broadcast kindergarten, which emboldens me to inquire when the B.B.C. will cut out of its published programmes all that silly twaddle of "Corners" and "Teens."

Future of the Relay Station.

I see that the consternation among relay station listeners is unabated. Protest meetings and petitions are being held in

Swansea, Hull, and Leeds-Bradford. In view of the necessarily temporary character of the whole of the present broadcasting system in this country, and, for that matter, in any other country, I am surprised that there should be such a fuss about the threatened substitution of relay stations by demonstrably better facilities. Last week I had something to say about a new high-power station system for the whole country.

In the interval rapid progress has been made with this scheme which is now engaging the serious attention of the authorities. The new plan contemplates at least two programmes on a crystal for everybody and a general concentration of resources both technical and artistic. With proposals of this magnitude in hand, neither relay stations nor the present main stations count for much.

If the eight big stations are substituted it does not necessarily follow that the present studios will be rolled up. It is, indeed, likely that even more studios will be established in various parts of the country.

Broadcasting for India?

Mr. Macarthy Jones is being sent out by the Marconi Company to undertake on behalf of the Government of India the organisation of broadcasting in that country. Mr. Macarthy Jones has been studying the B.B.C., but I fear he will find very little precedent or criterion to guide him in the task ahead.

To organise broadcasting in India is to organise it for a continent containing peoples and races as different from each other as are the peoples and races of Europe. Then again the programmes must vary not only as to language but as to taste and material. Will the masses of India react to the new medium?

If they do even in small measure the demand for apparatus will be tremendous, but nearly all for crystal sets because of the widespread poverty. It is good to know that the new scheme does go beyond the European population, which hitherto has had a practical monopoly of what little broadcasting there is in India. If imagination and adaptability are displayed in this great enterprise there is a good chance that the wireless medium may perform wonders in reconciling East and West.

A Peculiar Position.

A well-known music-hall star told me the other day that according to the average contract at present in force, although broadcasting in London is banned, there is no legal objection to most artistes broadcasting from the studio at Daventry. This is a curious "fiction," and apparently it is shortly to be tried out. If it comes off, it will be a nasty knock for those few people who still fight broadcasting.

Next Week!

In Next Week's issue of "Popular Wireless" will appear the first of a new series of constructional articles describing recent improvements and advancements made in the famous "Unidyne" Circuits. Listeners should make a point of reading these interesting articles.

The G.E.C. Experimental Plant

FOR the benefit of the reader, who is heretofore to remember something of the enormity of the G.E.C. plant at Schenectady, it is interesting to note that of the one hundred thousand inhabitants of Schenectady about twenty thousand are employed by this enormous concern. The total acreage of the concern covers 523 acres of land, but this figure does not include the new development laboratory devoted to radio experiments, with which we are immediately concerned.

The fact that the G.E.C.'s stations will be heard by thousands or even millions of European listeners this next winter, is the legal excuse for the publication of this article relating to a station, or stations, very remote from the receiving aerial of the reader.

Large Expanse of Country.

The development laboratory is not, as one would suppose, a large building, but a large tract of land of fifty-four acres containing many buildings and situated about two miles south-west of Schenectady. Here are aeri-als of every conceivable form, capable



This article has been specially written by our resident correspondent in New York, Mr. L. W. CORBETT, formerly on the London Staff of "P.W."

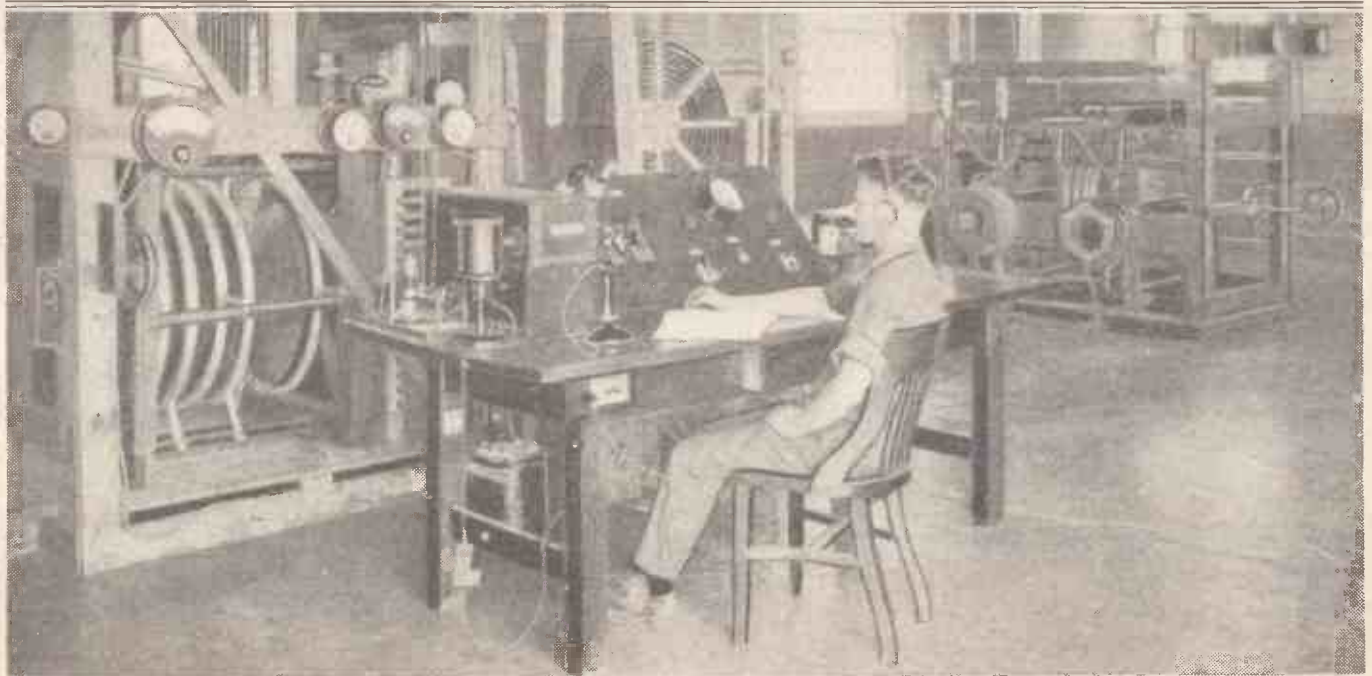
of radiating transmissions on wave-lengths of anything from five to three thousand metres. For the latter there are three masts erected in triangle form, each three hundred feet in height. In addition to these masts there are many others of various heights of from 150 feet down. I might almost describe the skyline as a veritable maze of aeri-als.

It is from this point that the recent test transmissions have taken place on W G Y's wave-length with a power output of 50 kilowatts. This is the first instance in which super power has been employed in America for broadcasting purposes. For the first tests the experimental call sign 2 X A G was employed, although W G Y's wave-length was used. The tests were not allowed to take place during the usual broadcasting hours, as the effect of super power on local listeners and other broadcasting stations was somewhat hazy. So the tests took place from midnight on, Eastern Standard Time. Local listeners expected more or less to have their heads blown off with

(Continued on page 474.)



A portable instrument for measuring wave intensity employed at the G.E.C. laboratory



The 109-metre transmitter at the Schenectady. The output power is frequently as high as 50 kw., and the station should be heard in this country on favourable nights.

**THE G.E.C.
EXPERIMENTAL PLANT.**

(Continued from page 473.)

50 kilowatts, as W G Y usually comes in extraordinarily loudly with its rated 2½ kilowatts output.

But here is a surprising thing. Local listeners reported that the transmission came in no louder than with the usual power. For longer distances than the above better reports were received. The transmissions were heard in Cuba, Pacific Coast cities, British Columbia and England. Normally W G Y is not heard at these points during the summer months. The writer, who happened to be on the air during the tests, has not heard from anybody in England who heard him, and would be glad of reports.

Results of Recent Tests.

A complete analysis relating to the tests has been made by the General Electric Company, and the following paragraph regarding the volume makes interesting reading:

Louder than W G Y (2½ kilowatts), 75 per cent.

Same strength as W G Y, 15.27 per cent.

Weaker than W G Y, 9.73 per cent.

The effect of atmospherics upon the transmission was greatly mitigated by the addition of power. This was very noticeable, as static disturbances were particularly bad during the first tests.

Due to the fact that the super power had no detrimental effects on other stations, etc., permission was given to the company by the Department of Commerce, to continue the experiments during the regular broadcasting hours. These tests took place during the latter part of August. A

switching arrangement was used whereby W G Y could switch from 2½ kilowatts to 50 kilowatts with a minimum of delay, and this was done alternately at intervals of half an hour or so. Reports were somewhat similar to those of the first test, namely



This photograph shows the meter placed in the centre of the 40-metre aerial.

that the volume was increased and the static was overruled. No definite schedule for the employment of super power during the coming months is yet available, but it is probable that 50 kilowatts will be used extensively during the winter, at which time listeners will be able better to judge its effects.

W J Z Increases Power.

One unusual report received after the last tests was to the effect that local listeners tuning to other stations from distant points found that as W G Y changed over from

2½ kilowatts to 50 kilowatts the strength of the other stations increased quite considerably. The report is considered quite authentic, as several listeners in the locality reported similarly.

Another interesting report is to the effect that the super power completely paralysed crystal sets used in Schenectady.

To what extent this was found to be the case it is difficult to say, for there are comparatively few crystal sets employed in America nowadays. While on the question of super power, it is interesting to note that W J Z of the Radio Corporation of America is shortly moving its transmitter to New Brunswick, a town in New Jersey, some fifty miles or so outside New York. An output power of at least 40 kilowatts will be used, and this station will be employed during the International Broadcasting Tests this coming winter. So much for the super power tests.

Four Experimental Stations.

There are bound to be many of my readers who are interested in DX work, so I will give the call signs and wave-lengths of these stations at the G.E. development laboratory:

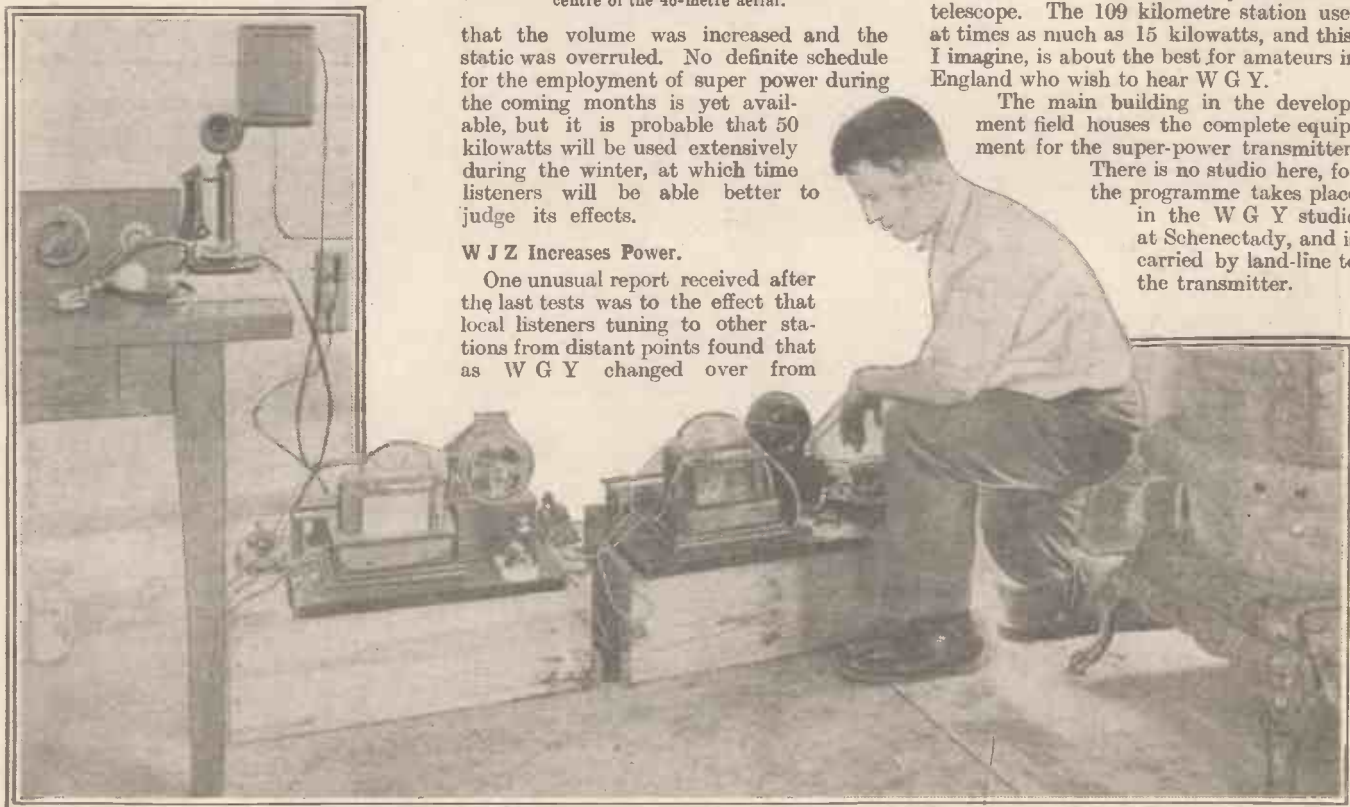
Call Sign.	Normal Wave-length
2 X A F	40.5 metres
2 X K	109 "
2 X A G	380 "
2 X A H	1,600 "

As a rule, all of these stations may be heard transmitting the same programme as W G Y when the latter is on.

The 40.5 metre transmitter employs a power of about 1 kilowatt, although this can always be altered with a minimum of delay. An unusual form of aerial is employed for this set. It is known as the "vertical doublet," and is not unlike the Hertz antenna. A special radio-frequency ammeter is inserted in the antenna system itself, and it has to be read by means of a telescope. The 109 kilometre station uses at times as much as 15 kilowatts, and this, I imagine, is about the best for amateurs in England who wish to hear W G Y.

The main building in the development field houses the complete equipment for the super-power transmitter.

There is no studio here, for the programme takes place in the W G Y studio at Schenectady, and is carried by land-line to the transmitter.



The tape transmitter at the G.E.C. Research Laboratory. It is capable of dealing with 100 words a minute.



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**"Made
Specially
to Stay
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That is the great difference between the Climax Crystal Set and the ordinary crystal set. **IT DOES STAY PUT.** You see it all hinges on the special catwhisker—The Climax Auto-micrometer Catwhisker (Prov. Pat. No. 21001/25).

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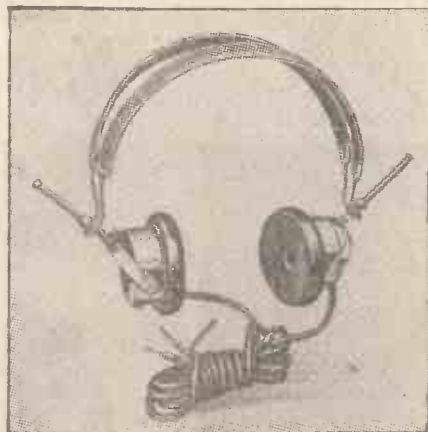
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2 O D CALLING!

SHORT-WAVE RECEPTION.

The Choice of Apparatus.

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

This is the second article by one of Britain's foremost amateurs. Mr. Simmonds' articles are appearing exclusively in this journal every fortnight. Until further notice he will not write in any other British wireless journal.

THE successful reception of signals on the ultra high frequencies (wave-lengths below 80 metres, say) depends upon two main things: the choice and arrangement of apparatus and the skill of the operator in handling the receiver.

Let us consider the first point—namely, the choice of apparatus. Naturally, those who propose the construction of a receiver for short-wave work do not want it to be an expensive branch of their hobby, and therein lies the root of many of the failures to obtain satisfactory results.

A suitable circuit is the first desideratum, but this should not present any very great difficulty, for most of the "hook-ups" based on the Reinartz circuit will give good results, even with an ordinary valve, down to about 20 metres.

The circuit I use at 2 O D for the reception of C.W. is shown in the figure accompanying this article, and is based upon the original Reinartz circuit, adapted for short-wave use. The values of the various condensers are shown in the diagram, and the coils used are described later on in the article. This circuit can be thoroughly recommended, and, provided the receiver is made up with good components and well laid out, really satisfactory results will be obtained.

Details of the Receiver.

The main part of my set—the tuner—is shown on the right in the photograph on the next page, the condensers being of the slow-motion type with vernier control on the closed circuit condenser. For ultra high frequencies I use a super-heterodyne, but this is a luxury which is not essential for C.W. reception, though I should find it difficult, if not impossible, to pick out weak telephony below 50 metres without it. I think this is the experience of all experimenters who do much short-wave reception.

The photograph of the receiver shows the construction of the low-loss coils and the holders in which they are placed. These are made up from an old but reliable three-coil holder, the ebonite plug pieces having been removed and well seasoned, dried, and paraffin-wax impregnated wood fitted in their places, the plugs being separated by an air space. The coils themselves are made of 18-gauge enamelled wire on the solenoid principle, spaced the diameter of

the wire apart, and supported by ebonite strips placed 120° apart, the turns being threaded through holes drilled in the supports.

The diameter of each coil—reaction, secondary and aerial, from left to right in the photograph—is three inches, and the sizes for a wave-length of 18 to 100 metres are as follow, two coils, reaction and secondary positions being necessary, the aerial coil being of three turns for all wave-lengths:

18 to 40 metres. Secondary 5 turns. Reaction 5 turns.

35 to 100 metres. Secondary 12 turns. Reaction 8 turns.

Only rough reaction control is carried out with the variable coil coupling, the finer adjustments being made by means of the right-hand variable condenser which has a capacity of 0.005 mfd.

Concerning the Components.

The choice of variable condensers should be made carefully, for these are instruments which can give no end of trouble if of poor quality. Their capacity should not exceed the values stated, and they should both be capable of smooth and fine adjustment. The new G.E.C. low-loss slow-motion condensers are ideal for short-wave work, and if the moving plates are connected to the low potential side of the circuit, hard capacity effects will be eliminated.

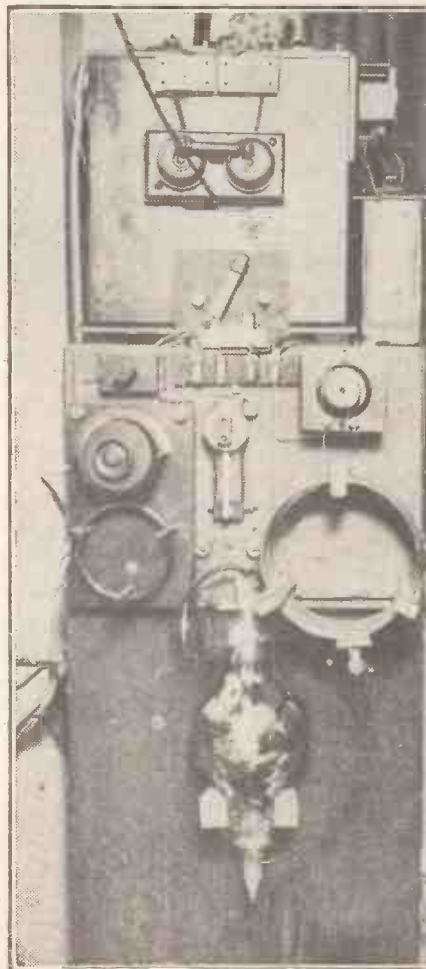
Loose contacts in condensers or uneven operation will always give rise to the most astounding amount of noise, with the result that the majority of signals are lost altogether.

Grid leaks should be of good make and quiet in operation, and the grid condenser should be as far as possible air supported and kept well away from all panels, etc. Wiring should be carried out with care, every joint being well soldered and bare copper wire of stout gauge (16 or 14) should be used throughout. These should be bent to shape before soldering the joints.

As much air spacing as is practicable should be provided in short-wave receiver design, the ebonite or other insulation being cut down to as small an amount as possible. Under the action of strong light the surface of ebonite very rapidly deteriorates, surface leakage is set up—giving rise to endless trouble in a receiver, especially when very high frequencies are being dealt with—and loss of signal strength, even complete failure results, while noisy reception is inevitable if the insulators are more or less leaky.

In the lay-out of the receiver the greatest care is necessary, short leads being essential, while parallel grid-plate connections should be avoided at all costs. Grid and plate leads should be kept short and at right angles

(Continued on page 478.)



Part of the short-wave transmitter used by Mr. Simmonds at Gerrard's Cross.

SHORT-WAVE RECEPTION

(Continued from page 477.)

to one another, while it is important from the point of view of operation that the variable condensers should be connected with their moving plates to earth.

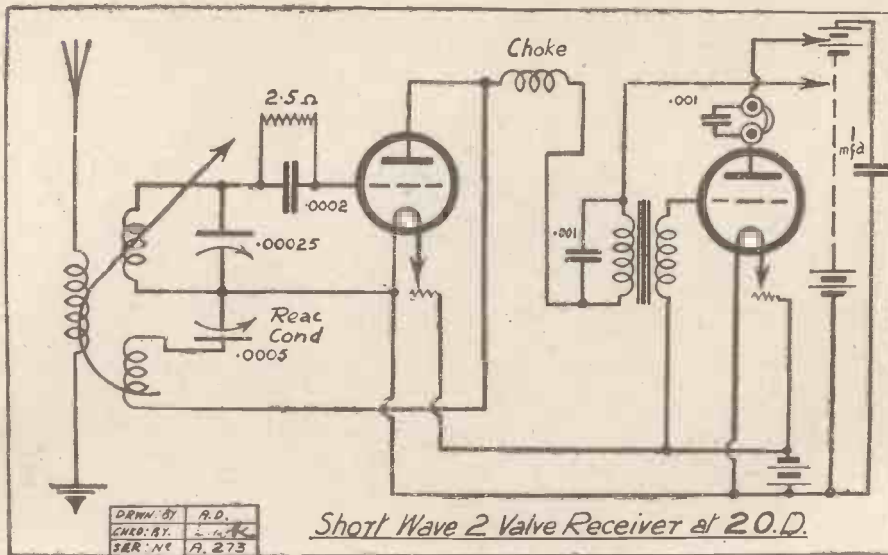
This is assuming that the fixed plates are insulated and the moving ones are taken to the spindle, the correct way of making a variable condenser. The G.E.C. low loss is made in this way, and, with this type of condenser in use hand capacity effects are nullified.

The Choice of Valves.

Referring to the circuit of my receiver you will see that the variable condensers are symbolised by a straight and a curved line, the latter being used to indicate the moving vanes which are at "earth" potential. This eliminates body capacity because these vanes are connected to the spindle, and are thus at the same potential as the hand of the person tuning the set.

The high-frequency choke consists of 50 turns of 32-gauge enamelled wire on a 2-in. former. It is most important that the H.F. choke should be well spaced from the other components, and fixed at right angles to any coil likely to link magnetically with it.

The valves used on my set are a D.E.Q. for detecting and a D.E. 5 for amplification when the receiver is used as a straight Det. and L.F.



immense importance when "DX" work is being carried out. A noisy valve—prone to cause hissing or rushing when the oscillation point is reached—is fatal to good reception, and though variations of grid leak and condenser values may keep the noise down to a great extent, it usually means a certain loss of efficiency.

The L.F. transformer can be of the usual 4-1 ratio, but must be of good make, and the H.T. battery must be a good one, preferably of the accumulator type, or of the new types recently marketed, using large cells to make sure that a steady voltage will be obtained with absence of bat-

tery noise. The operating voltage is usually about 30-40 volts on the detector and 60-100 on the amplifier, depending, of course, upon the characteristics of the valves used in these positions.

In conclusion, I should like to say that I am at present constructing a new short wave receiver for the Ultra short waves, and the construction of this will be fully described in POPULAR WIRELESS, either in my next chat or in the subsequent one. A new method of mounting the coils and components will be employed, and the set will probably have a minimum wave-length of about 10 metres.

SOME POINTS ON REFLEX RECEIVERS.

THOSE who have experimented with reflex receivers know that, although there is a great satisfaction in getting them to work efficiently—and they can be got to work exceedingly well—nevertheless, there is often a good deal of patient trial involved before success is achieved. One of the chief difficulties is the audio-frequency howl which is apt to arise. There are three frequencies present in each reflexed valve.

Cause of the Whistle.

First you have the radio-frequency due to the incoming signal; next you have the audio-frequency signal; and thirdly you have the local oscillations due to the primary of the audio-frequency transformer in the plate circuit and the secondary of another audio-frequency transformer in the grid circuit. Owing to the inductances and capacities associated with these primaries and secondaries, oscillations are set up, the frequency of which depends upon the constants of the transformers.

The presence of these oscillations causes a great sensitivity in the reflexed valve and its associated detector. Now, if the frequency of these oscillations is within the

audible limit, and they are not filtered out before going into the detector, the whistle will be produced. On the other hand, if the constants of the transformers are such that the whistle is above the limit of audibility, the whistle, whilst still present, will not be heard.

Thus, much depends upon the proper choice of the transformers, and, furthermore, the oscillations, even if they do not disturb the operation of the set, owing to their comparatively high frequency, should not be allowed to energise the aerial.

The L.F. transformers should be staggered, so as to prevent the self-generated reflex valve frequency from triggering the L.F. valves into an oscillation of this frequency.

NEXT WEEK.

HOW TO MAKE
"THE 1926 ONE-VALVE
UNIDYNE,"

A New and Greatly Improved Circuit.

By the Inventors
G. V. DOWDING & K. D. ROGERS.



The tuner in use at 20.D. The low loss coils are clearly shown.

Other valves than the above can be used successfully if anti-capacity valve-holders are employed. A valve with a fairly high impedance should be chosen for the detector stage, and the normal L.F. valve for the amplifier. It is better to use a D.E.V. or D.E.Q., for these valves are designed for high-frequency work and thus less inter-electrode capacity exists, while they are beautifully silent in operation, a feature of

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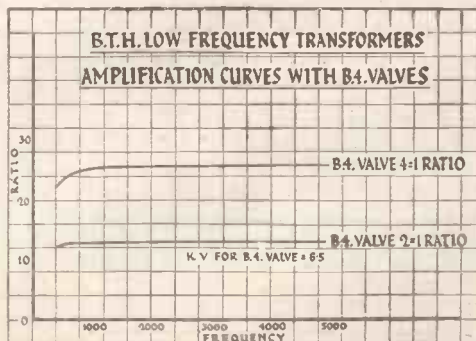
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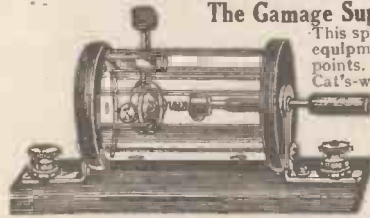
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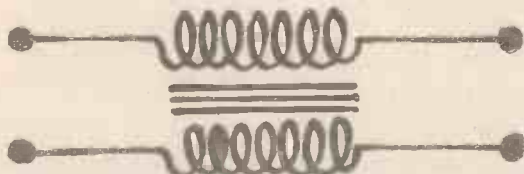
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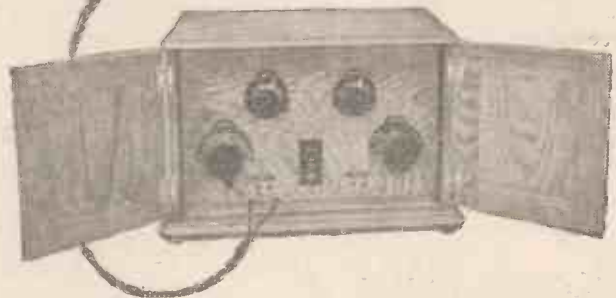


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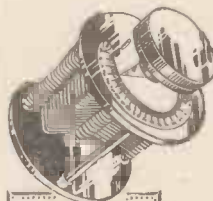
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You're missing a lot if you haven't Ericsson tested condensers. Wonderfully low in losses. Stout vanes accurately spaced.
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"RECTALLOY."

SOLVING THE ACCUMULATOR CHARGING PROBLEM.

PART II.

By **GEORGE HARLAND.**

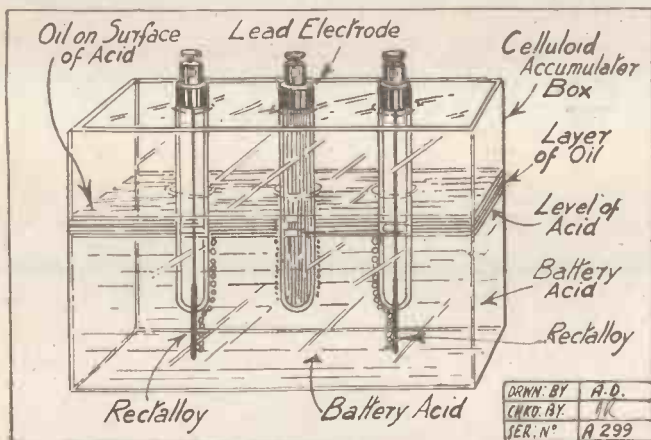
The following is the second of a series of important articles dealing with an improved method for charging your accumulators at home from A.C. mains.

IN last week's article I pointed out that the perfect way to keep your batteries in order and always charged is to employ a "trickle charger"—that is, a small charger which delivers only a very small current,

I also pointed out that although this amounted to the same thing as giving the batteries a huge charge once a fortnight (and was, in fact, much better for the health of the batteries) it only required a small charger, which cost less to make.

battery acid, with one lead electrode and two rectalloy electrodes.

The current can pass in at the lead electrodes and out at the rectalloy, but it cannot pass the other way, so the current delivered from the rectifier is unidirectional. It will be seen from the diagram that it



The complete Rectalloy rectifier as used for full-wave rectification.

but which works continuously, so that whenever your battery is not operating the valves it is switched over to the trickle charger, and receives its tiny trickle of current, which puts back into it in the course of about twenty-four hours what has been taken out of it during the previous evening's working.

being the addition of a little distilled water perhaps once a month to make up for evaporation.

Great Advantages.

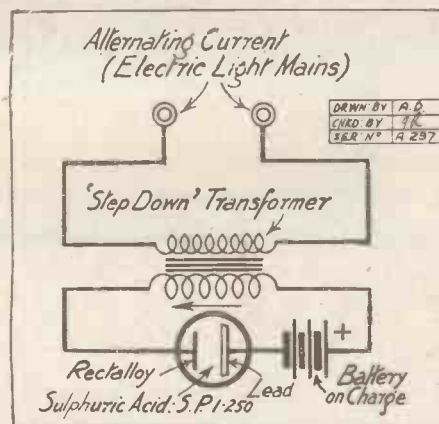
I will not enter here into a lengthy account of how this discovery was made, as that would take too long, and in any case can be given at some other time.

But it was made during a long series of experiments on rectification, and acting on scientific information and clues derived from German scientific papers published many years ago.

I found that all I needed was a small step-down transformer, capable of stepping down the voltage of the alternating current mains to about 10 volts. This low-tension alternating current was then fed into the rectifier, as shown in the accompanying diagrams. It will be

The only type of rectifier which will work without attention or expense is the electrolytic rectifier, and the type of electrolytic rectifier hitherto used—the aluminium rectifier—has been subject to many drawbacks.

But by the use of the remarkable new rectifying metal "Rectalloy," I have been able to make up a rectifier which will work continuously for an indefinite period, the only attention required

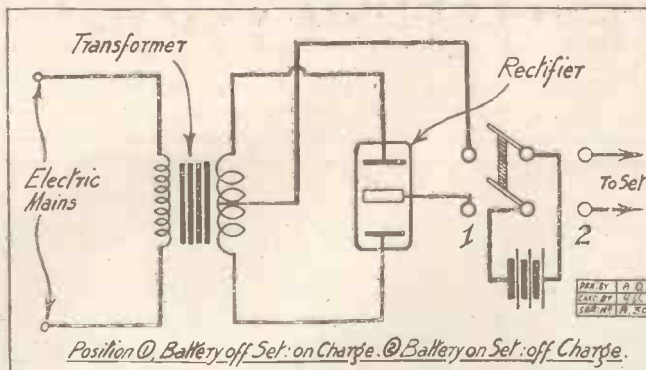


This diagram shows the direction of current flow for half-wave rectification.

passes always the same way through the battery.

There is nothing new, of course, in the using of a step-down transformer and an electrolytic rectifier for the making of a battery charger. What is new is the rectifying metal.

The great advantages of the Rectalloy metal over the aluminium and like types of rectifying metals are that (1) only



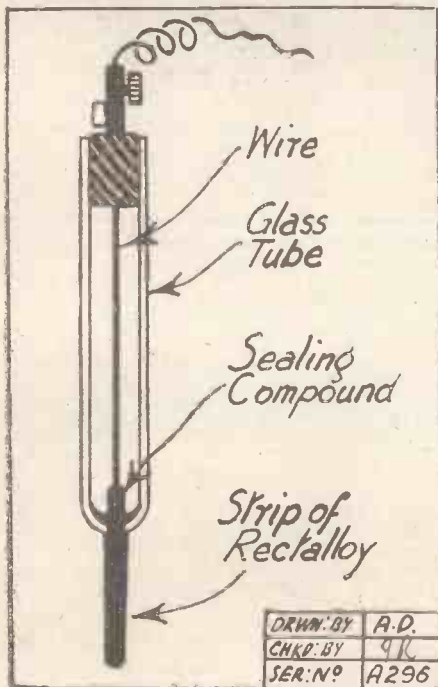
The circuit used for full-wave rectification, showing the step-down transformer and change-over switch.

seen from the diagrams that the rectifier may be used for single-wave rectification or for double-wave rectification, but I have found that the latter, although it requires two Rectalloy electrodes instead of one, is very much to be preferred.

The rectifier I used consists simply of a glass jar (in later experiments I have used an old celluloid accumulator case) containing

a very small piece of the metal is required; (2) the rectifier has a very low internal resistance, so that there is extremely little energy loss in the rectifier; (3) the electrolyte is clean and everlasting; and (4) the electrodes are everlasting, provided a certain important further discovery (which I shall mention presently) is made use of.

(Continued on page 506.)



The method employed for mounting the Rectalloy strips.

CURRENT TOPICS.

By THE EDITOR.

To-morrow's Great Wireless Meeting—The Unidyne—A New Series of Constructional Articles—Cheaper Valves.

OUR readers, having recovered from endeavouring to solve the twenty "sound problems" broadcast last Friday evening, will, we hope, bear in mind that to-morrow evening (Friday, October 23rd) is the date of our third great wireless meeting at the Central Hall, Westminster.

At this meeting Mr. J. C. W. Reith has promised to present the prizes to the first and second prize-winners of the "Radio Sounds" Competition.



Senatore G. Marconi, who has promised to speak at the "P.W." meeting.

We should like to remind readers that, although all the free seats for the meeting have now been disposed of, there still remain a number of seats for sale at 3/6, 2/4, and 1/2 (including tax), which can be booked at the Central Hall on the night of the meeting, or by application to "R.G.T.," c/o POPULAR WIRELESS, Fleetway House, Farringdon Street, E.C. 4. Programme details will be found on another page in this issue.

On page one of this issue we publish an editorial announcement in connection with a new series of Unidyne articles for constructors. During the last twelve months it is no exaggeration to say that we have received thousands of letters from highly satisfied users of the Unidyne from all parts of the world.

New Unidyne Developments.

Especially have we noticed the widespread popularity of the Unidyne in South Africa, and in the more isolated parts of this country and in Ireland, where accumulator charging problems and the H.T. battery bugbear are very much in evidence.

At this stage it would not be out of place if we briefly outlined the history of the Unidyne. When the circuit was first

announced and published exclusively in this journal a little more than a year ago, it was attacked with a virulence almost unprecedented in the history of wireless circuits. Even well known men were induced to pen criticisms of the circuit before testing it—criticisms which, although guarded, were far from favourable. We were thus forced to adopt an attitude towards our critics which has been described as pugnacious—but subsequent events proved that this policy was the inevitable one.

The Unidyne Patent.

Later, Senatore Marconi, like the true sportsman and fair-minded man he is, revoked his earlier criticism and paid the Unidyne a warm compliment. Sir Oliver Lodge also experimented with the circuit, and we had the honour of publishing in this paper a highly favourable report from his pen.

The inventors of the Unidyne, Messrs. Dowding and Rogers, both on the staff of this journal, having obtained Royal Letters Patent for the Unidyne, entered into a business arrangement with a certain firm for the sale of the Unidyne under licence.

This licence has now been withdrawn: the full patent rights are the sole property of the inventors, and without their written permission Unidyne sets may not be sold in this country, nor may complete sets of parts for the Unidyne be sold and advertised as such.

Fresh arrangements for placing complete sets of Unidyne parts on sale to the public are being made with another firm, and editorial and advertisement announcements will be made in due course.

An essential component for the Unidyne is, of course, the four-electrode valve. (And perhaps we had better mention here, for the benefit of new amateurs, that the Unidyne circuit is a patented one which eliminates the necessity for using a high-tension battery. For the benefit of new amateurs a résumé of the theory of the Unidyne will be published in next week's issue.)

The four-electrode valve has hitherto

been retailed at 14/-, and many amateurs have written to us asking why no reduction in the price has been made, as has been the case with ordinary three-electrode valves.

We need not detail the reasons which have prevented the sale of these four-electrode valves at a lower price during the last year, but will state definitely that, in future, constructors of Unidyne sets will have the great advantage of being able to purchase four-electrode valves at a considerably reduced price.

The 1926 Circuit.

Full details will be announced in our columns in next week's issue, together with a special constructional article by the inventors on "The 1926 Unidyne—A New and Improved One-Valve Receiver."

In subsequent issues the inventors will publish articles on the construction of two, three and four-valve Unidyne sets, incorporating the new developments already referred to above.

To-morrow's meeting at the Central Hall, Westminster, will be one of the biggest and most interesting wireless meetings ever organised.

Senatore Marconi has now definitely promised to be present and to speak in connection with a little "secret ceremony" which will interest and delight every wireless amateur and professional. Sir Oliver Lodge will also give an address.

We wish to inform readers that seats at 3/6, 2/4, and a few at 1/2 can be obtained at the box office at the Central Hall, when the doors open at 7 o'clock. The meeting is timed to commence at 7.30 and to end about 10 or 10.15.



The central battery switchboard at the Glasgow broadcasting station.

The "P.W." TWO VALVER

Designed and Described

by

P. R. BIRD,

and K. D. ROGERS

(Assistant Technical Editors).



Constructional Work

by

G. V. COLLE

and J. R. WHEATLEY

(Technical Staff).

THE receiver described in this article is a two-valve set constructed on the lines of what is probably the most popular of all valve circuits—the detector and L.F. circuit. From the point of view of handling it is extremely simple, and the results it is capable of giving have rightly earned its popularity.

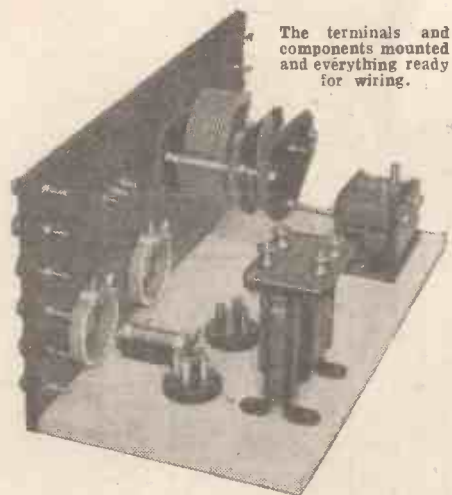
What the Set Will Do.

Let us discuss the results it is possible to obtain with the two-valve detector and

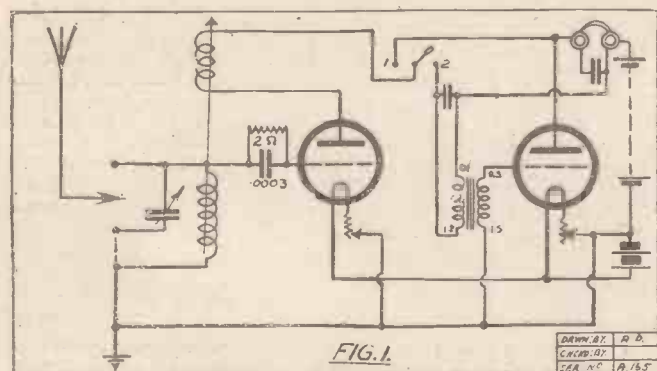
miles or so from a main station the two-valve set under description proves ideal, for it can either be adapted for use with headphones (the switch provided enables one valve to be cut out), or else it will operate a loud speaker with sufficient volume for the average room when both valves are in operation.

Reaction enables distant stations to be tuned in, and at least a dozen different transmissions should be readily picked up almost any evening, the headphones, of course, being used.

and have "stops" at "max." and "off" positions, so that if suitable valves are used there is no danger of anything happening to their filaments, while the tuning is done by one knob, the reaction control being used to "strengthen" the signals.



The terminals and components mounted and everything ready for wiring.



As a household set for the reception of the local station or perhaps 5 X X, this two-valve receiver is ideal from several points of view. In the first place the set is neat and has a pleasing appearance, while the fact that all the "works" are enclosed removes the dread that anything will happen to the valves or coils during the absence of the owner and while inexpert

L.F. (0-V-1) receiver when used under average conditions such as obtain in the majority of cases—the usual 50-100 foot aerial about 25 feet high in surroundings that are neither open nor particularly enclosed—in short, the normal conditions under which 75 per cent of wireless enthusiasts practise their hobby.

hands are operating it.

Components and Materials Required.

Then, above all, it is fool-proof. One of the batteries, aerial and earth and 'phone^s or loud speaker have been attached, there is nothing that can be mishandled in such a way as to do injury to any part of the set. The rheostats are positive in action

A glance at the various photographs on these pages will show that the receiver is an extremely easy one to build, and the components necessary are comparatively few when the results obtainable are taken into consideration.

In fact, all the parts necessary for the construction of the receiver, excluding valves and plug-in coils (of which Nos. 75 and 50 are the most useful), are:

	£	s.	d.
Panel, baseboard and case (Peto-Scott), 13" x 6 1/4" x 6 1/4"	1	5	0
Two filament rheostats		7	0
One variable condenser, .0005 and vernier (Peto-Scott)	10		6
One grid leak and condenser (Dubilier)		5	0
One two-way coil holder with long handle (Peto-Scott)		5	6
One L.F. transformer (Ferranti)	17		6
Two .001 mfd. fixed condensers (Dubilier)		6	0
Two valve holders for baseboard mounting		2	6
One S.P.D.T. panel mounting switch	1		6
Nine W.O. terminals, a few lengths of square tinned copper wire and some solder		3	0



Although everything is quite accessible, valves and coils are protected by the enclosing case.

Though the names of the firms either making or supplying the actual components used in the set photographed are given in

(Continued on page 484.)

THE "P.W." TWO-VALVER.

(Continued from page 483.)

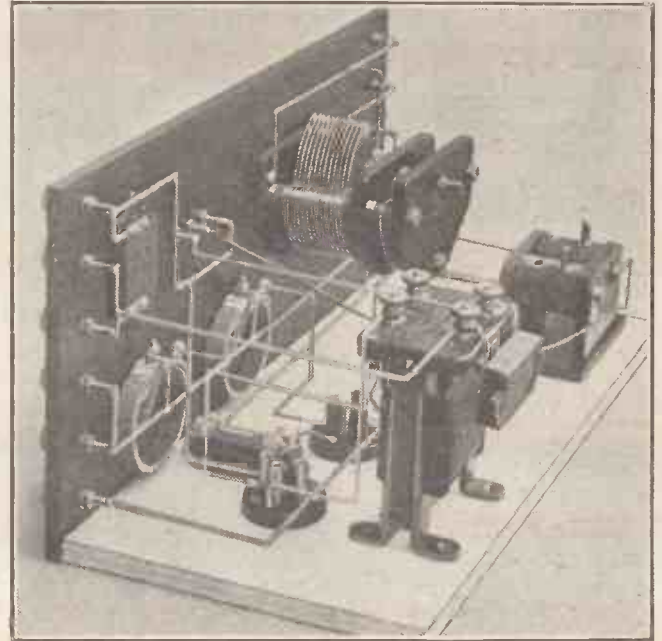
the foregoing list, there is no reason why the constructor should not use other makes and types of components provided they are of good manufacture. The use of other makes will, however, mean that the constructor must alter the panel drilling diagram given in Fig. 3 to accommodate the new components. The baseboard lay-out will remain approximately the same, though the measurements may have to be altered somewhat.

Drilling the Panel.

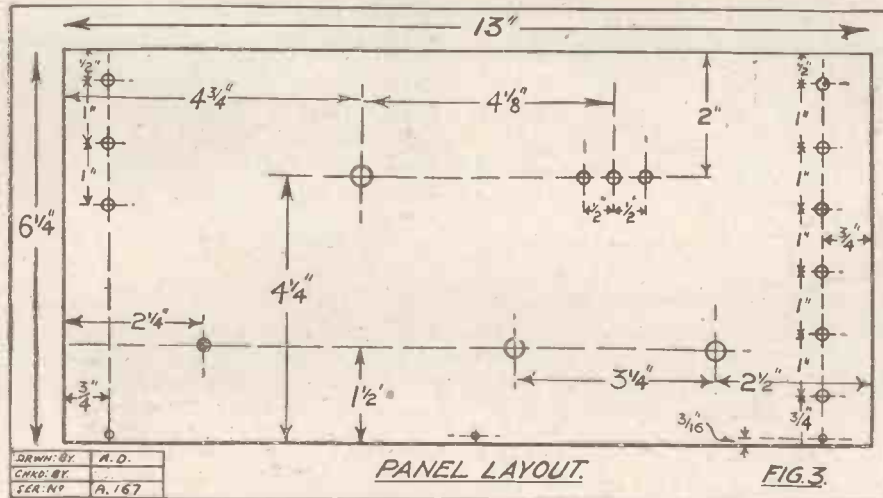
It will be noted that the three terminal system of providing series or parallel condenser tuning has been utilised, and this greatly simplifies the wiring of the receiver besides eliminating losses that might be incurred if a series-parallel switch were employed.

The drilling of the panel should present no difficulties, though it may be advisable

to remind constructors that ebonite is a brittle material and all operations requiring pressure upon it, as drilling does, should be carried out with the panel lying face upwards on a piece of wood. Another point of importance concerns the marking out of the panel, and more particularly the method used in making the actual marks. These should be made with a sharp instrument such as a scribe, the actual points for drilling being marked with a centre punch. Pencil lines should not be used as a means of obtaining accurate measurements, for these are difficult to remove afterwards, and if not removed



A view of the wiring showing the back-of-panel disposition and lay-out of panels.



PANEL LAYOUT.

FIG. 3.

may cause no end of trouble due to high-frequency losses along the surface of the panel.

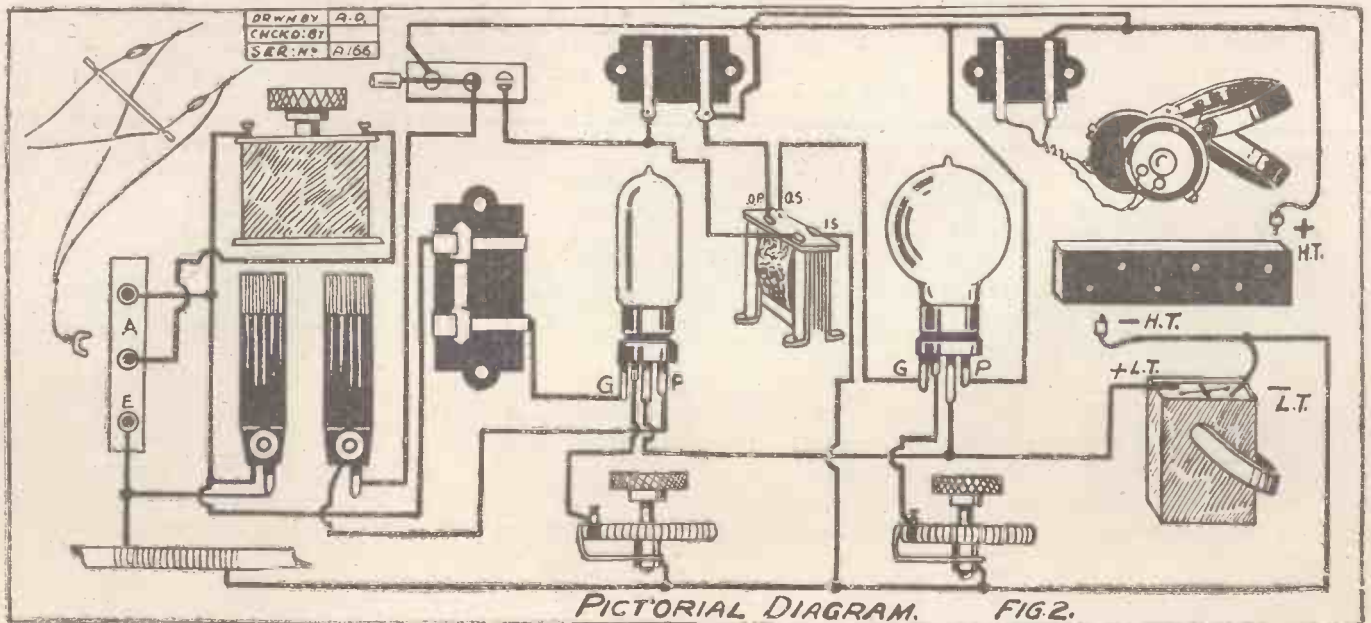
Mounting the Components.

When the drilling has been accomplished the mounting of the components on both the panel and the baseboard should be undertaken, and then the panel should be screwed by means of three half-inch wood screws.

It is advisable to solder all the connections, except perhaps those on the L.F. transformer, for this obviates any likelihood of noisy reception due to imperfect connections at any point. Flexible leads are taken to the moving coil holder in case any movement of the spindle through the holder takes place.

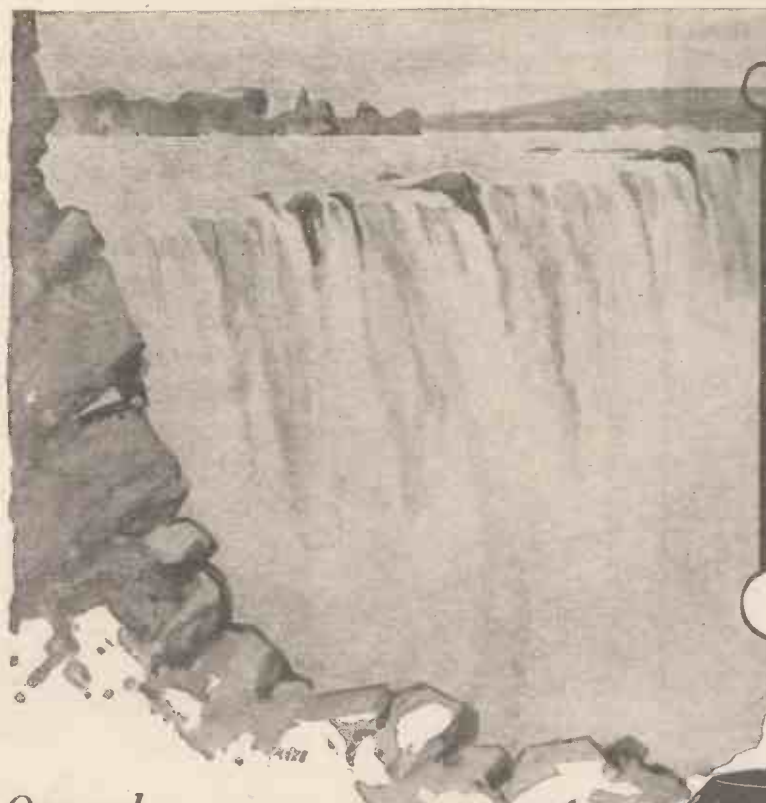
Those who are unused to soldering will do well to clean all terminal ends, valve holder

(Continued on page 487.)



PICTORIAL DIAGRAM.

FIG. 2.



FOUR MILLION *horse power under control*

NIAGARA FALLS supply the energy for huge electric power stations—power that is used to drive electric trams in cities 250 miles away.

A button pressed, a lever moved, the turn of a knob; that is how things are done to-day—the result of inventive genius and modern engineering skill.

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(SQUARE LAW)
(Patent applied for.)

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2. One-hole fixing—one $\frac{1}{4}$ in. diam. hole is needed to fix this condenser to panel.
3. Rigid construction—cannot warp; end plates of stout aluminium, perfectly flat.
4. Fixed vanes supported by $\frac{1}{2}$ in. ebonite strips.
5. Smooth action, spindle tension is maintained by a specially designed friction washer.
6. Moving vanes and end plates are at earth potential.
7. One-piece knob and dial—supplied loose. Secured by 4BA Set Screw.

This condenser is fitted with optional soldering Tags, or Terminals, and can be supplied with or without Vernier as desired.

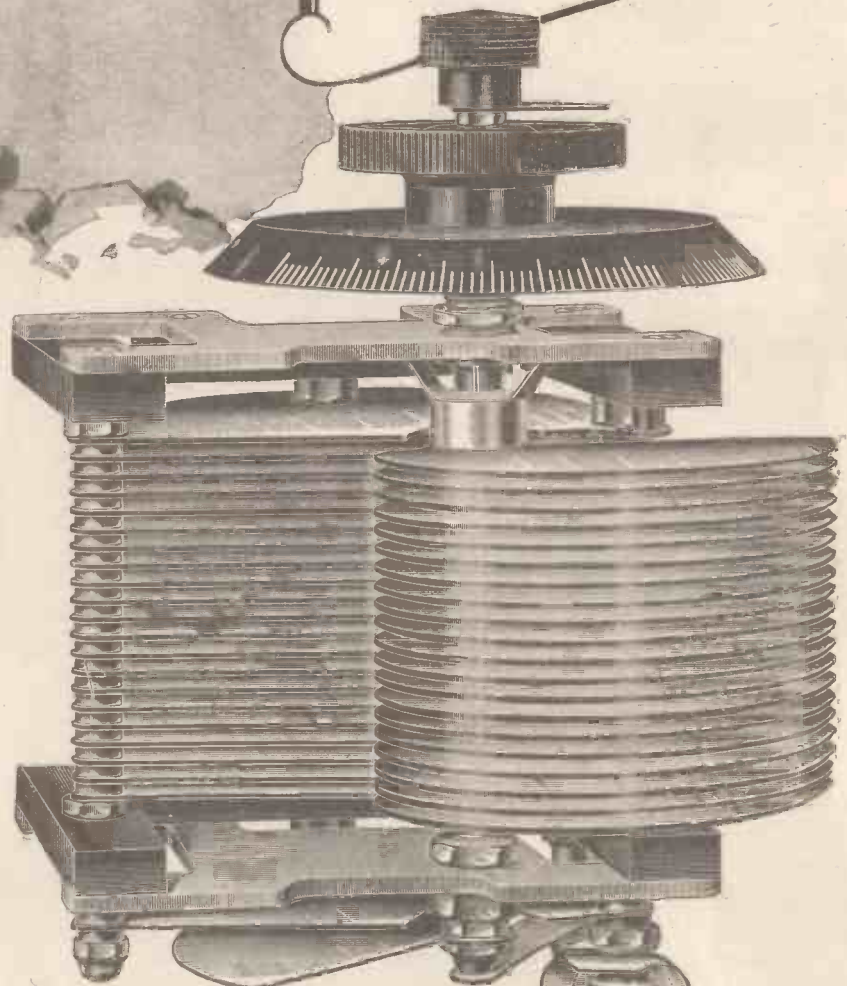
Supplied in the following sizes:

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

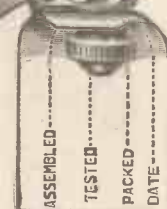
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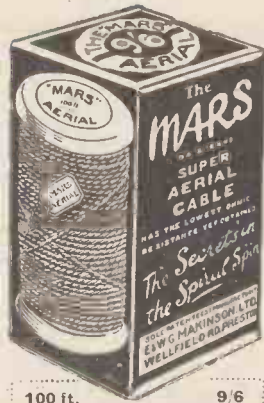
has the lowest ohmic resistance yet attained. It provides 80 per cent. greater surface area than 7-22's and gives 50 per cent. greater efficiency when used for reception, 90 per cent. greater efficiency when used for transmission. Recent National Physical Laboratory Tests afforded the following data:

Resistance Per Metre

"Mars" Wire 17 ohms
7-22's Wire 1-72 ohms

The "Mars" Aerial is unique—there is none other to compare with it. The secret of "Mars" superiority is in the spiral spinning of 84 phosphor-bronze wires, which air-insulates each wire. This is a patented feature. There are many imitations of the "Mars," but, generally, they are less efficient than 7-22's wire. Being merely twisted wire they lack the essential spiral spin feature.

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100 ft. 9/6
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is something quite new and very efficient. Absence of resistance, absence of dielectrics secured by the use of "Mars" spirally wound wire and an easily conceived method of winding constitute the basis of these super low-loss coils. Useless fittings which bring about shrouding and so increase capacity are eliminated. The Technical Editor of "Popular Wireless" reports that they are of commendably low capacity and very efficient in operation. Conforming with standard wave-length ranges they provide sharp tuning and close couplings, and in every receiver in which we tested them the results were excellent.

They cost only a few pence more than ordinary coils: they give at least 75 per cent. greater audibility.

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No.	Price	'0005 Condenser
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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The Secret is in the Base

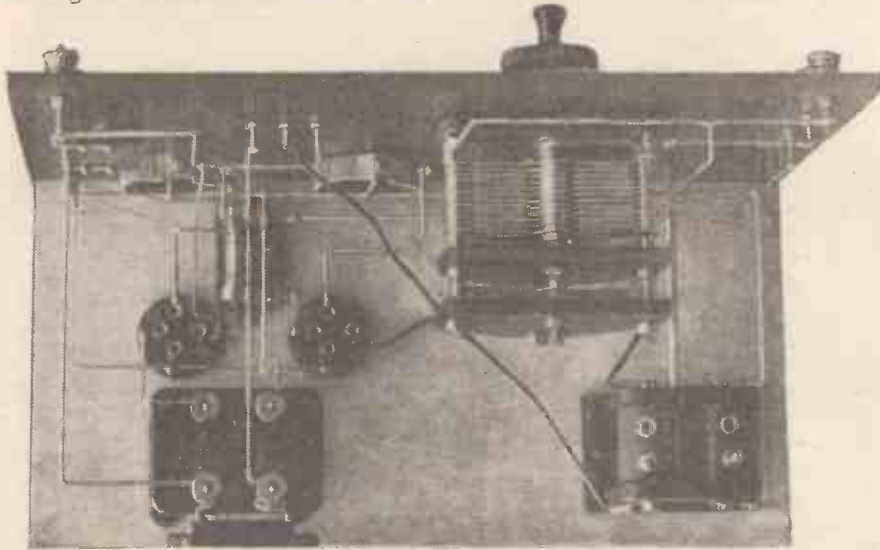
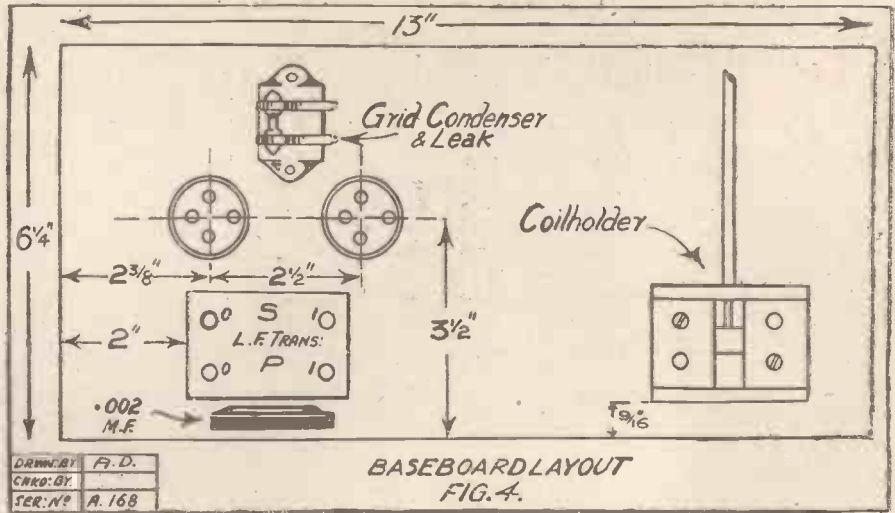
THE "P.W." TWO-VALVER.

(Continued from page 484.)

tags, etc., before mounting them in the set, and to apply a little flux and then drop a bead of solder on the places where the connections are to be made. This procedure will ensure a clean and easily made joint when the time comes to connect up the wiring, and the process is known as "tinning."

Reaction Coil Connections.

The wire itself is already "tinned," and does not need this preparation; all that is necessary when the actual soldering is to be done being a small spot of fluxite and a touch of a really hot soldering iron. The remaining fluxite should be removed from



Looking down on to the baseboard behind the panel. Note the long-handled coil holder.

size, etc.) and the wave-length of the station it is desired to receive, but for general purposes the series terminal should be used and the earth taken to "earth" terminal. The coils have already been inserted, the 75-turn coil being in the aerial circuit.

The coils shown in the photograph on this page are the well-known "Lissenagon" coils, and work exceedingly well in the 2-valve receiver.

Tuning Adjustments.

For the reception of 5-X X the aerial should be connected to the "parallel" terminal and the "series" terminal joined to the one marked "earth" and to which the earth lead is connected. The coils for 5 X X should be 200 in the aerial position and 150 in the reaction (moving coil holder).

Tuning is carried out by means of the variable condenser, about 60 volts H.T. being used and the valves turned up just brightly enough to make the set oscillate when the reaction coil is brought up close

(Continued on page 488.)

each joint immediately after it has been made and while it is still hot.

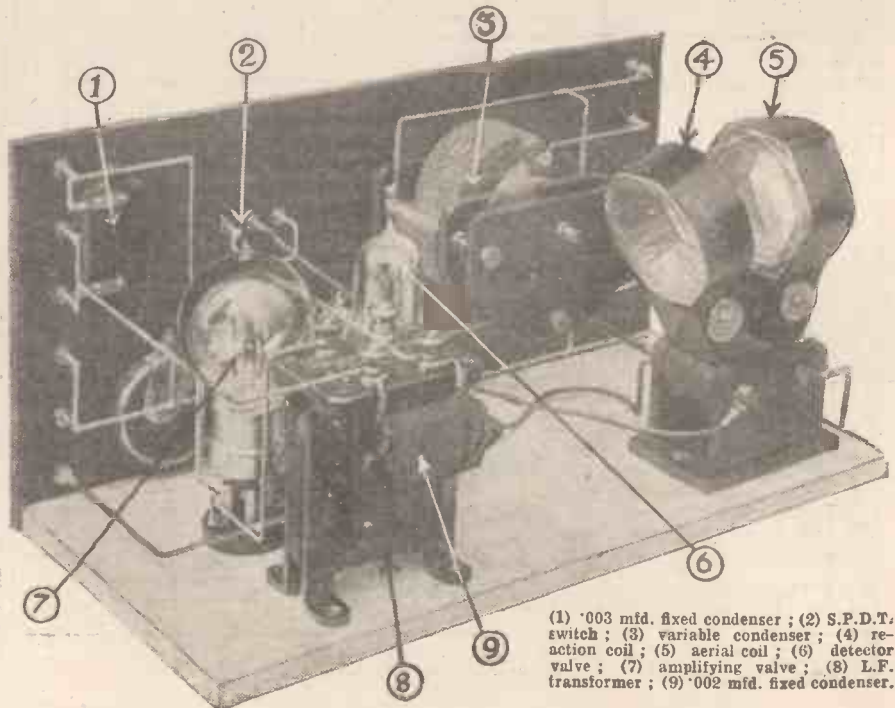
For the average plug-in coil the connections of the reaction coil holder as shown in Fig. 5 and in the photographs will ensure that the reaction coupling is correct, but should the set not oscillate after all has been completed and connected up, the reaction coil leads should be reversed and the set tested again. It does occasionally happen that coils are wrongly connected internally, when the connections given in the diagrams would have to be reversed, but this is not at all likely to occur.

Checking the Wiring.

When the receiver has been wired up according to Fig. 5 it should be carefully looked over to make sure that no connections have been omitted or wrongly made, and the wiring should be checked by the list of point-to-point connections given on another page.

After this the set should be cleaned and all traces of flux or loose solder removed, after which the valves may be placed in position, a 75-turn coil put in the fixed holder and a 50 in the moving sockets, and the batteries connected up ready for testing.

The actual connection of the aerial lead will depend upon the local conditions (aerial



(1) .003 mfd. fixed condenser; (2) S.P.D.T. switch; (3) variable condenser; (4) reaction coil; (5) aerial coil; (6) detector valve; (7) amplifying valve; (8) L.F. transformer; (9) .002 mfd. fixed condenser.

THE "P.W." TWO-VALVER.

(Continued from page 487.)

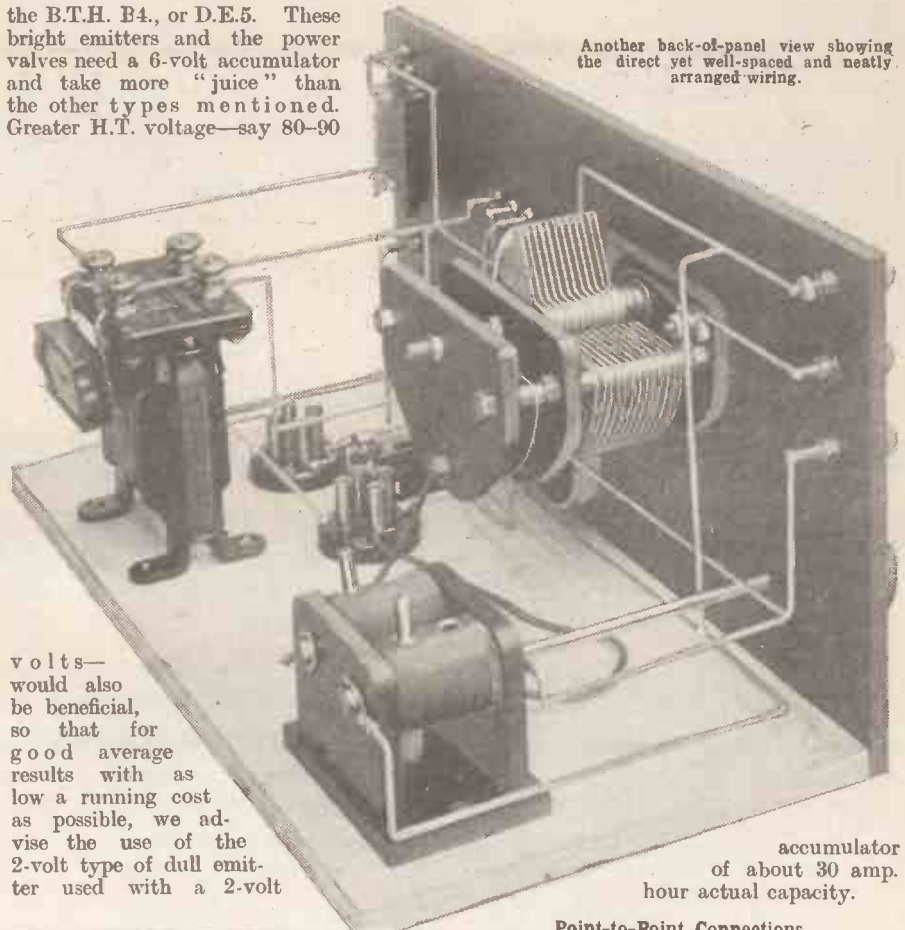
to the stationary one. While tuning, the reaction should not be close enough to make the set oscillate, but should be about half an inch farther out than the position at which oscillation (denoted by a click in the 'phones followed by a rushing sound) commences. Final adjustments on this coil will enable maximum signal strength to be obtained after the station has been tuned in by means of the condenser.

The Valves to Use.

Any good make of valve can be used, the Cossor W.1 in both stages, or the D.E.R. or B.3, or similar valve being quite suitable, in which case a 2-volt accumulator should be employed. Other valves, requiring a 4-volt accumulator, are the B.5, D.E.3, A.R. .06 (taking only .06 amp. each), but we prefer the 2-volt type of dull emitter to those taking 3 volts and needing a 4-volt accumulator. These latter are more difficult to control by means of the filament rheostats, as it is quite easy to injure them if they are turned up too brightly when the 4-volt battery is on.

Among the bright emitters the Marconi R.5V., the B.T.H.R. type and many other similar valves make good detectors with similar valves as L.F. amplifiers, or better still, one of the D.E. power valves such as

the B.T.H. B4., or D.E.5. These bright emitters and the power valves need a 6-volt accumulator and take more "juice" than the other types mentioned. Greater H.T. voltage—say 80-90



volts—would also be beneficial, so that for good average results with as low a running cost as possible, we advise the use of the 2-volt type of dull emitter used with a 2-volt

accumulator of about 30 amp. hour actual capacity.

Point-to-Point Connections.

Aerial ("parallel" terminal) to fixed vanes of condenser, to plug of fixed coil holder, and to one side of grid leak and condenser.

Other side of leak and condenser to grid of right-hand valve socket.

Plate of this valve socket to socket of moving coil holder.

"Series" aerial terminal is connected to moving vanes of condenser.

"Earth" terminal is connected to socket of fixed coil holder, to I.S. of L.F. transformer, and to both rheostats (moving contact) and to L.T. — and H.T. — terminals.

Plug connection of moving coil goes to centre of the switch.

Right-hand side of switch is taken to top 'phone terminal, and to plate of second valve socket.

The fixed terminal on each rheostat is connected to one filament socket of the respective valve holder.

The other filament sockets of the valve holders are joined together and taken to L.T. +.

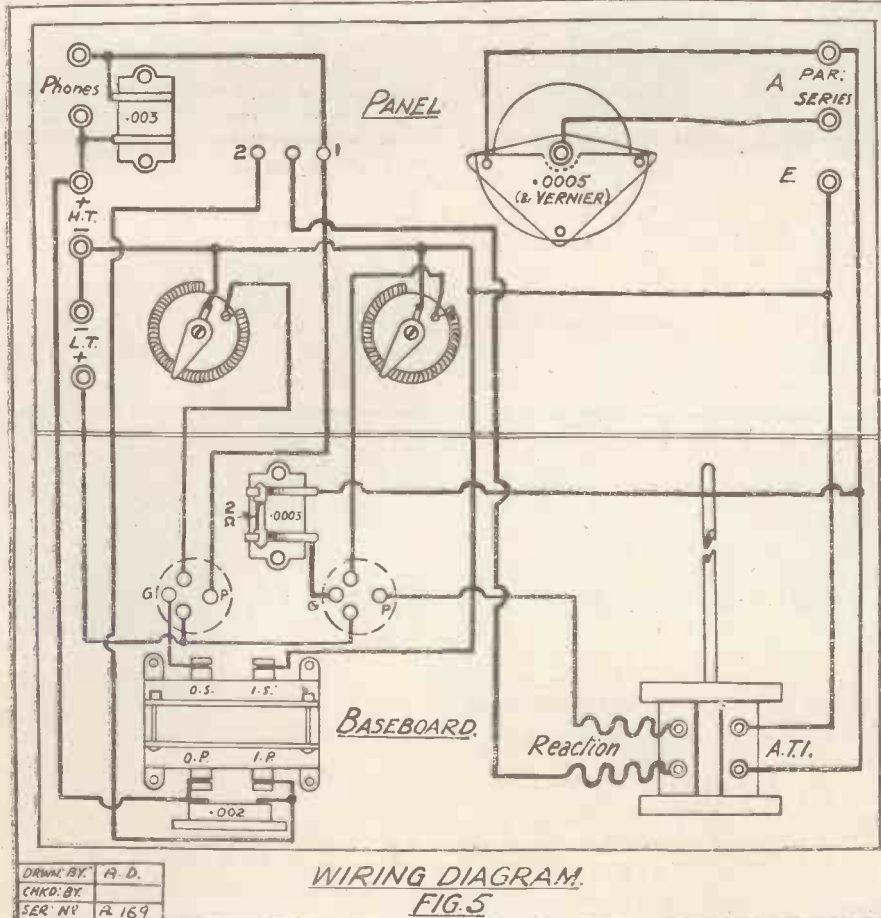
Lower 'phone terminal is joined to H.T. + and this is then taken to O.P. of L.F. transformer.

I.P. of the transformer goes to the left-hand contact of the switch.

A .003 mfd. fixed condenser is connected across the 'phone terminals and a .002 across I.P. and O.P. of the transformer.

O.S. of the transformer is connected to the grid of the second valve holder.

Switch positions are (looking at face of panel): To the right L.F. valve on (2 valves in use). To the left L.F. valve off (1 valve only). In this latter case the right-hand filament rheostat should be turned off.



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WIRING DIAGRAM.
FIG. 5



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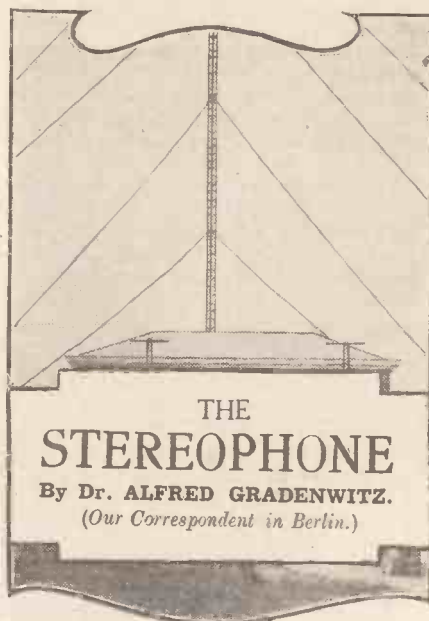
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BBROADCASTING, in spite of its unceasing technical improvements, is as yet unable to give the same musical enjoyment as direct listening. While this previously unavoidable deficiency was put down to imperfect rendering of the original music, but it is now being realised that the main factor in this connection is the one-sided hearing which results in a certain flatness of tone, the same as seeing with one eye generally conveys an impression of surface rather than three-dimensional space.

Use of Two Microphones.

Endeavours have therefore been made to devise some means by which the left and right ears respectively might receive slightly different acoustic impressions, the same as occurs in direct listening, our right ear, in accordance with the distance of about 21 cm. separating the two ears, receiving a slightly different impression from the left ear.

If two microphones separated by a corresponding distance were used as sound recorders, two separate lines of conductors being relied upon to lead the microphone currents to the left and right headphones respectively, a sound would be heard in exactly the same manner as though the two



received only by one, and those recorded by the second microphone by the other headphone. While this process in theory would seem to be quite feasible, it has not yet been carried out in actual practice.

A New Process.

A German wireless engineer, Mr. H. Kluth, of Nauen, has devised a new process based on a phase displacement of the waves striking the broadcast receiver, the transmitting station being, as usual, operated with a single microphone.

A shifting in phase of high-frequency vibrations in a wireless receiver could with relative ease be obtained with the aid of a variometer free to rotate through 360 degrees. The circuit in Fig. 1 illustrates a simple arrangement enabling a phase displacement from zero to 360 degrees to be obtained in accordance with the actual position of the variometer. If this arrangement were used in connection with the wireless receiver it would entail the use of two valves (Fig. 2), causing the original high-frequency current and that shifted by a fraction of a phase to be supplied to headphones 1 and 2 respectively. This arrangement has much to commend it, and has been found to work without any hitch, but though setting up a phase difference, it has proved utterly unable to convey an impression of "stereoscopic" hearing. The following instance will serve to make this clear.

Phase Displacement.

If the transmitter be operated, say, on a 500-metre wave, there would be as much as 600,000 high-frequency vibrations per second corresponding to a relatively small number

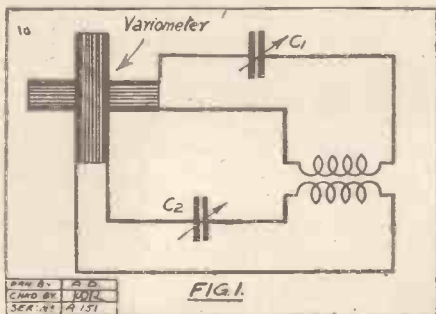
of acoustic vibrations, so that each high-frequency vibration would only carry a minute portion of a sound vibration. The arrangement above described will accordingly enable a sound vibration to be shifted at most by a few thousandths of its length.

This failure to obtain an adequate phase shifting by acting on the high-frequency current leads up to the actual solution of the problem as devised by Mr. Kluth—i.e. a phase displacement in the telephone current. Telephone currents, of course, have the same frequency as the sounds they set up in a telephone receiver and which, for the note A, is 435. This sound could accordingly be shifted through one-half vibration by a 180 degrees phase shifting. However, a shifting of about 100 degrees is quite sufficient for obtaining an impression of plastical hearing: The acoustic vibration corresponding to note A is about 75 cm. in length, and a sound coming, e.g. from the left, would have to travel through a distance about 21 cm. longer (corresponding to the mutual distance of the two ears) from the left ear to the right, thus undergoing a lag of 21 : 75 vibrations.

Introducing Current Lag.

As a wave-length of 75 cm. corresponds to a phase displacement of 360 degrees, a 21-cm. lag would correspond to a 100-degree phase displacement. If the phase of the telephone current could have a lag of about 100 degrees, this deferred current being supplied to the second headphone, the impression of a plastical acoustic picture would be produced by artificial means.

As regards the means to be adopted in

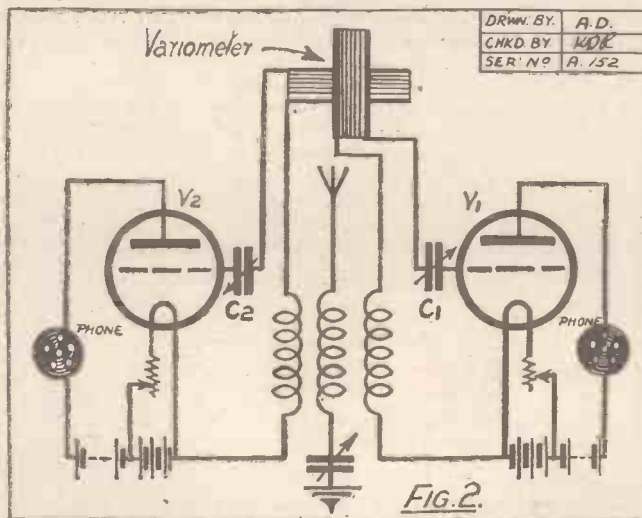


ears were substituted for the microphones—i.e. this arrangement would convey a perfectly natural, plastical (that is to say, three-dimensional) impression. If, on the other hand, the two lines of conductors between the microphones and telephones respectively are replaced by two wireless transmitters and receivers, the same phenomenon would occur, resulting in a perfectly plastical acoustic picture.

Practical Difficulties!

Another solution of the problem could be conceived of in theory as follows: Microphone vibrations are known to be superimposed on electric waves. Inasmuch as two microphones installed at a short distance apart are able to record the phase difference required for a plastical acoustic picture, the vibrations recorded by the two microphones could be superposed on a single train of electric waves. The waves issuing from the wireless transmitter would then carry the phase difference and the wireless receiver would receive it.

However, inasmuch as this phase difference is communicated simultaneously to both headphones, both ears are bound to receive the same acoustic picture, thus excluding any actual plasticity. In fact, the electric waves generated by the two microphones respectively and carried by the same train of broadcast waves would have to be disentangled so as to cause those corresponding to the first microphone to be



producing a phase displacement in a low-frequency current constituting a telephone current, the most obvious would be the insertion of a resistance. However, though reducing the current intensity this would be unable to act on the rate of current flow. If, on the other hand, so far from altering the original telephone current, means were devised for setting up a separate induction current for the second telephone, a near approach to the ideal solution could be obtained, while a fully satisfactory solution would be found to result from a very simple additional arrangement. A transformer traversed in its secondary winding by the

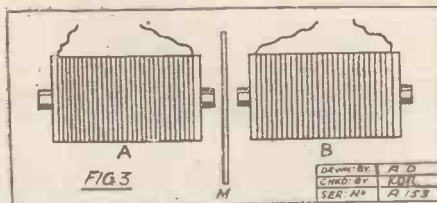
(Continued on page 492.)

THE STEREOPHONE.

(Continued from page 491.)

same current as in the primary winding could be used in this connection, though a more suitable alternative is the use of a combination of two electro-magnets between which a membrane is free to vibrate (Fig. 3).

As the current in magnet A is growing membrane M will be attracted and the



current in the coil of electro-magnet B will decrease. As, on the other hand, the current in A is decreasing membrane M will come close to electro-magnet B, causing the current in the latter to augment. In fact, a pulsating current of the same rhythm as the original telephone current, though with a phase displacement of about 180 degrees, is thus produced in electro-magnet B.

"Stereoscopic" Effect.

If now the current passing through A is listened to by one, and the current generated in B by the other headphone, there will still be an impression of practically one-eared hearing, a phase difference of 180 degrees being too great to produce the phenomenon of plastical hearing, while a phase displacement of only 100 degrees in accordance with the above is quite sufficient to produce it.

In order to effect this reduction in the phase difference of the current induced in the

two coils L and K. In order to supply headphone 2 with a current of the same intensity as the current operating in headphone 1, care should be taken to devise the coils i and L in accordance. This arrangement will result in a phase displacement of the current in headphone 2 of just sufficient magnitude to convey the impression of a plastical acoustic picture when listening-in with both headphones simultaneously. This effect will be further increased by acoustic differences unavoidably connected with the inductive production of the current in headphone 2.

Receiver Unaltered.

This arrangement thus gives rise to a similar effect to the stereoscope in optics, and therefore has been fitly styled a *stereophone*. It is readily accommodated in a small box, only the contacts a, b, c, d, e, f are required to obtain a connection with the wireless receiver (a and b) and the two headphones (c, d, and e, f respectively) being disengaged. The coils L and K are rigidly mounted at a suitable angle to one another.

This stereophone at the present time is the most suitable and straightforward solution of three-dimension broadcasting, entailing as it does no alteration of the transmitter or receiver.

WHAT'S WRONG WITH YOUR SET?

By A. W. HULBERT.

THAT old saying, "a little knowledge is a dangerous thing," is as true in wireless as in anything else, and one will often find the advanced experimenter going miles out of the way to trace a simple fault which could have been remedied in a quarter the time had common sense been brought into play. Small troubles to which the set is heir, and their equally simple remedies, will now be described and dealt with from a practical and straightforward point of view.

The Aerial.

The writer once knew a man who spent quite a good sum on having his aerial erected. Everything—in insulators, aerial wire, lead-in, etc.—was of the very best, and yet his set was most erratic in its performance. After the installation had been thoroughly tested, it was found that the whole cause of the trouble was the

down leads from aerial swaying in the wind and touching a zinc gutter on the garage roof. Every time the leads brushed against the gutter, the aerial was temporarily "earthed" and the set—a four-valve—put in violent oscillation.

Weak signals, especially in the case of a crystal set, will often be traced to a film of dirt on the insulators. It is a good plan to lower the aerial periodically and thoroughly clean the insulators with a rag moistened in petrol. Insulators function better when perfectly clean, and a periodical

inspection is essential; this is especially necessary in towns, where much smoke is present, the carbon dust deposit causing serious leakage and consequent poor reception.

The Earth Connection.

It is quite a common thing to find earth connections made by simply twisting the earth wire round the nearest water-tap. This is usually satisfactory for two or three months, but as soon as the wire becomes corroded with damp, it either breaks away or fails to make any real electrical connection at all. The only sure method is to solder the earth wire to a main water-pipe, as near the ground as possible.

The Accumulator.

If the signals are loud when the set is first switched on, but grow fainter after thirty seconds or so, it is a sure sign that the battery is practically exhausted and requires recharging.

Noisy H.T. Battery.

A friend of the writer's called him in to examine a loud speaker which, it was alleged, had suddenly become very noisy. The owner of the set was sure that the loud speaker was at fault because reception with the headphones was perfect. A short test revealed the fact that the fault lay in the H.T. battery, certain cells of which were dead. When the 'phones were used the wander plug was adjusted so that the H.T. voltage was cut down to about a third of its normal value, and by chance the dead cells did not happen to be in circuit.

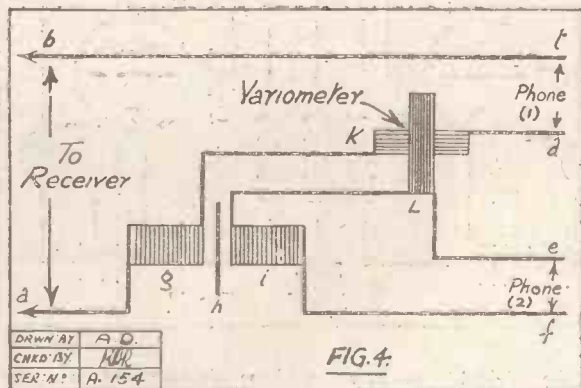
When the loud speaker was in use, however, and the whole of the H.T. battery brought into operation, the dead cells were in circuit and caused the crackling, whistling and trying noises for which loud speakers, transformers, and condensers had been blamed in turn.

Dirty Contacts.

Unpleasant noises, weak signals, etc., may often be traced to a dirty contact stud or partially broken connection. Filament switches, sliding contacts, variable grid leaks—all these should be examined occasionally. Tuner studs and switch arms should be cleaned whenever they get tarnished, with the aid of a dead smooth file or an emery buff-stick. All other connections should be soldered, if possible, and a deal of trouble will be prevented by making corrosion impossible.

Connections to the accumulator should be frequently inspected as the acid fumes will quickly corrode the wire and not the surrounding insulation. Frayed telephone or loud-speaker leads will cause endless trouble by partially shortening or leaking just in the middle of a concert—a complete new lead is the only real remedy, and far more satisfactory than attempting a repair.

The above notes describe a few of the minor troubles encountered; the reader will find it a good plan to keep a brief note of any others he may come up against from time to time. A few words on the trouble and how it was rectified may prove of inestimable value to one of his friends at some future date.



second headphone another phase shifting will be required. This, in accordance with what has been said in connection with phase shifting in the high-frequency current, can be obtained by means of an inductive variometer which, however, should be designed on somewhat different lines, its two coils being made up of a large number of turns (10 to 30,000) of thin wire to produce inductive coupling.

The arrangement of the variometer will be seen from Fig. 4. The phase shifting is found to vary according to the angle between the

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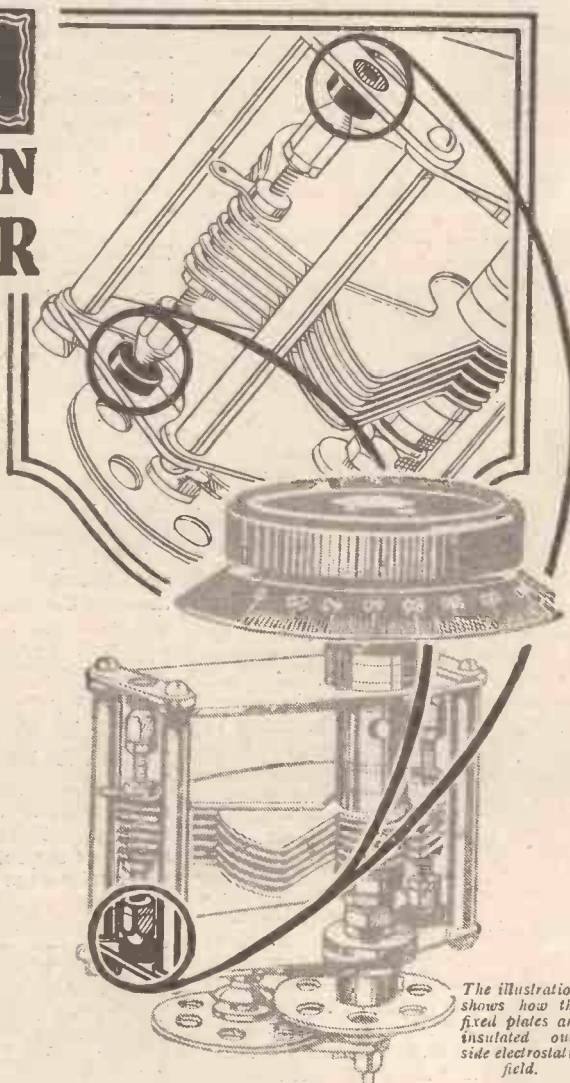
The large control knob assists the micrometer movement in providing fine tuning.

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The illustration shows how the fixed plates are insulated outside electrostatic field.

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UNCLE COMES BACK.

Another Adventure of the Inimitable Geary.

By HIGHAM BURLAC.

BUT for that three-ply, square-law, low-loss lunatic Geary I should have set up two-way communication with a five-watt Boy Scout station on the summit of Mt. Cook, New Zealand—a record in long-distance imagination. I was just on the breathless stage of tuning-in when Geary burst in with his set at a two-mile range, with "Hallo 7 H B, 6 A G calling (*dash this choke*) are you there Higham I say can you come round at once urgent 6 A G OVER."

Drearily I shifted wave and replied, "Here 7 H B all right what is it water-pipe burst or maiden aunt to be escorted over St. Paul's or usual loan?"

The reply came, "Hallo 7 H B here 6 A G can't spill it over the ether (*dash this microphone*) come round now 6 A G OVER and closing down *spit crackle gr-r-r-r phut.*" I went round.

A Kindly Thought.

"Well," I said, as I sat down, "and how much is it going to cost Higham this time?"

"Not a bean, not a bean," answered Geary, drawing up his chair till his bony knees pricked my own chubby ones. "This time, my boy, it's a mere histrionic effort I ask."

"And who is the victim?" I queried.

"Uncle Ezekiel."

"Er—not the one at 2 L O?" I asked, in alarm.

"Oh, no! A pukka uncle. A most valuable uncle, I assure you," said Geary. "He lives at Peckham, and his name is Staggers."

"Why?"

"Because—well—I appreciate your surprise and horror, Higham—but as a matter of fact it's *really* Forest Hill—as good as anyway."

"He's just sayed, then."

"Right. Very decent of you, Higham, old lad. Have another glass of water? Now, Uncle Zeke—we call him Ezekiel only on Sundays—has just—only just—heard about broadcasting and I want to interest him in it, and incidentally in myself. He's rising ninety and choked with money, and it would be a pity not to liven up the old chap's last years."

The Second Conspirator.

"But what do you want me to do? Put in a set for him, or what?"

"No! He's frightfully conservative. He's still living in the days of good Prince Albert, and thinks a pair of mutton-chop whiskers the last word. I want you to be the Second Conspirator and soothe the old bloke. All you have to do is to assure him that it won't blow up and that they play the 'Battle of Prague' and 'Come Lads and Lassies,' and awful tripe like that. He won't believe me. If he clicks with this my name is Heir. Are you on?"

"I am," I said, "and if your name

becomes Heir you can settle up for those valves you had three years back."

"All you think of is money," Geary replied.

A few days later we called at No. 9, Balacava Mansions, Peckham-really-Forest Hill, and found Uncle Zeke entirely surrounded by a smoking-cap and a sprightly young daughter of some seventy winters and autumns.

"Great Jupiter!" I whispered to Geary. "Have I got to fight the dragon as well?"

"Naw!" he hissed. "She's as putty in his hands. Smile like Prince Albert, — you!"

The Latest Scientific Marvel.

"How do you do, uncle?" said Geary, with a ghastly 1851 look on his features. "I've brought a good friend—Mr. Gundlestrow—to talk to you about the latest scientific marvel. (*Smile, you fool; smile.*)"

Uncle Zeke opened a fearful, toothless cavern, and mumbled something about "My darter."

"Oh, she's gone to do her patchwork quilt," said Geary. "Mr. Gundlestrow wants you to try the latest scientific marvel. He recommends it."

"Eh! My nevvie tells me there's a machine as sings out of the air. Can't abide these new-fangled notions, galvanic batteries and what next. Dangerous, dangerous! Give me the good old harpsichord. Or the kaleidoscope. Or a narp. I hearn a narp in '69. Played by Miss Rinfugeon, it were. Hangelic!"

"Bring I the Machine."

"Permit me, sir," I broke in. "This new marvel of the electric fluid enables us to project the voice or the sound of a spinet or serpent on aerial vibrations, so that audiences at a distance may listen and adore."

"No gunpowder—or—or shocks, eh?" quavered the Ancient.

"'Tis like the singer herself, Mr. Staggers," I replied, placing a hand on my heart, and nearly pulling off the white beaver I had hired from Willie Clarkson.

"I'm minded to try, I am. Will—tell me—will I hear 'My Love is Like a Dove, I Trow,' and—and—will I hear 'Maids in the Morn'?"

"Absolutely, sir. No danger, no sparks! Why, last week I heard 'Come Up, Ye Lassies,' so lifelike 'twere that my old house-keeper—a spinster body—blushed and poked her finger at my ribs."

"B'gum! And did she?" quavered Uncle Zeke. "Aloysius, bring I the machine."

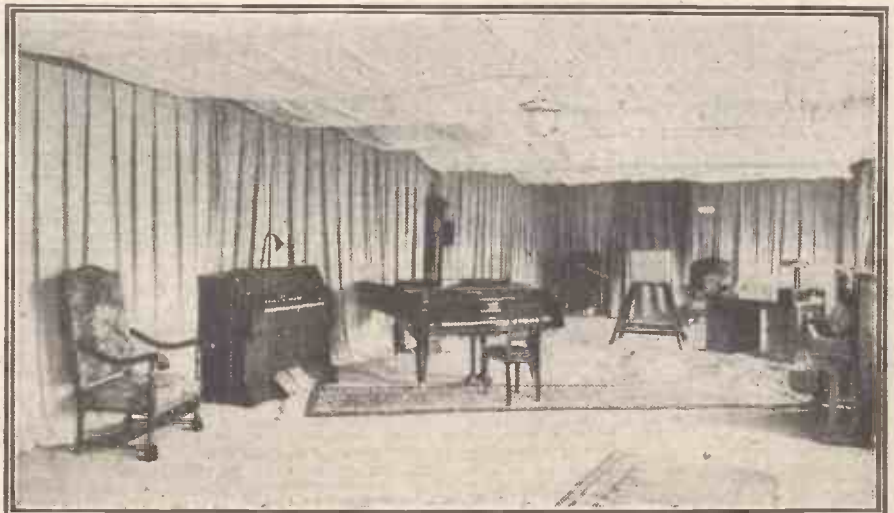
Love's Labour Lost.

Geary had a good set installed and worked it himself for a night or two, turning in all the old ballad stuff. Uncle Zeke stuck it bravely and tapped his old toes all through the minuets of 1840 to the mazurkas of 1870.

On the fifth night Uncle put on his Sunday cravat. In a month he had shaved off his whiskers and had smoked a cigar.

Geary began to get nervous and tried to keep the old fellow on a Sunday evening service diet, but Zeke was not to be swindled. One night, after Geary had gone, the old dodderer switched on and plunged clean into the Savoy Orpheans!

"It's all up for another two or three decades," wrote Geary, a few months later. "The old bloke has come on like a three-year-old. Dropped in last night to ask my opinion of the cut of his plus-fours. Explained the shimmy-shake to me. Had a card this morning to say that the old ruin is going to marry his cousin—aged sixty—next year. And I thought I was smoothing out his last few years on earth. Wonderful thing—wireless."



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MARBLE SWITCHBOARDS, complete with all fittings, in new condition, 10/- each.

R.A.F. MARCONI OSRAM AMPLIFYING R VALVES. Standard fitting, all brand new. Fil. voltage 4 volt, anode 40-60 volt. These are, without doubt, the loudest valves to be obtained at the above voltages. Price, to clear, 5/- each, post 6d. Guaranteed.

CHOKE COILS. Iron enclosed core, as used in thousands of sets for resistance coupled sets, smoothing filters, etc., etc. Sizes 1,000 ohms, 9d.; 500 ohms, 9d.; 250 ohms, 9d. Worth 8/- each, post 3d.

CHLORIDE UNSPILLABLE ACCUMULATORS. These accumulators are brand new, with 3 months' guarantee. Specially designed to prevent acid spilling or bubbling over the top. At Given-away prices: 2 volt 40 amp., 7/-, post 6d.; 4 volt 40 amp., 14/-, post 1/-; 6 volt 40 amp., 20/-, post 1/3; 2 volt 100 amp., 14/-; 4 volt 100 amp., in case, 28/-; 6 volt 100 amp., 40/- . All Celluloid cases.

D.III WATCH PATTERN MICROPHONES. Useful for Speech amplifying, etc., 2/- each, post 3d.

VULCANISED FLEXES AND WIRES at half retail prices. Heavy Maroon Twin Flex, 2/6 doz. yds., post 3d. Light Twin Flex, 2/- doz. yds., post 3d. 4-way Telephone Flex, 3/- doz. yds., post 4d. 22, 23 and 24 gauge Instrument Wire, 1/3 lb., post 6d. 36 gauge Enamelled Instrument Wire, in 3 lb. reels only, 7/- per reel, post 1/-. 7/22 Enamelled Aerial Wire, 2/6 per 100 ft. 7/20 super Aerial Wire, 4/- 100 ft., post 6d. Rubber and Vulcanised Lead-in Wire, 2/6 per doz. yds., post 3d: 1/18 Single Wire, already covered for wiring sets, 1/6 doz. yds., post 3d. Red and Black Positive and Negative coloured Flex, 2/6 doz. yds., post 3d. 1/18 Vulcanised Cable, Black, 5/6 100 yds. coil, post 1/-. etc., etc. All above are highest grade makers and brand new stock.

TRANSMITTING SETS R.A.F. These sets are high-class instruments, containing 1-in. Sterling spark coil, wound with 3 lb. 38 gauge silk wire, Ebonite panels, high-grade Aluminium Spark Gap, mounted on Ebonite, with adjuster, mica dielectric condenser, Ebonite panel. Terminals and other sundry fittings. Cost £15 each. Price, to clear, 12/- each, post 1/6. Useful to all experimenters for parts, etc. Anyone can purchase one of these sets.

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HIGH GRADE LABORATORY INSTRUMENTS, all brand new. Accuracy guaranteed. Laboratory combined moving coil, readings, 0-10 volt, 0-100 volt, 0-5 amp., 0-5 milliamps. Lowest reading 1-10th part of a milliamp., 57/6 each, post 1/-.
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MIRROR REFLECTING 0-1,000 MOVING COIL VOLTMETERS, 50/- each, post 1/6.

INSULATION TESTERS, with Hand Generator. £5 10s. each.

SWITCHBOARD AMP METERS AND VOLTMETERS, 4-5 in. dial, 0-30 amps., 22/- each, post 1/-; 0-50 amps., 24/- each, post 1/-; 0-80 volts, 24/-, post 1/-.
MICRO AMP METERS, mirror reflecting, beautiful clear reading, £7 10s. each.

POCKET VOLTMETERS, 0-12 volts, clear scale, 5/6 each, post 6d.

AERIAL AMP METERS, 1-5 amp., 7/6 each, panel mounting,

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PETROL ELECTRIC COUPLED GENERATING SETS. - A B C Sets, 50 volt. 20 amp., £20. Austin 4 cyl., 3 1/2 kw., 110 volt 32 amps., £40. Austin 2 cyl., 2 1/2 kw., 110 volt 23 amp., £35. Switchboards quoted for separately; state requirements.

GENERATORS. D.C. Shunt Wound, 75 volt 40 amp., 4-pole, £12; 110 volt 65 amp., £18; 400 volt 12 amp. motors, £15; 220 volt 8 H.P. motors, £15, and various other motors and generators in stock; state requirements.

4,000 OHM HEADPHONES. High grade make, retail price, 15/- . Our price, to clear, all brand new, 7/6 per pair, post 9d.

FULLER'S ACCUMULATORS. Brand new, especially designed for heavy or light discharges, without sulphating or shedding of plates, 2 volt 120 amp., 14/-, post 1/-; 4 volt 120 amp., 28/-; 6 volt 120 amp., 40/-.

MICROPHONES. Western Electric Wireless transmitting, with handle, very sensitive, 15/- each.

TRANSMITTING VARIABLE CONDENSERS. Ex-Naval, capacity .001. Heavy type, in glass case, 5,000 volt, 25/- each, post 1/6.

1,000-VOLT 100 MILLIAMPER. H.T. Generators, complete with 2-valve Rectifier and 2 Rectifying Valves, £2 10s. each.

LABORATORY BRIDGE CONDENSERS, 5,000 volt mica dielectric, and contain 7 separate condensers. Any condenser can be plugged in separate, and any combination of capacities can be obtained. Condensers all in 3 1/2 mfd., £2 each.

AMPLIFIERS, M.III and M.IV. Containing 3 Intervalve Transformers and 1 Telephone Transformer, Stud Switch, Fil. Rheostat, etc., etc. These are well known as perfect amplifiers, price 50/-, post 1/6.

M.III SINGLE VALVE TRANSMITTERS, range 300-1,450 metres, containing tuning coil with stud tapping, 2 Variometers, Variometer reaction and Variometer tuning, with ratchet movement. All coils wound on heavy ebonite. Condenser .01. Wound leak and condenser. Multiple switch, lamp, heavy key, aerial amp-meter, etc., etc., 1/2 in. ebonite panel. Cost £15. Price to clear, 30/- each. With slight alteration these can be used for receiving microphone to suit, 2/6. Passenger train, 2/6. Brand new sets.

COPPER EARTH MATS. Size 20 ft. by 2 ft., 12/6 each, post 1/6.

OTHER GOODS IN LARGE STOCKS:

Dewar Switches, 2/- each. Plugs and Jacks, 2/- pair. Plugs, spare, 1/- each. Condensers, 1 mfd., 1/6; 2 mfd., 2/6; .05, 6d. Terminal, 7-piece, 2/- per doz. Telephone Cords, 6-8 ft. long, 6 cords, 1/- . Buzzers, 2/6 each. Brown's Headbands, 2/6 each. Egg insulators, 1/- doz. Telephone earcaps, 2/- doz. Exchange boards, 10-line cordlers, new, 70/- each. Wavemeters, range 100-3,500 metres, £5 each. 2-ton brass oddments, screws, nuts, washers and various parts, 9d. lb., post 6d. 66 volt H.T. batteries, new 7/6 each, post 1/- . Single earphones, 1/3 each.

MASTER VIBRATOR BUZZERS, useful for rectifiers, buzzers, etc., cost 35/- each, price to clear 2/6, post 6d.

ACCUMULATOR PLATES. Standard, 4 by 3 1/2 in., positive plates, 10d. each; negative, 7d., post 3d.

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NAVAL MULTIPLE TUNERS, 100-1,000 metres, 12/6 each. Chater Lea terminals, 2/- per gross. Variometers, broadcasting, 3/- each. Morse practise keys, 1/6 each. Fixed condensers with grid leak. .0001, .0002, .0005, 9d. each. Fallon variometers, all moulded, list price, 10/6, to clear, 5/- . Fallon condensers at half prices, .0005 standard, 4/-, post 6d.: square law, .0005, 5/-, post 6d. And thousands of other accessories in stock.

All kinds of meggers and insulation testers in stock. Brand new. Prices from £5 to £15.

Foreign Orders must be accompanied by extra postage.

N.B. - All orders dealt with in strict rotation and in the event of any dissatisfaction the money will be immediately refunded or the article replaced.



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

WE recently received an interesting pair of telephone receivers for test, known as the H.M.H., and retailed at 18/6. They are manufactured by Harry Morser & Co. of 94 Hatton Garden, London, E.C.

Their outstanding features are the peculiarly shaped earpiece caps with which they are fitted. They are so designed that they do not press indiscriminately into the centre of the ear, but fit over it. The caps are made of light moulded material, and the whole headpiece is light in weight.

The H.M.H. phones are very comfortable to wear and fit easily yet closely over the head. External noises fail to interfere with listening to the extent that they do in most cases, but ventilation is not forgotten.

They proved to be quite sensitive in operation, and the purity of reproduction obtainable was well up to standard. Their

appearance is out of the ordinary and might be regarded by some as being rather ugly, but workmanship and finish leaves no room for criticism.

An automatic crystal detector embodying interesting and original features has been sent us for test by Messrs. Harlie Bros., 36, Wilton Road, London, E.8. Known as the "Harlie" super-sensitive detector, it retails at 5/6 complete with crystal. The crystal is in the form of a small roller which can be rotated by means of a milled knob, the edge of which protrudes through an aperture in an enveloping nicked case. A small spring cat's-whisker is so arranged that it bears lightly on the roller, and being provided with an adjustment movement, can be regulated so that the whole roller crystal surface is available. One cat's-whisker

setting will, however, last for considerable periods and the whole operation of adjustment is confined to the gentle rotation of the milled knob. The detector is provided with plugs and sockets so that it forms a very neat little panel-mounting component.

On test it gave excellent results. Sensitive spots appeared to exist in one continuous line round the "roller," and after being "set" at one particular point, efficient stable rectification was obtained in both crystal and valve crystal circuits. The "Harlie" detector can certainly be recommended to the attention of our readers.

We are informed by the Oldham accumulator company that they are now producing their "1/- per volt" H.T. batteries in units of 20 volts instead of 24, as they consider that the former value will prove more useful. Each cell is, of course, provided with plugs, so that variations of 2 volts are possible throughout.



One of the new improved Oldham accumulators recently placed on the market.

(Continued on page 498.)

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MELLOWTONE

COUPLERS
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ELIMINATES COSTLY COILS AND UGLY HOLDERS.

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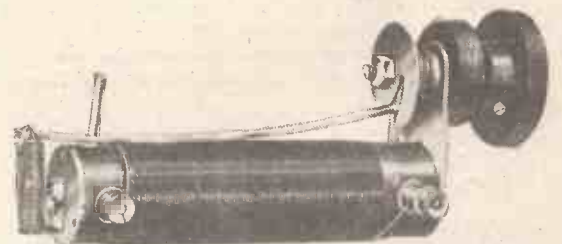
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FILAMENT CONTROLS
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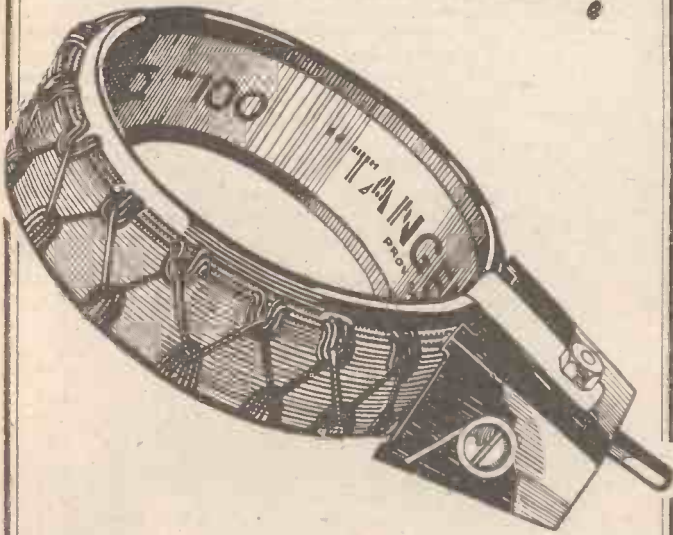
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BETTER—

because the special method of winding allows a larger gauge wire to be used, which naturally offers a minimum resistance to high-frequency currents.

BETTER—

because there is ample air-spacing between the windings, reducing the self-capacity to a minimum.

BETTER—

because these windings are in no way interlaced and this absence of turn crossing turn is a factor of no small importance.

BETTER—

because the coil is a sound mechanical job, substantially built on a stout frame, each coil being a solid and compact unit not affected in any way by handling. The tuning with the Tangent Coil is so sharp that the resulting selectivity is surprising and there is a complete absence of distortion at all frequencies.

Made to fit all standard coil holders.

See Tangent—The Better Coil Now.
Ask your Dealer to-day.

WRITE
FOR
BOOKLET
P.W.
FREE ON
REQUEST.

COIL No. - - 25 35 50 75 100 150 200 250
Self - Capacity in Micro-Microfarads } 9 25 31 22 16 22 22
PRICE, each - 4/3 4/3 4/3 4/6 5/- 6/- 7/- 7/6

COMPLETE SETS

4 Concert Coils (W L 250 to 1,180) 16/- the set.
11 " " (W/L 250 to 9,000) 67/- the set.

Most good houses sell Tangent fitments.



GENT & Co., Ltd., Faraday Works, Leicester



NEW RANGE OF COMPONENTS

THE SAME thoroughness of design and finish that made A.J.S. Receivers and Sets the considered choice of Sir Oliver Lodge are features of all A.J.S. Components—that is why expert constructors are now insisting on A.J.S. Components for building their own sets. Full details of the complete range of A.J.S. Sets, Loud Speakers and Components will be found in the illustrated literature, sent free on request.

A.J.S. Choke Units—illustrated here—are a great advance on the usual method of L.F. amplification. They bring in signals with a purity, strength and freedom from disturbing noises that make long-distance reception infinitely easier and Loud Speaker reproduction a real pleasure. These chokes are fitted to Sir Oliver Lodge's A.J.S. Receiver.

A. J. STEVENS & CO. (1914), LTD.,
Radio Branch, WOLVERHAMPTON

Phone: Wolverhampton 1748-52. Radio Call Sign 5 R.I.
Grams: "Reception, Wolverhampton."

London Offices and Radio Showrooms:

122-124, Charing Cross Road, W.C.2

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FIXED CONDENSER
1'9 and 2/-

INDUCTANCE COIL
4/3 UP

LOW LOSS VAR. CONDENSER
10/6 UP

A. J. S. Choke Unit (2nd Stage).
£1:0:0

A. J. S. Choke
15/-

A. J. S. Choke Unit (1st Stage, as illustrated). Combines Choke, By-pass and Grid Condenser and Grid Leak.
£1:0:0

CHOKE
15/-

A.J.S. PHONES
20/-

APPARATUS TESTED.

(Continued from page 496.)

A new pattern valve holder has been sent us for examination by Messrs. A. H. Clackson, Ltd., of 119, Fleet Street, E.C.4. Fitted with sunken sockets for filament-protecting purposes, it is a very neat, well-made component. Its centre is cut away in order to reduce capacity and surface leakage losses. It is made of good quality ebonite, and is nicely "rounded" and polished. We understand it is to be retailed at a reasonably low figure.

We recently received a quantity of conductor called "Simplestrip," for test. It was sent to us by the patentee, Mr. A. Edwards, of 22, Corby Road, Cove, Farnborough, Hants. As will be seen by the photograph which appears on this page, "Simplestrip" consists of slotted metal strip with fairly large active surfaces. Used as an aerial very good results were obtained, although some little care was necessary in pulling it up into position in order to prevent dangerous twists occurring.

It is not, in our opinion, to be particularly advised for set wiring, as although its H.F. resistance is undoubtedly low, interlead capacity is apt to assume proportions that outbalance the advantages of the material when it is used for such purposes. There may be, of course, circumstances where this might not be the case, but judging by the photograph sent to us,

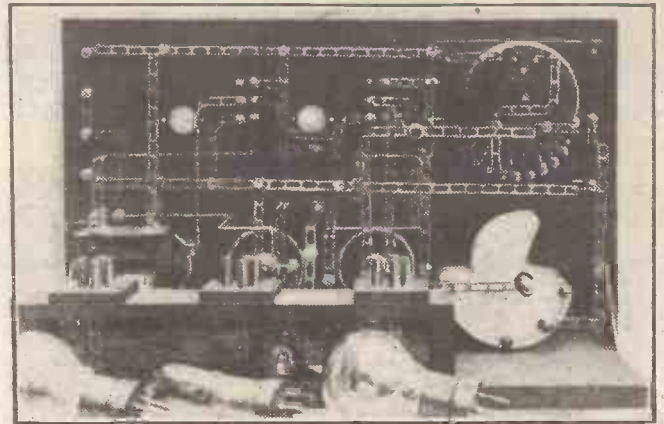
and which is reproduced on this page, it would appear that the patentee has not been so fortunate as to meet with such an exception.

For satisfactory loud-speaker reception it is necessary to employ the correct type of circuit and, an equally important consideration, to use valves suited for the task they have to perform. It is generally recognised that resistance-capacity coupling is the best method of L.F. amplification, but this is only true if suitable valves are employed. There is often doubt about the best valves to use, so that it was with pleasure that we received three valves from the General Electric Co., Ltd., specially designed for use in resistance coupled amplifiers. The trio consisted of a D.E. 5 B. for first stage work, a D.E. 5 for second stage, and a D.E. 5 A. for the last stage.

Operated according to the makers' instructions the valves gave excellent results and handled large currents extremely well. No distortion was apparent and it is with every confidence that we recommend these three valves to readers who desire really good loud-speaker signals. The valves should be used in the order mentioned with anything from 120 to 150 volts on

the plates and negative grid bias of 9-12 volts or so, this latter being adjusted for best results. The three valves take about .3 amp. each at a little under 6 volts, so that they are very economical in operation.

We have been asked to draw the attention of our readers to the fact that one or two errors crept into the recent advertisement concerning Messrs. Priestley and Ford's advertisement. Appearing on page 376 of our October 10th issue a type "B" condenser was illustrated, but the description and prices were those of type "A." Also the advertised products are obtainable only through retailers, and are not supplied direct to the public by Messrs. Priestley and Ford.



A receiver wired up with "Simplestrip."

"HEARING" IS BELIEVING

Before buying your New Loud Speaker, hear the Latest Model

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Hornless Loud Speaker

BRITISH MADE. Size 6" High, 5" Diam.

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Ask your Dealer to demonstrate one for you.



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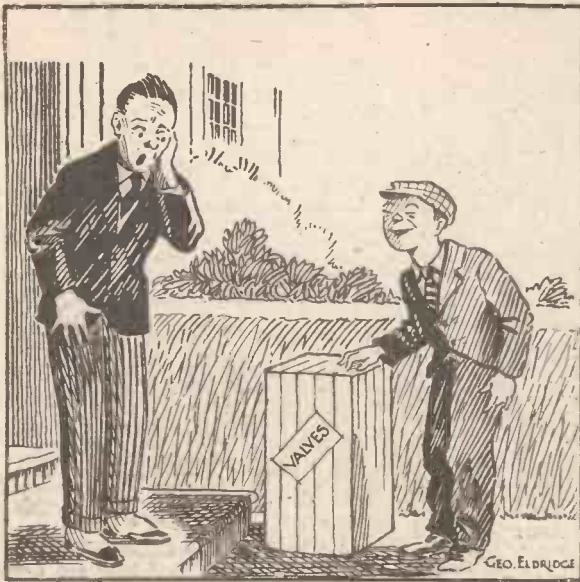
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Oxydized Copper or Silver

55/-

If you experience any difficulty in obtaining the "BE-CO" please send us the name and address of your Dealer.

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"I've brought your sixty-six valves, sir."
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There will be no mistake about your reception providing you use the valve with the wonderful **MOLYBDENUM Filament** — the "Six Sixty"



Ask your dealer for it.
 Filament volts 1.5-2.
 Filament current 0.3 amps.
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NEUTRON
 TRADE MARK
The Crystal with Valve Power

'Supremacy'
 The NEUTRON CRYSTAL having maintained its superlative qualities throughout since its inception, can now justifiably be termed

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WORLD'S GREATEST RADIO CRYSTAL
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The World's Greatest Radio Crystal

If Ebonite were transparent

you could see for yourself the ingenious internal construction of the Watmel Variable Grid Leak —and appreciate why it means the most efficient operation.

A glance at the sectional drawing will show how the pressure on the resistance elements may be accurately adjusted, thus permitting smooth and critical variation to be accomplished at will.

When you consider that, allied to these constructional refinements, the Watmel is continuously variable, dust and damp proof, and constant in any temperature, you cannot doubt that it will get the best from your detector valve.

GRID LEAK (Black Knob). ANODE RESISTANCE (Red Knob).
 5 to 5 megohms, 2 G. 50,000 to 100,000 ohms, 3 G.
 10,000 to 50,000 ohms (Green Knob), 3 G.

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The Watmel Wireless Co., Ltd., 332a, Goswell Road, London, E.C.1. Telephone: 7990 Clerkenwell

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A product of HOOTERLAND

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120, 2,000 or 4,000 ohms.
 Height 20 ins.
 Flair 12 ins.

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RADIOTORIAL

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

The Editor desires to direct the attention of his readers to the fact that, as much of the information given in the columns of this paper is of a technical nature and concerns the most recent developments in the Radio world, some of the arrangements and specialities described may be the subject of Letters Patent, and the amateur and trader would be well advised to obtain permission of the patentees to use the patents before doing so.

PATENT ADVICE FOR READERS.
 The Editor will be very pleased to recommend readers of POPULAR WIRELESS who have any wireless inventions to patent, or who desire advice on patent questions, to our patent agent. Letters dealing with patent questions, if sent to the Editor, will be forwarded to our own patent advisers, where every facility and help will be afforded to readers.

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

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

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

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

IMPORTANT.—If a wiring diagram, panel lay-out or 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 manufacturer, etc., cannot be supplied. Such particulars can only be obtained from the makers.

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

No questions can be answered by phone. Remittances should be in the form of Postal Orders.

Questions and Answers

FIXING CRYSTALS.

C. B. (Herne Hill).—I have just obtained a perikon detector (2 crystals) to work on my set, and was given to understand that these are best mounted in Woods' metal, as screws were liable to crush them. Can you please inform me how this is done? I have been told by another friend that if I apply too much heat to the crystals they will become insensitive. Is this so?

The best way to mount crystals in Woods' metal (which melts at a very low temperature) is to first insert the screw in the base of the crystal cup and then heat it gently. At the same time the stick of Woods' metal should be held to the inside of the cup and as soon as it melts, the flame removed.

Having filled the crystal cup about three-quarters full with the molten metal, the crystal should be

(Continued on page 502.)

NIGHTS OF PLEASURE by DAY'S of LISLE STREET

There is no better or cheaper form of Entertainment than a Wireless Installation in your own Home, especially when you can purchase a really High-Class Receiving Set of Reputable Make at the following Low Price :—

- 1 "Tanco" Baby Receiving Set, fitted with our famous Dayzite Crystal - - - 10 6
- 1 pair Brown's Headphones - - - 1 0 0
- 1 Coil Hard drawn 7/22 Aerial Wire - - - 2 2
- 4 Porcelain Bobbins, 1 Lead-in Tube, 1 Earth Clip, 1 Length Earth Wire - - - 2 6

Complete Cost - - - 1 15 2
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Delivered complete for £1 16 6

Write to-day, mentioning this paper, for free copy of our latest catalogue.

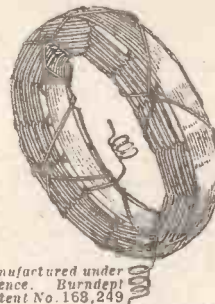
WILL DAY, LTD.,

19, Lisle Street, Leicester Square, London, W.C.2.

Telephone : 4577 Regent. Telegrams : "Titles, Westrand, London."

REFLEX

is the coil that experts choose and use.



Manufactured under licence. Burdett Patent No. 163,249

Immediately REFLEX Coils were offered to the public experts realised their great improvement over every coil then available. They have maintained this advantage ever since.

The use of cardboard formers, ebonite, moulded compositions, shellac and metal has been entirely eliminated. The special winding with its scientifically proportioned air spaces, the rigid structure which is entirely self-supporting, and the extremely low price are a few reasons why discriminating wireless enthusiasts insist on REFLEX.

Ask for it by name from all good dealers. If any difficulty, please send us name and address of your dealer.

NOTE THE LOW PRICES:
 Wave-length with .0005 in parallel (approx.).

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

REFLEX COIL PLUG.
 To further ensure perfect reception, use the REFLEX Coil Plug. Finest grade lapped ebonite, nickel-plated fittings, reversible pin. Entirely British made. Price 1/-.

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Our Cabinets are famous for their fine workmanship and high grade material. Solid Mahogany and best seasoned Oak, all hand polished, with high-grade fittings. Price of one illustrated, suitable for 3-valve Set, 12/6. Ebonite panel cut to fit, 7/6 extra.



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We stock all the leading makes of Headphones. A special line is the Ultra fitted with adjustable magnets, very sensitive and superb finish. 4,000 ohms. 20/-

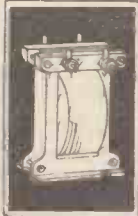
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Very selective and well finished.
No. 1. 300 to 600 metres 10/-
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The famous L.F. Transformer renowned for volume and exceptional purity of tone. Available in three ratios:
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Every Transformer fully guaranteed for 12 months. Shielded in metal case and well finished.



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We carry a large stock of Loud Speakers: Brown, Amplion, G.A.V., Ediswan are all represented. Before you choose your Loud Speaker call at any one of our five Branches and hear a comparative test—the only certain way to assure satisfaction.



Grid Leaks

Noiseless and absolutely constant. Fully guaranteed. Made throughout in our works.

- 1 megohm 1/6
- 2 megohms 1/6
- 3 megohms 1/6
- 4 megohms 1/6

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Send 3d. for a copy of our 48-page illustrated Catalogue of Components.

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of the 2 movable electrodes provides the highest degree of sensitivity and selectivity.

BRIDGE CONDENSER

.0003 and .0005 mfd.

Price - 25/-



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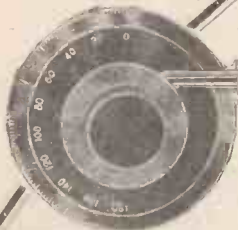
H.F. CONDUCTOR

Composed of hollow copper tube (=16 s.w.g.) with highly polished internal and external conducting surfaces.

- Minimum H.F. Resistance.
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In packets (contents, six 2 ft lengths.) In coils (12 ft. per coil) 2/- per packet.

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The "SECURITY" DIAL

With MICROMETER Adjustment

Enables BOTH coarse and fine tuning to be accomplished, with ANY existing Condenser. Easily fitted. Perfect Action.

Gear Ratio 80 : 1.

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PRICE COMPLETE
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PATENTED

Needs no Solder

JUNIT Wire simplifies your wiring work. The stick of solder is not needed (that frees one hand). Place the wires in position, moisten with flux, touch them at the junction with a soldering iron, and *hey presto* they stay put. Junit wire carries its own solder—that's the secret.

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See how it joins.

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MICROSTAT

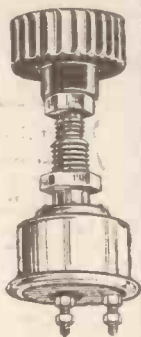
Filament Resistance.

Infinite graduation of resistance from zero to 100 ohms protects your valves from sudden shocks, and enables you to obtain the minute adjustment so essential for perfect tuning. Suitable for Bright or Dull Emitter Valves. One-Hole "Fastlock" Fixing. Small underpanel space. Price only **2/9**

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RADION G.P.A 4-v. Bright Valve only 7/-

A user writes: "I am really amazed at the result; they are the best valves I have yet come across. Let me thank you for executing my order so quickly, and when I require any more valves I will certainly send to Radions, Ltd."

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RADION
Reliable Valves

RADIOTORIAL QUESTIONS AND ANSWERS.

(Continued from page 500.)

picked up with a pair of tweezers, and firmly but gently pressed into the plastic mass in the cup.

If the Woods' metal is heated to the right temperature in the first place, it should immediately become "set" on introducing the crystal, as applying a "cold body" to it immediately chills it.

While it may not spoil the crystal to any appreciable extent, if the metal does not set immediately, care should be taken in seeing that the crystal cup is not overheated. Under no circumstances must the crystals be "fingered." Fresh surfaces can be exposed by chipping the crystal very gently with the edge of a knife or some other sharp instrument. But in any case do not *scrape* the surfaces.

Finally, when the crystals are mounted in the detector itself, the adjustment of them should be by removing one, rotating it a little way, and then letting it back into place gently and not by grinding one up against the other while in contact.

THE "P.W." 2-VALVE ULTRA SET.

H. C. (Chingford).—I am trying to make the above set, and I find that no mention is made in the list of point-to-point connections of the L.P. of the L.F. transformer. Could you please inform where this side of the primary goes?

The I.P. of the L.F. transformer should be connected to the + H.T. terminal.

ADDING AN L.F. VALVE.

B. T. (London).—I have a two-valve set (H.F. and detector) to which I wish to add an L.F. valve with grid bias and a separate H.T. tapping. But I find that using a S.P.D.T. switch to cut out the L.F. valve places the H.T. supply which previously went to the L.F. valve on the H.F. and detector; and as the L.F. valve will take more H.T. than the former two, it will upset them in consequence. I should therefore be grateful for a diagram and explanation of a switching arrangement whereby the same H.T. is kept on each valve even when the L.F. valve is out of circuit.

Your object can be accomplished, as per sketch given on this page. Instead of a S.P.D.T. switch a D.P.D.T. is utilised.

The point-to-point connections of this switch (in the position shown) are as follows: Plate of detector valve to bottom centre contact, or if a reaction coil is used, plate to one side of reaction. Other side of reaction to bottom centre contact.

Centre top contact to one side of 'phones. Other side of 'phones to plate of L.F. valve and to bottom right-hand contact of switch.

Top right-hand contact to one side of primary of L.F. transformer and to H.T. + terminal for supplying the H.T. to the H.F. and detector valves.

Other side of primary of L.F. transformer to bottom left-hand contact.

A .001 or .002 fixed condenser can be connected across the primary of the L.F. transformer to advantage, as this, as well as giving greater clarity to telephony, sometimes stabilises the set should it tend to howl.

The last connection to the switch is from the top left-hand contact to the H.T. + terminal (supplying the H.T. to the L.F. valve).

The secondary of the L.F. transformer is, of course, connected in the usual way, that is, to grid and negative grid bias, if used, or direct to negative L.T.

The filament resistance should be placed in the negative L.T. lead of the L.F. valve.

It would, perhaps, be well to point out that the switching arrangement described above is only good for one stage of L.F. amplification. If more than one L.F. valve is used and the above type of switching is required, it takes a more complicated form, which cannot be described in the short space at our disposal in these columns.

TREATING OLD EBONITE PANELS.

R. L. M. (Glasgow).—Can you tell me an effective way of filling in small holes in panels which, when finished off, does not leave any trace?

While small holes can be filled in with black sealing-wax or Clatterton's compound, a very effective method is to file pieces of ebonite in the shape of small pegs, tapering slightly at one end, and drive these into holes so that they make tight fits. When this has been done, the ends protruding from both surfaces of the panel can be either cut off if the pegs are not too thick) with a pair of cutters, or else sawn off to about $\frac{1}{8}$ in. above the surfaces of the panel. When all the pegs have been inserted and treated as above they can then be carefully filed down flush with the panel and finished off with fine glasspaper and oil.

BEST CRYSTALS.

M. L. (Leeds).—What, in your opinion, is the best crystal to use in a crystal set? What I require is not so much extra good volume but stable results whereby I do not have to adjust the crystal every time I listen-in.

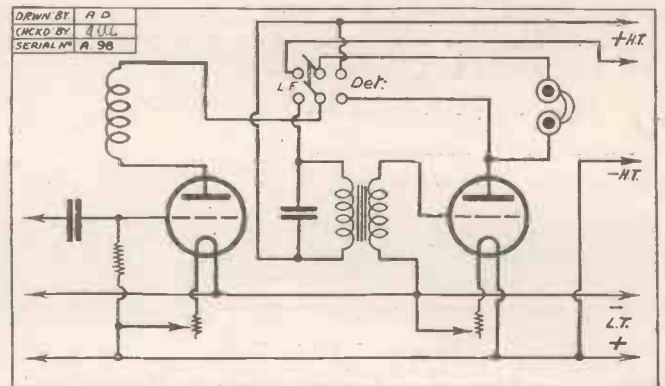
Under the circumstances we consider a carborundum crystal detector would suit your requirements. This consists of a carborundum crystal used in conjunction with a flat steel spring and operated from 1½-volt dry cells connected in series across a potentiometer.

A sketch of a suitable carborundum detector was given in Fig. 2, and a suitable circuit in which it is incorporated in Fig. 3 of the "P.W." Crystal Experimenter's Handbook. (See "P.W." 175.)

Such an arrangement is very stable, and providing a good piece of crystal is used, should only require readjusting about once a week.

EARTHING THE AERIAL.

O. P. R. (Glasgow).—Which is the best method of "earthing" the aerial in case of lightning? I have seen S.P.D.T. and D.P.D.T. switches used, but should like to know which you consider the best method of wiring same.



The D.P.D.T. switch is by far the best, as the earth, as well as the aerial, can be disconnected from the set.

The connections to this switch (looking at it so that the two knives throw from top to bottom) are as follows:

- Aerial lead-in to the centre left-hand contact.
- Aerial lead from aerial terminal on the set to the top left-hand contact.
- Earth lead from water-pipe or earth plate to the centre-right-hand contact.
- Earth lead from earth terminal on set to the top right-hand contact.
- Bottom left-hand contact to the bottom right-hand contact.
- When the switch is up the aerial and earth leads are automatically joined to their respective terminals on the set.
- When down, the aerial and earth leads are disconnected from the set and joined together.

Such a switch as the one described above should for safety be fixed *outside* the window through which the lead-in comes, as then the risk of fire in the event of the aerial ever being struck is minimised.

MICROPHONIC VALVES.

J. M. N. (Chester).—I am employing a well-known make of dull-emitter valve, but find that whenever I touch the panel or move the condensers a loud ringing sound is heard. Can you tell me the reason for this?

The trouble is due to the microphonic ring of the valves, and can probably be cured by the use of anti-microphonic valve holders, of which there are several types obtainable. Alternatively some form of rubber shock-absorber under the set might be tried, as this often reduces vibration very considerably.

Stop that continued vibration of the filament!

USE the Clearer Tone Valve Holder and float your valves—secure from the ever-present, tone - destroying vibrations caused by street traffic, indoor footsteps and the hundred and one other microphonic disturbances. So thoroughly does this new holder cushion the valve that foreign noises are completely dissipated. The springs, though delicately adjusted, are immensely strong and the tightest valve can be inserted without fear of damaging them. Each spring has one turn only. Bakelite construction of the body of the holder ensures high insulation, low capacity and sturdiness.



each 2/9

There are terminal connections for the experimenter and soldering tags for the permanent set. The springs themselves form the valve pin sockets. No soldered joints—all one solid metal piece from tag to valve leg. No flexible wire connections. The spring supports are not affected by stiff bus-bar wiring.

2/9 each.



For good reception with Dull Emitter Valves, Benjamin Clearer Tone Anti-Microphonic Valve Holders are essential.

Patents Pending.



BRITISH **BENJAMIN** MADE
CLEARER TONE VALVE HOLDER
(ANTI-MICROPHONIC)

From your Dealer or Direct from
THE BENJAMIN ELECTRIC Ltd.,
Brantwood Works, Tariff Road,
Tottenham, N.17.

The Benjamin Battery Switch gives perfect current control, 2/- each.

HAVE YOU ENTERED FOR the "SYLVEREX" RADIO CRYSTAL PRIZE SCHEME?

Read the side panel for full particulars of a competition in which every competitor receives a prize.

Ask your Wireless Dealer for Full Details—or send 2/- to Sylvex Ltd. (Dept. B), 41, High Holborn London, W.C. 1, when the crystal will be forwarded by return post.

Sylverex is a natural Crystal and is a revelation in sensitivity. It is subjected to the fullest tests of any crystal on the market, and as a consequence is fully guaranteed.



Entrants for the Sylverex Prize Scheme are asked to write down the following list of "turns" in their order of popularity. Put down first which item you consider most popular; then the item you consider second in popularity, and so on. Write only the items listed here. Prizes will be awarded to those entries most nearly in accordance with the total voting of all competitors.

Covent Garden Opera.
Symphony Orchestra.
The Children's Hour.
The Savoy Bands.
The Wireless Drama.
"Celebrity" Speeches.
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Humorous Entertainers
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Your list of items must be written on the plain side (back) of the printed direction slip enclosed with each packet of Sylverex Crystal.

£200

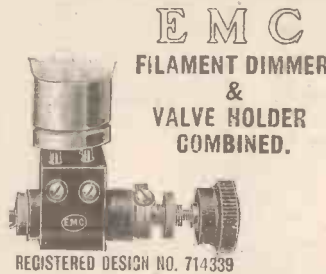
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Numerous additional prizes, consisting of Valve Sets, Crystal Sets, Loudspeakers, etc., and thousands of Consolation Prizes of copies of popular published songs.



NO SPRINGS. NO GEARS. NO BACKLASH. SUPER VERNIER MOVEMENT. UNIVERSAL FIXING.



PRICE, COMPLETE—

0-5 OHMS	5 9
0-10 "	6 -
0-20 "	6 3
0-30 "	6 6



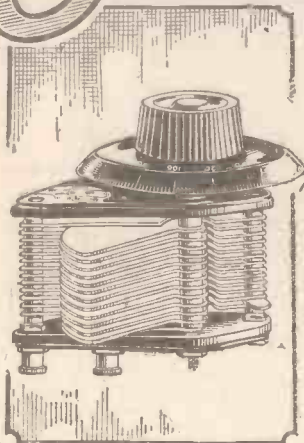
BARRIE'S ANTIVIBRATE VALVE HOLDER. 1 9 EACH.

AS USED IN "P.W." 4-VALVE SET.

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Something BETTER



in Condensers. The ASHDOWN NEW SQUARE LAW NO-LOSS CONDENSER, with Bakelite End Plates, is neither a Bird Cage or Rat Trap, but a Condenser of simplicity, as one well-known Wireless Paper mentioned—Simplicity Pays, because Simplicity works. The ASHDOWN NEW CONDENSER is simplicity itself. There is a minimum number of loose parts, and above all, it has a non-friction contact.

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.001	11/-
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Internal Metal Chuck to grip 14 to 44 gauge wire or flex.
Price: Plug 4d. Socket 2d. Indicating Ring 1d.

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(Handles and dome-shaped Indicating Rings in Red or Black) Stocked in the following indications:

Price: Brass 4d. Nickel 4 1/2d.

Aerial, Earth, Phones +, Phones -, L.T. +, L.T. -, H.T. +, H.T. -, Input +, Input -, Output +, Output -, L.S. +, L.S. -, Grid +, Grid -, A. T. I., Reaction, A. p. Aerial, H. T. Medium, and Blanks.

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Solid cast metal, with raised, polished letters showing white on a black background. Single hole fixing, complete with nut. Stocked in Tuner, Filament, Reaction, Aerial, Anode, H. F. Tuner, Secondary, Rectifier.

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Eliminate Soldering.

Perfect connection; lowest possible self-capacity; low resistance; connection changed in an instant. Tapped to screw on to 2, 4, 5 and 6 B.A. threads; also T connectors for joining wires.

Every high-class dealer stocks them, but in case of difficulty send to **BELLING & LEE, LTD.,** Queensway Works, Ponder's End, Midx.

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ANODE REACTION UNIT.

Constructed for reception of all stations operating on wave-lengths from 300 to 2,000 metres without extras. Ensures increased range, volume and selectivity.



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PRODUCTS

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Money back guarantee that each and all Panels are free from surface leakage, Meggar test Infinity.
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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/-; 14" x 10", 3/5;
14" x 12", 4/-; 7" x 5", 1/- thick. Post Free.
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Remagnetizing only 2/-. Loud Speakers from 3/6.
Transformers from 5/-. Post extra.
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THE VALVE WITH THE NEW FILAMENT

ENSURING GREATER MECHANICAL STRENGTH.

DULL-EMITTERS Fil. 31-4. Plate 8/- POST FREE
30-120. Amps. 06
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Money refunded if dissatisfied Trade supplied.
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TECHNICAL NOTES

(Continued from page 462.)

plate, the electric field being then created between the upper metal plate and the metal containing-dish.

The electrification effect is presumably due to some internal strains existing in the hardened wax. It is found that if the surface electrification is destroyed—for example, by passing a flame over the surface momentarily—it will soon reappear, and this kind of treatment can go on for months or years. One surface of the wax plate is permanently positive and the other side is permanently negative.

It is unlikely, of course, that such a piece of strained material could be used in place, say, of a high-tension wireless battery, as the passage of the high-tension current would have the effect of destroying the surface electrification, and this would not be restored sufficiently readily to give the material the property of a battery.

But there are many instruments where a high voltage is needed to be maintained, and where the current drawn from the source of the high potential is excessively small; in such cases it seems quite probable that the permanently electrified plate may find a use.

Interesting Valve Invention.

I notice a new type of valve has appeared on the market in Germany which has several novel features, one of the most noticeable being the method of making connection to the electrodes of the valve. Instead of the four long pins of the British type of valve, or the four short stubby pins of the American valves, it has a blunt-ended valve base, and four very thin brass strips proceed from the interior of the valves and are turned up around the outer part of the valve base. Looked at from the side, the cap or base of the valve has the appearance of having four short brass strips pasted against it at equal, or practically equal, intervals.

The holder for this valve has, of course, to be correspondingly altered: A hole is drilled in the panel, somewhat larger than the diameter of the valve base, and the valve holder is secured to the panel in the usual way. The holder has a central hole, larger than the diameter of the valve base, and is provided with four brass contact strips fitted internally, so that when the valve is pushed into the holder, the four outer strips of the valve base contact with the four inner strips of the holder. To prevent the valve being inserted the wrong way round, there is a longitudinal projection on the valve base (formed from the base composition when the base is moulded), and this slides into a corresponding channel or groove in the holder.

Many advantages are claimed for this new type of holder and base, but the reader will be able to judge these for himself. There would not appear to be any likelihood of this type of valve base making its appearance on the English market, since the ordinary kind is now so standardised; but there seems to be little doubt that the present kind of holder and base is not regarded as the best that might have been chosen.

New Filament Resistance Design.

Another interesting innovation concerns the filament rheostat. Many constructors object to the carbon-pile type of rheostat, its main advantage being the fact that it takes up little space on the panel. Some of the manufacturers of carbon rheostats are, in fact, going back to the wire rheostats which are, in my opinion, much more satisfactory. The type of rheostat to which I want to refer is a wire-wound resistance, more or less of the ordinary kind so far as the resistance element is concerned, but instead of being mounted with the circular "former" of the resistance element in a plane parallel to the panel (which takes up a fair amount of space at the back of the panel) it is mounted edgewise, with considerable economy of back-of-panel space.

Moreover, instead of being a complete circle it is only semi-circular, the diametral flat part being placed against the back of the panel. The "control knob," which is circular, and which is also placed edgewise to the panel, projects half-way through the front of the panel, a slot being necessary in the panel instead of the usual small hole.

An Improved Condenser.

A reader sends me the following hint with regard to the making of an emergency condenser for increasing the range of a coil. If you happen to have any spare vanes from a discarded variable condenser, two of these may be used for the making up of a fixed condenser of roughly 0.0005 mfd. One "fixed" vane and one "moving" vane placed together, with a piece of mica about 0.01 inch thick between them give, according to my correspondent, a condenser of capacity about 0.0005 mfd.

A Drilling Tip.

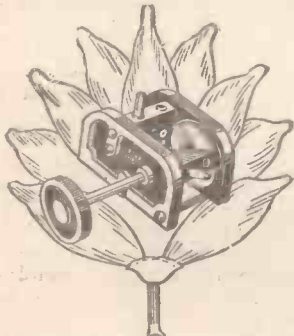
Any constructors who have had experience of drilling holes in thin sheet metal (for example, in condenser vanes) will have noticed that it is not easy to ensure the drilling of a clean hole, owing to the fact that the drill "bites" the metal when about to emerge. This is not got over even by backing the sheet metal against a piece of wood (which you have to do in any case). It will be found, however, that if the thin sheet is backed against a piece of very hard wood, or preferably against a thicker sheet of metal, the holes may be drilled quite easily. The thin sheet should be clamped, or otherwise held very tightly, against the backing metal.

Choke Coupler L.F. Stages.

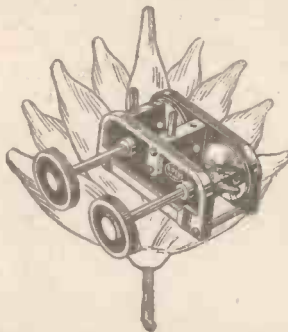
Questions are often asked, especially by beginners in the making of valve sets, as to the relative merits of choke and transformer coupling. I suppose it is safe to say that transformer coupling is at present the more usual, but choke coupling is coming greatly into favour, owing to the fact that it introduces less distortion. The amplification obtainable by a stage of choke-coupling is not, however, equal to that given by a stage of transformer-coupling. It may generally be taken that three stages of choke-coupling will be about equal to two stages of transformer-coupling. Where considerable low-frequency amplification is required, however, it is often advantageous to adopt the choke-coupling method.

If there is anything in these pages that you do not like, please let us know what it is when writing to us.

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"LOTUS" COIL-HOLDER
 and Realise what Perfect Reception means



THE "LOTUS" cut-gear Vernier Coil-Holders are fitted with Vernier movement actuated by three sets of encased precision-cut gears representing a reduction of 8 to 1.



Moving Block CANNOT FALL
 Made from Bakelite Mouldings with Nickel-Plated Parts

Retail Selling Prices:

Two-way - 7/-

Three-way - 10/6

With six-inch handle for inside mounting.

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 12 for 4/6

Special non-soldering tags - - - 2d. each.
 Complete sets of 12 with these tags 6/-

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YOUR NEW SET will have the finest possible control if it incorporates C.E. PRECISION RHEOSTATS AND POTENTIOMETERS. Efficient in action and "natty" in appearance, they are, in quality and workmanship, the equal of those selling at much higher prices. The neat, silvered dials form an accurate guide for the filament controls and are calculated to enhance any wireless receiver. The smoothness of action and stability of the resistance element are remarkable, and effectively safeguard the valves from all possible strains.

C.E. PRECISION components are GUARANTEED and thoroughly TESTED before despatch.

C.E. PRECISION RHEOSTATS, made in 7 and 15 ohms, price 2/9; 30 ohms, price 3/-.
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C.E. PRECISION products are obtainable through all reliable dealers. We can supply direct, but your dealer's name must be enclosed with your order.

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THIS IS THE BEST BOOK OBTAINABLE, AND ENABLES ANYONE WITHOUT PREVIOUS EXPERIENCE TO MAKE WIRELESS SETS WHICH ARE UNEQUALLED IN PRICE, QUALITY, OR EFFICIENCY.

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SAXON RADIO CO. (Dept. 14), SOUTH SHORE, BLACKPOOL.

The VISIVOLT
 H.T. TAPPING SWITCH
 (Prov. Patent 24317.)

An "off" position and 15 different voltages for each valve H.T. without interfering with the wander plugs. No interruption of reception when altering H.T. to any valve. You can see the voltage on any valve by the position of its respective lever. A quality instrument, nickel finish for panel mounting.

2 valve .. 27/6	4 valve .. 32/6	
3 " .. 30/-	5 " .. 35/-	

7 days' approval willingly against cash. Special 16-way small flexible cable for use with switch can be supplied.

F. SMITH, Maker, Basil Street, RUSHOLME,
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YOURS FOR 20/-

Send 20/- to-day, together with your order for the "Tonyphone," and this wonderful set, which receives all B.B.C. Stations, will be sent on approval complete with all accessories. You pay a further £1 each month, or 5/- each week until completed.

"Tonyphone" Super
 Two - Valve Set.

Complete with Accumulator, H.T. Battery, Aerial, one pair of 4,000 ohms Headphones and two Valves - one High Frequency and one Detector. All Royalties paid.

Send to-day and enjoy broadcasting NOW.
 Illustrated Price List free on application.

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 (Valve Dept.), Windsor House, Victoria St., London, S.W.1.

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CABINETS for Wireless CONSTRUCTORS

PICKETTS
NICELY POLISHED
CABINETS
from 1/6 each
They're good Value

Send for constructors list free -
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BEXLEYHEATH S.E.

ESTIMATES & LISTS (P.W.) SEND SIZES.

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NUMBER 1 2 3 4 5 Size of hole 4BA, 2BA, 1/4", 5/16", 3/8"	
DAREX RADIO Co., Standard Works, Forest Hill, S.E.23.	Price each: 1d. 1d. 1 1/4d. 2d. 2d.

AT LAST!

P. Patent No 21642/25

THE AERIAL INTENSIFIER

Can be fitted by anybody.
HELPS TO INCREASE SIGNALS.

2/6 each. Post Free. Trade Enquiries Invited.
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WIRELESS MIRACLE

Two-valve set regularly receives stations over 400 miles distant on the Loud Speaker. 72/6 plus Royalties. A Two-Valve Set with the Power and Range of 4 valves.

Special Terms to the Trade. LIST FREE.
WORLD'S WIRELESS STORES, WALLINGTON.

big bargains for Wireless Dealers

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SUPERLAMP

ELECTRICAL AND WIRELESS ACCESSORIES LTD
92/94, Paul St., London, E.C.2.

"RECTALLOY."

(Continued from page 481.)

Electrodes Everlasting.

The actual pieces of rectalloy which I used were about 1 in. in length and about 1/8 in. in breadth, and very thin, perhaps one-tenth of a millimetre. These were found to be ample to deliver a rectified charging current of up to half an ampere without any heating.

Now we come to the important discovery I mentioned above. When I first started these experiments I used a lead electrode for the "neutral" or non-rectifying electrode, and I found that the value of the current was uncertain and variable. Moreover, on an extended test, of some weeks' duration, I found that the rectalloy electrodes were gradually corroded away. In another experiment, however, where the electrolyte was contained in an iron vessel, the electrodes appeared to last a much longer time.

Observations of this kind led to a proper scientific investigation of the whole matter, and eventually it was discovered that when a small quantity of the iron became dissolved in the acid (iron dissolves slowly in sulphuric acid, forming ferrous sulphate in solution) owing to some peculiar electrochemical action of which I do not yet understand the nature, the electrical conductivity of the rectifier is considerably increased and, what is much more important, the rectalloy metal is not corroded away—in fact, it may be said to be everlasting!

I tried dissolving actual chemical ferrous sulphate in the acid electrolyte, with precisely the same result.

But since iron dissolves, giving the same result, there is no need to buy ferrous sulphate, and all I do now when making up a rectifier is to drop a few iron filings, or a small iron nail into the acid, and leave it there for a few days, when it dissolves and gives me the necessary small amount of the salt in the electrolyte!

This, I may say, is the great secret of making the electrodes everlasting, and of generally improving the behaviour of the rectifier.

Oil on Surface.

When the rectifier is in action, fine bubbles of hydrogen and oxygen rise from the electrodes, due to the electrolytic dissociation of the water in the acid. To prevent the escape of gas, and reduce evaporation, a layer of any heavy mineral machine oil is poured on the surface to the depth of about 1/2 in.—this is, of course, a well-known dodge. I found it better not to use paraffin oil for this purpose. When the cell is working this layer of oil becomes frothy, but it functions just the same.

Another curious thing I have found is that if the electrodes are removed from the liquid, when the oil is on the surface (in which case they become covered with oil as they are removed and replaced), this oil does not seem to make any difference to their working; they "carry on" just the same when they are replaced.

The rectifier is entirely automatic in action, does not get hot, may be very small, and requires no attention other than the addition of a little distilled water to make up for evaporation. It is absolutely silent in operation.



One-hole fixing

The L. & P. Coil Holder, besides having the smoothest movement of any on the market, has a one-hole fixing that STAYS FIXED.

It operates through worm and pinion together with a compensating spring that makes backlash impossible. Hence the wonderful ease with which reaction can be controlled with this coil holder.

From all Good Dealers or write at once for list. Sent free on request.

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L. & P. Coil Holder now 8/6

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Other leading "Ellanpe" Lines.—L. & P. Valve Windows enhance the appearance of any set. Small size 2/6 each. Large size 3/6 each. L. & P. Miniature Switches, D.P.D.T., 1/6 each. L. & P. Pull & Push Switch—positive action, positive satisfaction only—2/- each

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ACCUMULATOR BARGAINS.

C.A.V. & Fullers, soiled, but guaranteed 12 months. Sent on approval against cash.

2v-40a ... 9/6	4v-80a ... 27/6	6v-60a ... 32/6
4v-40a ... 17/-	4v-100a ... 32/6	6v-80a ... 40/-
4v-60a ... 21/9	6v-40a ... 25/-	6v-100a ... 46/-

MAUDE RUBBER CO., 58, PRAED ST., W.

REPAIRS

Headphones re-wound and re-magnetised, 5/- per pair.
Any kind L.F. Transformer re-wound and repaired, 5/-.
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All work guaranteed and tested on our aerial
Phone: 1795 Clerk.
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Let our valve-making plant repair your broken or burnt-out valves efficiently 5/- and promptly (any make). Amplification, radiation and current consumption guaranteed same as new. Bright emitters, 5/- "D.E.'s" (2 & 4 v. types), 7/6.

RADION Reliable Repairs
RADIONS, LTD BOLLINGTON, NR. MACCLESFIELD, CHES.
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DULL EMITTERS REPAIRED

Each concert tested, 7/6. '06 Valves, 9/6. Bright, 4/9. Power 12/-. Quick delivery. Send remittance with valve to W. G. Eames, 15, Red Lion St., London, W.C.1. Phone: Chancery 7750.

F.W. JOHNSON & TRILLEGGER'S

EBONITE

FAMOUS GENUINE PANELS

H. RAYMOND

FOREIGN RADIO NEWS.

FROM OUR OWN CORRESPONDENTS.

Radio in Greenland.

GREENLAND is the latest country to go in for radio. Not that the Eskimos, who compose most of the very sparse population that roams "Greenland's icy mountains," are likely to be keen radio enthusiasts, but it is thought that radio installations are essential for the protection of the hundreds of whaling and fishing boats that frequent these waters.

The Danish Government, after consultation with the Icelandic Government, has decided to put up three stations. The most powerful one, on the East coast, will be paid for and controlled by Denmark, the two others, on the west and north-west coasts, respectively, by Iceland.

The chief aim of these stations will be to broadcast meteorological information concerning an area that is of peculiar importance, as many of the atmospheric disturbances that affect the weather in Europe and America originate in that region, and to act as guide and source of information to the fishing fleets. They are expected to be ready by the end of the year.

Budapest Tries New Wave-length.

The Hungarian Ministry of Posts and Telegraphs is trying out a new wave-length for the Budapest station, namely, 565 metres. It is broadcasting a request to all stations picking up the messages thus transmitted to send a report to the Direction des Postes (Versuchsabteilung), Budapest IX.

Paris Amateur Picks Up Shanghai.

M. Octave Durand, a Paris schoolboy, with a home-made set, has picked up a programme broadcast from Shanghai station, in China, on a 365 metre wave-length. The reception was faint, but clear enough for purposes of identification. The first time was accidental, but on three occasions within a space of a month the experience was successfully repeated.

Success of Broadcast Plays.

The French P.T.T. station has met with such success in its broadcasting of Molière's plays, ending with "Le Malade Imaginaire," that it is starting on a further series very shortly. The dramatic authors whose plays will be thus broadcast will all be contemporaries and immediate successors of Molière, among them being Regnard, Marivaux and Beaumarchais, whose place in French literature may roughly be compared to that of the Restoration dramatists in the history of English drama.

Broadcasting in the Far East.

The latest fad among Paris amateurs is to try and pick up Far Eastern stations. Very few successes have so far been registered.

The principal stations are:

- TOKIO : J O A K, 375 metres.
- OSAKA : J O B K, 385 metres.
- NAGOYA : J O C K, 360 metres.
- SHANGHAI : 365 metres.
- TIENTSIN : 360 metres.

(Continued on page 508.)

POST ORDERS SENT POST FREE except where stated. Foreign orders please include ample extra postage.

BOWSER LOWE—H.P. Transformers, 7/-; Antl. Pong V.H. 3/-; Var. Condensers, with V., .0003, 19/-; .0005, 20/-; Low Loss Coil Former, 5/-; B.U.N.D.E.P.P.—Rheostats, 5/-; Dual, 7/6; Detector, 4/-; L.F. 24/-; Potentiometer, 7/6; Anti-Phonic, 5/-; Coils from 3/-. **CRYSTALS**—Neutron, 1/6; Liltron, 1/6; Uranium, 1/6; Shaw's Genuine Herizite (Sealed), 1/-; Silverex, 2/6; COLLINSONS—Selector Low Loss Geared Variable, .0003, 20/-; .0005, 21/-; Vernier, 2/6; Neurodyne, 3/6; DUBBLIER—0.001 to .0005, each 2/6; .001 to .0006, 2/6 each; Grid Leaks, 2/6 each; Type 610, Fixed, 3/-; 3/6; 4/6; Anode, 70, 80, 100,000, each, 5/6 on stand. Mandrill Variable, .0001, 2/00; 1,800, 1/26; DORWOOD—0.01 to .0003, 3/- each; .001, 3/6; .0003 (with grid leak clip), 2/6; EUREKA—Concert Grand, 25/-; 2nd Stage, 21/-; Baby Grand, 15/-; Grandity Detector, 8/6; ERBERG—H.F.—B.C., 3/11; Daventry 4/6; EDISON-BELL PARTS—Variometer for B.C. or 5 X X, 1/6; Old Model, 10/-; Fixed Condenser, .001, .0001 to .0005, each 1/3; .001 to .0006, each 2/-; .0003, with grid leak, 2/6; Shaped Plug, 2 for 2/-; Loud Speaker, 42/-; Dulcetron, 2/6; GOSWELL QUALITY RADIO) Coils, mounted 25, 1/6; 35, 1/6; 50, 2/-; 75, 2/3; 100, 2/6; 150, 3/-; 175, 3/6; 200, 3/6; 250, 5/3; 300, 6/-; Valve Holders, Legless, 1/8; Sub-Panel, 1/3; 4-Valve Sockets, 1/-; Coil Stands Panel—2 way, 3/-; 3-way, 4/-; Cam, 6/-; 2 way, 2 way, 3/-; 3-way, 12/6; GAMBRILL—L.F., 1st or 2nd Stage, 2/6 each; 2-way Anti Cap Switch, 7/-; 3-way, 9/6; Neurodyne Condenser, 5/6; Coils all sizes. H.T.G. VALVE HOLDERS—A "A" or "B" 1/8; C, 1/6; H.T. BATTERIES—B.C., 36v., 6/3; 60v., 8/6; Extra Large B.C., 10/8; Ever-ready 60v., 12/6; 108v., 20/-; 60v., best made, 8/11; 45, 5/6; 6/- dozen. HEADPHONES, BRITISH, 4,000 OHMS—B.T.H., Browns, Brantles, 20/- pair; Sterling, English Ericsson, 22/6 pair. BOWMAN'S 8 up e Phone, 12/6 pair. HEADPHONES, NESPHER, 4,000 ohms.—Dr. Nesper Adjustable, 12/11; Telefunken Adjustable, 16/8; N and K Standard on back, 14/11; Brunet, new, 14/11. IGRANIC—L.F., 1st, Stage, 21/-; 2nd Stage, 19/6; Coils, Urtlink, 9/-; Unitune, Major, 9/-; Minor, 7/6; Honeycomb, 25, 35, 4/3; 50, 4/6; 75, 4/10; 100, 6/3; 150, 7/-; 200, 8/-; 250, 8/6; 300, 9/3; 400, 10/-; 500, 10/3; 600, 11/6; 750, 12/6; 1,250, 15/6; 1,500, 17/6; Rheostats, 3/6, 5/6; Variometers, 10/-, 12/6; Potentiometer, 5/6; H.R. 8/6; Variable Grid Leak, 8/6; New Square Plate Varia. Condensers, .001, 27/6; .0005, 24/-; .0003, 21/-.—"RAY RAY" DETECTORS—Enclosed Nickel fittings, trigger movement, 2/6; Permanent, 2/-; Do., one-hole fixing, 2/6.

LOUD SPEAKERS—Baby, 5/6; 55/-; Dinkie, 30/-; Frimax, 155/-; Amplions Dragon Fly, 25/-; Junior 27/6; A.R. 111, 50/-; A.R. 114, 65/-; A.R. 19, 105/-; Brown, all models, Ultra, 27/6; C.A.V., 27/6, 30/-; And all new models makers' prices. LISSEN PARTS.—Anode or Variable Grid Leak, 2/6; L.F. or H.F. Choke, 10/-; Switches, D.P.D.T., 5 point Reversing, 4/- each; 2-way series Par., 2/6 each; Minor, 3/6; Major, 7/6; Universal, 10/6; Field Meter, 10/6; Wire Rheostat, 4/- each; Neurodyne Condenser, 4/6; Coils 25, 35, 4/10 each; 50, 5/-; 75, 5/6 each; 100, 6/3; 150, 7/-; 200, 8/5; Lissen X 50, 6/-; 60, 6/4; 75, 6/5; 250, 9/8; Tuner, 22/6; Mark III, Var., 17/6; MARCONI PHONE—Potentiometer 21/-; Ideal L.F. Transformer, 6-1, 4.1, 2-7.1, 35/- each; Automatic Detector, 8/-; MICHAEL PARTS—Rheostat, 5/6; D.B., 6/6; Dual, 7/6; Triple, 22/6; Potentiometer, 7/6; H.F. Transformers, 10/- each; Superionic A7, 12/6; Fixed, and clips, .001 to .001, 1/3 each; .002 to .01, 2/3 each; Grid Leaks, 2/-; Anode, 70, 80, 100,000 ohms, 2/6; L.F.T., 21/-; MAGNUM (BURNIE JONES)—H.F. Transformers, 7/- each; Coil Holders, 3-way, 9/6; 3-way, 12/6; Valve Holders, 2/6; Vibro, 5/-; T.A.T. Tapp, Coil, 8/6; Net. Cond., 1/6; All parts stocked. POLAR RADIO COMM. CO.—H.C.R. Unit, 15/-; Condensers, Micro, 5/6; Neut., 5/6; Variable, .001, .0005, .0003, 10/6 each; Coil Stands, Cam, 2-way, 4/6; 3-way, 9/6; LOTS OF PARTS.—2-way, 7/-; 3-way, 10/6; R.I. (RADIO INSTRUMENTS)—L.F. in sealed box, 25/-; Anode Wires, 10/-; Permanent Detectors, 6/-; 7/6; New Var. Air Condensers and V., .0003, 25/6; .0005, 24/-; REFLEX RADIO COILS (Made under Burnsted License)—35/-; 40, 50, 60, 75, 1/-; 100, 1/2; 150, 1/8; 200, 1/6; 250, 3/8; Post 2d. each. STERLING PARTS—0.0025 Square Law and V., 23/6; .0005, 25/6; Non Pong Valve Holder, 4/3; T.C.C. "MANSBRIDGE"—2 Mid., 4/3; 1 Mid., 3/10; 25, 3/6; SUCCESSORS (WRIGHT & FITCH)—L.F., all black Super, 21/-; Choke, 10/6; Var. Condensers, No Loss, List Prices. SHEPPOD—Rheostats, 7/6, 50 ohms, 2/6; Potentiometer, 500 ohms, 4/6; TRANSFORMERS (L.F.)—Ferranti, 17/6; Pyc, 22/6; Silvertune, 21/-; Ormond, 14/-; Royal, 20/-; Lissen T1, 30/-; T2, 55; T3, 16/6; Pouquip, 14/6; Formo Shrouded, 10/6; Ormond Latest Shrouded Model, 15/6; Cros, 9/6; 3-wire Supra, 12/6; Brunet Shrouded, 5.1-3.1, 13/6 each; UTILITY (WILKINS & WRIGHT)—Variable Condensers, .0003, 9/3; .0005, 10/6 (Vernier, 2/6 extra); Switches, Knob, 2-way, 4/-; 4-way, 6/-; 6-way, 8/-; Lever, 5/-; 7/6, 10/-; Nickel, 6d. extra. Not responsible for money not registered. Please WRITE plainly.

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RAYMOND VARIABLE CONDENSERS SQUARE LAW LOW LOSS.

One hole Fixing. Ebonite Ends. With Vernier
.001 ... 8/6
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Without Vernier
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Knob & Dial FREE. Post 3d.

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Knob and Dial.
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J. B. (JACKSON BROS.)—Square Law—.001, 9/6; .0005, 8/-; .0003, 6/6; .0002, 6/6; Standard, .001, 8/6; .0005, 7/6; .0002, 5/6; Square Law with Vernier—.001, 13/6; .0005, 12/6; .0003, 11/6. GEARED MODELS SHORTLY

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I will accept in part payment for new goods for purchase (if so desired) any articles you have no use for. SPECIAL CUSTOMERS. Please write first. Silence polite negative. Callers can bring goods in as desired, but am under no obligation to buy.

VALVES
1 Burnt-out VALVE bought by me for any New British Valve you purchase here. Prices given from 1/- to 4/- according to Valve you take.

ALSO USABLE VALVES taken in part exchange.

Customers purchasing 25 worth of our OWN goods at full prices presented with a first class pair of HEADPHONES, 4,000 ohms.

DR. NESPER OR GENUINE N & K Or, alternatively, if you buy 15/- worth of our OWN goods you can purchase a good pair of PHONES for 4/- extra. **OUR SELECTION.** Or have your **PANEL DRILLED FREE**

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BRETWOOD Grid-leak and Condenser, 50,000 ohms to 15 megohms; B.C.C. 2/11, 5 X X 3/6; Fibre Strip, 36 X 1 1/2; Ceilmold, 3d. piece; Empire Tape, 6d. doz. yards; Ad. Tape, 3d. 5d. Nuts, 6 a doz.; Telefunken adjustable Phones, 14/11; Fine value in phones, 8/11; Gentine N and K 12/11; Ericsson E.V. continental 11/6 pair.

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7 GRAPE STREET Shaftesbury Avenue, W.C.2. NEW OXFORD STREET END (Phone: Gerard 2231.)

THIS ADDRESS IS:—Back of Prince's Theatre. 1 min. Tottenham Court Road Tube. 1 min. Museum Tube. 3 mins. Holborn Tube. 2 mins. Palace Theatre.

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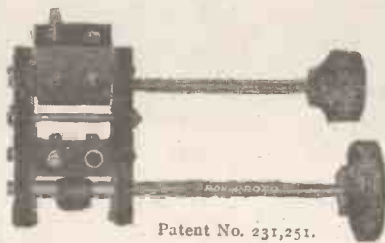


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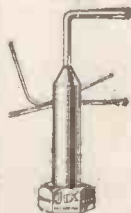
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Quality CAM-VERNIER RADIO COIL HOLDER

Price 9/-; on base 1/- extra.

With Reaction Reverse and Shorting Switch incorporated, 12/6; postage 4d.

"JIX" CONNECTORS



A soldered joint is a necessity for permanently good reception. JIX Connectors do not supersede soldering but greatly facilitate it.

2, 4, 6 B.A., price 2/- dozen. Postage 3d. doz.

GOSWELL ENGINEERING CO., LTD.

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Liberal Trade Terms. Phone: North 3051.

FOREIGN RADIO NEWS.

(Continued from page 507.)

These stations generally transmit between 7 a.m. and 11 p.m. local time, which is about eight hours in advance of West European time.

Studying American Methods.

American methods of securing money for broadcasting are to be studied by European concerns. In some Continental countries, the state and local authorities, realising the great importance of radio, are affording a measure of financial support to the broadcasting companies. In others the rôle of paymaster is undertaken, doubtless with an eye to publicity, by leading newspapers.

But there remain a number of stations that are not in receipt of any subsidy of the kind, and that are finding it increasingly difficult to make both ends meet, and at the same time supply programmes worth listening to. Spain and Belgium are two instances in point.

It is understood that at the recent Geneva conference concerning the reorganisation of wave-lengths in order to prevent mutual interference, the financial aspect of broadcasting was seriously, although informally, discussed by some of the leading delegates, and a movement has been initiated concerning a visit of experts to the United States to study the methods used by broadcasting companies there.

The large scale and excellent results of American broadcasting have greatly impressed European managers, and as they realise that this is in the main a financial question they are determined to probe the money-getting methods employed with a view, as far as possible, of applying them on the Continent.

While nothing definite has yet been decided, the trip is likely to take place within the next few months, and some of the leading Continental concerns will, it is understood, be represented on the deputation.

Reorganising European Wave-lengths.

It is expected that the reorganised wave length plan for European stations will be finally adopted some time in December, so that it may come into operation by the New Year.

The practical application of the principles laid down regarding this matter at the recent conference here, has proved much more difficult than had been expected. Further tests will shortly be carried out in the various countries.

It is realised, however, that the situation is constantly changing. New stations are constantly cropping up and introducing new elements into an already complicated situation. The instance is given of Radio-Toulouse, which was originally meant to be merely a relaying station for the South-West of France, but which turns out to be far away the clearest of French transmissions and to be interfering with reception of other stations in distant parts where no one had ever expected it to be heard clearly at all.

New Spanish Regulations.

The Spanish Government has ordered the Postal Department to draft a new set of radio regulations for Spain.

Official interference and control will, it is believed, be pushed a good deal farther than before. One reason given for this is the exceedingly bad results obtained from many Spanish stations, indeed from all but three or four of them, such as Madrid, Radio-Barcelona and Radio-San Sebastian.

Belgian Amateurs' Congress.

A national congress of Belgian radio amateur clubs, representing 1,433 amateurs, has been holding its session in Mechlin.

A series of resolutions were adopted and transmitted to the proper authorities. Among these were the following:

Much more latitude than at present ought to be shown in the granting of licences by the postal department.

Amateur stations ought to be allowed to use up to 100 watts.

Amateurs ought to be given the C.W. wave-lengths ascribed to them by the Paris International Congress, that is 43-47, 70-75, 95-115 metres; for telephonic purposes, a range below 20 metres and one from 180 to 200 metres.

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.

THE

BRITISH THOMSON-HOUSTON CO. LTD.

MAZDA HOUSE, NEWMAN STREET,
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H & H Tubular Galvanized Steel Telescope WIRELESS MAST

(Patent applied for)

35 ft. HIGH.

Complete with base plate, ground pegs, stay wires, straining screws, pulley and cleat.

Price £2:17:6 complete
25 ft. Rigid Masts, 20/-

HILDICK & HILDICK, Pleck Rd., Walsall.

2-VALVE AMPLIFIER, 35/-

1-Valve Amplifier, 20/-, both perfect as new; Valves, 4/6 each; smart Headphones, 8/6 pair; new 4-Volt Accumulator, celluloid case, 13/5; new 66-Volt H.P. Battery, guaranteed, 7/-; 2-Valve All-Station Set, £4. Approval willingly.
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The FAMOUS GENERAL RADIOPHONES

YOURS for 6⁶_D

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 instalment of 3/- monthly until only 21/- is paid. Price, full cash with order (or within 7 days of receipt) £1.
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SEA SONGS AND SHANTIES



There were two loft-y ships from old Eng-land came. Blow

“O, I am not a man-o’-war nor privateer,” said he

“But I’m a salt-sea pirate a-looking for my fee,

Cruising down along the coast of the High Barbaree.”

The Last Word in Cigarettes



It must be Players

20 for 11^D
10 for 5½^D



LISSENIUM

Transferring maximum energy

Your aerial picks up energy—your inductance builds up the voltage which will operate the grid of the first valve. Do the coils you use make a maximum transfer of this energy, or is there any loss which weakens the strength of your detection?

LISSENAGON COILS tune so sharply and strongly because there is no energy loss. The farther coils can be kept apart, the sharper and more selective tuning becomes. LISSENAGON coils will transfer energy even though the coils are comparatively a great distance apart. This is partly due to the strong magnetic field existing between the coils themselves due to the design and making, and partly due to the negligible losses in the coils themselves. Due to this also LISSENAGON coils will oscillate easily even though widely separated. There are practically no damping losses to be overcome in LISSENAGON coils, even on the extreme low wave-lengths.

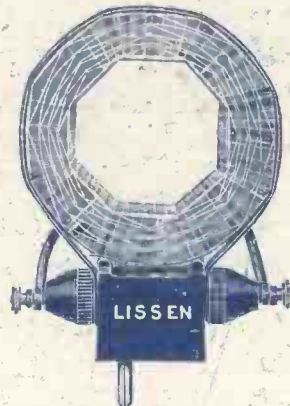


LISSENAGON COILS.

No. 25	4/10
30	4/10
35	4/10
40	4/10
50	5/-
60	5/4
75	5/4
100	6/9
150	7/7
200	8/5
250	8/9
300	9/2

Hairbreadth tuning—

Whenever the need arises to separate stations two or three metres apart, the user will appreciate the aid of LISSENAGON "X" coils. These coils are similar to standard LISSENAGON coils, but have the addition of two tapping coils near the socket end of the coil. Extreme selectivity, stability, and smoothness of reaction control in particularly critical circuits are noticeable features of these coils.



Made at present in four sizes. Coil No. 60 "X" covers the broadcasting band of wave-lengths; but in order to obtain the best coil combination for all conditions of reception LISSENAGON "X"

LISSENAGON "X" COILS.

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

coils Nos. 50 and 75 are recommended for the lower and higher broadcasting wave-lengths respectively. LISSENAGON "X" No. 250 covers Daventry and Radio-Paris.

THE EXPERIMENTER USUALLY BUYS THE COMPLETE SET.

Readers are invited to send for interesting leaflet describing the uses of LISSENAGON "X" coils.

A copy of the LISSEN Text Book will also be sent if 3d. is enclosed for postage.

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

LISSEN LIMITED

LISSEN PARTS—WELL THOUGHT OUT, THEN WELL MADE.

LISSENIUM WORKS,
8-16, Friars Lane, Richmond, Surrey
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October 31st, 1925.

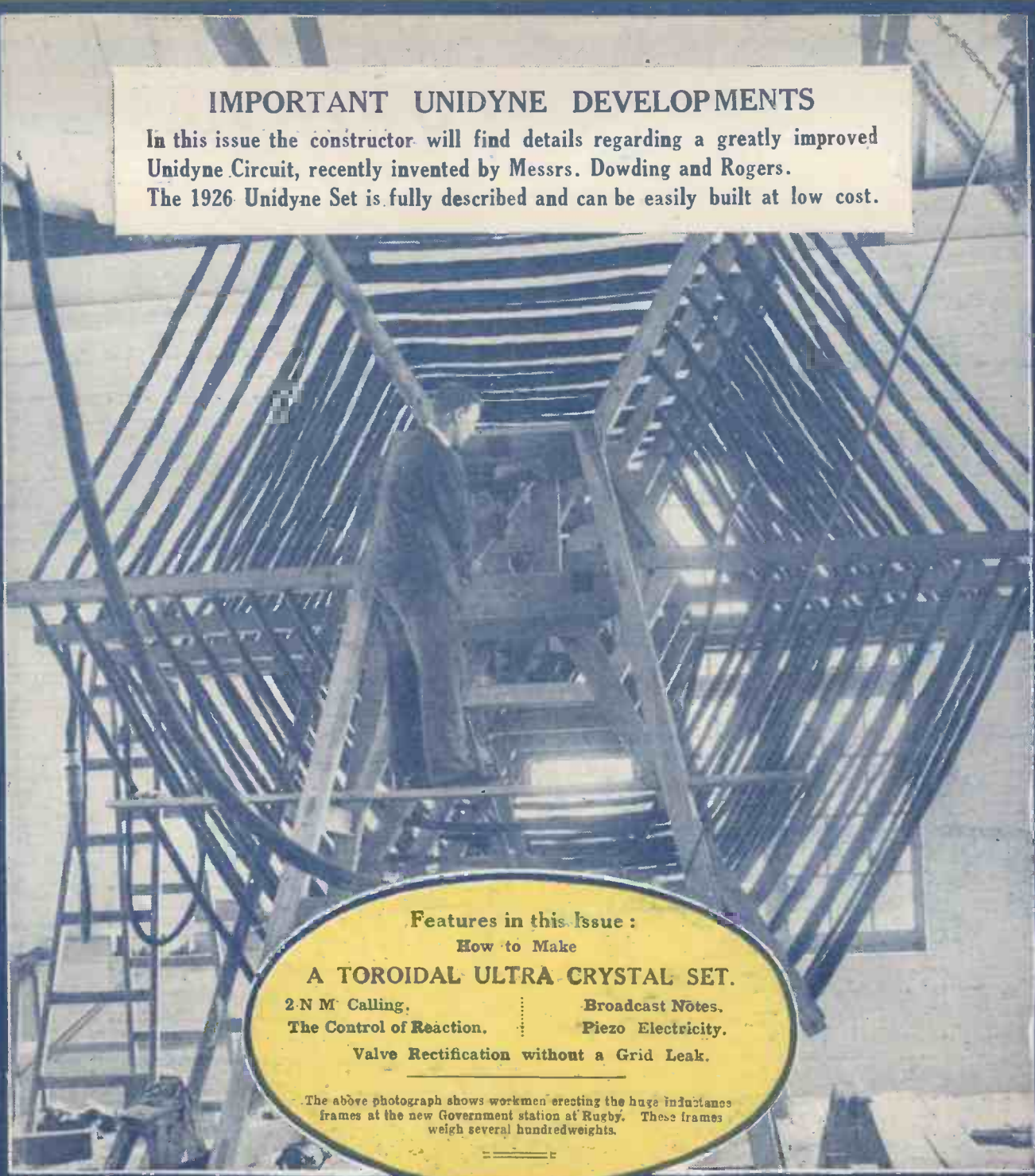
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EVERY THURSDAY.

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IMPORTANT UNIDYNE DEVELOPMENTS

In this issue the constructor will find details regarding a greatly improved Unidyne Circuit, recently invented by Messrs. Dowding and Rogers. The 1926 Unidyne Set is fully described and can be easily built at low cost.



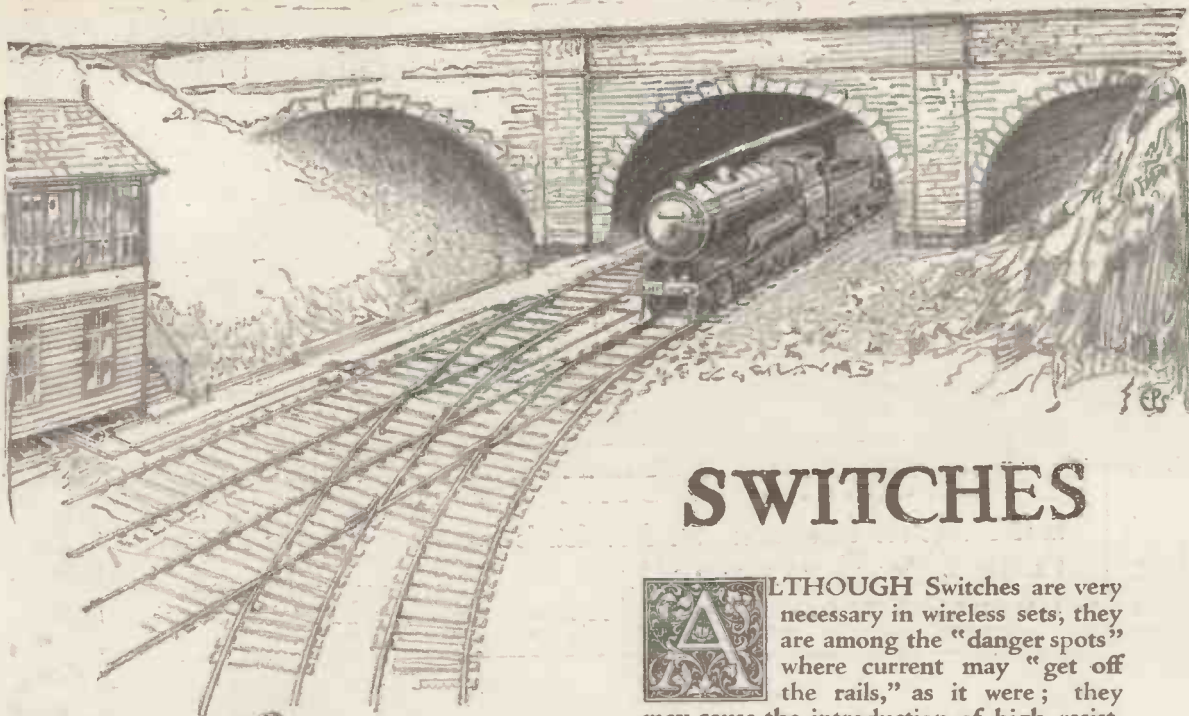
Features in this Issue :
How to Make

A TOROIDAL ULTRA CRYSTAL SET.

- | | | |
|--|-------|--------------------|
| 2 N M Calling. | ..... | Broadcast Notes. |
| The Control of Reaction. | ..... | Piezo Electricity. |
| Valve Rectification without a Grid Leak. | | |

The above photograph shows workmen erecting the huge inductance frames at the new Government station at Rugby. These frames weigh several hundredweights.

X



SWITCHES

ALTHOUGH Switches are very necessary in wireless sets, they are among the "danger spots" where current may "get off the rails," as it were; they may cause the introduction of high resistance owing to faulty or dirty contacts, and in addition they may introduce very undesirable capacity effects between the opposing terminal strips.

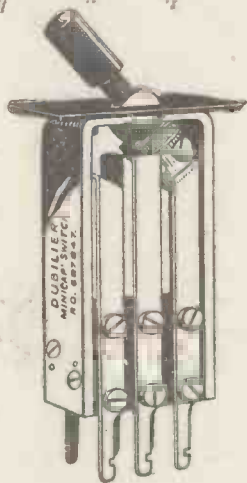
When the Dubilier Minicap Switch was designed, these particular problems were solved—the first by the use of definite self-cleaning rubbing contacts, the second by a special arrangement of the terminal strips, as shown in the illustration. The terminals have substantial tags for soldering, and the frame is solidly constructed of a special metallic alloy.

The Minicap is a double-pole double-throw switch useful in all circumstances for general purposes.

Manufactured by the Dubilier Condenser Co. (1925) Ltd., in addition to the following:—Fixed Mica Condensers, Variable Air Condensers, Anode Resistances, Grid Leaks, the Dubrescon Valve Protector, the Ducon Aerial Adaptor, the Mansbridge Variometer. The Company are also sole concessionaires for the products of the Mansbridge Condenser Co., Ltd.

Whenever any of these products are required, the wisest course is to

Specify Dubilier.



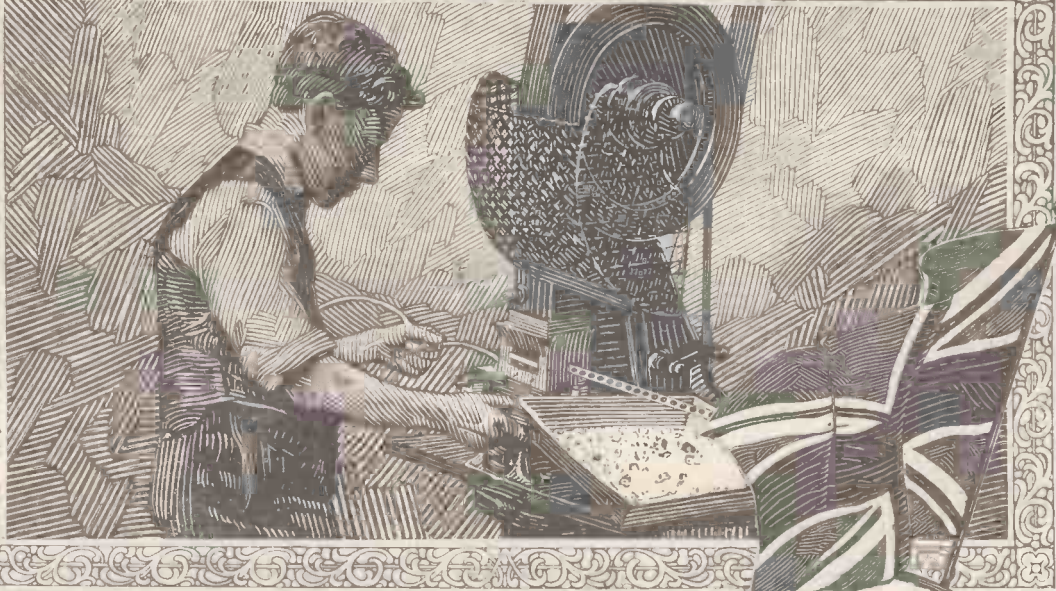
The Dubilier Minicap Switch.

8/-

REGISTERED  TRADE MARK

DUBILIER
CONDENSER CO (1925) LTD

THE FIRST WIRELESS LOUD-SPEAKER WAS A BROWN



Only exceptional manufacturing resources permit this new Brown A-type Headphone being sold at 30/-

Brown A-type Headphones are unique. For sensitiveness they enjoy an international reputation. On sea, on land, in the air you will find them being chosen in preference to all others. Their wonderful reliability and power to respond to the weakest signals makes them an essential part of the equipment of the professional wireless operator.

But, like many another superlative product, their cost of manufacture—due to their intricate design—has unavoidably been somewhat high. Many wireless enthusiasts who coveted them could not afford their price. Now, however, after many months of patient experimental work, we announce an entirely new Brown A-type Headphone—a simplified instrument more suitable for mass production. We guarantee that these new 'phones contain all the essential features of the standard A-type—the same tuned reed principles of reproduction—the same superior workmanship—the same high standard of material. At 30/- they are a manufacturing triumph.

The Crystal Set user will find that the replacement of his old 'phones with a pair of the new Brown A-type will mean an amazing increase in signal strength, while the multi-valve Set user will find that stations previously elusive can be logged with ease.

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The new Brown A-type 30/-

The New Brown Loud Speakers

Wireless Dealers are now showing a complete range of Brown Loud Speakers from the new H4 at 30/- to the superb Q-type costing £15-15-0. Before buying your Loud Speaker be sure to hear the Brown—no other can approach it for purity of tone and volume.

To the Trade

If you have any difficulty in obtaining from your usual source of supply, write to us at once.

BRITISH

Brown

THROUGHOUT



Choose the Wuncell and be money in pocket

EVERY week sees several thousand wireless enthusiasts leaving the ranks of the bright emitter valve users and changing over to Wuncells. And each month these new adherents make a practical saving of several shillings in reduced accumulator re-charging fees. But this is not the only economy effected. The new Wuncell possesses a filament having exceptional long-wearing qualities. Owing to the fact that the valve operates at its best when the filament is barely glowing, it is subjected to very few stresses. The Wuncell filament is made under a process known only to Cossor. It is built up layer upon layer. Each layer means additional strength. This process ensures a filament wonderfully productive of electrons—and when allied to the well-known Cossor electron-retaining design of Grid and

Anode, obviously an ultra-sensitive valve is the result.

Now is the time to change over to Wuncells—and start saving money. If yours is a multi-valve Set operated from a 4 or 6-volt accumulator it is unnecessary for you to discard all your valves at once, you can change over one by one as your existing valves become useless. For your convenience the W.R. series of Wuncells has been evolved. These are 1.8 volt valves with special bases which permit the Wuncells being used with 2-volt, 4-volt, or 6-volt accumulators without the slightest alteration to Set. A small in-built resistance controlled by a switch enables the valve being used on any voltage between 2 volts and 6 volts. Get acquainted with these super-economy valves without delay—your dealer can supply you with interesting descriptive folders free of charge.



The Wuncell Dull Emitter
Voltage 1.8 volts. Consumption .3 amp.
W1 for Detector and L.F. 14/-
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RADIO NOTES AND NEWS.

Foreign Relaying—The Ether Shuffle—One Valve Records—German Call Signs—
Armistice Day Broadcasting.

An Unusual Broadcast.

“WILL the writer of a letter, dated October 14th, 1925, to Lord Waring communicate again and make an appointment, when matters can be arranged?” This unusual message was broadcast by 2LO recently, and behind the cryptic announcement is a story of a mysterious burglary, now being investigated by Scotland Yard. Some weeks ago burglars entered Lord Waring’s house in Portland Place and extracted some very valuable jewellery from the safe, including a watch inscribed “Presented by Queen Alexandra.” Lord Waring called in Scotland Yard, and following the receipt of the letter referred to, Scotland Yard called in 2LO. Further developments are awaited with interest.

The Weather Forecasts.

HAVE you noticed how accurate the weather forecasts have been of late? The B.B.C. is now doing the community a real service in this respect, for in addition to local forecasts from Newcastle, Bournemouth and Liverpool, the Daventry station now sends out a regular weather bulletin at 9.30 a.m., G.M.T.

Foreign Relaying.

CONTRARY to what appears to be the general opinion, I thought that the B.B.C.’s first “Round-the-Continent” programme was rather disappointing. It is true that the Brussels broadcast was received and re-transmitted clearly enough to be enjoyable, but the programmes of the other stations were a strain upon the listener. This was partly due to X’s and jamming, and partly due to defective “showmanship” in the control of amplification. I hope this point will receive attention in future Continental broadcasts, for it can easily make or mar the effect.

German Drama.

THE trouble during the experiment of October 15th was that Captain Eckersley’s explanations were superimposed upon a “background” that was too strong for them. That drama from Dortmund, for instance, should have been faded out further, so that the Chief Engineer’s comments upon it could have been heard

distinctly. The German “acting” was intriguing, and the comments were interesting, but neither had a fair chance to be heard by listeners, because they were sent out simultaneously at equal strength.

The Ether Shuffle.

THE wavelengths chosen during the Geneva tests have not yet been enforced, so there is still a nightly shuffle for space in the ether. Nineteen Continental broadcasting stations, and Newcastle, Dundee, Leeds, Hull, Liverpool, and London have all made slight wave-

IMPORTANT UNIDYNE DEVELOPMENTS.

NEW AND IMPROVED CIRCUITS FOR READERS.

In this issue we publish the first of several constructional articles dealing with improved Unidyne Circuits. Special announcements regarding four-electrode valves and Unidyne sets of parts will be found in our advertisement columns.

length alterations lately, but the complaints of heterodyning are just as bad as ever! The wave-length scale is becoming so crowded that no station can move a metre without treading upon the wave-band of another, and the only remedy seems to be that of fewer stations using greater power.

5 XX on Short Waves.

DAVENTRY’S programmes, sent out upon short waves of less than 100 metres, have been responsible for the report that the B.B.C. is starting a short-wave broadcasting station. As a matter of fact, although these short-wave programmes really belong to the B.B.C., the short-wave transmission is entirely due to amateurs. By receiving the regular broadcast programmes and re-transmitting them upon the very low wave-lengths, the amateurs are saved the trouble of putting on gramophone records, or providing other forms of music for their experiments in short-wave working.

2 BJK.

MEMBERS of the Lewisham and Bellingham Radio Society have determined to go in for transmission, and I hear that this society’s own station will shortly start to shake up the South London ether. The various parts are being constructed, as far as possible, by members of the society, and the new station has been allotted the call sign 2BJK.

Short Waves from Italy.

SHORT-WAVE enthusiasts should listen in on 18 metres at 15.00 G.M.T., and on 38 metres at 06.00, and 16.00 G.M.T., for telephony from Lake Como. Signals are sent at these times every Sunday, by the station of the Radio-giornale, Bellagio (call sign I-1 R G). Reports are welcomed, and should be addressed to Mr. E. Montu.

One-Valve Records.

“HOW many foreign stations ought a one-valve set receive?” I am frequently asked this question, and from the large number of reports I receive, I think that a fair average amongst my correspondents would be half a dozen foreign stations per set. Under ordinary conditions a straightforward one-valver ought to be able to scoop in six stations or so, from overseas, not as a regular thing, perhaps, but when conditions happen to be favourable. And there seems to be no limit to the number that a well-situated set will bring in.

A Fine “Bag.”

A GOOD instance of a really successful one-valve set is reported by Mr. S. Townsend, Barnwood House, Gloucester. At various times 37 different stations have been received upon a good aerial, including three American, five French, three Spanish, six German, and six British. No doubt many of my readers can beat this “bag,” but nevertheless it is a good one, and all the more interesting because the circuit is quite a simple one, incorporating many of “P.W.’s” tips.

Radio and Farmers.

HOW the American farmer is helped by radio is well shown by the returns recently published in the U.S.A. No

(Continued on page 512.)

NOTES AND NEWS.

(Continued from page 511.)

less than 500,000 farms are equipped with wireless receiving sets, which figure shows an increase of 25 per cent. upon last year's total. In addition to gingering-up the yokels with jazz, these farm radios do invaluable work in making known the market prices and tendencies, and in keeping the agriculturalist abreast of modern methods.

Helping Public Departments.

IN this country we are slowly taking up the public service side of broadcasting, and the B.B.C. is doing its utmost to assist the various public departments. Already periodical talks by the Ministry of Agriculture, Air Ministry, and Ministry of Health have been arranged. The transmissions to schools show that the Board of Education is on the alert, but not all the other Government departments are alive to the possibilities of the microphone. Whitehall should remember that every crystal set is a chance for service.

Chinese Crystal Fans.

BROADCASTING is now catching on in China and Japan at an amazing pace. Recently the Shanghai station started broadcasting two hours of jazz music daily, and immediately the Chinese made a big rush for crystal sets! Across the water the Japanese jump for joy when jazz comes on, and the interest in wireless there is so keen that it is said to be interfering with ordinary educational plans. It certainly looks as though the "Unchanging East" has met its match in radio!

The Radio Howler.

THE Blackburn and Radio Society have just published an ambitious little annual entitled "Radio Howler." Its cost is sixpence, for which the reader has some excellent short articles, and the satisfaction of helping a good cause. Copies may be obtained from the Hon. Sec., Municipal Technical College, Blackburn, and I hope that other Radio societies also will consider this idea of an annual magazine.

Percy Pitt—Editor.

PART II. of the new fortnightly publication, "Music Masterpieces," which is on sale at the bookstalls to-day, promises to be another outstanding success. Handsomely printed in full music size, the contents include a selection of the principal melodies from "Madame Butterfly," "When a Maiden You Have Chosen," from Mozart's "Il Seraglio," and "On With the Motley" ("I Pagliacci"). The complete work will contain about 150 pieces of the world's finest music, selected by Mr. Percy Pitt, as well as special articles by Robert Radford, Herman Finck, and other musical celebrities.

German Call Signs.

SOME of the German stations appear to be revising their call signs recently. Nauen, for instance, has been sending out the letters A G A in place of the familiar

SHORT WAVES.

"The discovery of wireless, with all that it implies, opens the most romantic chapter in the history of science."—Alfred Noyes, writing in the "Radio Times."

"It is more blessed to send than to receive."—Capt. P. P. Eckersley, in "Lloyd's Sunday News."

Radio is a big thing, and, like all big things, may easily get out of hand; but I believe that as in Great Britain, sanely regulated, wisely developed, it will become one of the most potent influences in the lives of the people of the world."—Mr. Wm. Dubilier.

"Electric waves are proving to be far too valuable to be always broadcasted in all directions."—Senator: Marconi.

POZ, upon its normal wave-length. When working on 12,600 metres this is changed to A G O, whilst for 21,000 metres the letters A G W are used. Similarly Königswusterhausen has discarded L P, and now "comes out" on the various wave-lengths with A F T, A F P, and so forth.



Dr. J. H. T. Roberts, F.Inst.P., before the microphone at 2 L O, during the "P.W." "Radio Sounds" Competition.

Radio and the Telephone.

THE London-New York telephone service by wireless will soon be an accomplished fact, and open to public service, if the expectations of the engineers concerned are fulfilled. The tests have been very satisfactory, and New York 'phone subscribers linked up through the Rocky Point Station (Long Island) have talked to Britain clearly through our receiving station at Chedzoy, Somerset.

Rugby Ready.

AS was officially announced last April, the transmission from this country to America will take place through the new P.O. station at Rugby. This vast high-power station, the greatest in the world, is now ready for transmission. Tests may be heard before these lines are in print, for the telephone transmitter is completed, and has been handed over by the contractors to the Post Office. When the service is in full swing it will be possible to phone New

York in the same way that one can now call up Paris, but instead of a cable link the connection will be via Rugby-radio. The charge for a three-minute chat is estimated at approximately £1.

Reports Wanted.

SPECIAL tests for British listeners have been broadcast recently from C N R A, the powerful station at Moncton-New-Brunswick. This is one of a chain of ten stations, belonging to the Canadian National Railways, and any reports of reception will be gratefully received by the C.N.R. at their London office, 17/19, Cockspur Street, S.W. The wave-lengths used were 291 metres (11.30 p.m.—12.30 a.m.), and 313 metres (1.0 a.m.—1.30 a.m.).

Armistice Day and Broadcasting.

PREPARATIONS for an impressive Armistice Day programme are now well in hand. I hear that the B.B.C. is arranging to broadcast a sermon by the Archbishop of Canterbury, on the Sunday evening preceding Armistice Day. This message to the nation will probably be delivered in Canterbury Cathedral, from which successful broadcasting has already been carried out.

"Tess" Broadcast.

NEXT Saturday's broadcasting of "Tess of the d'Urbervilles" will be the first occasion upon which any of Mr. Thomas Hardy's works have been broadcast. The great author will himself be listening-in at his home near Dorchester, where a receiving set is already installed.

The Unidyne in New Zealand.

I AM indebted to a New Zealand Unidyne enthusiast for details of the twelve N.Z. broadcasting stations, and full details of these will be published shortly in our "Correspondence" columns. The three chief stations are Dunedin (4 Y A), 370 metres; Auckland (1 Y A), 330 metres; and Wellington (2 Y K), 285 metres; and with a 2-valve Unidyne this reader can scoop in all the twelve New Zealanders and all the Australian stations except Perth!

"Silent Night" for Europe.

THE policy of a "silent night" for every broadcasting station—during which local listeners can "reach out" for long-distance results—is now finding favour in Europe. Copying the American example, the two Danish stations at Ryvang and Copenhagen have decided to preserve silence one evening every week. I hear that there is a possibility of other Continental stations following suit, but public opinion in this country is against the B.B.C. adopting the plan.



PROBABLY the most popular type of receiver in use at the present time is the simple grid leak rectifier with reaction on to the aerial, followed by one or more low-frequency amplifying valves. This type of receiver necessitates only one tuning control, and when worked near the point of oscillation is reasonably selective and very sensitive. In experienced hands it is capable of extraordinary achievements in long-distance reception, but success or otherwise in this direction is very largely dependent on convenient control of reaction, so that the receiver can be tuned dead on the carrier wave of the station, and brought up to the very edge of reaction.

One of the most popular types of tuning arrangements consists in the use of plug-in coils and a coil holder arranged so that the reaction coil can be moved farther from or

An article of practical interest

By

Lt.-Comdr. H. SHOVE, D.S.O., R.N.

The chief disadvantage of this tuning system is that any movement of the reaction coil slightly alters the mutual inductance of the two coils, and so necessitates slight readjustment of the aerial circuit tuning. Before any distant reception is attempted, "backlash" in the reaction must of course be carefully eliminated by adjustment of the H.T. voltage, filament current or value of grid leak and condenser, so that the set slides smoothly in and out of oscillation at the same position of reaction coupling.

Capacity Reaction.

Another type of reaction control which is very popular, particularly with American amateurs, consists in tuning the anode circuit of the rectifier, usually with a variometer, the resultant feed back of energy

through the capacity between the plate and grid of the valve being sufficient to throw the set into oscillation. In practice, a small fixed condenser of about .00005 mfd. is usually connected from plate to grid to assist the internal capacity of the valve, and the receiver is arranged so that it goes into oscillation before the anode circuit comes exactly into tune with the aerial.

Reaction is thus controlled by bringing the wave-length of the anode circuit nearer to or farther from that of the aerial. In this type of reaction control there is some tendency for the two circuits to "pull" one another, particularly if there is any direct magnetic coupling between the two coils, and thus the aerial circuit has to be slightly retuned when reaction is altered.

This system is one of the two forms of capacity reaction, the other arrangement being that in which the inductance or choke in the plate circuit of the rectifier is fixed, and the feed-back condenser is variable. An ordinary honeycomb coil may be used as

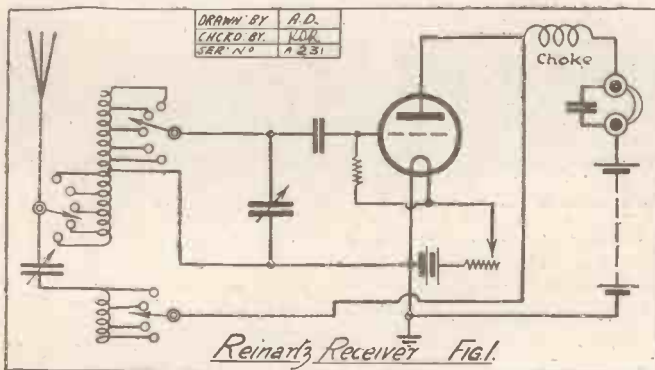
a choke, and its natural wave-length must be above that to which the aerial is tuned. The arrangement suffers from the same disadvantage as the other two, that is to say each slight adjustment of the reaction condenser alters the wave-length of the aerial circuit and necessitates slight retuning. This form of capacity reaction is in fact probably the worst offender, and this is probably the cause of its rather limited popularity.

The Reinartz Circuit.

A receiver which incorporates a combination of magnetic and capacity reaction in conjunction with loose coupling has received considerable popularity under the name of the Reinartz receiver (Fig. 1). The aerial, closed circuit and reaction coils may be wound on the same cylindrical former, and reaction is controlled by means of the variable feed-back condenser. The system is most efficient on short waves, and is preferred by many experimenters for reception on the very short waves, as exceptionally smooth reaction is obtained.

Direct Reaction.

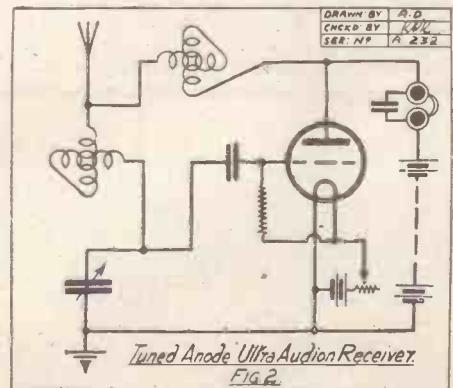
There are also a number of circuits in which there is a direct connection between plate and grid of a valve, with some means of controlling the amount of energy which is fed back through this connection. That



nearer to the aerial coil, the latter being tuned by a variable condenser either in series or in parallel. In such a receiver, a fairly nearby station should be tuned in with the reaction coil well away from the aerial coil, the reaction being then increased until sufficient strength is obtained.

D X Reception.

A very distant station, on the other hand, is most easily tuned in by throwing the set into oscillation by tightening the reaction coupling, tuning to the mid-point of the heterodyne whistle, and then loosening the reaction coupling until the set is just off the oscillating point. A vernier or geared movement of the reaction coil is essential if the set is to be easily brought right up to the edge of oscillation. A small variable condenser connected across the reaction coil is also useful as a vernier adjustment, the condenser being used not to tune the coil, but to shunt away a part of the H.F. current, thus reducing reaction.



shown in Fig. 2, which appeared in POPULAR WIRELESS some months ago, for example, is a variation of the well-known "Ultra-Audion" receiver. Rough setting of reaction is obtained by adjusting the relative values of C and L, the feed back being (Continued on page 514.)

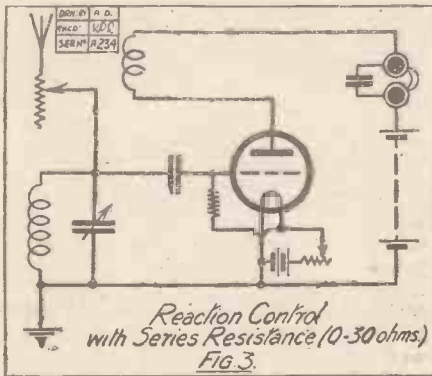
THE CONTROL OF REACTION.

(Continued from page 513.)

greater when C is reduced. A fine control is then obtained by tuning the anode nearer to or farther from the wave-length of the aerial circuit. The voltage which is impressed on the grid is that occurring across the series aerial condenser, so that the maximum value of the latter must be low. Considerable success can be achieved with this receiver, but the wave-range is rather limited, and, as in the other systems, adjustment of reaction necessitates slight tuning adjustment.

Spade Control of Reaction.

One more method of reaction control, and a very ingenious one, is to vary the inductance of the reaction coil by means of a copper disc or plate, which is moved nearer to or farther from the coil, the inductance



of the latter being reduced as the plate is moved nearer to it. The plate may be fitted on a screw thread so that it approaches the knob as it is rotated, or it may slide across the coil.

Now although each of the different systems described is quite satisfactory for general work, they are all handicapped when really long-distance work is attempted, owing to the difficulty of adjusting the reaction so as to bring the receiver smoothly right up to the extreme edge of oscillation, each slight adjustment being necessarily accompanied by a corresponding tuning adjustment, which itself may be sufficient to throw the reaction off the critical point again.

Fine Control Possible.

It is obvious, then, that some sort of fine reaction adjustment is necessary which will have absolutely no effect on the tuning. One of the simplest methods is to adjust the filament current of the rectifier valve, and for this reason a separate filament resistance should be provided for the rectifier. Another useful means is provided by using a potentiometer connected so that the potential of the grid can be controlled, whilst control of the value of the grid condenser and the grid leak is also occasionally employed, but these also affect to some extent the quality of reproduction and are therefore not to be recommended.

Before coming to what is probably the best method of all, let us see exactly what factors determine reaction conditions. When reaction is applied to a circuit, the resistance

losses in the circuit are compensated for, and signal strength increases up to a point when the circuit bursts into oscillation, all the resistance losses being neutralised at this point. Thus the greater the losses, the stronger will be the reaction coupling necessary to produce oscillation, and at the point of oscillation all resistance losses are neutralised.

An Ingenious Method.

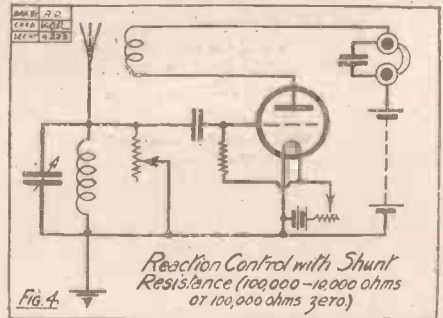
Now it follows that if we were to fix the actual reaction coupling we could alter the oscillation point by varying the losses in the circuit, and this gives us a reaction control of very great convenience. The variable "loss" may take the form of a relatively low variable resistance connected in series with the aerial (Fig. 3), so that increasing the resistance reduces reaction or vice-versa, or alternatively a much higher resistance can be connected in parallel with the aerial coil so that reaction is decreased by decreasing the value of this resistance (Fig. 4). By either of these methods, the receiver can be taken smoothly in and out of oscillation without any alteration to the tuning adjustment, provided that the resistance is non-inductive.

To come down to practical data—for 300 to 500 metres, with an average aerial of 0.00025 mfd. and a 35 plug-in coil with a 50 or 75 coil for reaction; a series resistance of 30 to 40 ohms (maximum) would provide excellent control; the relative position of the coils being roughly adjusted beforehand. A filament resistance of the carbon compression type as used with "06" dull

emitter valves would be suitable, although possibly inclined to crackle.

If a parallel resistance is used, and it is probably the better of the two methods, an "anode" resistance of 10,000 to 100,000 ohms would be satisfactory, 10,000 ohms in parallel being roughly equivalent to 30 ohms in series. The difficulty is of course to find a variable resistance of suitable value which does not crackle as the oscillation point is reached, and although the writer has not yet tried it, an Igranite potentiometer would probably be very satisfactory as a parallel resistance, using one end and the tapping point.

The resistance can be used as a complete control of reaction, or if desired it can be used as a "vernier" in conjunction with a



conventional system. In either case, the system offers very considerable advantages, and is well worth the attention of all amateurs interested in long-distance reception.

"RECTALLOY."

FINAL DETAILS ABOUT THE TRICKLE CHARGER.

By GEORGE HARLAND.

IN the previous article a description was given of experiments with the new rectifying metal Rectalloy, and it was shown how the writer made up his experimental models of rectifiers suitable for "trickle-charging."

All that was necessary for the rectifier was a pair of electrodes of Rectalloy and another electrode (the "neutral" electrode) of lead. These three electrodes were immersed in ordinary battery acid (sulphuric acid, dilute), in which a small quantity of ferrous sulphate was dissolved. Dissolving an iron nail, or a few iron filings, is the same thing as dissolving a small quantity of ferrous sulphate, since the iron forms, with the sulphuric acid, ferrous sulphate in solution. This was found to have the effect of increasing the conductivity of the rectifier, enabling it to pass more current, and of rendering the current quite steady. It was also found to have the much more important result of preventing the corrosion of the Rectalloy, rendering it everlasting, or practically so.

The Transformer.

Now the only remaining part of the complete battery charger, or "trickle charger," as we have called it, is the transformer. This is used for the purpose of

stepping down the voltage of the electric mains to the value of about ten volts, which is the value required to be applied to the rectifier and the 6-volt battery, for the purpose of charging the latter.

The construction of the transformer was quite a straightforward matter, as it is merely a small step-down power transformer.

Low Consumption.

In the first place, since the transformer is to be working practically 24 hours a day, it is essential that the current consumption in the primary (that is, the winding connected to the electric-light mains) shall be "wattless" consumption—in other words, that it shall consume practically nothing when nothing is being taken out of the low-tension winding.

In order to ensure this result, it is necessary that the transformer be designed with the requisite amount of iron in the magnetic circuit, or core, and that the number of turns on the primary winding be sufficient.

For this purpose, and having regard to the output considered in the last article, it was decided to use a bobbin, having a cross-section of iron of about one square inch, although, according to theoretical considerations, a somewhat smaller iron core

(Continued on page 552.)

A Toroidal Ultra Crystal Set



THE little receiver to be described in this article really has got a right to its rather scientific name, even although it is no harder to make than an average crystal set of more lowly designation. Moreover, it possesses the full advantages of the two systems mentioned—i.e. Toroidal and Ultra. Both of them are combined in such a manner that they work together as efficiently as they would operate individually.

An Ultra coil is a coil with centrally placed tappings. It is selective, and by virtue of what are known as its "balanced end effects" stronger signals can be obtained with it than with other types of coils. The advantages of a Toroidal coil do not overlap those of the Ultra at all, as the former is primarily a reducer of local interference. Its windings are so arranged that it has no externally distributed field, and consequently it does not tend to "pick up" stray energy.

Remarkable Wave-length Range.

Quite incidentally it was discovered that the Ultra-Toroidal combination enables a very large wave-length band to be covered. That provided by the coil described in this article, when used in conjunction with the specified variable condenser and an average aerial system, proved to be approximately 165 to 525 metres. This, it should be clearly understood, was without introducing any "series-parallel" complications.

Fig. 1 is the theoretical diagram of the circuit. The 144-turn coil is bent round into a circle so that its two ends meet. It is not shown in this way, as it would make it difficult to follow the connections.

The coil, for which 18-gauge D.C.C. wire should be used ($\frac{1}{2}$ lb. will be required), is wound in the form of an ordinary cylindrical coil on a cardboard former 2 in. in diameter, 6 or 7 in. long. A roll of books can be used for the purpose; 148 or so turns should be wound on, because at least four



This is the complete receiver. It is both simple and neat in appearance.

will be lost in the slight springing which is certain to occur when the wire is slipped off the former. The diameter of the coil will also increase to about $2\frac{1}{4}$ in. This must be allowed for, as with all the care in the world "springing" to some extent is inevitable. The ends of the wire should be temporarily secured by twisting them around the last turn.

Constructing the Coil.

A piece of 2 in. in diameter cardboard tubing $1\frac{1}{2}$ in. long should be cut, and around this the coil of wire should be encircled. String through the centre of the wire tightly tied round the central former will hold the coil rigidly in position.

Figs. 2A and 2B illustrate the method that should be adopted in the construction of the coil. Constructors should not anticipate loss of efficiency if they cannot get an absolute even spacing of turns. The ap-

This easily made and certainly inexpensive receiver can be strongly recommended to crystal users. Despite its name the set is easy to make and handle.

Designed and described by
G. V. DOWDING, Grad.I.E.E.
(Technical Editor.)

Constructional work by
H. MEADOWS.
(Technical Staff.)

pearance of the turns of the completed coil may be anything but regular, as our photographs indicate, but such absence of uniformity does not appear to affect results to any appreciable extent.

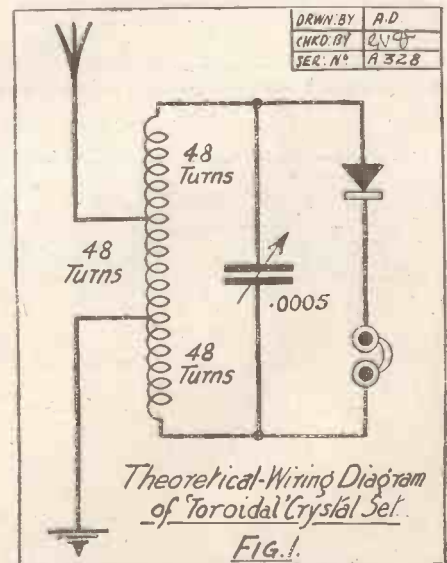
The panel, $\frac{1}{8}$ in. thick, should measure 7 x 7 in., and should be drilled in accordance with the details given in Fig. 3. The crystal detector can be of any reliable make, one designed specifically for panel mounting being preferable. This and the necessary four terminals can be mounted in position, as can also a .0005 mfd. variable condenser. This latter component should not be of large dimensions, a J. B. being particularly suitable for the purpose.

The Tapping Points.

The coil should be tapped twice at equal distances—i.e. at 48 and 96 turns, two pieces of flexible wire being soldered on at those points.

The case must, of course, be fairly deep, 5 in. at least being allowed, as the coil is to be fixed on the base of the condenser. This operation is not a difficult one. Two short pieces of stout copper wire, each about $2\frac{3}{4}$ in. long, should be firmly secured to the terminals at the base of the condenser.

(Continued on page 516.)



A TOROIDAL ULTRA-CRYSTAL SET.

(Continued from page 515.)

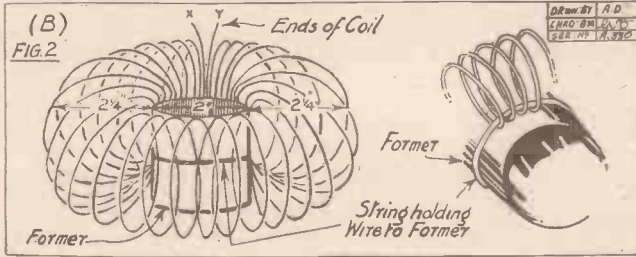
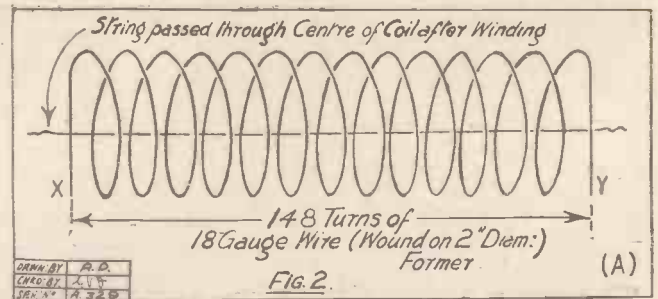
The pieces of wire pass through the centre of the coil former, and should be soldered to the ends of the coil. It does not matter exactly which end of the coil is taken to a particular condenser terminal, although the other connections from the end of the coil bear a relation to the tapping connections, which it will be as well to adhere to strictly.

the coil will be protected from mechanical stresses and will hang well away from the condenser.

The Wiring.

The remaining connections are few in number. One end of the coil, which is, of course, already connected to one terminal of the variable condenser, should also be connected to one side of the crystal detector. The other side of the

crystal detector should be connected to one of the 'phone terminals and the other 'phone terminal connected to the other end of the coil. That tapping nearest the end of the coil connected to the crystal detector should be taken to the aerial terminal and the other tapping connected to the earth terminal. This completes the job, and all that remains is to screw the panel down on to



Thus it will be seen that the coil is supported by its connections. Should the constructor desire to make it a more rigid fixing, a bracket arrangement could be arranged; but this is not at all essential, as once the panel is screwed on to its case.

mains is to screw the case.

Tuning the Set.

Transfers will, of course, improve the appearance of this little receiver; and these,

if used, should be fixed on the panel in accordance with the indications given in the photographs.

Tuning in this little receiver is quite a simple operation. There is only the usual crystal adjustment and the variable condenser to consider. This latter, the variable condenser, really controls the tuning of two circuits simultaneously. This effect is known as "auto-coupling," and the term refers to a permanent coupling between the aerial circuit and a closed circuit across which the detector and phones are connected.

The Theory of the Circuit.

Auto-coupling is by no means a new principle, but the particular manner in which it is applied in this set is original. It will, perhaps, be of interest if we give a few fuller details concerning the functioning of the circuit. Reverting back to Fig. 1, it will be noticed that a centre part of the coil is connected between the aerial and earth. This section of the coil, the centre section, is obviously in the aerial circuit, although it is also included in the closed circuit, which consists of the whole of the coil and the variable condenser.

Now, this variable condenser tunes both the whole of the coil and the aerial circuit, which only includes a section of the coil.

Concerning Selectivity.

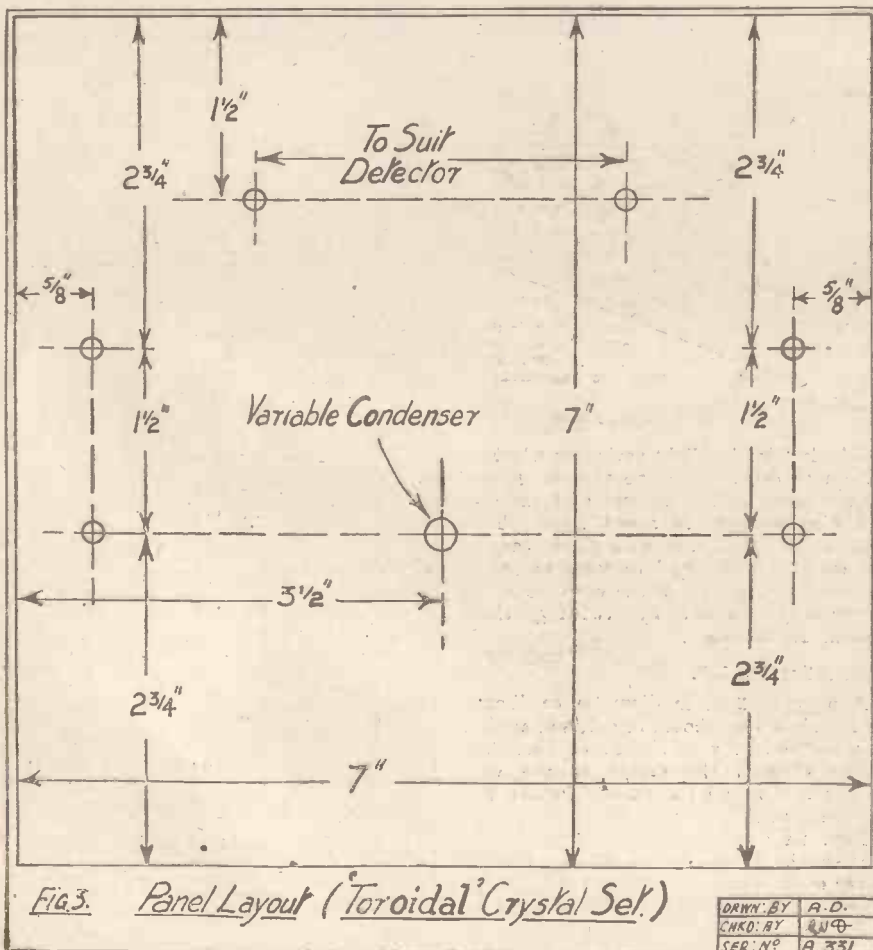
Thus the turning of the one solitary tuning control carries out at once two duties; the tuning of two circuits coupled together. Therefore nearly all the advantages of a two-circuit tuner are available without introducing additional controls.

Of course, the system is not quite as efficient from a selectivity point of view as the loose coupled circuit tuner, as the detector circuit in the latter case is "bridged across" only one of the two circuits and not across both as in the auto-coupling system.

A detector circuit "damps" an oscillating circuit and broadens tuning or, rather, decreases selectivity. But it is here that the "Ultra" method, by virtue of its balanced end effects, compensates to some considerable extent for the loss of selectivity that would otherwise occur.

The toroidal method of winding the coil in no way interferes with the "Ultra" functions of the circuit, as before stated. In fact, it can be ignored when considering the above factors. Additionally, of course, it provides its own advantages and the constructor should note with interest the reluctance of the little set to pick up those local interfering noises that so frequently hamper reception on ordinary sets.

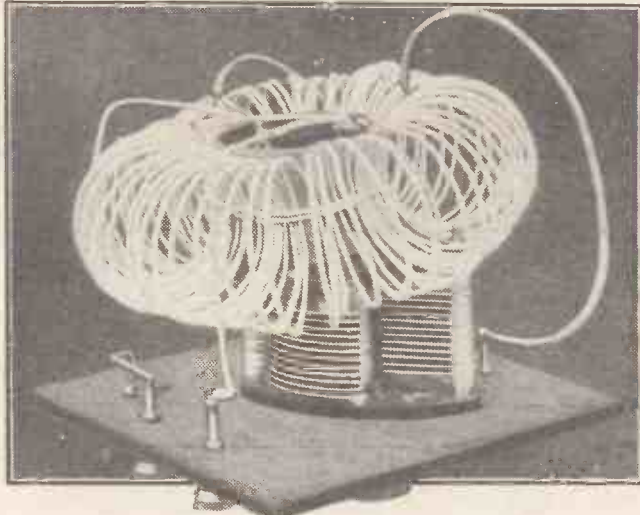
(Continued on page 517.)



A TOROIDAL ULTRA-CRYSTAL SET.

(Continued from page 516.)

It should be remembered that the Toroidal-Ultra crystal set is not claimed to be a marvellous "DX" instrument. With all types of crystal receivers one is



Although this coil is hardly "tidy" in appearance, it is none the less efficient for that.

limited to the use of the energy that is received on the aerial; no local energy being available, as in a valve set. That in the

circumstances this particular crystal set makes the best possible use of such received energy is without doubt, but, nevertheless, every opportunity should be taken to get as high an aerial and earth efficiency as possible. Under good conditions "freak" reception may easily become *standard* reception with the Toroidal-Ultra.

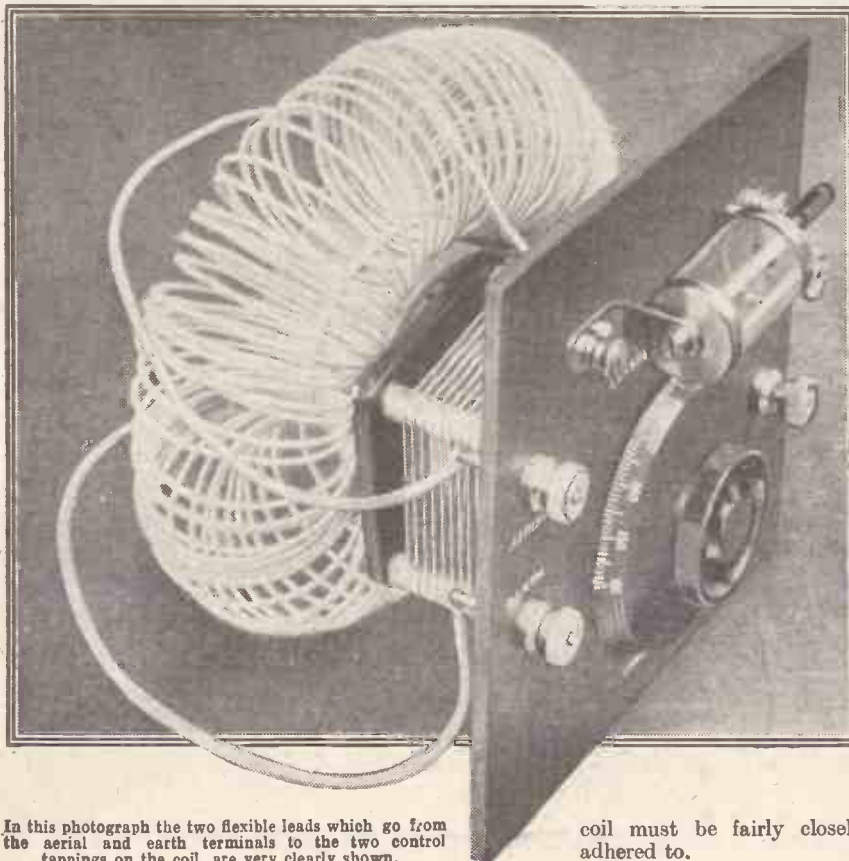
Finally, constructors should not be disheartened if they cannot make a neat job of the coil: as the photographs which appear on this page show, we ourselves did not employ one of extraordinary handsomeness.

Position of the Coil.

It is by no means a difficult task to wind a toroidal coil, but if absolute symmetry is desired, considerable difficulty may be experienced. Painstaking constructors who can spare the time will find that it is not impossible, but as we have pointed out, from a practical point of view it is not at all important.

The position of the coil in relation to the variable condenser also, is another factor that does not appear to be at all critical, so that it will be seen that

considerable latitude can exist in the construction of the Toroidal-Ultra crystal set, although of course, the dimensions of the



In this photograph the two flexible leads which go from the aerial and earth terminals to the two control tappings on the coil, are very clearly shown.

coil must be fairly closely adhered to.

FOREIGN RADIO NEWS

From Our Own Correspondent.

Holland's Royal Amateurs.

IT has recently transpired that one of the most enthusiastic amateurs in Holland is H.R.H. Princess Juliana, the only daughter of the Queen of the Netherlands, and heiress to the throne.

The Grand Duchess of Luxemburg is also keenly interested in radio, and it is stated that the two princesses exchange frequent messages by their own private wireless installations.

Educative Radio for Russia.

The intention is attributed to M. Lunacharsky, the Russian Commissary for Instruction and Fine Arts, of adopting radio for educational purposes.

Although the Soviet Government has devoted large sums to education, there is a lack of trained teachers.

The plan being studied provides for radio to become the "village schoolmaster" throughout Russia. Elementary instruction will be diffused by the broadcasting stations.

The idea was first suggested by the success of one of the German stations in broadcasting English lessons.

Esperanto Talks from Oslo.

The Oslo station last week commenced daily to transmit messages in Esperanto.

The hour of transmission is 7.30 p.m., and the wave-length is 382 metres. Amateurs picking up these Esperanto talks are requested to send report postcards giving particulars to the Norvega Esperantista Ligo, 11, Bergliensgade, Oslo, Norway.

Improving French Broadcasting.

French broadcasting experts are at present turning their attention to the problem of the solution of a wireless defect frequently commented on by listeners. Vocalists and soloists are sometimes heard with utmost clearness, while the accompaniments come through as faint or confused echoes.

This is not, as a rule, so serious in the case of piano accompaniments, since the voice or the violin solo is the thing that counts, but in operatic music, which enjoys such outstanding popularity among Continental listeners, the defect is a very serious one.

The theory is held that the difficulty has to do with the position of the microphone in relation to the soloist and the accompanist respectively, and exhaustive tests are to be made to try and determine the best conditions.

The New Vienna Station.

The new Vienna station is starting work and has adopted O T W as its call sign. It is of 5-kilowatt power and is using a 400-metres wave-length, at 10 a.m. and 6 p.m. From next week it will also broadcast at 10 p.m.

Considerable interest is being taken in

(Continued on page 554.)

WHEN A "SQUARE LAW" CONDENSER DOES NOT GIVE "STRAIGHT LINE" TUNING.

By W. SHERELIFF, B.Sc.

A PART from slight sources of error, a square law condenser will give straight line tuning, when used in parallel with an inductance as, for instance, in the secondary circuit of a loose coupled tuner, a tuned anode, or in a wave-meter. In the important case of the aerial tuning condenser this is not true and the error is considerable.

This error is due to the fact that allow-

In actual practice a straight line is not obtained, owing to the fact that the minimum capacity of the condenser is not zero and the capacity of the coil and leads under the panel are not negligible. The departure from a straight line is, however, very slight.

Now consider the same condenser and inductance used as A.T.C. and A.T.I., with an

aerial system having a capacity .0002 mfd., which is quite a likely figure. This capacity must be added to that of the condenser, and Table B shows the new conditions.

These wave-lengths plotted on the same graph do not give a straight line, but a curve—B on the figure.

It is quite possible, if the capacity of the aerial is known, to construct condenser vanes to give straight line tuning in the aerial circuit. Such a condenser would not give straight line tuning in the other circuits.

The graph also shows the tuning curve for a condenser of the usual pattern—curve C. It is obvious that even in the A.T.C. the square law type is much superior to the older pattern, as there is no crowding of wave-lengths on the lowest parts of the scale.

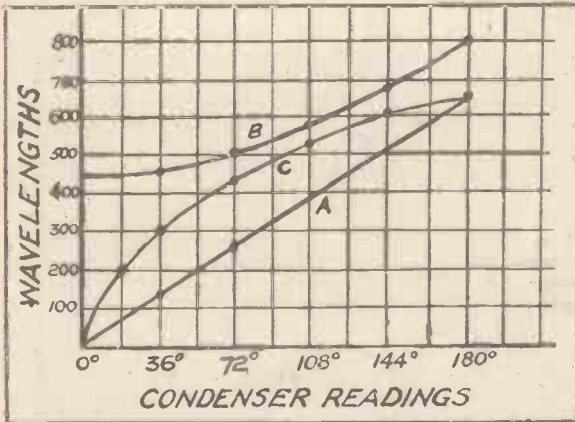


TABLE A.

CONDENSER READING.	CONDENSER CAPACITY.	EQUATION.	WAVE-LENGTH.
	Mfd.		Metres.
0°	0	$W = 30,000 \sqrt{0}$	0
36°	.00002	$W = 30,000 \sqrt{.00002}$	134
72°	.00008	$W = 30,000 \sqrt{.00008}$	268
108°	.00018	$W = 30,000 \sqrt{.00018}$	402
144°	.00032	$W = 30,000 \sqrt{.00032}$	536
180°	.0005	$W = 30,000 \sqrt{.0005}$	670

TABLE B.

CONDENSER READING.	CAPACITY OF CONDENSER PLUS AERIAL.	EQUATION.	WAVE-LENGTH.
	Mfd.		Metres.
0°	.0002	$W = 30,000 \sqrt{.0002}$	424
36°	.00022	$W = 30,000 \sqrt{.00022}$	445
72°	.00028	$W = 30,000 \sqrt{.00028}$	503
108°	.00038	$W = 30,000 \sqrt{.00038}$	585
144°	.00052	$W = 30,000 \sqrt{.00052}$	684
180°	.0007	$W = 30,000 \sqrt{.0007}$	793

ance must be made for the capacity of the aerial-earth system, which is in parallel with the A.T.C., so that the two capacities must be added when calculating the wave-length of the system. The theory involved is simple and worth examining. First, let us consider the case of a fixed inductance tuned by a square law condenser. Here wave-length equals a constant multiplied by the square root of the capacity of the condenser, or stated mathematically:

$$W = K\sqrt{C} \text{ where } W = \text{wave-length.}$$

K is constant,
and C = the capacity of

the condenser.

Suppose $W = 300$ metres when $C = .0001$ mfd. the equation becomes:

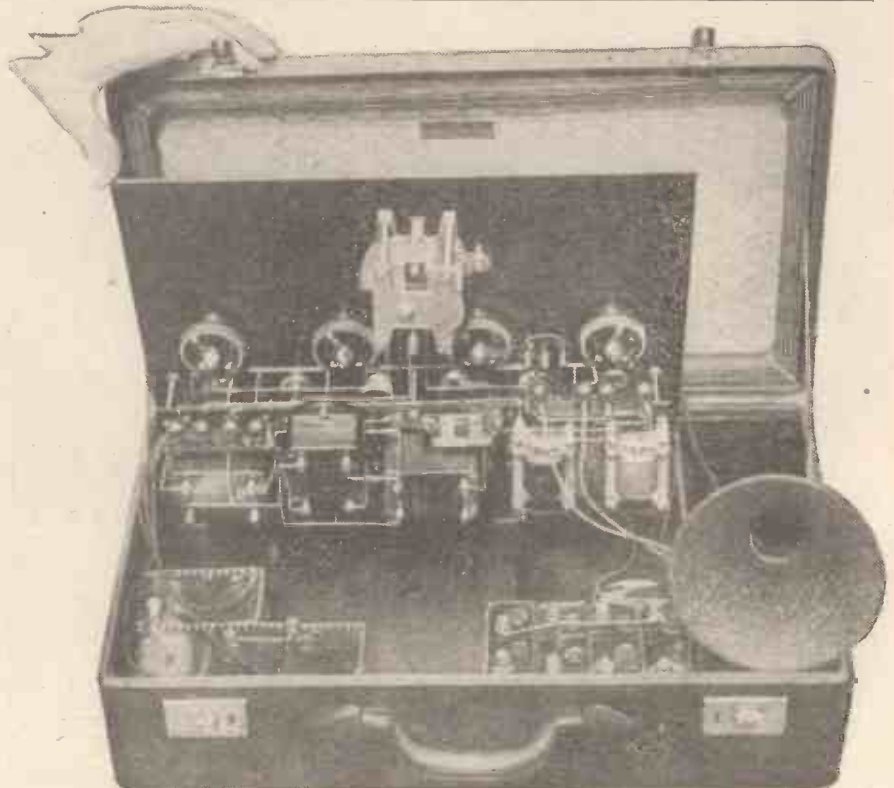
$$300 = K\sqrt{.0001}, \text{ so that}$$

$$K = \frac{300}{.01} = 30,000$$

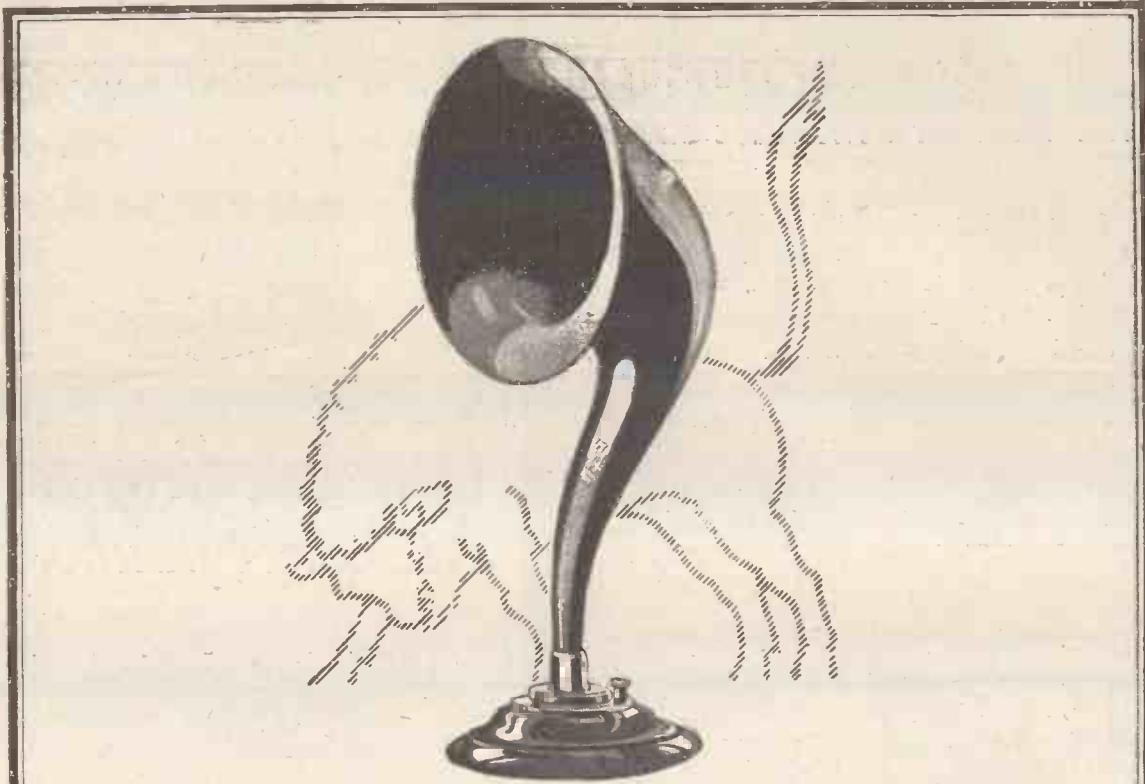
Aerial Capacity to be Considered.

This is quite a possible value for K, so let us assume it in the following discussion. Our equation now become $W = 30,000 \sqrt{C}$. Now suppose that the condenser has a minimum capacity zero (which is far from being the case) and a maximum .0005 mfd. Consider the readings 0°, 36°, 72°, etc., of the condenser dial: the capacity in circuit at each stage is shown in the second column of the following table. The formula for the wave-length is shown in the third column and the figure for the wave-length is worked out in the fourth column of Table A.

These wave-lengths plotted on a graph against condenser readings give a straight line—curve A in the figure.



The interior of a 6-valve portable receiver made by an enthusiastic amateur. The receiver is said to be very efficient in operation, the only aerial used being that shown in the lid of the case.



"bullying" the electrical impulse

NOTE—Acoustics: the science of sound. Radio Acoustics: transforming the electrical impulse into audible sound

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a sufficiently friendly understanding with this elusive spirit of radio. "Bullying" perhaps, but always in a friendly spirit. Tactfully handled in the Brandes laboratories, he has revealed many helpful theories, and the value of this research shows itself in the quality of the Brandes instruments. He brings the voice and music and we get him to talk as naturally as possible.

The Brandola



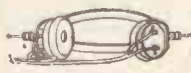
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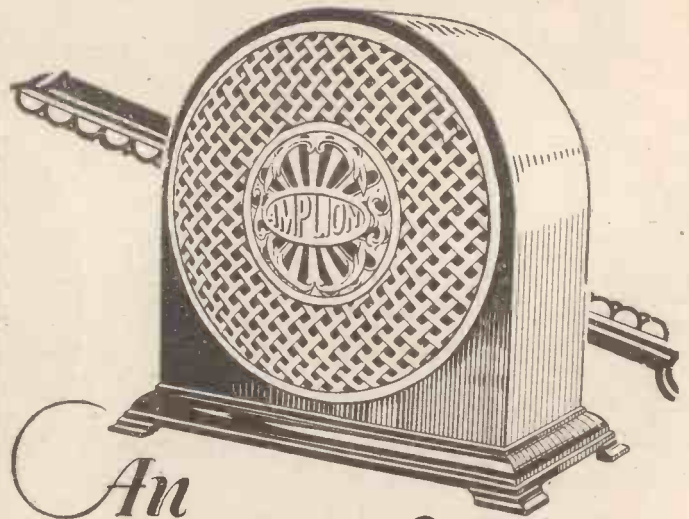
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BEFORE I go any further in these articles, I should like to thank readers who have sent me their reports on my transmissions. Some of these have been very useful, but, unfortunately, in other cases the lack of detail has made what might have been valuable information of no importance. It is often difficult to get really accurate reports even from pre-arranged listening posts, but unless such reports are accurate and contain the required data, the time of both the listener and the transmitter has, to some extent at any rate, been wasted.

For instance, some of the reports merely give the time and date of reception with remarks such as "Good 'phone strength on Det. and L.F.," and so on. These have their uses; they give an indication of how the transmissions are going on, how they are getting over, but they say nothing about the quality of the speech and music (if telephony tests are on) or of the note (if C.W. is the order of the day). In the case of telephony, quality should be remarked upon, any peculiarities noted, etc., and in C.W. any "sizzle" or "wavering" should be entered on the report, while signal strength should be stated as accurately as possible.

Unreliable Reports.

Talking about reports, we amateurs have a very difficult task sometimes to get reports on long-distance work. The Americans, for instance, are most unreliable.

We do our best to arrange things, but we have great difficulty in getting reliable collaboration on the other side. They don't seem to be so keen as we are, though they are not hampered by regulations like we are over here; they do not seem to be able to keep to a definite schedule for any length of time.

Taking the States again, as an instance. I suppose many of my readers listen to them occasionally? I should like them to listen *carefully* and see what they think of the quality of the transmissions. There are one or two goods ones, but most of them use unsmoothed A.C. throughout and their keying is often terrible.

We over here can't get them interested in telephony on short waves at all. It does not seem as if they know how to receive it properly, let alone transmit it. The fact is that the U.S.A. (speaking for the majority) use their transmitters for private enjoyment, being satisfied if they can get communication and being utterly regardless of the quality of their transmissions. As for serious tests—well, few of them know what they are.

Need for Keen Experimenters.

New Zealand and Australia are better, but they suffer largely from the lack of power. No one out there seems to use much, although they hardly have any restrictions. But there again they do not seem keen enough to sit up at night or get up early in the morning in order to carry out tests. Some of them do it spasmodically, but it is very difficult to find one that will stick to a schedule and really experiment in earnest.

2 N M CALLING.

REPORTS FROM AMATEURS.

THE NEED FOR RELIABILITY—MORE SHORT-WAVE REMARKS.

By **GERALD MARCUSE.**

We publish below another exclusive article by Mr. Gerald Marcuse, one of the foremost amateur experimenters in the world. Mr. Marcuse writes only in "Popular Wireless," and we have already received a large number of letters from readers in this and other countries, warmly appreciating Mr. Marcuse's articles—The Editor.

Unless we can get hold of such people and arouse some enthusiasm in them we cannot go very far in our researches.

It certainly is necessary to get reliable listening stations in various parts of the

have to await a favourable morning on both sides.

Behaviour of Short-Waves.

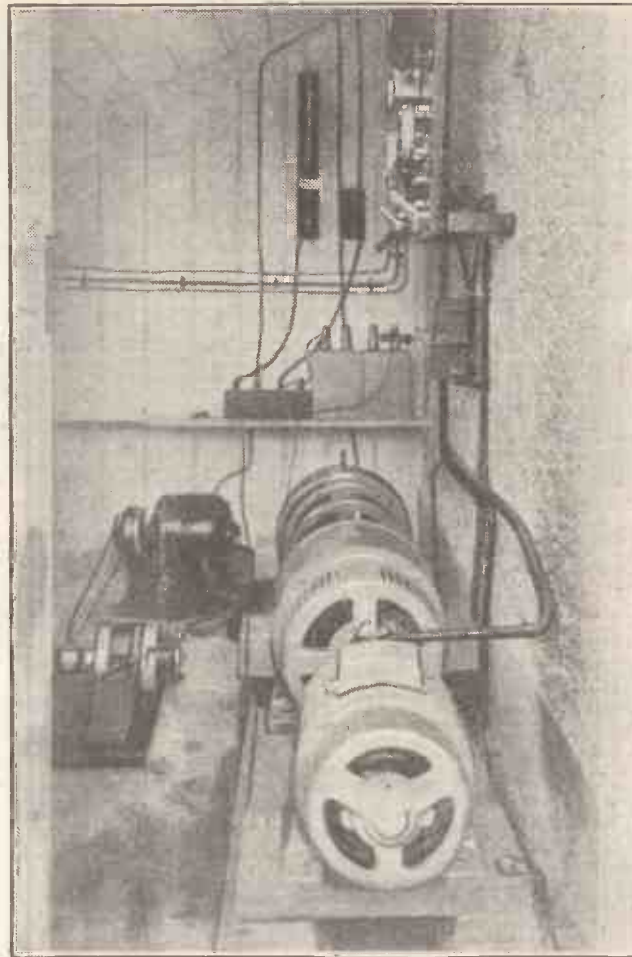
We don't yet know how the waves behave between here and Australia, for example, and we shall not find out until we get a band of listeners along the various possible routes, and the other (foreign) amateurs seem, with the exception of those mentioned and a few others, to be so apathetic about the whole business. I only wish we had their facilities and were not bound down like we are in this country.

We want a band of enthusiasts round the world so that we can tell how the waves go and what periods of fading there are, if any do occur. So far we know very little about the behaviour of short waves, and as to whether they will ever be certain enough for extensive commercial traffic is a moot point.

In the first place, it is not possible to work automatic stuff on the low frequencies, and in the second you have to tune in every time you wish to pick up a transmission and then *keep* the set tuned. To a commercial station this would be fatal. In heavy traffic you have to be able to reel off and receive messages for hours on end without having to adjust your receiver or transmitter at all.

Then we have the "time period," and the effect of weather conditions to consider, and while it is possible to carry out traffic (in a mild sense of the word), with even the

(Continued on page 522.)



The generators installed at Mr. Marcuse's station in Caterham.

world, amateurs who are really keen on experimental work, and who will test regularly, say, once or twice a week, as this is the only way to gather reliable data, for then one will be able to make changes and adjustments and get reports week by week from the same station. We have, however, been greatly assisted in this respect by



Technical Notes

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

The Radio Sounds Competition.

It is a little early yet to judge what technical information will result from the competition on "radio sounds" organised by POPULAR WIRELESS and the B.B.C. It seems to be generally admitted that one or two, at least, of the sounds broadcast were rather difficult to identify. Of course, you know that many of the sounds broadcast have to be "made up," just as they are on the stage, or "behind the scenes," I should say. For, if the actual sounds were broadcast, it would not sound as it should do, owing to the effects of the transmission, and so special sounds have to be made
(Continued on page 555.)

A QUESTION which continually crops up, and is an interesting one for discussion, is as to the length of life which should reasonably be expected from a valve. It depends a good deal, of course, upon the type of valve; a bright emitter would, according to theoretical considerations, be expected to have a shorter life than a dull emitter. A dull emitter frequently has a shorter life than the average bright emitter, owing to the fact that it is not treated as a dull emitter but is badly over-run.

Again, it should be remembered that the "life" of the valve is its working life, and is expressible in working hours, not in weeks or months. The more hours per day it is used, and the more days per year, the shorter will be its life—in days or years.

Cases are on record of bright emitters lasting considerably over two years, with almost daily use, and of dull emitters lasting quite as long as this, if not longer. It is important to use a first-class valve, but it is even more important to treat the valve properly when you are using it.

The Universal Transformer.

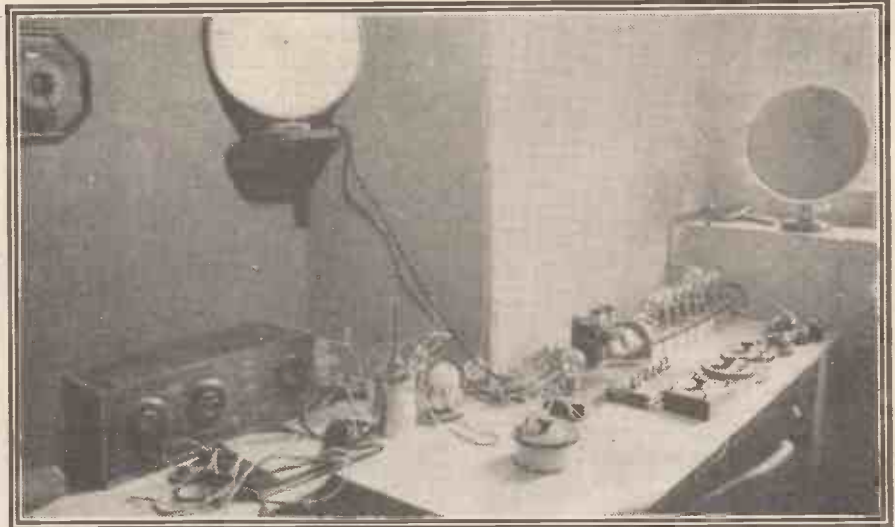
In consequence of an article from a correspondent recently published in this journal, on the variable and universal L.F. transformer, a great many inquiries have been received from readers anxious to know more about this transformer and its possibilities. I have examined a model of this transformer myself, and have also tested the same in a number of wireless receiving sets. It appears to me to be a development of considerable importance, although, in principle, it is very simple. Hitherto, there has been little real advance in the design of low-frequency transformers, attention having been concentrated chiefly on small points.

The new "universal" transformer certainly seems to me to live up to its description, for it can be used in any circuit—so far as I can judge—and is also, so far as I am aware, entirely novel in design. I tried it when listening to a varied programme of music from 2 L.O., and it gives a curious *volume control* over a very wide range of volume, the volume fading as the control is withdrawn, and rising again in a most striking manner when the control is advanced.

Tone Control.

I noticed another thing about it, although I do not know whether this is one of the claims made for it: when adjusted, it sometimes permits *selective control* on different kinds of sounds. For example, it enables a position to be found where the set seems to be better adapted for the reception of, say, violin music, and another position in which reception is better for bass music, such as drums, or a bass vocalist. It is altogether an extremely interesting com-

ponent, and one which I have no doubt will quickly find favour with experimenters and constructors if it appears on the market.



The receiving installation employed by M. Leon Deloy, the well-known French amateur.

REPORTS FROM AMATEURS.

(Continued from page 521.)

Antipodes on 40 metres, say, it is by no means a certainty that you will be able to do it for any period of time or on any one day.

Take a case in point. I have been in touch with Seattle by telephony for a whole week, working at certain hours, but since then I have gone days without hearing a sound from New Zealand, while Australia has been coming in well. It is far too uncertain a business to allow commercial work to be carried out on any scale—at present.

I am going to carry out experiments on 23 metres, but we do not expect that to be much more successful than 45 metres, for down there we are up against the time period business. It is a remarkable thing that time period—apart from the effect of weather and cloud conditions—for the wave-length of a transmission between two distant places may have to be altered frequently to stop the signals dying away altogether.

Apparently the ultra high frequencies are only effective over long distances at certain times, that is under certain degrees of light or darkness, and as these change the waves become less and less effective, so that a new wave-length suitable for the new conditions has to be found.

Of course, such changes may become unnecessary after more research has been

done, and I personally think we shall find a definite wave between 20 and 50 metres which, while having the carrying-power of the 20 metres wave for daylight work and the properties of the 50 metre, will not be affected to any important extent by a time period, and this wave might be used commercially if suitable apparatus is designed.

The work is full of interest, of course, and once you have taken the plunge, so to speak, short-wave work becomes a kind of obsession. I am devoting my experiments mainly to telephony tests so that the dropping to 23 metres is not going to be an easy job. It will all have to be worked out on a dummy aerial at first to prevent interference, and then the outside antenna will necessitate a further re-organisation of controls.

A New Record.

I don't know whether I shall get a bottle to stand up to the frequency for any length of time, but we shall see. Meanwhile, I am carrying out telephony tests on 45 metres. I am still hunting for a really satisfactory circuit for my master oscillator for 23 metres—not an easy job. There is a push-pull method I am anxious to try, for it seems to have several features that make it attractive.

By the way, I have just completed another record—first two-way communication with India. This station was the first British amateur station to be received in India on 90 metres, and I have now successfully transmitted speech to Kahat, every word being received perfectly on two occasions. Regular schedules are now being run between this station and 2 N.M.



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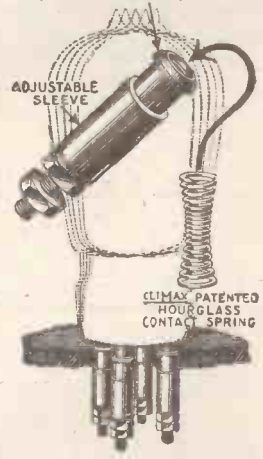
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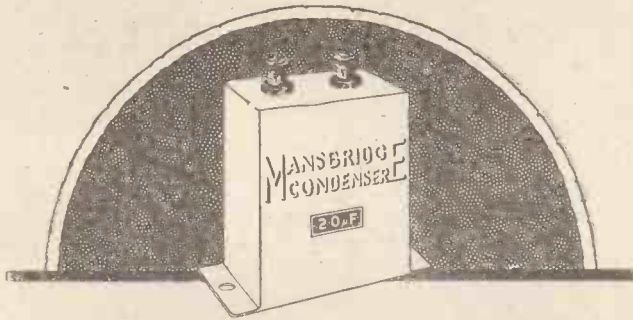


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No Condenser of the "Mansbridge" Type is a genuine product of the Mansbridge Condenser Co. unless the words "Mansbridge Condenser" are plainly embossed on the metal case. The colour of the case is maroon.

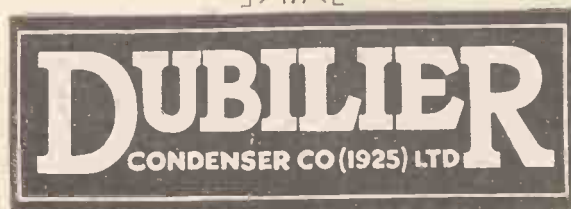
The capacity is plainly marked and is accurate to within fine limits, and nickel plated screw terminals are provided for making connections.

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J.U.D.D.

VALVE RECTIFICATION WITHOUT A GRID LEAK.

By Lieutenant-Commander H. W. SHOVE,
D.S.O., R.N.



THE three-electrode valve is essentially an "amplifying relay"—i.e. the application of varying voltages across the grid filament circuit gives rise to amplified variations of current passing in the anode-filament circuit. These variations are due to the attraction or repulsion by the grid of electrons on their way from filament to anode. The electrons, being themselves negative, are attracted to the grid when it becomes positive and repelled when it

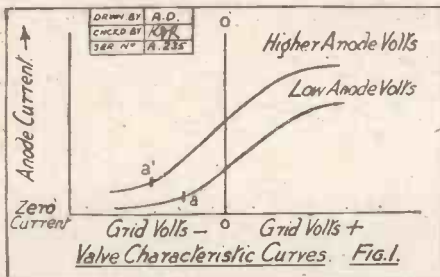
* This practical and informative article is by a well-known naval authority on wireless, and will prove especially interesting to valve experimenters. *

anode current, due to the "helping on" of the electron stream when the grid is positive, will always be slightly less than the decrease, caused by the "holding back" by a corresponding negative impulse.

When the fluctuations are large this difference is sufficiently great to cause serious distortion, and for this reason L.F. amplifying valves should generally have their grids "biased" by the application of an initial negative potential, so that the fluctuations take the form merely of increases and decreases in the "negativeness" of the grid, instead of alternations above and below zero volts. But, if grid bias is not applied, weak rectified signals, due to this unequal amplification, can be heard by connecting a pair of 'phones in the anode circuit of, say, an H.F. amplifying valve. They will not, however, generally be of sufficient strength to make this method of using a valve as a rectifier a really practical one.

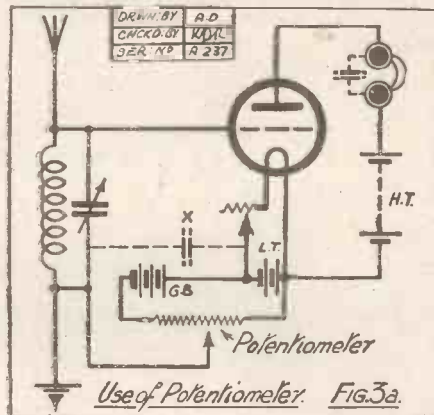
the clicks take place at these longer (audio-frequency) intervals. Thus a musical note is produced composed of this succession of clicks.

Now it is obvious that the proper functioning of this, the common "grid leak and condenser," method of rectification will depend on the capacity of the condenser (and hence the rate at which the grid becomes negative) and the value of the leak (and



becomes negative. Thus the flow of current from filament to anode is regulated.

But whenever the grid is positive with respect to the filament some electrons are actually abstracted from the flow to anode and a current (called the "grid current"), of a similar nature to that in the anode circuit, flows from grid to filament through the external circuit. No corresponding phenomenon takes place when the grid becomes negative, so that the increase in



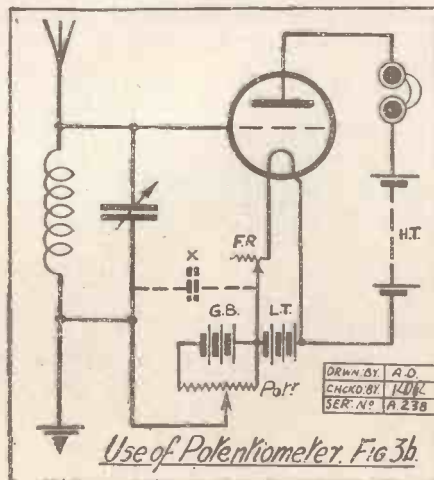
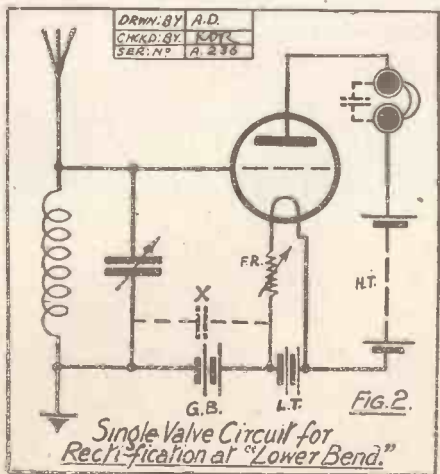
hence how far it is really negligible during the accumulation of the charge, and whether it really has time to discharge the grid between audio-frequency impulses).

If these values are not correctly proportioned to one another and to the other (Continued on page 526.)

The "Cumulative" Method.

The ordinary method employed when a valve is used to rectify while operating on the "straight" portion of its characteristic curve is that known as the "cumulative" method. In this a condenser (across which electrons cannot pass) is connected in the grid circuit. The electrons attracted to the grid are thus "imprisoned" thereon, so that a negative charge accumulates, each successive positive impulse finding the grid initially more negative than the last. The result is that over a group (or "train" as it is usually called in dealing with spark signals) of rapidly succeeding impulses the grid (roughly speaking) acts as if the train were concentrated into one big negative impulse, and (again roughly speaking) the result is a single, comparatively large, diminution of anode current, giving rise to a "click" in the 'phones.

A high resistance leak is provided which, while its effect is negligible during the rapid accumulation of electrons throughout the duration of the train (impulses at radio frequency), nevertheless allows their escape in the interval between the trains, so that



VALVE RECTIFICATION WITHOUT A GRID LEAK.

(Continued from page 525.)

constants of the circuit (e.g. valve design) either poor signal strength or distortion, or both, and perhaps instability, will result. For this reason it is difficult to obtain the same purity of reproduction of telephony with a valve detector operating on this principle as is given by a crystal or by a valve rectifying on the system now to be described (incidentally an older, though now unfashionable, one).

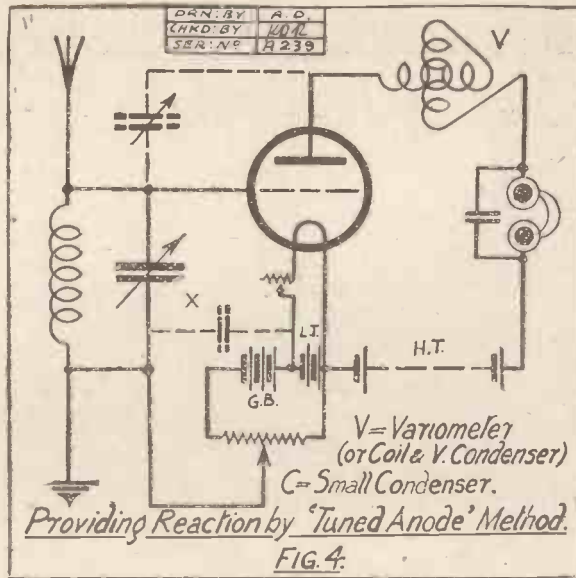
Rectification at the "Lower Bend."

Fig. 1 shows the "characteristic curves" of a valve with two different values of H.T. There is not space in this short article to explain these curves in detail. But the salient facts relevant to our present purpose are:

(a) that there is a point (the "lower bend," a, a) on both curves where the anode current is suddenly reduced practically to zero through the negative grid potential.

(b) that the position of this bend relative to the "zero grid volts" line o, o, depends on the H.T. voltage, the length of the straight portion of the curve to the left of o, o being greater with the higher H.T.

The actual values will, of course, depend on the design of the valve. In practice it may be taken that the negative impulse necessary to reach the lower bend is less with a soft than with a hard valve. It is evident that, in any case, if we apply a suitable negative grid bias, corresponding to the H.T. in use, the effect will be wholly to suppress the negative impulses due to the incoming signals (the fluctuation being entirely to the left of the bend, a), while the positive ones are duly amplified by working up the lower straight part of the characteristic. Our valve will thus be operating as a rectifier on an exactly similar principle to a crystal and giving equally pure reproduction. At the same time, it will be amplifying the signals, though, owing to the



fact that we are compelled to work under conditions unfavourable for good amplification, the latter effect will not be very great.

Practical Circuits.

Fig. 2 shows a practical one-valve circuit operating on the principle. The voltage of the grid battery necessary will depend on the type of valve and the anode (H.T.) voltage used. With a really suitable soft valve (as e.g. some of the Dutch detectors) and keeping the H.T. low it is often possible to arrange matters so that the drop of voltage

phased that a good, soft valve and some care in the initial adjustment of H.T. and potentiometer setting are essential to good results, and that, generally speaking, the improved quality will be obtained at a sacrifice (though often so slight as to be well worth while) of signal strength.

Reaction can be applied in the usual way, but, of course, here as always, tends to the detriment of quality of reproduction. With

a good soft valve the writer has found the popular American method of tuning the anode circuit (as in Fig. 4) an excellent one. If the valve will not oscillate and it is desired to be able to push reaction to the extreme limit, a small condenser, of the type used in "Neutrodyne" circuits, connected in the position shown by the dotted lines, will generally provide the necessary additional coupling. A small by-pass condenser, as shown at X in all the Figs., is also often a help to fine tuning and an improver of signal strength.



Erecting a field wireless station. The photograph shows the laying of the earth-mat—a copper gauze strip which takes the place of the more permanent "buried" earth.

The valve with the tape filament

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Orange Spot " .. L.F. Amplifier
Green Spot " .. Detector

OPERATING CHARACTERISTICS.

Filament Current ..	0.25 amps.
Filament Voltage ..	0.8 to 1.1 volts.
Detector Plate Voltage	15 to 22 volts.
Amplifier Plate Voltage	22 to 60 volts.
Amplification Factor ..	5 to 6.5.

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(Trade Mark)

Great Offer to "P.W." Readers

WE are pleased to announce that, for a limited period only, we are offering four electrode valves specially designed for Unidyne Circuits at an extraordinarily low price. These valves are highly recommended by the inventors of the Unidyne Circuits.

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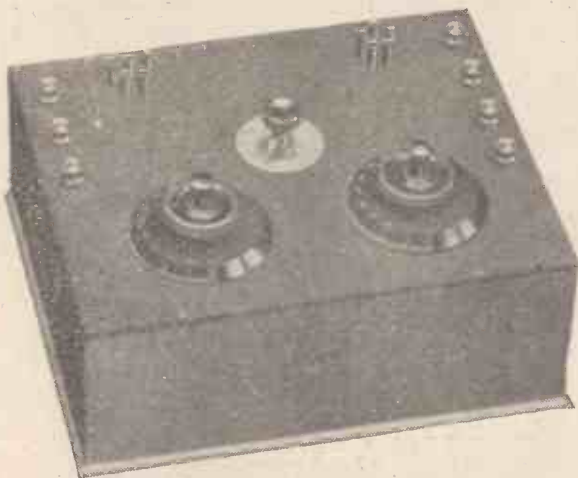
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Unidyne Kit of Parts

Includes the following: One Square Law Variable Condenser, .0005 mfd., and one ditto, .0003 mfd. Each with taper 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.

4/1-

Extra if required:
"Red Triangle" Ebonite Panel,
10 x 8 x 3/16th, drilled and
tapped 5/-
Engraving extra 1/6
Polished Cabinet to fit 8/6

Coil Unit for B.B.C. wave-
lengths (comprising aerial and
reaction coils mounted on
duplex plug-in base) 4/6
Interchangeable Daventry Coils,
similar to above 5/6

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

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

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P.S. 3548

The 1926 UNIDYNE

by the Inventors

The Set Designed,
Described and
Constructed by
G. V. Dowding,
Grad., I.E.E.
(Technical Editor),
and
K. D. Rogers.
(Assistant Technical Editor)



DURING the past twelve months a considerable amount of experimental work has been carried out in the "P.W." laboratories in connection with the Unidyne system, and the receiver described in this article is one of the direct results of this activity. To a certain extent we have been working in the dark, and almost every step in the progress of our task has occasioned the breaking of entirely new ground.

Not that Unidyne circuits absolutely oppose the laws of accepted theory, but on many occasions we discovered that "rule of thumb" methods are quite valueless in H.T.-less work. We had to modify our

have received from readers, that a Unidyne actually scores over H.T. sets for "DX" (long distance) reception. Anyway, among

This 1926 Unidyne—only recently developed by the inventors—is guaranteed to give complete satisfaction if the instructions in this article are faithfully adhered to. For a limited period, and in order to afford every assistance to new Unidyne constructors, the Technical Queries Department will answer all Unidyne queries free of charge.—The Editor.

a very great number of amateurs the Unidyne is regarded as the "DX" receiver.

The 1926 Unidyne one-valve possesses all the advantages of the original one-valve Unidyne: crystal clear reception, etc., and additionally an improved reaction control is introduced. This, as readers will know, means a still further increased range of reception. Further, the inner grid of the four-

much active work as the main grid perhaps a bit more.

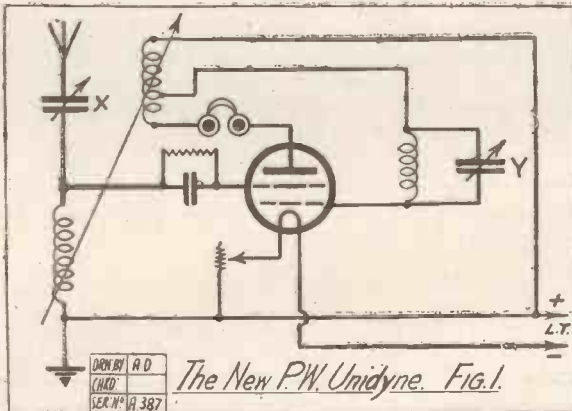
Although an extra variable condenser is employed it must not be thought that this receiver is harder to tune-in and control than the original. Only two tuning controls are employed—two variable condensers, no coil coupling adjustment being necessary—one for wave-length tuning and the other for reaction control.

Variable Grid Resistance Eliminated.

The variable grid resistance is eliminated and the importance of this will be realised by all those amateurs who have discovered how important that item was in the original Unidynes.

The theory of the operation of the circuit is fairly straightforward. In the first place the primary function of the inner of the two

(Continued on page 530.)



X. Variable condenser '0005 mfd. Y. Variable condenser '0003 mfd.

theory as we went along and this, of course, rendered progress slow.

However, we do not intend to weary our readers by placing on record the hundreds of observations taken, we feel sure that they will be far more interested in the final stages of development—those which concern the several new and practical circuits evolved and which are now to be placed, for the first time, before the public.

New Reaction Control.

Primarily, the Unidyne is a system which permits the operation of valve receiving sets without H.T. batteries. Our original claim was that this elimination of H.T. was accomplished without loss of efficiency. It has been proved, however, and this is amply corroborated by the hundreds of letters we

electrode valve, as well as being employed as heretofore, is made to do other additional work. In fact, as the inner grid is now used for reaction control purposes interactions between the two grids and between those two electrodes and the anode individually and collectively, all contribute to the general efficiency of the new circuit. The inner grid, instead of merely acting as a static "valve resistance de- creaser," now does as



The completed one-valve 1926 Unidyne showing the original type of tuning unit employed.

THE 1926 UNIDYNE.

(Continued from page 529.)

grids is to introduce a positive potential near the filament, and thus by accelerating the electron flow at a point near its source of origin, giving it a greater power, as it were, to overcome the space charge or cloud of repelling electrons that has to be passed through on the journey to the anode.

Utilising the Inner Grid.

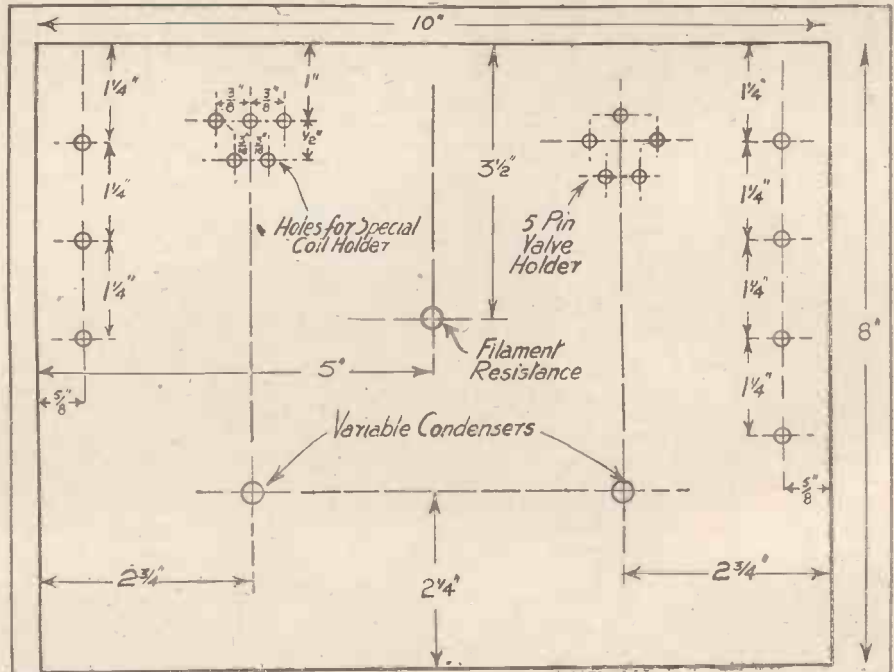
A "feed back" or reaction effect between the anode and grid circuit is arranged magnetically by coupling an anode coil permanently to the aerial tuning coil. In the ordinary course of events, that is if the inner grid were taken as previously straight

LIST OF COMPONENTS.

	s.	d.
1 Panel, 10 by 8 in. (Peto-Scott)	5	0
1 Cabinet (Peto-Scott)	8	6
1 .0003 mfd. Variable Condenser with Vernier (Peto-Scott)	9	3
1 .0005 ditto.	10	6
1 Peerless Junior Rheostat, 30 ohms	2	6
1 Grid Leak and Condenser, .0002 and 2 meg. (Dubilier)	5	0
1 lb. 28 S.W.G. D.C.C. Wire approx.	1	6
1 lb. 32 S.W.G. S.S.C. Wire approx.	2	3
5 Flush Mounting Sockets (Peto-Scott)	7	1/2
5 Valve Legs	5	
7 W.O. Terminals	10	1/2
5 Valve Sockets	5	
Wire, Transfers, etc.	2	0

to battery plus, the circuit would remain in a state of oscillation indefinitely.

It was discovered however, that this oscillation could be "killed" by taking the



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Panel Layout Fig. 2

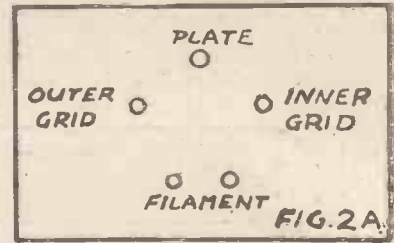
inner grid to a tapping point on the reaction or anode coil. (See Fig. 1). It will be seen, therefore, that either a condition of continued oscillation or one of no oscillation at all became available, and our endeavours were then directed towards obtaining a smooth variation between those two extremes.

Smooth Reaction Obtained.

The insertion of an H.F. choke between the inner grid and its anode coil tapping point revived the "feeding back" process, and oscillation again developed. After that

discovery everything was plain sailing. The H.F. choke (Y Fig. 1) was bridged by a variable condenser and a beautifully smooth reaction control resulted. Obviously the capacity "by-passing" of the H.F. choke destroys its "choking" properties and oscillation ceases, so that when the variable condenser is adjusted towards its minimum, oscillation is commenced, and "killed" when it is adjusted towards its maximum.

The great advantage of this reaction control is that no wave-length change occurs during the process of adjustment, so that tuning-in distant stations becomes quite an inexpert and effortless operation. The importance of this feature can hardly be over emphasised. Juggling with a coil holder adjustment and a variable condenser is a

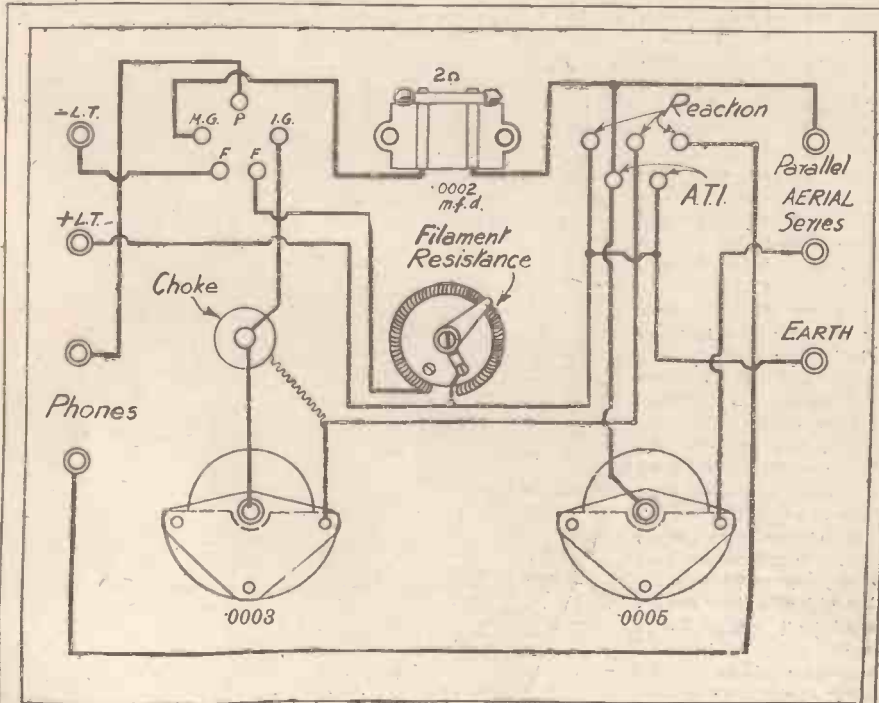


tricky business, and the difference between this and the smooth control introduced in the 1926 Unidyne, must be experienced before it can be realised. And with the elimination of the variable grid leak and the elimination of hand capacity effects, which is incidental to the new system, the receiver will find no rival in H.T. practice.

The Tuning Units.

In order to get the results that the circuit is capable of, very strict attention must be paid to certain details. Of these, by far the most important are the tuning and reaction units. This consists of two coils permanently coupled together and fitted to two plugs of special design. The plugs fit into five valve sockets arranged on the panel

(Continued on page 531.)



DRAWN BY A.D.
CHKD BY
SER: No A. 389

Wiring Diagram Fig. 3

THE 1926 UNIDYNE

(Continued from page 530.)

in a definite manner, the exact measurements being shown in Fig. 2.

It will be seen that these sockets are arranged in two lines, one of three and one of two. The latter are the aerial coil connections, the former the anode or reaction coil connections. Of these the two outer connect to the ends of the coil, and the centre one to a tapping point.

An Efficient Valve

The sizes of the coils and therefore the wave-length range are in direct relation to the position of that tapping, and the determining of this relation has been the object of close investigation. It has been found that the slightest deviation from the correct coil values and tapping causes distinct loss of efficiency.

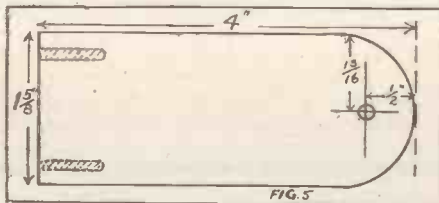


FIG. 5

Another important item is the H.F. choke, but it can be added that neither this nor the tuner is at all hard to make. We merely wish to stress the point that close adherence to specifications is essential.

The construction of the set itself is very straightforward. A complete set of parts, including the tuning unit and choke, can be obtained from Messrs. Peto-Scott's, but if

the constructor employs components already in his possession he should make sure that they are trustworthy and exactly of the value indicated.

The panel drilling must be carried out carefully, especially in respect of the tuning unit sockets (ordinary valve sockets can be used) and the valve sockets. The new U.C. valves are very suitable for this set and if a U.C.5 is to be used the template, Fig. 2A, can be employed for marking out the socket holes. The U.C.4 valve has four pins arranged in standard manner, the inner grid being connected to a small terminal screw on the side of its base.

For this the U.C.4, an ordinary valve holder and four sockets arranged in the usual way can be used. Connections must, however, be rearranged accordingly. A terminal mounted on the panel near the valve holder can be employed for the additional connection.

The terminals, valve sockets, and variable condensers should be mounted on the panel, as also can the grid leak and condenser and filament resistance. All these components, it should be noted, are quite normal and not special to the circuit in any way.

Winding the Choke.

The choke should then be constructed. For this 2 oz. of 32-gauge S.S.C. wire should be obtained. The former can consist of an ordinary wooden bobbin, such as is used for holding small quantities of

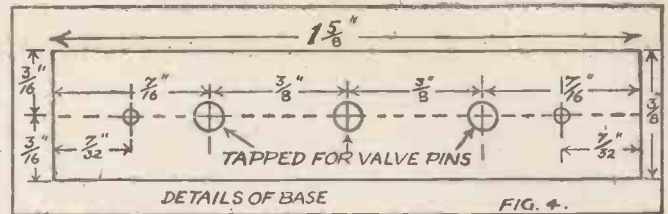


FIG. 4.

wire. It should have an internal diameter of 3/4 in. and an internal (cheek to cheek) length of 2 in. A small rod of wood of this size could be used, and two circular end pieces 1 1/2 in. in diameter fitted.

The important point about the choke is the method of winding. The dimensions can be slightly altered; for instance a bobbin 2 1/2 ins. by 1 in. would be O.K., but the 500

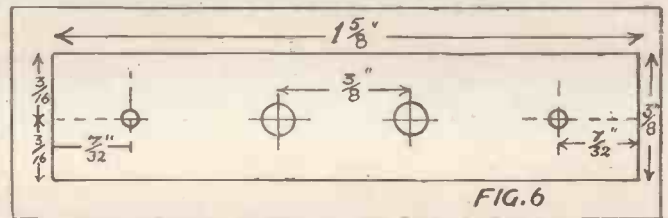


FIG. 6

turns of 32 S.W.G. must be wound not as cotton is wound on a cotton reel, but in the following manner.

Leaving about 5 in. for connecting purposes wind about 40 turns in a bunch, then pass along the former and wind another 60 turns in a bunch. Then a further two bunches and the layer is complete. It should be covered with a single layer of ordinary waxed paper and then another series of little bunches wound on. Four layers of about four bunches per layer will conclude the 500 turns after which a length of about 5 in. can be left for connecting and the little choke is finished. To make a neat job of it a layer of Empire cloth should be wrapped round it.

The choke can be mounted on the panel by means of two countersinking wood screws. The photographs very clearly show the position of this component relative to the others.

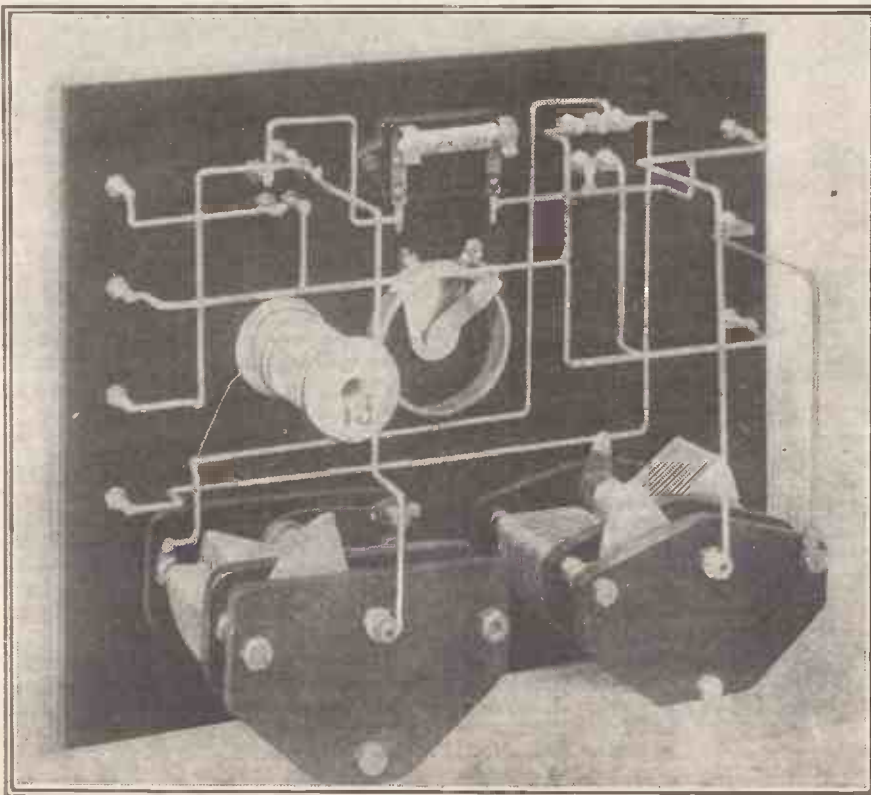
The wiring is the next phase of the work to tackle. For the convenience of constructors, Fig. 3 (the wiring diagram) and the photographs are supplemented by a list of point-to-point connections.

Needless to say, the wiring should be carried out with care as the position of the two grid connections and the connections to the coil wires are very critical,

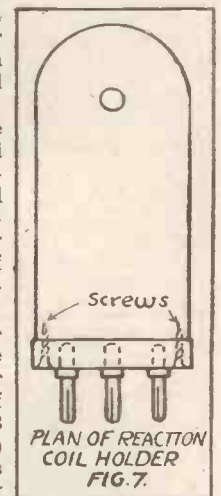
Only One Reaction Coil.

One of the most important discoveries made in connection with the new Unidyne circuit was that the same size of reaction or anode coil was suitable for both the lower band of broadcasting wave-lengths

(Continued on page 532.)



A photograph of the reverse side of the panel showing very clearly the various components and the completed wiring.



PLAN OF REACTION COIL HOLDER FIG. 7.

THE 1926 UNIDYNE

(Continued from page 531.)

and for 5 X X. This is, as will be realised by all constructors, a distinct asset, and one that gives the circuit yet another advantage over others.

In the original model, that one the photographs of which appear in these pages, a unit was used which included both aerial and reaction coils, and this unit

POINT-TO-POINT CONNECTIONS.

Aerial series terminal to one side of A.T.C.

Aerial parallel terminal to other side of A.T.C., one side of A.T.I. (bottom left-hand socket), and to one side of Grid Leak and Condenser, the other connection of which goes to Main Grid.

Earth terminal to bottom R.H. coil socket.

Top L.H. socket one side of Rheostat and L.T. + and to earth connection.

Other side of Rheostat to one filament socket, other filament socket direct to L.T. —.

Inner Grid to one side of Choke and .0003 mfd. Variable Condenser, other side of Choke and Condenser to top centre coil socket.

Plate to one side of 'Phones, other side of 'Phones to top R.H. Coil socket.

was changed for different wave-length ranges. It was subsequently proved unnecessary to change the reaction coil, as mentioned above, so that a slight modification in the design of the coil holders can be made.

Both aerial and reaction coils can be mounted on similar holders. Using $\frac{1}{4}$ -in.

ebonite, two pieces, as per Fig. 5, should be cut, and one each as per Figs. 4 and 6. A finished reaction coil holder is shown in section in Fig. 7. It will be noticed that on the base of the aerial coil holder two valve pins are fitted, while on the reaction coil holder three are necessary.

The bases of the holders are fixed to the uprights by means of countersinking screws. The valve pins should not pass right through the bases, but must be screwed through tapped holes and cut short. Connections should be soldered on to the valve pins underneath the base. We trust that the diagram will make these points quite clear.

Constructing the Coils.

The coils should be wound on ordinary 11-slot spider coil formers, with $1\frac{1}{4}$ in. centres, 28 gauge wire is quite suitable. Forty turns are required for the reaction (this coil should be tapped at its sixteenth turn), and 68 for the aerial coil. Both coils should be wound in the same direction, and arranged so that they correspond in this respect when mounted on their holders.

The coils should not be both on the insides of the ebonite uprights when they are plugged into the set; one should be outside and one inside, so that there is the thickness of one ebonite upright between them. For this reason care should be taken that the coil connections are taken correctly, as reversing the positions of the coils in the sockets will bring them either too close or too far away from each other.

Looking down on to the panel with the three valve sockets towards the top, the coils should be so connected to their holders that they correspond with the following connections. Inside of aerial coil to left-hand of bottom two sockets, outside of aerial coil to right-hand bottom socket. Inside of reaction coil to left-hand top socket, outside of reaction coil to right-hand top socket, tapping of reaction coil to centre top socket.

For 5 X X, 130 turns of 28 S.W.G. will be required, and, of course, another aerial coil holder is necessary if that coil is to be used. To get 130 turns of 28 on a



A close-up of the panel face, showing the lay-out of components. The two counter sunk screws beneath the valve sockets hold the choke in place.

moderately-sized former the wire should pass through every *third* slot and not through every slot as is the usual practice.

The reaction coil remains the same for 5 X X, a distinct advantage as will be acknowledged. For stations round about 2 L O's wave-length, series tuning should be employed, but for 5 X X parallel tuning is necessary. In the former case the aerial lead is taken to the series terminal, but for parallel tuning it is taken to the parallel terminal, and the series terminal connected to the earth terminal by means of a short length of wire.

A word or two further in respect of the coils used might prove useful. As constructors who experiment with coil values in the set will discover, the relative sizes of the coils and the position of the inner grid-choke tapping point bear very directly on the behaviour of the circuit.

For instance, one diversion from the detailed arrangements given might prevent oscillation over the whole of the condenser scale, while another might make it impossible to control oscillation at all.

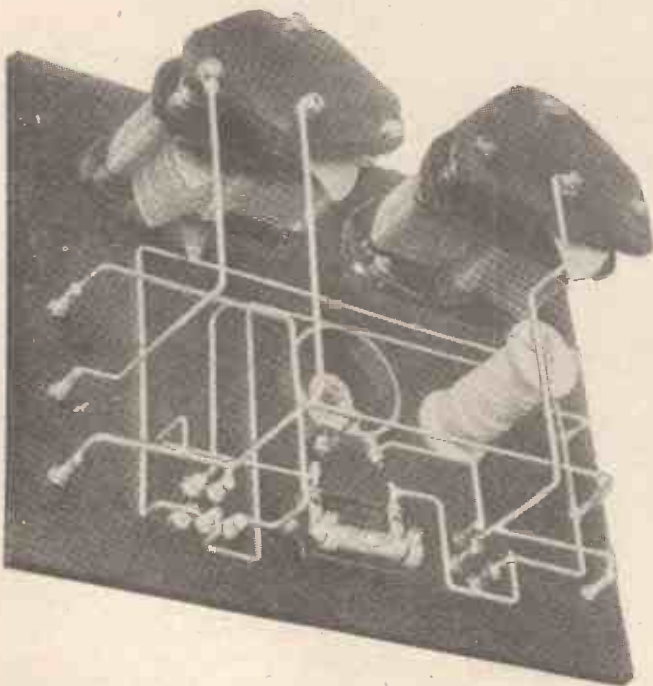
Then again, a still further diversion would perhaps render the receiver unstable on series tuning and impair section control on parallel. Although we do not wish to give the impression that it is all a matter of chance whether the set will work or not, to get the results we want every reader who builds the 1926 Unidyne to get, it is necessary that the "written word" should be closely followed in respect of the coils.

The little set is very easy to handle and even "DX" work is quite simple.

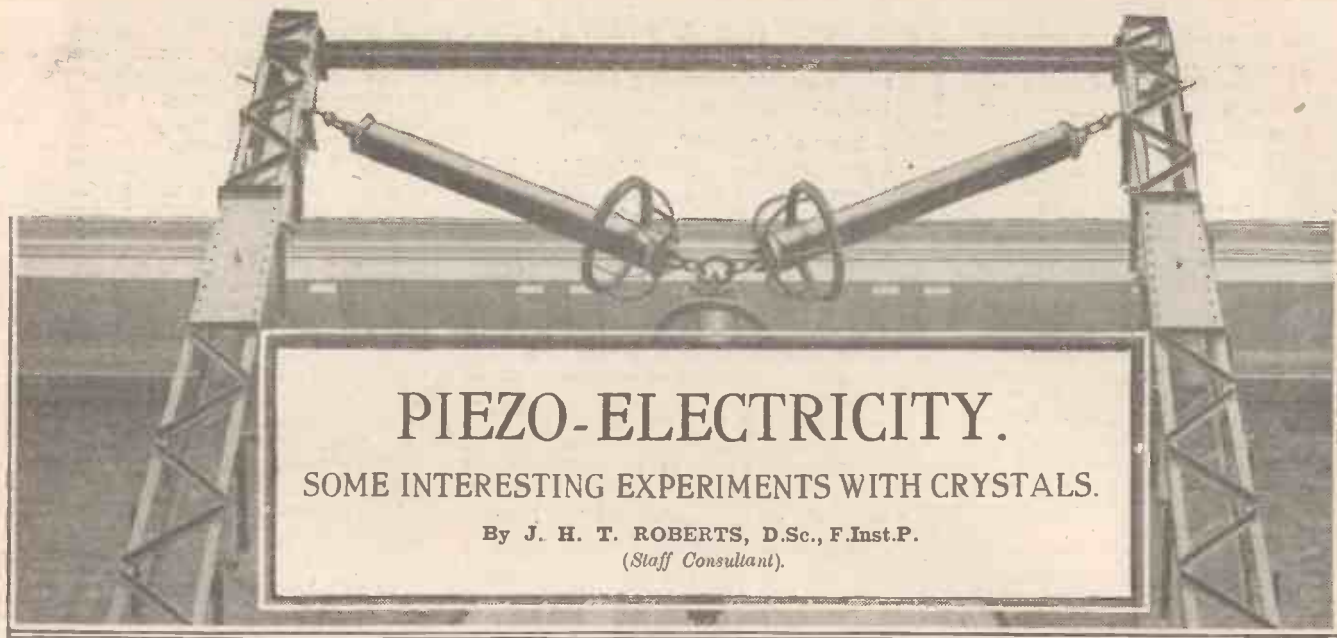
An Ideal "DX" Receiver.

Wave-length tuning is carried out with the left-hand condenser on the panel (.0005 mfd.), reaction being controlled by means of the right-hand variable (.0003 mfd.). The filament should not be too bright—no advantage obtains over a certain degree of brightness, in fact there follows a distinct loss.

Finally, we confidently anticipate that the constructor who really appreciates a "DX" receiver which has a smooth unchanging wave-length reaction control, no hand capacity effects, and the clarity of a crystal set will discover his ideal in the 1926 Unidyne.



Constructors of the 1926 Unidyne should use this photograph in conjunction with the wiring diagram of the receiver when connecting up the components.



PIEZO-ELECTRICITY.

SOME INTERESTING EXPERIMENTS WITH CRYSTALS.

By J. H. T. ROBERTS, D.Sc., F.Inst.P.
(Staff Consultant).

MENTION has occasionally been made in these columns of the research work which is now being carried on in connection with so-called electric crystals, sometimes referred to as "talking crystals."

Crystals of this kind have been used for the purpose of telephone receivers and microphone transmitters, and they appear to give great promise of development in the future.

in the crystal being brought about by various internal stresses due to the heating. In some experiments of Riecke it was found that the pyro-electric effect, if it existed at all, was certainly less than ten per cent. of the whole effect, and this opinion was also reached by Curie and by Röntgen, the substance under investigation in that case being tourmaline.

The electrification produced by heating can easily be demonstrated with tourmaline crystals by heating them in an oven and dusting them after removal with a mixture of red lead and flowers of sulphur. The mixture should be shaken through muslin when, by friction, the sulphur becomes negatively electrified and adheres to one end of the crystal, whilst the red lead, which becomes positively electrified, adheres to the other end of the crystal. If, after being heated, the crystal is allowed to cool, the polarity will be reversed.

Piezo-Electric Effect.

Amongst the substances which exhibit the piezo effect the most notable are Rochelle salt, silicate of zinc, cane sugar, and quartz.

With quartz there is some difficulty in finding a suitable specimen, as the natural quartz crystals are apt to be twinned in formation, and twinned crystals have opposite effects, so that the net effect for a comparatively small area of the crystal may be very small. With Rochelle salt, however, the effect is very marked.

The production of electrification due to the straining of the crystal may readily be demonstrated by placing a small sheet of tin-foil upon the surface of a slab of tourmaline and exerting pressure (by means of an insulator), the tin-foil being connected by a wire to an electrometer. If the slab of tourmaline be turned the other way up, the tin-foil being again placed on the top surface, the deflection on the electrometer, when pressure is applied to the crystal, will be reversed.

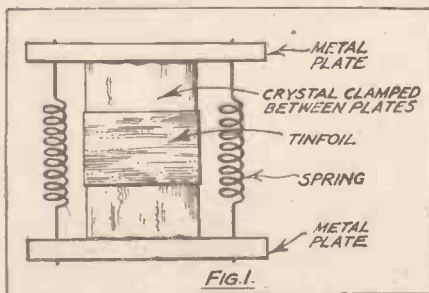
The relation between the pressure applied to a piezo-electric crystal and the electric charge developed was investigated by Curie,

who found that the charge developed was proportional to the pressure, the charge Q being given by the equation $Q=KP$ where P is the total force applied, Q is the charge in electrostatic units, and K is a constant known as the piezo-electric constant of the crystal.

It is evident that the higher the piezo-electric constant of a crystal, the greater the electrostatic charge developed by that crystal for a given total applied force, and Curie found that of all the substances which he examined, the one with the highest of the piezo-electric constant was Rochelle salt.

Preparation of Rochelle Salt Crystals.

Rochelle salt crystals are probably the most easily prepared, and are the most suitable, for amateur experimenters, of the various piezo-electric crystals, but even these crystals require some considerable care and skill for their successful preparation. The more recent research work on Rochelle

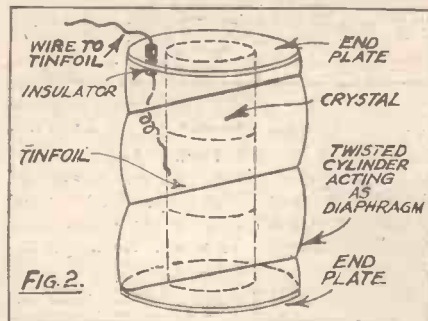


Many readers have evinced a considerable interest in this subject, and a desire to carry out experiments of their own on these lines. For this reason it is felt that a short account of the properties and use of piezo-electric crystals may be of value.

There are certain kinds of crystal which, on being heated or cooled, or on being subjected to strain such as elongation, compression or twisting, develop electric charges at particular regions of their surface. The production of electrification upon a crystal by the action of heat is known as the pyro-electric effect, and the production of a similar result owing to a strain of the crystal is known as the piezo-electric effect.

Pyro-Electricity.

Although these electrical effects with crystals have been divided into pyro-electric and piezo-electric classes, it is not certain that in reality these two classes are separate, and it is believed by many investigators that the so-called pyro effect is really a piezo effect, the necessary strains



salt crystals has been mainly carried out by the Western Electric Company of America, and particularly by Nicholson, who has been able to produce very efficient crystals varying in mass from a few grams up to half a kilogram.

The method of making these crystals is as follows: A super-saturated solution of Rochelle salt is made, by cooling a saturated

(Continued on page 534.)

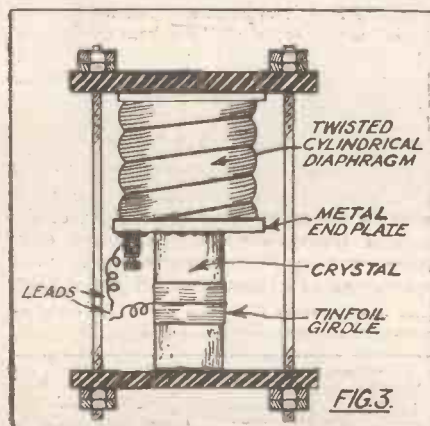
PIEZO-ELECTRICITY.

(Continued from page 533.)

solution, and in this a large number of small crystal nuclei are produced. (Rochelle salt is a sodium potassium tartrate, and has the formula $\text{Na KC}_4\text{H}_4\text{O}_6 \cdot 4\text{H}_2\text{O}$.) The nuclear crystals are immersed in a clear, saturated solution of the salt, the nuclei and the solution being carefully brought to the same temperature before the immersion. The nuclear crystals may be suspended from a thread, or floated upon mercury, or supported upon a glass plate. The growth of the crystals is brought about by the slow evaporation of the solution. Nicholson states that after the crystals have been grown to a sufficient size, their piezo-electric property is enhanced by drying them, either by long-continued gentle heat, or by immersing them in alcohol and subsequently heating gently. It has been found by other experimenters, however, that this drying process, if carried too far, destroys the piezo-electric property and causes the crystal to crumble.

Experimental Applications.

If various pressures are applied to a Rochelle salt crystal, parallel to a diagonal, the relation between the electric potential and the load is not a linear one; that is to



say, the electric potential developed is not proportional to the load. For the best results, it is desirable to apply a permanent static pressure to the crystal, and the most suitable value of this pressure has been found to be equal to about 15 kilograms' weight.

In order to make experiments with the Rochelle salt crystal, the crystal is compressed between two discs which are held by springs, as shown in Fig. 1. Around the crystal is wrapped a girdle of tin-foil, the discs forming one electrode and the girdle the other. If a suitable receiver is connected to the electrodes and the crystal is placed upon the table, the ticking of a watch placed near the crystal may easily be heard in the telephone receiver. This is due to the fact that the impulses from the watch cause small increases and decreases in the static pressure upon the crystal, and so produce small electrostatic charges or

alternating potentials upon the surface, which escape by the electrodes and give rise to minute alternating currents in the receiver.

Twisting of the Crystal.

If a Rochelle salt crystal is subjected to a twisting couple about the principal axis, the greatest piezo-electric effect is obtained. In this case, the charge Q in electrostatic units is equal to $K.C$ where K is the piezo-electric constant as before, and C is the applied couple in kilogram-centimetres. In some crystals K has been found to have a value as great as 100, so that if a force equal to the weight of one kilogram be applied at the end of an arm 10 centimetres long (giving a twisting couple of 1,000 kilogram-centimetres) the charge produced in this case would be 1,000 electrostatic units.

Used as a Transmitter.

If a piezo-electric crystal be mounted in the way we have described, it will consequently be sensitive to the incidence of sound-waves, these having the effect of producing slight increases and decreases in the permanent static pressure. A convenient and efficient method of mounting the Rochelle salt crystal for use as a telephone transmitter (that is, as a microphone) is to surround the crystal with a twisted cylindrical diaphragm which exerts the necessary force upon the end plates. (See Figs. 2 and 3.) When sound-waves fall upon this cylinder, they have a relatively large influence in causing torsional (twisting) stresses to be applied to the crystal, with the generation of corresponding electrical oscillations. In a particularly good crystal when the incident sound has the same frequency as the natural frequency of vibration of the twisted cylindrical diaphragm, a difference of potential at the electrodes of 15 volts on open circuit was produced. By the employment of suitable valve amplifiers good transmission of speech may be obtained.

For Reception Purposes.

Just as the production of strain in a piezo-electric crystal gives rise to an electric charge upon the crystal, so the application of a potential-difference to such a crystal will conversely bring about a change in its dimensions, and if the applied potential difference be fluctuating or alternating the crystal will be set into mechanical vibration. Thus, not only may a piezo-electric crystal be employed as a microphone transmitter (that is, converting mechanical vibrational energy into electrical vibrations) but it may be used as a telephone receiver (converting electrical vibrations into mechanical or sound-vibrations). As a telephone receiver, however, it does not compare favourably (on the score of efficiency) with certain other types of receiver.

Application to Gramophones.

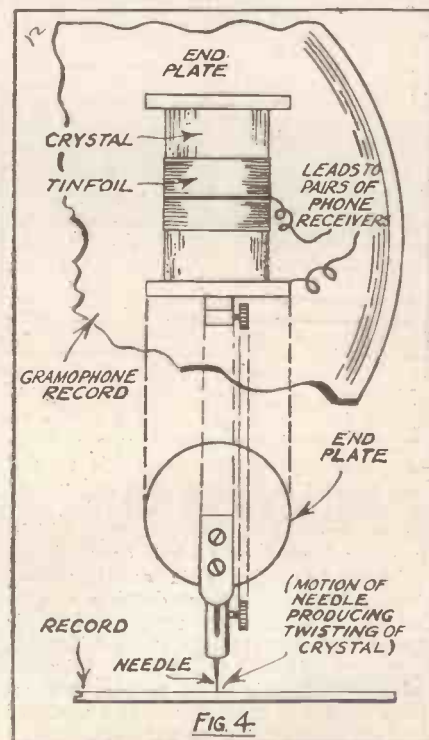
An interesting application of the Rochelle salt crystal as a device for converting mechanical into electrical energy has been made in connection with the reproducer of a gramophone. A suitably mounted crystal, provided with a special needle engaging with the gramophone record, has been found to be capable of operating, with appropriate amplification, several hundred pairs of telephone receivers.

Another important practical application of the piezo-electric effect was recently suggested by Sir J. J. Thomson, who pointed out that, since the quantity of electricity liberated by the crystal is directly proportional to the pressure, the crystal might be used for the determination of pressure-changes in explosions, where the rise of pressure is completed in perhaps one-thousandth or even one-ten-thousandth of a second. It is evident that in a case of this kind, the ordinary mechanical pressure indicators are unsuitable, owing to the fact that the lag in their indications may be very much greater than the total duration of the effect which is to be observed. With the piezo-electric device, however, the lag is infinitesimal, and the development of the piezo-electric charge follows the pressure-variation of the crystal with considerable faithfulness.

This method has been used very successfully in conjunction with the cathode ray oscillograph, using photographic plates requiring, in the conditions of the experiment, an exposure of less than 0.00,001 of a second. The method has proved of great value in the determination of the time-pressure curve for the explosion of various gaseous mixtures in research on petrol engines and for the determination of the rate of propagation of an explosive wave through solids and liquids.

Ample Scope for Investigation.

Rochelle salt crystals have thus been applied as telephone transmitters and receivers, as gramophone reproducers, and to



certain industrial and scientific purposes, as indicated above. Considerable experimental work has been carried out in connection with their use as transmitters, and as reproducers for wireless loud-speaker work. The wireless experimenter may find in this subject ample scope for investigation which, apart from its interest, may quite possibly yield results of great practical importance.

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Sir OLIVER LODGE.

SOME UNIDYNE OPINIONS.

In view of the publication in this issue of the 1926 One-Valve Unidyne we publish on this page, together with extracts from the reports on the Unidyne by Sir Oliver Lodge and Senatore Marconi, extracts from a few of the thousands of letters we have received on the Unidyne during the last year.—The Editor.



SENATORE MARCONI.

I consider its simplicity and efficiency make the one-valve Unidyne an ideal home constructor's set.
Weymouth. A. W. K.

I really must write you again to let you know of the continued excellent results I am getting from my Unidyne 2 valves, Det. and L.F.
No. 4, Westbrook Villas, Darlington. H. V. SIMPSON.

From the first build up of the Unidyne by me, copied from your valuable paper, it has been a real delight to use.
27, Pratt Street, Camden Town, N.W.1. D. H. T. DAY.

I offer my sincere thanks and congratulations to Messrs. Dowding and Rogers for the Unidyne Circuit and assure you it is my best set.
33, Church Street, Rotherham. ALFRED FRANCE.

Hats off to Messrs. Dowding and Rogers' H.T.-less invention.
49, High Street, Easton. H. J. VOWLES.

It may interest you to know that I have received about sixty European Stations (including B.B.C.) on my Unidyne set.
Sunningdale Nurseries, Windlesham, Surrey. LOUIS H. GRAY.

For purity of tone and selectivity this set is far superior to any I have heard.
"Dunkirk," Oxenhope, nr. Keighley, Yorks. D. HEATON.

The set works splendidly, equal in every respect to an ordinary 2-valve straight set.
I have received Manchester on a 2 ft. 6 in. frame, using only one valve.
1, Moorside Terrace, Widnes, Lancashire. G. H. BURROWS.

I shall never use the H.T. battery for wireless again.
le Ringdykstraat 37, Amsterdam. W. PEETERS.

I cannot understand how any other form of valve circuit can displace it.
"Ravenswood," Penn Road, Penn, Wolverhampton. HECTOR JEFFREYS.

The signal strength of even distant stations is remarkable.
Portobello. WILLIAM N. L. MACDHAL.

No more H.T. batteries for me.
112, Bedford Road, Clapham, S.W.4. E. G. BARRATT.

Dear Sir,—I feel compelled to write and thank you and the inventors for the Unidyne circuit.
21, Talbot Terrace, St. Michael's Lane, Leeds. H. WOLFSON.

It speaks well for the Unidyne that a novice such as myself—this is my first valve set—should be able to obtain such results.
Pinner. F. H. M.

The Unidyne circuit undoubtedly gives extremely pure reception.
Prof. A. M. LOW.

I have just finished a one-valve Unidyne set, which is a great success.
7, Blucher Street, Waterloo, near Liverpool. H. GRAFTON.

It will pay any amateur to make this set up, and he will never go back to H.T.
43, Robert Avenue, Harehills Lane, Leeds. J. P. PHILLIPS.

It is well worth the trouble to adapt any kind of portable set to the Unidyne principle, thereby saving the expense, bother and space of the now obsolete high-tension battery.
Langley Park Road, Sutton, Surrey. G. J. MARCUS.

From my Somerset home I can get most stations when I want them . . . using my bedstead as aerial in conjunction with an earth.
1294a Clergy School, Clarendon Road, Leeds. PERCY W. G. CLOUGH.

SIR OLIVER LODGE'S OPINION OF THE UNIDYNE.

In the course of an official report on the "Unidyne," published in "Popular Wireless," No. 108, Vol. V., our Scientific Adviser, Sir Oliver Lodge, wrote:—"I consider that I may congratulate the inventors on having produced a set for amateur receivers of remarkable simplicity and effectiveness. I was surprised to find it work as well as it does, without the magnification usually obtained by a high-tension battery and the customary high-resistance valve." (Signed) OLIVER LODGE.

I have attained splendid results, having heard all the B.B.C. stations and also Radiola and Ecole Supérieure very loudly.

St. Edmunds College, Chiltoner House, Old Hall, Ware, Herts. J. ENGLEHEART.

With a Unidyne receiver we have at last a valve set capable of reproducing a studio concert without extraneous noises—a claim which few H.T. receivers can make.

The Schoolhouse, Cwmearn, Crosskeys, Mon. O. G. SUTTON.

I consider it a real gem. I should like to thank Mr. Rogers and Mr. Dowding for what I think is a great invention.

Sunnyside, Princes Street, Slough, Bucks. EDWARD GORDON.

SENATORE MARCONI ON THE UNIDYNE.

AN EXTRACT FROM HIS REPORT.

I admit, however, that the results obtained with your set have somewhat exceeded my expectations, and I must now say that, from the amateur's point of view, the "Unidyne" presents many interesting possibilities.
Yours faithfully,
(Signed) G. MARCONI.

All B.B.C. stations can be considered as "small fry." So can most European stations. American transmissions I get nightly.

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

I must thank you all for such a fine set.
3, Old Church Yard, Liverpool. A. W. BUTLER.

I, like many others, tender my thanks to the inventors, Messrs. Dowding and Rogers.
Platt Lane, Dobeross, near Oldham. EDWARD HEWKIN.

I am looking forward to further developments of the Unidyne principle.
145, Hampden Road, Gipsy Lane, Leicester. FRANK W. GREGORY.

Please accept my best wishes for the future success of "P.W." and the Unidyne, which I am certain is assured for all time.

2, North Row, Warrington. ERNEST BACKHOUSE.

It is my eighth valve set and the best of the lot of them.

10, Madrid Street, Belfast. CHARLES BURROWS.

I am astonished at the present performance and the hint of latent possibilities in the 2-Valve Unidyne (1 L.F.) that it becomes an obligation to offer thanks and appreciation to the inventors. Their claims are well on the side of modesty.

School House, Wrangle, Boston, Lincs. H. TYLER.

Using good component parts, a Unidyne I find will stand a test of equality against any H.T. two-valve super set, both in range and volume.
140, Franklin Road, Gillingham, Kent. E. F. PERRY.

I am writing to let you know what a great success my 2-Valve Unidyne is.
Seven Barrows, Lambourn, Berks. H. L. COTTRILL.

I wish you would kindly convey to Mr. Dowding and Mr. Rogers my congratulations on their invention of the Unidyne, which I think is a revolution in radio.
13D, Sda. Chiesa Vecchia, Birchiera, Malta. ROBERT F. GALRA.
Lecturer, Malta Radio Soc.

It is simplicity itself to tune.
6, Church Lane, Harpurhey, Manchester. H. BANNISTER.

We are confident that during the next few years the Solodyne (Unidyne) principle will be adopted in the majority of radio receiving sets.
(Editor of "Radio News," America.) HUGO GERNSBACK.

Just a line to let you know the excellent results I am having with my two-valve Unidyne.
St. Piran's, Maidenhead. MICHAEL NESTKSY.

It works really wonderfully, and I have never been more satisfied with a set.
Rugby. W. E.

They will do as I have done and transfer the useless H.T. battery to the asphalt.
163, Gourlay Street, Springburn, Glasgow. WILLIAM CLARK.

Poor old Mr. High Tension. Shed a tear for the passing of an old and faithful servant. With full respect. I have read his burial service and committed his body to the deep. Give the inventors the thanks and congrats. of a now very radiant radio "fan."
Montgomery House, Carlow, Ireland. J. B. TIVY.

I feel I must write and thank Messrs. Dowding and Rogers for their invention.
134, Meads Lane, Seven Kings, Ilford. G. W. NORRIS.

With regard to the Unidyne set, I feel that I must thank Messrs. Rogers and Dowding for inventing so good a set.
Linley Cottages, Talke, Staffs. F. CHADWICK.

I intend to scrap all my wireless sets, using H.T. batteries.
17, Park Road, Stratford-on-Avon. E. W. KNIGHT.

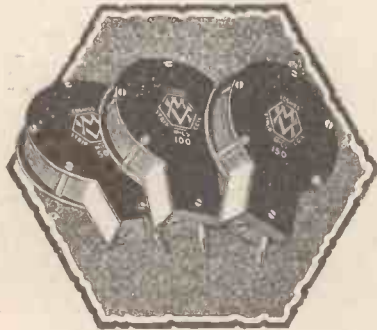
All the above stations come in very clearly and with a tone quality not heard on a set employing high tension.
106, Soho Road, Handsworth, Birmingham. P. H. COHEN.

I do not think you are boosting your Unidyne circuits enough. I'm sure that if it was dealt with a little more often, it would be vastly more popular—anyhow, it deserves to be. I shall be happy to let anyone who cares to make an appointment hear the set.
Harden, Holmfirth, near Huddersfield. PERCY SYKES.

Up to a week ago I regarded my Unidyne set as a common radio receiver, just about equal to an ordinary H.T. one-valve set. To day I regard it as worth ten one-valve H.T. sets.
75, High Street, Mountain Ash, Glam. N. LUKEY-DAVIES.

The set was constructed as a portable set, and gives fine results.
Ash Leigh, Ellesmere Park, Eccles. E. CLAYTON.

N.P.L. Tested Coils at remarkably low prices



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STRIP INDUCTANCE COILS

The table given below shows the results of tests carried out by the National Physical Laboratory. As will be seen, the Self-capacity of these coils is exceptionally low, particularly in the coils used for the B.B.C. waveband.

Coil No.	Inductance Microhenries	Self-Capacity m/mfds.	Approx. Wave Length			Price each
			.0001 mfds.	.0005 mfds.	.001 mfds.	
20	12.5	9	70	150	210	3 6
25	25	9	100	215	300	3 6
35	50	10	145	300	425	3 6
40	100	10	200	425	600	3 6
50	150	10	245	520	735	3 6
75	300	10	340	740	1040	3 9
100	700	11	530	1130	1590	4 8
150	1000	16	640	1360	1900	4 8
175	1400	18	765	1610	2250	4 8
200	2500	17	1020	2150	3000	5 4
300	5000	24	1490	3060	4260	6 6
400	9000	28	2030	4130	5740	8 6

In addition to Low Self-capacity "Cosmos" Strip Coils have a Low H.F. Resistance, Minimum Ohmic Resistance, are sound in construction, entirely enclosed, and neat in appearance.

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The All-Important Variable Condenser

And the Prestige behind the "Polar"

Not all variable condensers can be judged by appearance and price alone. It is unlikely that the condensers produced by any but long-established Radio Engineers can be fully efficient.

"The Polar" Junior Condenser.

5/6



All Capacities.

Possesses all the characteristics of the well-known Polar "Straight-line-Frequency" condenser. Gives a straight line of frequencies, with an approximately even movement of dial in relation to change of wavelength. Low minimum self-capacity; one-hole fixing; 350 degrees dial; perfectly screened; remarkably compact; occupying minimum space behind panel.



The "Polar" Cam-Vernier Variable Condenser.

Compensated square-law design of vanes; this means that the Condenser functions in the square-law manner, not on the bench, but on your set. Its shape of vanes compensates for the inherent self-capacity of your coils and aerial, with the result that the figures on the dial indicate definite wavelengths. You can recognise the Cam-Vernier Variable Condenser, if by nothing else, by the specially engraved dial which commences at "26"—recognising that no aerial tuning system can have a zero capacity. It embodies the well-known Cam-Vernier device, giving 10 degrees of Vernier movement in any position; and the vernier readings register on the dial.

Prices:

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.0005 - - - 11/6
.001 - - - 12/6

It is, further, unlikely that nondescript, cheaply-assembled condensers will carry anything like the UNCONDITIONAL written GUARANTEE enclosed with every "Polar" Condenser. It is a guarantee against original defects, as well as against breakdown or the development of faults in ordinary use—for a period of ONE YEAR.

All constructors of Radio Sets have an appreciation of quality in appearance, as well as of quality in performance; yet not all are equally able to indulge in the expensive class of components. For this reason we have introduced the "Polar" Junior Condenser, at a price of 5/6 for all capacities—putting a product of high quality (backed by a great reputation) within the reach of all.

Buy the products of well-known Firms—disregard any may-be biased recommendations of "cheap" components—and depend upon the Manufacturers to "see you through."

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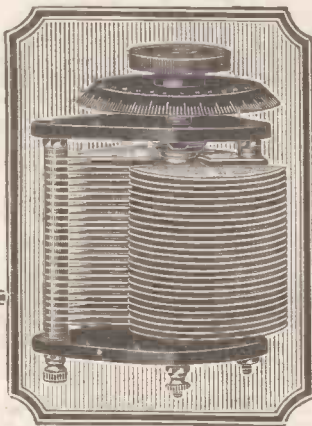
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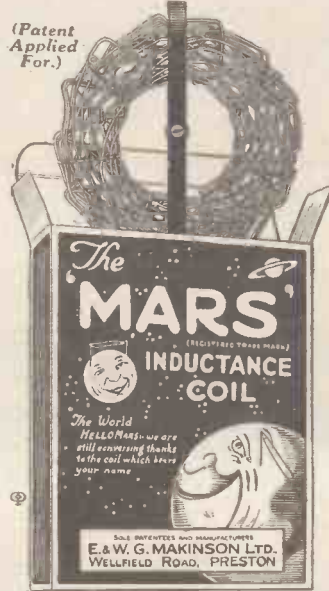
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250	8/9	1,800 " 2,700 "

The "Mars" Aerial is by far the most efficient you can obtain, as expert tests have conclusively proved.

National Physical Laboratory tests prove that the resistance per metre of the "Mars" Coil Wire is only .17 ohms against 1.72 ohms recorded by 7/22's wire.

Extensively used for ships' aerials, and for transmission work, it is most audibly appreciated when used in conjunction with a simple crystal set, to which the "Mars" Aerial gives valve-set volume. This patented aerial, of which 50,000 were sold last year, is a boon to those who prefer the sweetness of tone provided by a crystal set, for it provides extra strength of signals to make listening-in doubly enjoyable.

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CURRENT TOPICS.

By THE EDITOR.

The Government Committee—A Big Problem—The Need For Showmanship—The Announcer's Personality—A New Post.

IT is now definite that the Government broadcasting committee will hold its first official meeting on November 19th. Exactly what will be the outcome of the committee's labours nobody can say, but a view is strongly held in more or less authoritative quarters that the committee will suggest that the B.B.C. should become a Civil department, more or less under Government control. This would mean some radical changes in the B.B.C. directorate.

It is doubtful if any great changes would be made in the executive staff, beyond the pleasing fact that, like all other Civil servants, they would be eligible for pensions.

It has been suggested more than once that competition should be introduced into broadcasting. Theoretically this suggestion is sound, because it is a fundamental truth that competition is a great incentive.

But broadcasting is, in many ways, similar to the telephone service; it is undoubtedly a public utility concern, and it would be difficult to imagine the telephone service enjoying such a title if a competitive 'phone service were allowed to operate.

Keeping Up Interest.

Perhaps the similarity is not so close in actual practice. Possibly the advantages of a competitive broadcasting service would outweigh the disadvantages. We can only suggest that the committee endeavour to sum up the situation, and then, if the evidence supports it, recommend a competitive broadcasting service.

One thing is certain these days—and that is that the B.B.C. are finding it increasingly difficult to find new sources of variety; they have explored most of the avenues leading to "stunt" broadcasts; they have broadcast special "star" concerts; famous men have had their wise and otherwise utterances broadcast to the four corners of the country, and now, it would seem, the store of novelties has almost been exhausted and the problem—a most pressing one—is "How to retain the keen interest of the listener?—how to stop him from getting blasé?"

It is a big problem, but we are confident the B.B.C. will tackle it, and will strain every nerve to keep up the public interest in their programmes.

We would suggest, however, that the B.B.C. will never win the day unless they introduce more showmanship into their work. We have always held that the B.B.C.'s broadcasting *modus operandi* is too formal; the announcers of to-day are mere voices; the listener knows absolutely nothing about them; they are ghosts—wraiths behind the microphone, which is as bad as being behind the veil.

In the early days the B.B.C.'s first announcers, Arthur Burrows, C. A. Lewis, Stanton Jeffries and Rex Palmer were allowed to develop their personalities before the microphone. Listening to them you felt their presence; they were not voices and only voices, they were human beings, and

some of them, the public found, were very charming and lovable human beings.

Probably quite unconscious of the fact, they were developing a brand of showmanship which helped to an enormous degree to establish the early popularity of the B.B.C. They originated a new kind of publicity.

The Announcer's Personality.

To-day all that is gone. For some reason or other the personal touch has been severely "sat on;" the announcer is a voice. His name is not known, his utterances are on many occasions extremely formal, and however much the listener tries he cannot work up much enthusiasm for an unknown voice.

Public psychology is a curious thing. Details about the announcers would be read with interest: their little foibles, habits, views, etc., all those little human details, instead of being suppressed, should be carefully brought out in the best interests of the B.B.C.

When one particular announcer becomes popular he should be deliberately (but judiciously) exploited. The fact that Mr. So-and-So would be announcer on a certain evening should convey a pleasurable feeling to listeners just as much as the announcement that De Groot, or some other famous and popular artiste, would create a pleasurable interest when announced for some particular evening's programme.

We could easily enlarge on this theme. The example we have taken—the example of the announcer—is but one of many.

The B.B.C. staff can do a great deal to revive the personal touch in broadcasting—it can develop a new art in showmanship, and so create a steady interest, a steady popularity, which is half the battle when catering for a huge public. Any journalist knows

that the suggestion made above is the essence of success to-day.

We suggest, then, the B.B.C. create a new post—that of Director of Showmanship. The right man in such a job would create a new interest in broadcasting.

* * *

The "Radio Sounds" competition which we recently broadcast in co-operation with the B.B.C., created a great interest throughout the country, and the entries exceeded all expectations. Owing to the fact, however, that a number of competitors misunderstood the rules of the competition, and sent in their solutions on ordinary pieces of paper instead of on the official coupon printed in the issues of this journal, dated week ending October 3rd, 10th, and 17th, we had to extend the closing date until October 28th in order to allow those competitors to again send in their solutions in the proper way.

This made it impossible for us to adjudicate the competition in time for the Central Hall Wireless Meeting, held on October 23rd, and in consequence Mr. J. C. W. Reith could not present the first and second prizes.

However, the special judges we have appointed to deal with the entries, report that they have their task well in hand, and we hope to announce, exclusively, in an early issue the names of the lucky prize winners.

We are sure readers will be pleased to know that even at this stage, it is evident that the Radio Sounds competition has been the means of providing the B.B.C. with very useful evidence. In due course we shall collate this evidence and, we hope, publish a series of interesting little tables showing which sounds "got over" best, and were most clearly understood by the thousands who entered the competition.

* * *

This issue of POPULAR WIRELESS will go to press just one day before the Central Hall Wireless Meeting, and so it is not possible to include an account of the proceedings, or to publish reports of the speeches.

We have made arrangements, however, to include them in our next issue, as a great number of country readers, unable to attend the meeting, have written and asked us to publish the speeches of Sir Oliver Lodge and Signore Marconi.



Members of the Eastern Metropolitan Radio Societies operating a mobile wireless station during one of their recent field days.

THE panels described in the foregoing articles represent the average amount of apparatus required for carrying out a series of experiments on a fairly large scale. The obvious method of extending the system to conform with more ambitious undertakings is to duplicate the panels as many times as desired, as previously hinted, and to modify any given example to suit individual requirements.

Although a considerable number of different panels have been described the subject is by no means exhausted, and the interested reader will soon realise that his scope in devising other arrangements is practically unlimited. As the title of this

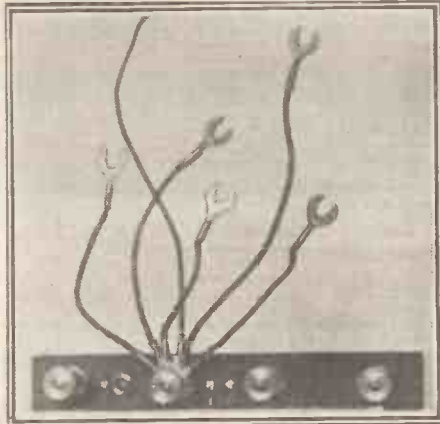


Fig. 32. The extra terminal strip.

article implies, we are concerned chiefly with the system, and since this comprises the essential pieces of apparatus now fully dealt with, it would seem futile to proceed further with non-essential ideas which would only be adaptable to individual requirements and not of general interest or necessity.

The "Spare" Panel.

There is yet one panel, however, which should be included in the outfit; this is called the "spare" panel, the uses of which are manifold. It is cut to the average size (6 in. by 3 in.) and provided with a selective series of holes and slots to take terminals, sockets, resistance or condenser clips, one-hole fixing components, etc., so

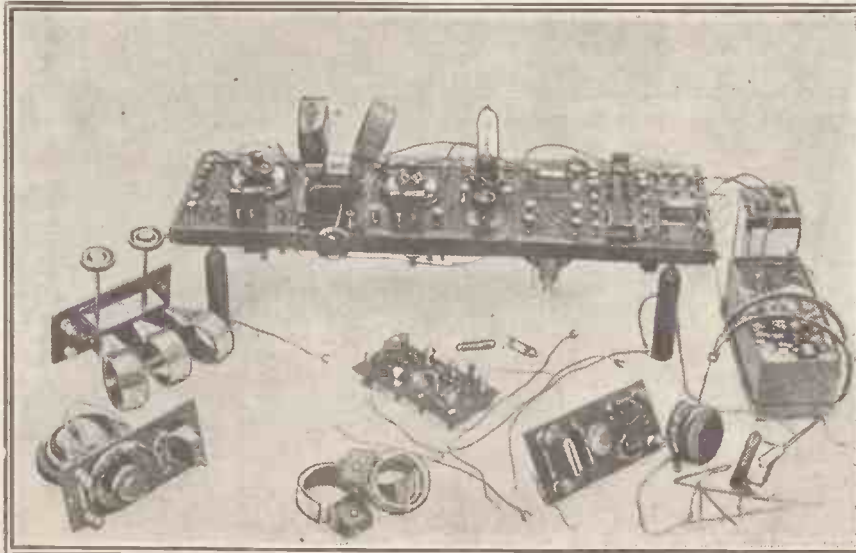


Fig. 34. An experimental one-valve circuit ready for testing by means of the experimental system.

AN EXPERIMENTAL SYSTEM.

By O. J. RANKIN.
Part V. (conclusion).

that if an extra component or circuit junction is required it can be quickly attached to the panel.

A Useful Unit.

The spade terminals soldered to the ends of all insulated connecting leads are of the light stamped variety, the bared ends of the leads being carefully soldered into the grooved shanks, which are then closed to form sleeves and neatly trimmed up with a file. Fig. 32 shows how any one of the 2 B.A. terminals will easily accommodate five or six leads, but if the leads were not fitted with spades and were hooked round the terminals in a careless manner, then, of course, it would not be possible to make the same number of contacts with any degree of efficiency.

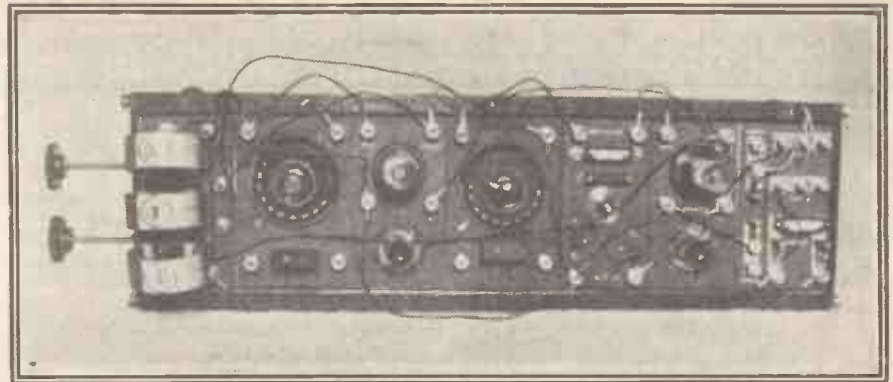


Fig. 33. A bird's-eye view of the panels arranged for a two-valve set.

This photograph portrays a sort of excessive test; one seldom requires six connections at one particular point, but nevertheless it is comforting to know that provision has been made for any emergency, and as it often happens, a short lead connected between two adjacent terminals,

which are already carrying the average number of leads, will often save a very long lead which might otherwise present certain difficulties. Thus, there is everything to be gained and nothing to be lost by using large panel terminals and thin stamped spades. All short leads are made with flexible wire, and the long and medium leads with ordinary rubber-covered single 18 S.W.G. copper wire.

When making the circuit connections the leads should be kept clear of all control knobs, valves, and coils, and wherever possible they should be brought out over the sides of the frame in the manner indicated in Fig. 33, which shows a top view of the single frame with a 2-valve double reaction circuit connected up ready for trial. Although this frame, which was fully described in the first article, was originally designed for single-valve work, it has been found that it will easily accommodate sufficient apparatus for trying out many different 2-valve circuits. The panels left to right are: three coil holder; .0005 mfd. variable condenser; H.F. valve; .0005 mfd. variable condenser; grid leak and condenser arrangement; valve detector; aerial and earth; terminal block

for L.T., H.T., and 'phone panel. Dull-emitter valves are used in conjunction with a small accumulator.

Ten Different Circuits.

The writer is at present engaged on a series of experiments with various types of aeriels, and if results are interesting readers of "P.W." will be given the full benefit of the experience in a future article.

The photograph shown in Fig. 34 should convey an idea of the unlimited amount of enjoyment one can derive from the simple single-frame outfit, a few extra panels, a liberal supply of connecting leads, and last but not least, a selection of "P.W." circuit diagrams.

This photograph was taken just before a test in which ten different single-valve circuits were successfully tried out between the hours of 8 and 10 one evening.

PHOTOGRAPHS.

Readers are invited to submit photographs of wireless interest for publication in "Popular Wireless." Every photograph accepted and published will be paid for at the rate of 10/6 per copy.



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FLUXITE SOLDERING SET

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12" x 12" 5/9	5/9
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8" in. 1" d.	1/1d.

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Wave-lengths with '0005 mfd., Condenser in Parallel. Passed and approved by National Physical Laboratory.

No. of Turns	Min.	Max.
35	115 to	475 metres
56	250 "	700 "
80	400 "	1,000 "
92	625 "	1,450 "
105	950 "	2,000 "

These Wave-lengths are Guaranteed.

If your dealer does not stock, a complete set of five coils will be sent, post free, for 5/6. Special Daventry Aerial coils, 1,600 metres, 2/-
Ditto, Reaction, 2/6
Snake Adapters, 1/6 each; 3/- per pair.

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Trade enquiries invited

THE new scheme of high-power regional stations, of which I gave the first information in these columns, is rapidly taking form. Various factors are helping to expedite its adoption. First of all, there are the difficulties of the international position which were acutely evident during the experimental transmission from the Continent on October 15th. And there are the areas in the south-east, far north, and far west where crystal reception is inadequate.

The new scheme means the scrapping of the present broadcasting system of twenty-one stations and the substitution of about eight high-power transmitting stations, possibly working through existing studios.

Armistice Play.

I hear that Norman O'Neil is writing the music for the special Armistice Day radio drama, which Captain Reginald Berkeley was commissioned to write.

This is the first time that the B.B.C. has commissioned a play for an occasion. Captain Berkeley's theme is the transition from war to peace. He has written an attractive play round the tradition and experiences associated with the White Château at Hollebeke. The play will be available in book form before it is broadcast on November 11th.

November Arrangements.

Some mystery surrounds the plans of the B.B.C. for the second week in November. I gather that it is proposed to run some kind of broadcast festival to include an unprecedented aggregation of stars, novelties, and new features.

The Broadcasting Committee.

The announcement that the Government Committee on broadcasting will commence its meeting on November 19th is the signal for the final mobilization of those interested who are determined to use the Broadcasting Committee for the purpose either of controlling or of participating in the control of broadcasting after 1926.

I hear from one of the members of the Committee that he has already received 2,000 letters containing about as many different suggestions. Apparently the cranks are going all out.

Billy Merson.

The decision of Billy Merson to broadcast on behalf of the Wireless for the Wards Fund threatened a serious crisis. There was a last-minute exchange of angry telegrams. It was a very good thing that Billy Merson stacked his guns. It will make things much easier for other variety artistes to appear before the microphone.

B.B.C. to Move?

Savoy Hill, even with its recent considerable extensions, is still quite inadequate. It looks as if the B.B.C. head office will have to move into more commodious quarters. One idea is to erect a special "Broadcasting House" to contain a theatre and capacious studios in addition to offices.

Another scheme is to buy a place of entertainment such as Covent Garden, and erect offices round it.

Whatever is decided, it is certain that next year will see the beginning of a move from Savoy Hill.

BROADCAST NOTES.
By O. H. M.

It is curiously significant of the uncertainty of the trend of public opinion that there should now be an objection at Manchester to S.B. from London. This agitation runs a definite counter to opinion at other centres. It was brought to a head by the B.N.O.C. opera which was relayed from Leeds-Bradford. Music lovers at Manchester are nothing if not critical and they quite frankly do not care for B.N.O.C. opera. They took advantage of the opportunity to protest against the present limitations of local programmes.

I shall be interested to see how the situation develops. Manchester's local programmes have always been considered excellent.

A Novel Programme.

I am gratified to note that my suggestion about St. Cecilia's Day, November 22nd, has been taken up by the B.B.C. The occasion is to be marked by a special

programme provided entirely by blind artistes. It is excellent news also to hear that Captain Ian Fraser, M.P., will probably be the announcer and master of ceremonies.

Radio Sounds Competition.

The Radio Sounds Competition, organised by POPULAR WIRELESS and broadcast simultaneously on October 18th, had most remarkable results. Thousands of letters of inquiry were received by the B.B.C. before the event.

This was all right. But then, after the competition, some letters with solutions were sent to the B.B.C. both in London and the Provinces. In order to give these listeners a chance still to comply with the conditions of the competition it was arranged to extend the closing date a week to October 28th, a move heartily approved both by listeners and the B.B.C.

The B.B.C. Monopoly War.

The first shot has been fired in the big battle of broadcasting of 1925. The combatants in this war are not embarrassed by weather. The worse the weather, probably, the keener they will become out of sheer depression. A journalist formerly associated with the late Wireless League Gazette, writing in a newspaper recently, called down all the wrath of heaven on the hideous monopoly that controlled British broadcasting.

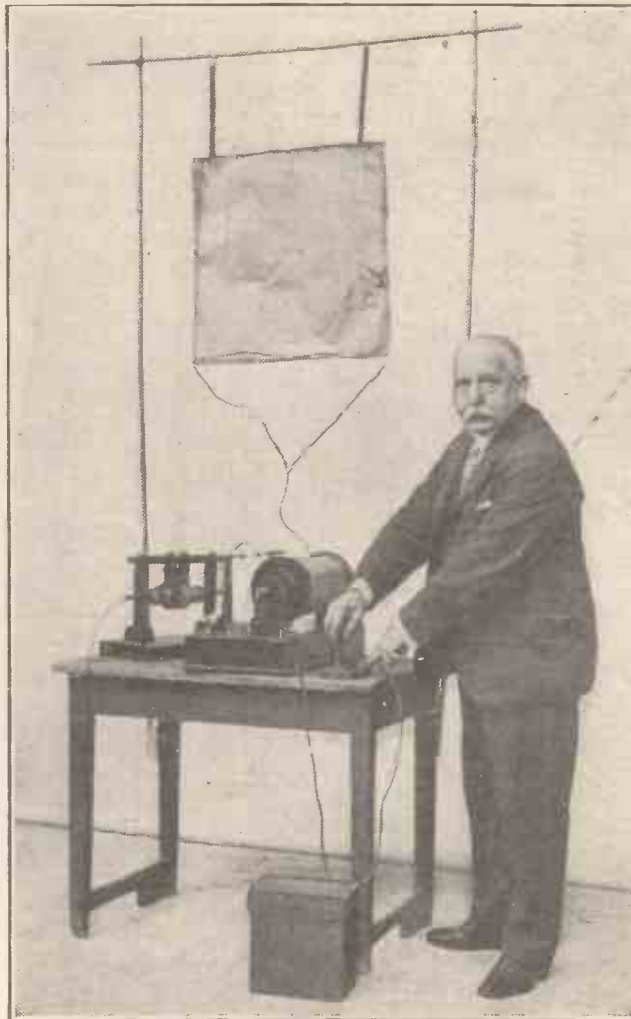
But the vivid account of the ideal conditions of free America was really a little too much for an average reasonable listener to swallow.

This kind of heavy hammering plays right into the hands of the B.B.C., and if it is to characterise the policy of the "anti-unified controllers," then I say a hundred to one bar none on the B.B.C. coming through unscathed on that score.

Brighter Programmes.

Now that Donald Calthrop has joined the staff of the B.B.C. we should see brighter broadcasting with a vengeance. Ever since the redoubtable Donald broke the front of the theatre managers by risking a broadcast of "Yoicks" he has been keen on the new medium into which he has now jumped with both feet.

His pet theory is revues and more revues—make the snappy revue the model for all broadcast entertainments. Hey ho, for the highbrows!



The first transmitter used by Senatore Marconi when he carried out his early tests in Italy in 1895.



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

A CAT'S-WHISKER of novel design has been sent us for test by Clear-Hooters, Ltd. It is called the "Stay Put" and retails at 6d. It consists of a small spring, one end of which flattens into a sharp spear-head shape, while the other is attached to a straight piece of wire which, besides holding the spring, acts as a guide to it and prevents it from "bulging."

On test it functioned very well, and undoubtedly assisted in obtaining a good adjustment, as the usual buckling and springing did not occur. We did not obtain greater signal current with this device than that which is obtainable with a standard cat's-whisker, but undoubtedly a distinct gain resulted in stability, and this, after all, is a most desirable factor.

Although "vernier" dials have been popular in the United States for some time, it is but quite recently that they have made their appearance on the British market. A distinctive component of this nature is the "Combine," a sample of which recently reached us from Messrs. A. F. Bulgin & Co., of 9, 10, 11, Cursitor St., London, E.C.4. In appearance it resembles a conventional condenser dial with a small vernier control in its centre. Obtainable for 2 B.A. on $\frac{1}{8}$ in. or $\frac{1}{4}$ in. shafts, it is designed to replace an ordinary condenser variometer on the tuning control dial.

The small knob rotates the central mounting screw at a ratio of 180 to 1 of the movement of the dial itself. The action is very smooth and no backlash is present.

A small pointer moves over a 10 degree scale to indicate the "vernier" adjustment.

The "Combine" is very well made and finished (it is stated to be a British production throughout) and fits as easily into a component as its original dial—no additional securing whatever being required. At the retail price of 5s. 9d. it should find considerable favour among those amateurs who are preparing for a season's "DX" work.

We recently received a number of T.C.C. condensers of improved design. These new models are fitted with duplex terminals in place of the original tags, and all metal tops are now provided. It speaks well for the T.C.C. people that they should still continue to endeavour to improve their products, for the Mansbridge condenser never has had a serious rival in the whole of its history, so that such developments as are recorded above represent clear gain for wireless amateurs and constructors.

Messrs. Superadio, Ltd., 111, Gt. Eastern Street, London, E.C.2, have asked us to point out that they have not nor ever have had any connection with the Super Radio Co., who were recently mentioned in our columns in connection with police court proceedings at Nottingham.

We are pleased to be able to announce that further expansion has been proved possible in respect of that old-established but progressive firm Messrs. Igranic Electric Co., Ltd., and that they have now opened

(Continued on page 546.)

The World's Receiver

That's what the "Brownie Wireless" is often called—just because it is so universally popular. Anywhere within a radius of 25-30 miles from the local station or 120 miles from 5 X X it gives clear voluminous reproduction of broadcast entertainment.

The "Brownie" Wireless Model No. 2 embodies all the features of the Standard "Brownie" Receiver.

10/6
Model No. 2

It is capable of resisting extreme climatic conditions. The receiver has a natural wave-length up to 600 metres and a standard plug and socket coil attachment is provided, which, with the aid of a special coil (price 2/9 extra) makes the set adaptable to 5 X X. Complete, with Glass Protected Detector, D.L.5 Crystal and Palladium Cat-whisker, 10/6.

The Standard "Brownie." Just as good as ever, but sold now with integral ebonite base, 7/6. 5 X X Loading Coil for the Standard 2/-.

Buy Brownie Wireless—and buy satisfaction.

The BROWNIE
WIRELESS
Co. (of Great
Britain) Ltd.,
310a—312a,
EUSTON ROAD,
LONDON,
N.W.1.

Phone:
Museum
3747.



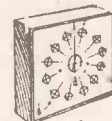
Ask your Dealer to show you these models, also the many other Brownie components, including the D.L.5 Crystal and Brownie Transformer.

BOWYER-LOWE PARTS

Series Parallel & Stud Switch Parts for Panel Mounting

These inexpensive components make it a simple matter for the amateur to incorporate on his panel switches for any number of ways at a low cost. The stud switch set contains all parts required for the construction of any switch from 2 to 10 way. The Series Parallel Switch contains parts for making double-pole switches.

In each case the parts are sold complete in box with Drilling Template, and include Studs, Stops, Nuts, Switch Arm, and Ebonite Knob. All brass parts thoroughly lacquered.



STUD SWITCH PARTS .. 2/3
SERIES PARALLEL PARTS 4/-

Richer Signals from Every Valve

3/6

Fit this valve holder into every set to secure maximum signal purity with minimum losses. Its valve legs, separated by air, reduce inter-electrode capacity to a negligible amount. Its four phosphor bronze springs prevent all microphonic noises in Dull Emitter Valves and protect all types of valve from accidental shocks. The mounting is a non-inflammable Bakelite Ring. Universal Fitting. All screws supplied.

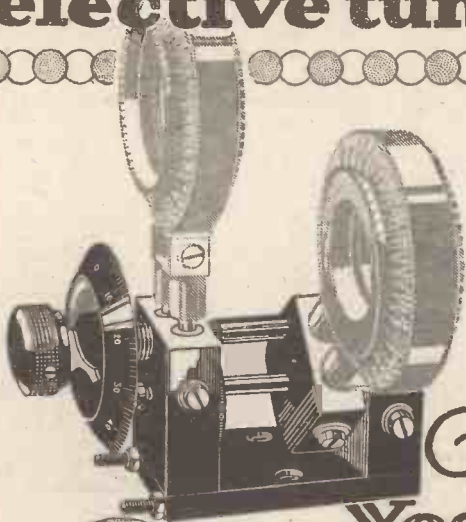


ANTIPONG
Low Loss Shock Absorbing
VALVE HOLDERS

BOWYER-LOWE CO., LTD., LETCHWORTH

FOR SUCCESSFUL SETS

A Revelation in Selective tuning



The Yesly "Ecliptic" Coil holder



THE superiority of a tuning system that permits *right angle adjustment* in the relative positions of tuning coils can be readily appreciated by all who understand the theory of magnetic fields and the influence they have on each other.

PROV. PAT.
No. 24683

Up to the present the more simple method of coil adjustment has been employed in the construction of the majority of coil holders, despite the *wonderful improvement that can be obtained by direct cross flux adjustment.*

In the new YESLY ECLIPTIC COIL HOLDER the adjustment of the coils is made so as to produce a perfect electrical combination between the coils by a *gear cut "face to face" movement* having a ratio of 6 to 1. *The immediate increase in selectivity and resulting strength of signals is beyond that of all other coil holders on the market.*

This unique coil holder can be fitted to either *front, side or back of panel positions* and is thoroughly finished in highly polished ebonite. A knob and pointer assist tuning in conjunction with a fully graduated dial and two additional fixing screws are supplied to prevent bodily rotation in the case of back of panel mounting. The high standard of Yesly Tuning has already created a premier position in the wireless field and the ECLIPTIC COIL HOLDER will secure still better results for all radio amateurs.

LOOK FOR THE NAME

REGISTERED



TRADE

MARK

Ask your dealer, or write direct

ENGINEERING SUPPLIES, LTD.,

235 Blackfriars Road, LONDON, S.E.1.

"YESLY" Components are being exhibited at Stand 60, Manchester Wireless Exhibition.

Ashley Radio

JACKS AND JACK SWITCHES

A complete range of Jacks for every purpose. The use of these components saves labour and dispenses with the need for complicated switches.

PRICES:

Jack No. 1.
Single Circuit
(Open)

2/-

Jack No. 2.
Single Circuit
(Closed)

2/3

Jack No. 3.
Double Circuit;

2/6

Jack No. 4.
Filament
Single Control

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Jack No. 5.
Filament
Double Control

3/6

Jack Switch
No. 6.
Single Pole,
Single Throw

2/9

Jack Switch
No. 7.
Single Pole,
Double Throw

3/6

Jack Switch
No. 8.
Double Pole,
Single Throw

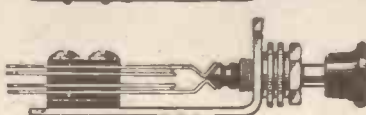
3/6

Jack Switch
No. 9.
Double Pole,
Double Throw

4/-

Two-Way Jack
Plug.

3/-



ASHLEY WIRELESS TELEPHONE COMPANY

69 Renshaw Street, Liverpool

Telephone: 4628 Royal. Telegrams: "Rotary, Liverpool,"

APPARATUS TESTED.

(Continued from page 544.)

offices in Bristol. The full address is British Dominions House, Tramways Centre, Bristol.

Over a period of some months a four-electrode valve was on the market, which gave very irregular performances in Unidyne circuits. Its characteristics were quite unsuitable for "H.T. - less" tasks. Fortunately we were able to draw our readers' attention to the fact, but even so a few wily dealers managed to convince their customers that it was a suitable valve.

However, to the best of our knowledge the above unsatisfactory component has been completely withdrawn, but in view of the fact that new and improved Unidyne circuits are being published, however, it is only fair to our readers to point out that special valves are made for Unidyne circuits. Other four electrodes sometimes give satisfactory re-



Showing the arrangement of the five pins in the base of the U.C.5 valve.

sults, but Unidyne constructors should give their strongest preference to the proper types, otherwise they run the risk of being disappointed.

Messrs. the Ludgate Radio Co., 56, Ludgate Hill, London, E.C.4, have sent us samples of their U.C.4 and U.C.5 valves. U.C. are the initials of "Unidyne Circuits," and the figure indicates the number of pins provided in each case. The U.C.4 which is, therefore, fitted with a four-pin base, can be plugged into standard valve holders, the fifth connection being made to a small screw terminal provided for that purpose. In the case of the U.C.5, five-pin valve holders are required, although, of course, five valve sockets mounted on the panel will answer the purpose just as well.

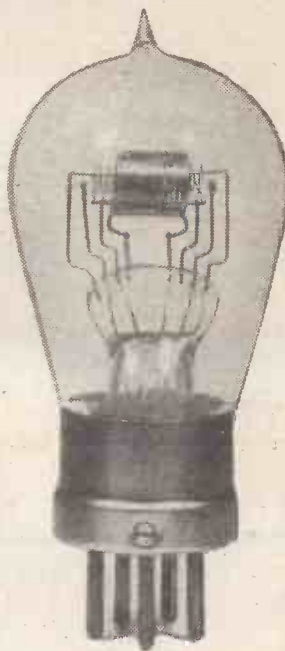
There is nothing unorthodox in the general design of the U.C. valves, and in appearance they are very similar to other valves of a similar nature. The U.C.4 and the U.C.5 have exactly identical characteristics and take 5 amps. at 3.5 to 4 volts.

They are exceedingly well made valves, and bear evidence of the highest mechanical and scientific craftsmanship. We have given all the samples sent us very careful tests, both in the standard and new Unidyne circuits. Results were in all cases excellent, more particularly in the new one-valve circuit, a noticeable improvement obtained in respect of reaction control. Of course, among other things, it was in order to obtain such that the new Unidynes were designed; but, nevertheless, the U.C.'s proved to be superior when compared with

other four electrodes used in a similar capacity.

As with other bright-emitter valves, it proved advantageous to employ a six-volt accumulator when more than one valve was in use, but in the single-valve circuit a four-volt accumulator was quite satisfactory.

Although we have not been able to give the U.C.'s a prolonged "life" test up to the time of writing, one of them has been left at full filament brightness for a period exceeding 100 hours. A close examination subsequent to this failed to reveal undue "pitting" so that we can assume that it should be good for a "life" approximating that of any ordinary H.T. valve.



The U.C.5 valve.

Something Entirely New in Radio Detector Crystals



Abolish your Crystal and cat's-whisker and adopt this trouble-free method of detection. Not a permanent detector, but a readily adjustable one, with a zinc ball making contact with a smooth plate coated with mineral compounds.

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

METAL PLATE

Kathoxyd
DETECTOR CRYSTAL

All enquiries welcomed by—
KATHOXYD, Ltd., 41, High Holborn, London, W.C.1. 'Phone, Chancery 8542.
If unobtainable locally, send 1/6 and Dealer's Name and Address, when the Crystal will be sent by return post.

Each sealed Kathoxyd carton contains one Detector Element and two Contacts, as follows:—

1 The "Crystal"—a Metal Plate.

This consists of a brass holder, in which is mounted the specially treated Kathoxyd metal plate, of perfectly smooth surface, sensitive all over, giving clear and loud results, together with splendid long-distance reception.



2 The "General-Purpose" Contact.

A zinc ball-ended rod, held in a spiral spring, suitable for short-distance reception, is merely dropped at any point on the Kathoxyd Plate.



3 The "Long-Distance" Contact.

Consists of a special pointed rod, held in a spring, for use in place of ordinary cat's-whisker. This is specially suitable for long-distance work.



The Kathoxyd Element and two Contacts are supplied in attractive cellophane-windowed carton at

RETAIL PRICE
1/6



**Hello!
Hello!!
Hello!!!**

Let it be known that a Progressive English firm now offer their

ALL BRITISH HEADPHONES

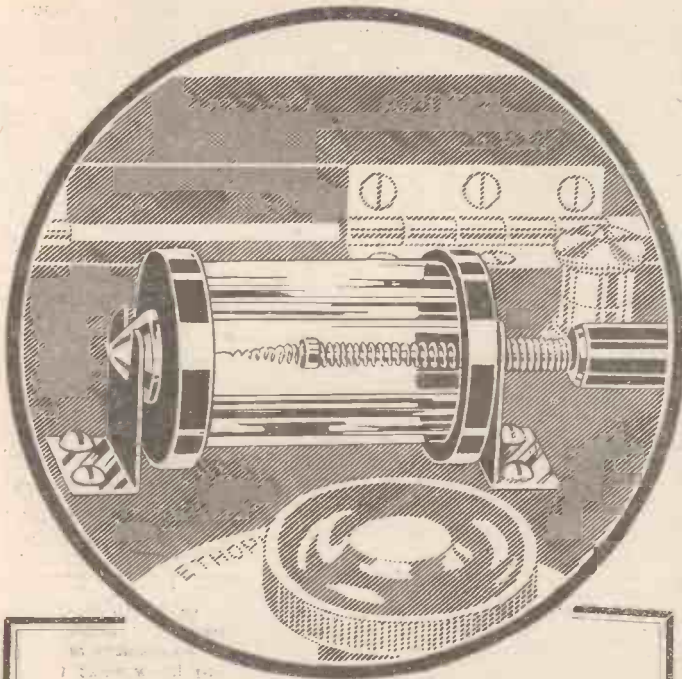
at prices and quality that will compete with any other 'Phones on the world's market, be they of British or foreign manufacture.

BONTONE ORIGINALS **11/6**
BONTONE LIGHTWEIGHTS **12/6**
Post Free.

We guarantee to forward by return of post. We guarantee to replace if 'phones do not give entire satisfaction and same are returned to us within 10 days of purchase undamaged.

SPECIFICATION.—Simple adjusted, comfortable and highly polished "Featherweight" Headbands. Specially designed permanent magnets. Perfectly matched coils, wound to a total resistance of 4,000 Ohms. Best quality 5 ft. 6 in. cords, serrated Swedish Iron Pole Pieces, beautifully polished Trolite Earcups. Remember, that behind this offer is the name of BONTONE, with a sale exceeding 100,000 'Phones. Better value than the above cannot be obtained at double their purchase price.

BONTONE 'PHONES may be obtained from all Radio Stores, or direct from the actual manufacturers.
B. D. & Co. (ED. A. BOYNTON), Admiralty and War Office Contractors.
167-173, GOSWELL ROAD, LONDON, E.C.1.



A really good Crystal Detector

THE sound design and neat appearance of the Burndept Crystal Detector commend it strongly to all home constructors.

It has three main features: the cat-whisker is controlled by a micrometer screw which enables fine adjustments to be made with ease; frequent re-setting is not required even when the contact between cat-whisker and crystal is very delicate; and the Detector is well protected from dust by a glass tube.

The sensitive synthetic crystal employed in this component gives loud and clear signals.

Like all other Burndept products, this Crystal Detector is fully guaranteed. The Burndept Range includes everything for radio reception from components to complete installations.

Latest Catalogue of Components sent free on request.

No. 215. Crystal Detector, complete with end clips, screws and drilling template, for panel mounting, 4/-.

No. 196. Spare Crystal, mounted in cup, and cat-whisker, in carton, 1/6.



HEAD OFFICE: Dept. P.W., Aldine House, Bedford Street, Strand, LONDON, W.C.2.
Branches and Agents everywhere.



The New Duplex Terminal

Patent applied for

WHILE it has not been found possible to improve the design of the T.C.C. Mansbridge Condenser, important alterations have been effected in the actual metal case. The new T.C.C. Mansbridge is fitted with Duplex terminals. A quick connection can now be made by means of the milled head. Soldering can still be carried out—a lug being fitted as shown.

One further improvement to be found in the use of a metal top instead of a pitch sealing compound. Thus the danger of heat affecting the Condenser during soldering is now completely abolished.

Once more T.C.C. demonstrates its ability to lead the way in condenser design—its 20 years' experience places it in a unique position for building *genuine* Mansbridge Condensers accurately and economically.

T.C.C. Mansbridge Condensers are now supplied in green metal cases in all values from .005 mfd. to 4 mfd. Your Dealer stocks them

Get the new T.C.C. Mansbridge



T.C.C. Mansbridge Condenser

RADIOTORIAL

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

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

The Editor desires to direct the attention of his readers to the fact that, as much of the information given in the columns of this paper is of a technical nature and concerns the most recent developments in the Radio world, some of the arrangements and specialities described may be the subject of Letters Patent, and the amateur and trader would be well advised to obtain permission of the patentees to use the patents before doing so.

PATENT ADVICE FOR READERS:

The Editor will be very pleased to recommend readers of POPULAR WIRELESS who have any wireless inventions to patent, or who desire advice on patent questions, to our patent agent. Letters dealing with patent questions, if sent to the Editor, will be forwarded to our own patent advisers, where every facility and help will be afforded to readers.

TECHNICAL QUERIES.

Letters should be addressed to :

Technical Query Dept.,
"Popular Wireless,"
The Fleetway House,
Farringdon Street,
London, E.C. 4.

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

Queries should be asked in the form of 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 point-to-point wiring is required an additional fee of 1/- must be enclosed.

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

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

No questions can be answered by 'phone.

Remittances should be in the form of Postal Orders.
NOTE: Unidyne queries will be answered free until further notice.

Questions and Answers

CRYSTAL SET FOR LOCAL STATION.

S. R. (London).—I desire to receive the local station at maximum signal strength on a crystal set. As I have an efficient aerial and earth I should like to know what type of circuit you would recommend. I do not wish to receive 5 X X on this set, as I have found by experience that it does not come in well in London on a crystal set.

As you only wish to receive 2 L O, we advise you to wind a coil with No. 22 or 24 bare tinned copper wire on a low-loss former. These formers are obtainable from any good wireless dealer and they consist of two rings of ebonite with three or four strips laid across and bolted to the rings.

The diameter of the one recommended is about 3½ in., although other sizes can be used at will.

(Continued on page 550.)

TROLITE

WAVY DESIGN SHEETS

ADD 100%
TO THE APPEARANCE OF ANY SET



Finger marks and scratches will not show on the beautifully etched wavy design finish of the new TROLITE PANELS.

Ready for immediate use without any special attention.

Highly polished—does not harbour dust.

Obtainable in beautiful shades and mottled effects.

Ask your dealer to show you Standard parts made from TROLITE.

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Telephone :
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Long Life Batteries which Improve Reception

The new GECOPHONE Super-capacity High-Tension Radio Batteries have made an instantaneous appeal—Wireless users have found them to be "just the thing" they have long been wanting.

Their outstanding merits:

LONG LIFE—4 to 5 times as long as other types.

LARGE CAPACITY,

SILENCE IN USE,

MINIMUM INTERNAL RESISTANCE are the outcome of much research and experiment, and make for an immense improvement in reception.

These Batteries are the latest development in BRITISH Battery manufacture and will undoubtedly become the Standard H.T. Batteries for Radio use.

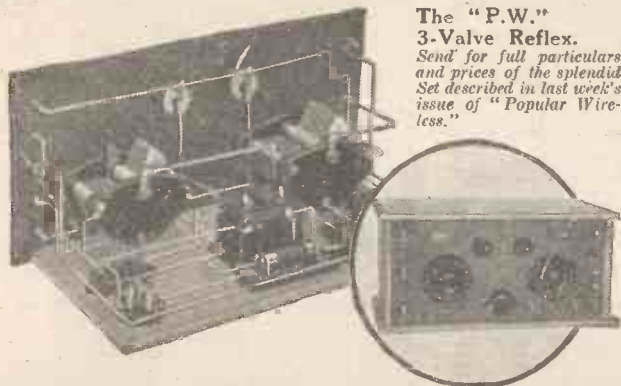


GECOPHONE

Super - Capacity High - Tension
RADIO BATTERIES
Prices from 7/6 to 27/6

Sold by Wireless and Electrical Dealers everywhere.

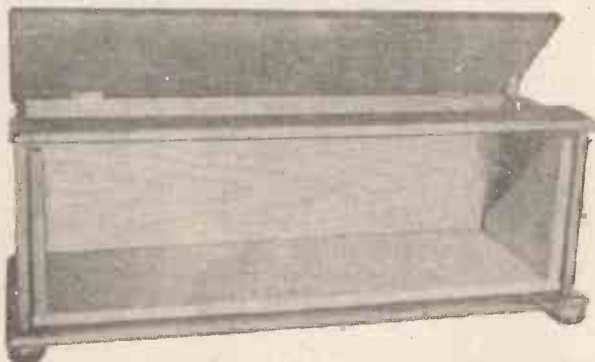
Manufacturers :—
The General Electric Co., Ltd., Magnet House, Kingsway, W.C.



The "P.W."
3-Valve Reflex.
Send for full particulars
and prices of the splendid
Set described in last week's
issue, of "Popular Wire-
less."

CAXTON 4-VALVE CABINET

Made for Editor of Wireless Magazine
for Set "As good as money can buy"
described in issue February, 1925.



Cash with Order. Fumed Oak ... £1 5 0
or Real Mahogany polished ... £1 14 0

With detachable recess fitted Base Board to mount 21 in. by 7 in. panel to slide out of Cabinet front.
Extra 10/- with two beaded front doors totally enclosing fitted panel.

Cabinet overall length 22½ ins. Width 8½ ins. Height 9 ins.

Polished with the new enamel that gives a glass hard surface that cannot be soiled or scratched.

SENT FREE.—Catalogue of standard Wireless Cabinets in various sizes and woods. Special Cabinets made to customer's orders.

PACKED AND DELIVERED FREE IN U.K.

CAXTON WOOD TURNERY CO., Market Harborough

Now you can buy a splendid 2-Valve Set
for 68/- a Crystal Set is not worth while

NO need to spend a lot of money on a ready-built receiver when you can build the splendid "Popular Wireless" 2-Valve Continental Set shown above for just over £3. This is a wonderful Set for long-distance reception. Now that valves have been reduced in price no one can say that a Valve Receiver is costly to build or expensive to run.

The splendid Set shown here is only one of many shown in the Pilot Chart (post free 3d.). Send for your copy to-day, and see what you save when you build your own set.

PETO-SCOTT CO., Ltd.,
77, CITY ROAD, LONDON, E.C.1.

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PLYMOUTH—4, Bank of England Place.
LIVERPOOL—4, Manchester St. P.S. 271

1 Peto-Scott Square Law	£	s.	d.
Condenser, '0005	8	0	
1 Peto-Scott Square Law			
Condenser, '0003	6	9	
2 Microstats	5	6	
1 Two-Coil Holder, Board			
Mounting	5	6	
2 Anti-capacity Valve			
Holders	2	6	
1 Board Mounting Coil			
Holder	1	6	
1 2-Meg. Leak and Fixed			
Condenser (Peto-Scott)	3	6	
1 '002 Fixed Condenser			
(Peto-Scott)	1	6	
10 Mark III. Terminals	1	8	
6 2 ft. Lengths 1/16 Bus			
Bar, Nuts, Screws, etc.	1	1	
1 Packet Panel Transfers			
Plain Panel "Red Tri-			
angle," 13" x 6" x 6 1/2"	5	0	
Panel drilled, extra	2	0	
Panel engraved, extra	2	0	
CABINET, 13" x 6 1/2" x			
6 1/2", with Baseboard,			
Mahogany	1	1	0
	£3	8	0

AH!—that's better

That is what your verdict
will be when you try the
CLEAR-SPEAKER
HEADPHONES



17/6
per pair

Try the CLEAR-SPEAKER Headphone and you will be amazed at the improvement in the sound reproduction. The result of years of scientific research, it is a great advance on anything yet produced at the price. With matched ear-pieces it is instantly adjustable without screws and it sits lightly on the head without disturbing the wearer's comfort in the slightest.

Sole Manufacturers and Patentees:
CLEAR HOOTERS Ltd.,
Hooterland,
Highgate Square,
BIRMINGHAM.

MURRAY VALVE HOLDER

Made of the finest low loss ebonite, is neat and well finished. Countersunk sockets provide ABSOLUTE SAFETY against burning out. Cap specially constructed to serve as drilling Template. Valve legs always make good contacts. Just the thing for experimenters as well as the amateur. Above all it's cheap, as well as good. Each one on card with instructions for simple fixing.

Export enquiries invited.

From all Dealers, or in case of difficulty write to the Patentees,

MURRAY, SON & CO.,

(Dept. 3), 387a, High Road, Tottenham, N.17.

Phone: TOTTENHAM 178.

Patent No.
15426/24.

Postage, one or two, 2d., three or more, post free



1/3

The Finest
Valve Holder
Ever Produced!

RADIOTORIAL QUESTIONS AND ANSWERS.

(Continued from page 548.)

If the former diameter is used ($3\frac{1}{2}$ in.) and 22-gauge tinned copper wire, then 40 turns approximately will be required. The turns should not touch when wound on the former, but if this is unavoidable, enamelled wire can be employed.

The idea of the set is that a variable condenser is dispensed with and the coil tapped with a small paper clip until maximum volume is obtained. When this is done, should there be more than five turns not in use, the surplus can be cut off.

The five extra turns should not, however, be cut off, as these may come in useful in the event of the local station raising its wave-length.

Of course, if enamelled wire is utilised, the wire must be cleaned at the point where it is desired to tap.

The ordinary straightforward crystal circuit is advised as this, when using a coil of the above description, will give the best results.

AERIAL TAPPING POINT.

H. R. D. (Coventry).—I propose to take my aerial lead-in at a distance approximately two-thirds from one end of the flat portion of the aerial but I have been told that this arrangement is not correct.

It is essential that in any ordinary type of aerial that the tapping should be taken either from the exact centre or from one end. The latter case refers to the point at which the aerial joins the insulators.

WORKING A LOUD SPEAKER ON ONE VALVE.

J. N. D. (Bournemouth).—I have been very interested in the article "Working a loud speaker on one valve," and propose making the set shown from the circuit in Fig. 1. Will you therefore give me the size of the coils and condensers, etc.? Can a zincite-bornite detector be employed in this circuit?

The size of the various coils are as follows: A.T.I. 35-50 (the latter will be necessary if a fairly small aerial is employed). Reaction coil 50-75: the exact size is best found by experiment, and it is advisable

to employ as small a coil as possible so that the reaction affects are quite smooth. The remaining coil in series with primary of the L.F. transformer consists of a 75-turn coil, and should be coupled to the centre coil by means of a three-way coil holder. The A.T.I. being placed in the other moving coil holder. A suitable variable condenser for the aerial circuit is a '0005 mid., and for tuning the coupling coil a '0003 mid. should be employed, to obtain maximum results

THE "P.W." TECHNICAL ASSISTANCE DEPT.

Personal Help for Amateurs in Trouble With Their Sets.

DURING the autumn months, and until further notice, readers of "Popular Wireless" may obtain personal interviews with the Queries Editor or one of his staff on Mondays, Wednesdays, and Fridays.

Just as a patient may talk over his troubles with a medical specialist, so it is now possible for readers to make an appointment with a "P.W." radio specialist and, on advance payment of a fee of 2/6, have a ten minutes' interview in order to discuss troubles verbally—a much more satisfactory and expeditious method than asking for assistance by post.

Also, in special cases, and on payment of a fee of 10/6, plus all expenses, a member of the "P.W." Queries Staff will visit the home of any reader of "P.W." within a radius of twenty miles of London, and will give advice on wireless sets already installed, or on the installation of receivers, aeriols, etc., etc. Hours of visit can be obtained on written application to the Queries Editor.

Readers also desirous of having their sets completely overhauled, tested, and certificated by "P.W." according to merit, may on application, and by forwarding a fee of 10/6, send their receivers to the "P.W." Testing Room. In the latter case sets must be brought by readers and taken away again after test. Sets cannot be received by post.

All queries in connection with this new "P.W." Technical Assistance Dept. should be addressed to the Queries Editor, "Popular Wireless," Fleetway House, Farringdon Street, London, E.C.4. Appointments and testing of readers' sets will be dealt with in strict rotation.

these should both be fitted with verniers. The condenser across the secondary of the L.F. transformer being '0002 mfd. In this circuit it will be possible to employ most of the super-sensitive crystals, owing to H.T. not being directly applied to the circuit.

A zincite-bornite detector can be employed if desired, and will tend to be less effected by mechanical vibrations, etc., than the more common cat's-whisker type.

THE CHOICE OF VALVES.

O. L. R. (Preston).—I have just finished the construction of the "P.W." long-range loud-speaker set described in "P.W." Nos. 146 and 147, but before testing same I should like to know what are suitable combinations of valves for this set?

As you did not state whether you desired dull- or bright-emitters, we are giving lists of both below:

Bright Emitters (with 6 volts L.T.)—
H.F.: Cossor red top or red ring Mullard.
Det.: Cossor plain top or Marconi or Osram R.
L.F.: Marconi or Osram R. 5V. Mullard green ring, Cossor P.1, or Ediswan P.V.3.
L.F.2: Marconi or Osram D.E.5, B.T.H. B.4, or Mullard D.F. A.1.

Bright Emitters (with 4 volts L.T.)—
H.F.: Cossor red top (P.2) or red ring Mullard.
Det.: Mullard O.R.A., Ediswan A.R., Marconi or Osram R., or Mullard S.5.
L.F.1: Cossor P.1, Marconi or Osram L.S. 3, Mullard green ring, or Ediswan P.V.3.
L.F.2: Mullard P.M.4, Mullard D.F. A.2, Marconi or Osram D.E.4, or Pyramid Radion.

Dull Emitters (with 4 volts)—
H.F.: Marconi or Osram D.E.3, B.T.H. B.5, or Ediswan A.R. '06 (red).
Det.: Marconi or Osram D.E.3 or B.T.H. B.5.
L.F.1: Marconi or Osram D.E.3, Radion D.E. '06, or B.T.H. B.6.
L.F.1: Mullard P.M. 4, Marconi or Osram D.F. 4, or Mullard D.F.A.O.

Dull Emitters (with 2 volts L.T.)—
H.F.: A.R.D.E. Ediswan (red), B.T.H. B.3, or Mullard D.3.
Det.: Dextraudion, A.R.D.E. Ediswan, or Radion D.E. '34.
L.F.1: Cossor W.3, Ediswan A.R.D.E. (green line), Mullard D.3 (I.F.), Marconi or Osram D.E.6, or Ediswan P.V.6 D.E.
L.F.2: Marconi or Osram D.E.6 or Ediswan P.V.6 D.E.

It must be remembered that when using the dull-emitter valves filament rheostats having suitable resistances (usually about 30 ohms) are necessary.

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Hornless Loud Speaker
BRITISH MADE. Size 6" High, 5" Diam.

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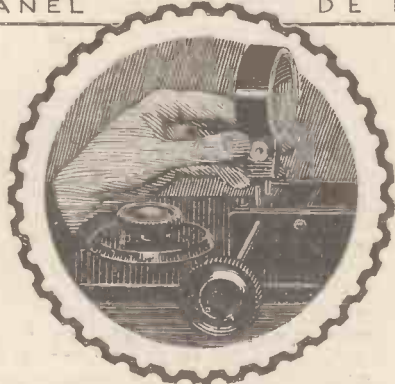
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Radion is available in 27 different sizes in black and mahogany. Radion can also be supplied in any special size. Black 1d. per square inch, mahogany 1 1/2d. per square inch.

RADION

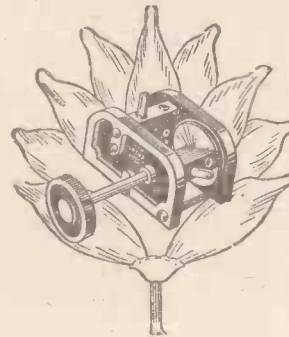
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Moving Block **CANNOT FALL**
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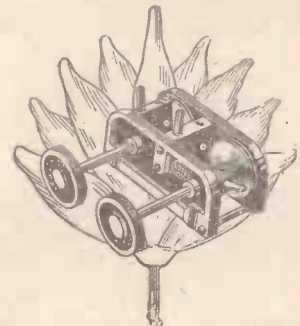
Two-way - 7/-

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With six-inch handle for inside mounting.

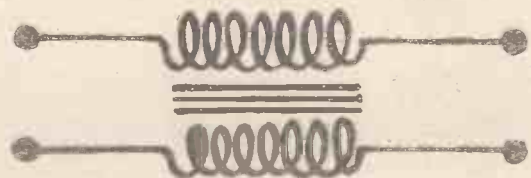
Two-way 1/- extra.
Three-way 2/- extra.

THE "LOTUS" cut-gear Vernier Coil-Holders are fitted with Vernier movement actuated by three sets of encased precision-cut gears representing a reduction of 8 to 1.



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a "RENOWN"

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if you require MAXIMUM EFFICIENCY

YOU CAN TEST FOR YOURSELF

If you do not find it MORE EFFICIENT in every respect than ANY OTHER, return it to us within 14 days, and we will refund Cash immediately.
All Ratios. Price 8/4. Post free.

We REPAIR ANY MAKE of L.F. Intervalve Transformer, efficiency equal to new, for 5/-, post free

Write for descriptive literature

**TRANSFORMER REPAIR COMPANY
PORTSMOUTH**

"RECTALLOY."

(Continued from page 514.)

would be sufficient. But it is always a good thing to err on the generous side with small power transformers, as this prevents heating effects and other losses.

Transformer Details.

Using a bobbin having an iron space of about one square inch cross section, and the bobbin about five inches in length, the primary winding was put on by hand. This consisted of 5,000 turns of No. 36 enamelled wire, tapped at the centre, so that when used on a 200—250 volt circuit, the whole 5,000 turns could be used, and on a 100—110 volt circuit, the 2,500 turns could be used. If it had been intended to work only on a 110-volt circuit, the 2,500 turns alone need have been used.

It was found that with this transformer the heating effect was negligible, and the current consumption from the mains (when no current was being drawn from the low-tension winding) was also negligible. The iron core consisted of iron wires threaded through and turned over, after the usual manner with a "hedgehog" transformer.

The secondary or low tension winding consisted of about 800 turns of No. 26 enamelled wire, wound upon the primary, suitable insulation being of course provided in the usual way between every two or three layers.

The low-tension winding was in two parts, each of about 400 turns, with a tapping from the centre, so that for full-wave

rectification, using two Rectalloy electrodes, there were 400 turns each way.

This was found to give the necessary current through the rectifier and the battery on closed circuit.

For trickle charging it must be remembered it is only necessary to have a charging current of about 0.1 or 0.2 amps, but with the transformer just described, it was possible, by the addition of a few more turns, to obtain a charging current of 0.5 amps, giving a charge to the battery per day of about 10 ampere hours—far more than was ever taken out of it in a single evening.

The only other components were the connector to the electric mains, and the double-pole double-throw switch for throwing the battery on to the charger or on to the set. As a matter of fact, it was found that if the battery was connected to the set without being disconnected from the charger, it did not make any humming noise.

A Useful Rectifier.

Owing to the small voltage difference between the transformer secondary and the battery (about 10 volts against 6), the current through the battery diminishes as the latter becomes more fully charged and its voltage rises. So that the charging current automatically approximates to what is sometimes called a "taper" charge, that is, it becomes much less as the battery approaches full charge. This is a great advantage.

If a 2-volt cell is placed in circuit instead of a 6-volt cell, the charging current is decidedly larger, but this can easily be

compensated by inserting (when a 2-volt cell is on charge) a resistance which I found to be of the order of about 8 to 10 ohms.

This new rectifier seems to me to be the best thing ever discovered in the way of rectifiers, as it is absolutely automatic and everlasting, or practically so, it costs nothing for upkeep, does not heat up, is absolutely silent, and only requires the occasional addition of a little distilled water, say once every month. Moreover, if the supply current should fail, or anything else should go wrong, the battery cannot discharge itself backwards through the rectifier (as is the case with many kinds of mechanical rectifier), for the Rectalloy electrodes refuse to allow the smallest current to pass the wrong way.

The reader will agree that this discovery represents the reduction of the battery charging problem to its very simplest terms. It is so simple that I am able to forget about the charger altogether; it is equivalent to "working direct off the mains."

NEXT WEEK.

**HOW TO MAKE
A Two-Valve 1926
Unidyne Set.**

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THE H.T. BATTERY THAT WON'T LET YOU DOWN

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9 volts, grid bias, tap every 1½ volts, 1/9 each	60 volts, tap every 3 volts, 7/6 each
15 volts, tap every 3 volts 2/3 each	90 volts, tap every 6 volts, 11/6 each
36 volts, tap every 3 volts, 5/- each	Wander-plugs, 6d. per pair.

THE BETTERTON H.T. FOR WIRELESS.

All batteries guaranteed to show full voltage.

L.F. TRANSFORMERS 10/- each, carrying one year's guarantee. Perfect amplification obtained from these excellent transformers. Hundreds of users thoroughly satisfied. Postage and packing free on all goods and full responsibility for damage in transit accepted.

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∴ We shall be pleased to quote you for any other components ∴

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THIS IS THE BEST BOOK OBTAINABLE, AND ENABLES ANYONE WITHOUT PREVIOUS EXPERIENCE TO MAKE WIRELESS SETS WHICH ARE UNEQUALLED IN PRICE, QUALITY, OR EFFICIENCY.

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NO SOLDERING, NO SPECIAL TOOLS, 176 PAGES
NO TROUBLE. Simply follow instructions PRICE
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Minimum D.E. current 0.15 amps. when repaired.

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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 INTERFERENCE PROBLEM.

We have received from Capt. Ian Fraser, C.B.E., M.P., copies of the following letters concerning the question of interference with broadcasting.

Dear Viscount Wolmer,—As promised, I am writing you about one or two points which I raised in the House on the Post Office Debate.

My submission is that the time has come when a real effort should be made by the Post Office to give the Broadcasting Service a band of wave-lengths free entirely from jamming. I am aware that you cannot, at present, free it from jamming due to harmonics of powerful arc stations, but bad as this sometimes is it does not by any means give the most trouble; the direction-finding stations and the shore and ship traffic on 450 metres interfere, according to my own observation and information, very seriously with broadcasting. I submit that, at least, the time has come to call a halt in any increase in numbers of stations working on this wave-length, and that at the same time efforts should be made as quickly as possible to move these stations off this wave-length on to some other.

This may cost money; indeed, even a full technical inquiry such as I asked for in a recent question in the House might cost money, but I have suggested that the Postmaster-General is exceedingly lucky for he need not use his own money for the purpose, but can use the money belonging to the listeners, which he has accumulated as the result of his share of their licence fees.

With the limited knowledge which any individual outside the department can have, I do not submit these observations without being well aware that there may be circumstances which render my suggestions extremely difficult of fulfilment. My plea is that, at least, the Post Office should accede to the demand to make a technical inquiry into the matter with a view to ascertaining precisely what trouble and expense would be caused were the B.B.C. given an adequate band, free from interference.

Shipping on 600 metres also interferes with broadcasting, but I do not suggest that anything immediate can be done about it, for I am well aware of the international complications and the vast amount of traffic on this wave-length. It is a fact, however, that ships and shore stations have to spread so far above and below 600 metres and have to use the alternative wave-length of 450 metres so frequently that there is evidence that sooner or later, and probably sooner, something will have to be done to avoid confusion in this sphere, purely in their own interest, apart from that of broadcasting. I suggest that it should be considered as to whether or not regulations could be made which would have the effect of prohibiting the installation of new apparatus on ships which emits badly damped waves.

Yours sincerely,
(Sgd.) IAN FRASER.

To Viscount Wolmer, M.P.,
Assistant Postmaster-General,
St. John's Lodge, N.W. 1.

General Post Office,
London, E.C. 1.

My Dear Fraser,—With reference to your letter of July 27th to Viscount Wolmer, I am glad to have the opportunity of explaining to you what we have already done to ensure that the broadcast programmes shall, as far as possible, be immune from interference by other British services.

So far as the harmonics of Post Office stations are concerned, we have so far succeeded in suppressing the unwanted emissions at the Leafield wireless station that London broadcast programmes can now be received satisfactorily on a two-valve set situated immediately underneath the Leafield aerial. We have also fitted similar anti-harmonic appliances at Northolt.

The 450-metre wave has not for some months past been used for direction finding purposes in this country, as all such work has, with the co-operation of the Admiralty, been transferred to the 600-metre and 800-metre waves. The alteration suggested in your letter has thus been carried out; and, following on this alteration, the 440-460-metre band, which was originally excluded from the broadcasting band, has recently been placed at the disposal of the British Broadcasting Company.

There is, I can assure you, no intention of allotting waves in the 300-500-metre band in this country, for any new services other than broadcasting; and, as you are aware, experimenters who are entitled to use the 440-metre wave at certain times are expressly forbidden to use it during broadcasting hours.

(Continued on page 554.)

25/-

25/-



A careful experimenters' opinion

WE find that the best way to advertise the M-L Transformer is the easiest: we glance through our file of letters from people who have bought the transformers, and pick out one at random.

The one we have lighted on this time is from an experienced and painstaking English experimenter. He says:—

"After a large number of comparative tests with other makes, I have found the M-L Transformer to be entirely satisfactory. I find that it is absolutely silent in working, with practically no distortion, and that the amplification is quite high enough for all ordinary purposes. . . . There is no Transformer on the market that distorts less."

Wireless experimenters will find that their own experience will be the same as this.

If you cannot get the M-L L.F. Transformer from your Wireless Dealer, write and let us know.

The 1:6 ratio is used for amplification after a crystal rectifier.

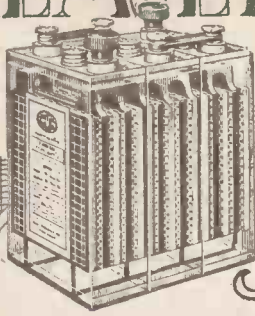
The 1:4 ratio is used for single stage L-F amplification.

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Money back guarantee that each and all Panels are free from surface leakage, Meggar 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/-; 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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Don't say "d.c.c." Always ask for MARS D.C.C. Use it wherever D.C.C. is specified and get 50% higher efficiency.

SEE THIS LABEL ON EVERY BOBBIN



CORRESPONDENCE.

(Continued from page 553.)

The question of the use of 300 and 450-metre waves by shipping and kindred questions will no doubt be considered at the International Radiotelegraphic Conference at Washington next year, and can, of course, only be regulated by International Agreement.

Yours sincerely,
(Sgd.) W. MITCHELL-THOMSON.
Captain Ian Fraser, C.B.E., M.P.

MR. LE QUEUX AND THE FELLOWSHIP OF THE RADIO ASSOCIATION.

The Editor, POPULAR WIRELESS.
Dear Sir,—Owing to my absence abroad I have only just seen your reference to the Examinations for Fellowship (F.R.A.) and Associateship (A.Rad.A.) of the Radio Association.

Your view that the examinations are too difficult is one that I cannot share. It is a fact that the questions involve a good knowledge of mathematics and science, but that is inevitable in wireless, the whole of which is the result of scientific work conducted by the great pioneers such as Hertz, Maxwell, Lodge, Fleming, Marconi and others.

The standard of Fellowship is naturally a high one, but the Associateship is considerably less difficult.

Radio engineers and others whose record of practical achievement is a good one may be exempted from part or the whole of the examinations. The Fellowship of the Radio Association is a distinction which any radio engineer may be proud to have, and I am confident that promotion in wireless will increasingly depend on qualification and recognition by the Radio Association.

Keen men with an eye to advancement should get into touch with the Secretary of the Association, 24, Queen Victoria Street, E.C.4, who will be glad to advise each case on its merits.

Yours faithfully,

WILLIAM LE QUEUX.

Hotel Kastell van Antwerpen, Utrecht, Holland.
[Mr. Le Queux seems to have forgotten that the Radio Association is essentially for amateurs and that the holding of exams., etc., for radio engineers is no part of its business. We cannot agree that the Fellowship of the Radio Association is a "distinction which any radio engineer may be proud to have," and until the examination is made more sensible and the Radio Association realise its own limitations, the F.R.A. will not carry any weight at all.—The Editor.]

THE ULTRA-AUDION.

The Editor, POPULAR WIRELESS.

Dear Sir,—I have made the American Ultra-Audion single-valve set, and I am writing in its praise. It is the best single-valve set I have ever tried. I have had two French stations and most of B.B.C. stations with a 100 coil in the antenna. My local station comes in very well on the loud-speaker. I get Daventry, using a 300 coil, as loud as Manchester, and I am now making a four-valve set, using the Ultra-Audion as detector.

Wishing your paper every success.

I remain,

S. ROWLAND.

183, Falkner Street,
Liverpool.

Re "CHITOS CIRCUIT"

The Editor, POPULAR WIRELESS.

Dear Sir,—I made the above circuit up when it first appeared in the Correspondence column of "P.W." and have had very good results from it. You stated a few weeks ago that it was impossible to add L.F. valves without separate H.T. battery. I should like to say that I found no difficulty in adding one valve, which I think is necessary for real loud speaker reception, but a third valve sets up a considerable amount of howling. I can get more stations with the two-valve combination, and on three occasions have had American broadcasting in the early hours of the morning, when I have taken the trouble to sit up for them. I find the 100 coil recommended too large for 2 L.O. and use 90 aerial and 60 reaction. For Daventry and Radio-Paris 300 and 200 reaction are suitable.

Have any other readers found difficulty with the third valve?

Yours faithfully,

H. J. PRENTIS.

161, Kyverdale Road,
Stamford Hill, N.16.

A SOLDERING TIP.

The Editor, POPULAR WIRELESS.

Dear Sir.—The following tip to remove unwanted flux splutterings may be of interest to some of your readers. A few days ago I made a Reinartz receiver, and although I was careful during soldering, putting blotting-paper over all parts to be soldered, I noticed the panel was very greasy when finished. I accordingly got a drop of benzol in a saucer and proceeded with a rag to remove the flux. I don't know whether this method has been used before or not. Wishing POPULAR WIRELESS every success.

Yours faithfully,

F. W. SHARP.

Barton-under-Needwood,
Burton-on-Trent.

FOREIGN RADIO NEWS.

(Continued from page 517.)

this experiment in morning broadcasting. Listeners picking up the station within the next few weeks are requested to communicate their observations on its reception to Mr. Franz Anderle, Rudengasse 11, Vienna, Austria.

Swiss Radio Developments.

The Munchenbuchsee station in Switzerland, the construction of which was recently announced in these notes, will open on November 1 with a wave-length which has not yet been definitely fixed, but which will range between 250 and 300 metres.

The project for a new broadcasting station at Berne is held up at the moment for want of money. The sum required is £40,000, and of this, £36,000 has been raised by public subscription which, however, seems to have dried up temporarily. It is hoped that the city authorities will step in and fill the breach.

The Belgian Radio-Drama Competition.

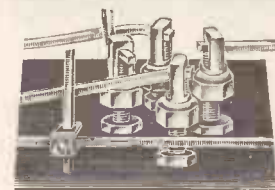
The competition held by a Belgian radio paper offering a prize of 500 francs for the best original dramatic work submitted specially written for broadcasting has resulted in a fiasco.

Only three works were submitted, and none of them met with the approval of the judges. The competition remains open.

Undismayed by this failure, "Radio-Belgique" is offering a further prize for the best poem for broadcasting. Belgian poets, however, are fighting shy of the contest, as they claim that the jury's requirements are altogether too difficult to meet.

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Send Stamped Addressed Envelope for Samples.

Enable you to connect up any circuit with lightning rapidity.

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7 x 5 x 4 1/2	2/-	9 x 7 x 5	4/-
7 x 6 x 4 1/2	2/6	10 x 7 x 5	4/6
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BRETWOOD LEAK. 3/- MICROSTAT. 2/9

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K. RAYMOND

TECHNICAL NOTES

(Continued from page 522.)

which have been found, by previous experiment and observation, to give about the proper effect in the listener's set.

I have received an immense number of letters from listeners in all parts of the country who were kind enough to acknowledge and refer to the little introductory speech I made. POPULAR WIRELESS will no doubt deal with these letters in due course, but, as it is impossible for me to attempt to reply to them individually, I hope all my correspondents will accept this acknowledgment.

* * *

Dull Emitter Power Valves.

Some readers have inquired from time to time as to whether the dull-emitter power valves are equal to the ordinary bright power valves, or whether dull emitters should be confined to the ordinary detector and amplifier valves. The answer is that there is no reason whatever why a power valve should not also be made on the dull filament principle and be quite equal to a bright emitter.

In fact, the advantage of the dull-emitter filament is more pronounced in the case of a power valve than in the case of an ordinary valve, since the output is so much greater, and therefore the filament heating current correspondingly larger. A bright-emitter power valve may consume 1 ampere of heating current, at 6 volts, whereas a dull emitter may consume no more than 0.4 or 0.5 at 2 volts. Thus the saving is more important in the case of power valves than with ordinary valves.

* * *

Shrouded Transformers.

A correspondent writes to ask whether the shrouded or totally encased transformer has any technical advantage, other than the fact that the leads and so on are covered and protected from damage. The enclosed transformer has several advantages besides the one referred to. In the first place, the damp is kept out of it, and the effect of moisture upon the performance of a low-frequency transformer is much greater than many amateurs seem to realise. A really first-class transformer of the shrouded type has the actual bobbin, with magnetic core complete, embedded and hermetically sealed in a special compound which keeps out dust and moisture, the completed bobbin having been thoroughly dried out before sealing.

A second important advantage is that interaction between adjacent transformers is very largely prevented, although this advantage is not peculiar to shrouded transformers. Any properly designed transformer, even if not shrouded, should be free from interaction effects. Where interaction takes place, it is usually due to "skipping" the iron in the magnetic circuit, or to allowing only one return path for the flux instead of two in parallel. But, nevertheless, there does seem to be a little extra advantage in the shrouded transformer in this respect.

Many experimenters find that two properly shrouded transformers may be

(Continued on page 556.)

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BOWYER LOWE.—H.F. Transformers, 7/-; Anti-Pong V.H., 3/-; Var. Condensers, with V., .0003, 15/-; .0003, 20/-; Low Loss Coil Former, 5/-.

BURN DEPT.—Rheostats, 5/-; Dual, 7/6; Detector, 4/-; L.F. 24/-; Potentiometer, 7/6; Anti-Phonic, 5/-; Coils from 3/-. **CRYSTALS.**—Neutron, 1/6; Litron, 1/6; Uranium, 1/3; Shaw's Genuine Hertzite (Sealed), 1/-; Silverex, 2/6.

COLLINSONS.—Selector Low Loss Gears, Variable .0003, 20/-; .0005, 21/-; Vernier, 2/6; Neurodyne, 3/6; **DUBILLER.**—0001 to .0005, each 2/6; .001 to .006, 3/- each; Grid Leaks, 2/8 each; Type 610, fixed, 3/-; 3/6, 4/-; 4/6, Anode, 70, 80, 100, 000, each 5/6 on stand. Mansbridge Variometer, 30/0; 1.500, 1.216; **DOEWOOD.**—001 to .006, 3/- each; .001, 3/6; .0003 (with grid leak coil), 2/6; **EUREKA.**—Conc. Sub. Grand, 25/-; 2nd Stage, 21/-; Baby Grand, 15/-; Gravity Detector, 6/6; **ENERGO H.F.—B.B.C.**, 3/11; Daventry 4/6; **EDISON-BELL PARTS.**—Variometer for B.B.C. or 5 X X, 15/6; Old Model, 10/-; Fixed Condenser, .001, .0001 to .0005, each 1/3; .002 to .006, each 2/-; .0003, Grid Leak, 2/6; Shaped Plug, 2 for 2/-; **Low Speaker, 42/-; Dulcevox, 42/-; GOSWELL QUALITY RADIO COILS.** mounted 25/1; 35/1; 50/1; 75/1; 100/1; 150/1; 3/-; 175/1; 200/1; 300/1; 250/1; 300/1; 1/3; **Legless, 1/3; Sub. Panel, 1/3; 4 Valve Sockets, 1/3; Coil Stands, Panel—2 way, 3/-; 3 way, 5/-; Cam operated—2 way, 5/-; 3 way, 12/6; **GAMBELL.—L.F.** 1st or 2nd Stage, 27/6 each; 2-way; Anti-Cup Filter, 7/-; 4-way, 9/6; Neurodyne Condenser, 5/6; Coils all sizes; **H.T.C. VALVE HOLDERS.**—4" or "B", 1/2; C, 1/6; **H.T. BATTERIES.**—B.B.C., 36/-; 6/3; 60v., 8/6; Extra Large B.B.C., 10/6; Ever-ready, 96v., 15/6; 108v., 20/-; 60v., Best made, 3/11; 4.5, 5/6; 6/-; doz., 5/6; **HEADPHONES, BRITISH 4,000 OHMS.**—B.T.L., Brown, Brandes, 20/-; Pair; Sterling, English, Ericsson, 22/6 pair; Boverman's Super Phones, 12/6 pair; **HEADPHONES, GENUINE 4,000 OHMS.—Dr. Neuberger, Adjustable, 12/11; Telefunken A4, Justable, 16/8; N and K Stamped on back, 14/11; Brunet, new model, 14/11; **IGRANIG.**—L.F., 1st, Stage, 21/-; C, 2nd Stage, 18/6; Cila, Ultrinic, 9/-; Unitone, Major, 9/-; Minor, 7/6; Honeycomb, 25, 35, 43/6; 50, 4/6; 75, 4/10; 100, 6/2; 150, 7/-; 200, 8/-; 250, 9/6; 300, 9/-; 400, 10/-; 500, 10/3; 600, 11/-; 750, 12/6; 1,250, 15/6; 1,500, 17/6; Rheostat, 3/6; H.R. Variometer, 12/12; **PHONETIC POTENTIOMETER, 5/6; 5/8; 8/6; Variable Grid Leak, 8/6; New Square Law Varia. Condensers, 001, 27/8; .0005, 24/-; .0003, 21/-; "KAY RAY" DETECTORS.**—Enclosed nickel fittings, trigger movement, 2/6; Permanent, 2/-; Do, one-hole fixing, 2/6.****

LOUD SPEAKERS Sterling "Baby," 50/-; 55/-; Dinkle, 30/-; Pii max, 155/-; Amplions Dragon Fly, 25/-; Junior 27/8; A.R. 111, 52/-; A.R. 114, 65/-; A.R. 19, 105/-; Browns, all models, Ultra, 27/8; C.A.V., 27/6, 30/-. And all new models makers' prices. **LISSEN PARTS.**—Anode or Variable Grid Leak, 2/6 ea; L.F. or H.F. Choke, 10/-; Switches, D.P.D.T., 5 point reversing, 4/- each; 2-way series, 25, 2/6 each; Minor, 3/8; Major, 7/8; Universal, 10/8; Potentiometer or Wire Rheostat, 4/- each; Neurodyne Condenser, 4/8; Type 23, 4/8 each; 50, 5/-; 100, 7/5; 5/8 each; 100, 6/8; 150, 7/-; 200, 8/5; Lissen X 50, 6/-; 60, 6/4; 75, 6/5; 250, 9/9; Toner, 22/6; Mark III, Ver., 5/-; T.A.T., MARCHIONI, Potentiometer 11/-; Ideal L.F. Transformers, 6-1, 4-1, 2-7-1, 35/- each; Automatic Detector, 8/6; **MICHEL, B.A.S.**—Neurodyne, 2/6; Rheostat, 5/8; D.E., 6/6; Dual, 7/6; Triple, 22/8; Potentiometer, 7/6; H.F. Transformers, 10/- each; Superonic A7, 12/6; Fixed Condensers, .001 to .001, 1/2 each; .002 to .01, 2/3 each; Grid Leaks, 2/-; Anode, 70, 80, 100, 000 ohms, 2/-; L.F.T., 2/6; **MARCONI NUM BURNE JONES.**—H.F. Transformers, 7/- each; Coil Holders, 2/- way, 9/6; 3-way, 12/6; Valve Holders, 2/6; Vibe, 10/6; T.A.T. Supp. Coil, 8/6; Neut. Con. 4/6. All parts stocked. **POLAR RADIO COMM. CO.**—R.C.R. Unit, 15/-; Condensers, Micro, 5/6; Neut. Con., 4/6; Vibe, .001, .0005, .0003, 10/6 each; Coil Stands, Cam, V., 2-way, 6/-; 3-way, 9/6; **LOTUS (GEARED).**—2-way, 7/-; 3-way, 10/6; **TRAD (RADIOS INSTRUMENTS).**—L.F. in scaled box, 25/-; Anode Choke, 10/-; Permanent Detectors, 6/-; 7/6; New Var. A.C. Condensers and V., .0003, 22/8; .0005, 24/-; **REFLEX RADIO COILS** (Made under Burnsted License)—35, 5d.; 50, 8d.; 75, 1/1; 100, 12s.; 150, 1/8; 200, 2/9; 250, 2/8; Post 2d. each. **STERLING PARTS**—00025 Square Law and V., 23/6; .0005, 25/6; Non Pong Valve Holder, 18/-; **T.O.V. BRIDGE.**—2 Mid. 4/8; 1 Mid. 3/10; 25, 3/-; **SUCCESS (BEARD & FITCH).**—L.F., all black Super, 21/-; Choke, 10/6; Var. Condensers, No Loss. List Prices. **SHIPTON.**—Rheostats, 7, 30, 60 ohms, 3/- each; Potentiometer, 600 ohms, 4/6; **TRANSFORMERS (L.F.)**—Ferradi, 17/8; Fre. 32/8; Silvertone, 21/-; Ormond, 14/-; Royal, 20/-; Lissen T1, 30/-; T2, 25/-; T3, 16/6; Powquip, 14/8; Forno Shrouded, 16/8; Ormond Latest Shrouded Model, 18/6; Croix, 9/6; Wates Supra, 12/6; Brunet Shrouded, 5-1, 3-1, 13/6 ea; **TRIPLEX, KINGS & WRIGHT.**—Variable Condensers, .0003, 8/9; .0005, 10/6 (Vernier 2/6 extra); Switches, Knob, 2-way, 4/-; 4-way, 6/-; 6-way, 8/-; Lever, 5/-; 7, 6, 10/- Nickel, 6d. extra. Not responsible for money not reg. itered. Please WRITE plainly.

GRAN-COILS. Made under patent Dickinson Electric, No. 206233, etc. Mounted plug-in, air-spaced coils. 25, 1/6; 35, 1/6; 50, 1/8; 75, 1/11; 100, 2/3; 150, 2/6; 200, 2/11; 250, 3/3; 300, 3/6; 400, 3/9; Don't forget these are mounted. We will give you price for complete set. **WATMEL.**—Variable Grid Leak, 2/6; Anode, 3/6; Green Knob, 3/6; Fixed Condensers, 2/8, 3/6 (all sizes). **WOODHALL PARTS.**—L.F. Transformer, 23/6; Vernier Rheostat, 7 ohms, 2/8; 30, 3/8; 2-way, 10/8. "WONDER" AERIAL.—Multi 49 Strand, Phosphor Bronze, Indoor, Outdoor, Frame Aerial, 108, 4 B.3. SUNDRIES.—**COIL STANDS.**—2 way Standard, 2/9; Cam, V., 4/6; Geared, 5/6; 6/-; 3-way Standard, 6/-; Cam, 6/6; Geared, 7/11; **COIL PIGS (Ebonite).**—Fitted Fibre, 1/8 pair. Shaped, Brass sides 1/8 pair. Standard, 1/8 pair. Panel Mtg., 1/6 pair. **ACCUMULATORS.**—2, 4, 6, 8, 10, 12, 20 amp., 9/6; 10/6; 4 v. 40 amp., 15/11; 17/6; 4 v. 60 amp., 22/6, 23/11; 4 v. 80 amp., 25/-, 25/11; 6 v. 60 amp., 30/-, 33/-; 6 v. 80 amp., 36/-, 38/-; 6 v. 100 amp., 45/-; Radiocell, Rotax, etc., etc. **ATHOL VALVE HOLDERS.—1/3; Acromic, 1/8; 4 B.3. SUNDRIES.**—Wave trap former, 3/6; **TERMINALS.—Complete, per dozen.—Ormond, W.O. and Pillar, standard size, 2/-; Geared do, 1/3; Nickel, 2d. dozen extra; Phone, 1/1. Screw Pins or Spades, 1/-; Do, Red or Black, 1/8. Nickelled Tags, 6d. Brass Tags (3 dozen), 6d. Flush Panel, 8d. 20, 1. 5 doz. 5/6. **RHEOSTATS.**—Raymond, 1/6. Extra quality with Dial, 2/6. Peerless, 6 or 30 ohms, 2/6 each; 6 or 30 ohms, 2/6 each; chd. former, 2/- each; Ormond, 2/-; Ormond New Model, 2/6; **AERIAL WIRE** (100 feet).—Heavy, 7/22; 2/6; Ribbon (Tape), 2/6; **FLEX (Twin)**, etc. (any length cut).—Red and Black, 12 yds., 2/-; Miniature Silk, 12 yds., 1/6; Rubber Lead-in, 10 yds., 1/8; Extra heavy, 4/-; 8/6; Insulating Hooks, 1/8 doz. Empire Tape, 1/11; 12 yds., 1/-; **TOOLS.**—Soldering Irons, 1/6; Set of high-class drills, 1/6; 4 Taps, 0, 1, 4, 8, 14, 2/8 set. Cutting Pliers, 1/8. **PHONE CORDS,** etc.—6 ft. Rubber Insulated, 1/11; 7 ft. do, 2/6; Low Speaker, do, 12/11; 25, 20, 15, 5/6. Beautifully made and finished. **COIL WINDERS (Money-comb).**—Westminster, 4/-; "Kay Ray" well made, 45 spokes, handle cannot be equalled, 2/-; **EBONITE** (fine quality).—Cut to size, 1d. per square inch, 3/16; 1d. for 1 in. Post extra. **VARIOMETERS.**—8 tan dials; 2/11; Ebonite Former; Ball Rotor, 4/6. Inside wound (similar to Edison Bell, etc.), 6/11. Complete with Knob and Dial. **PANEL SWITCHES.**—Nickel SPT, 1/-; DPDT 1/3. **VALVES, Marconi, Ostram, Mullard, Ediswan, Cossor Bright, 8/-; D.E.R., 14/-; 06, 16/6; Power, 18/6, 22/6.****

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6 v. 800,000 amp., 263/6; 6 v. 1,000,000 amp., 269/6; 6 v. 1,200,000 amp., 275/6; 6 v. 1,500,000 amp., 281/6; 6 v. 2,000,000 amp., 287/6; 6 v. 2,500,000 amp., 293/6; 6 v. 3,000,000 amp., 299/6; 6 v. 4,000,000 amp., 305/6; 6 v. 5,000,000 amp., 311/6; 6 v. 6,000,000 amp., 317/6; 6 v. 8,000,000 amp., 323/6; 6 v. 10,000,000 amp., 329/6; 6 v. 12,000,000 amp., 335/6; 6 v. 15,000,000 amp., 341/6; 6 v. 20,000,000 amp., 347/6; 6 v. 25,000,000 amp., 353/6; 6 v. 30,000,000 amp., 359/6; 6 v. 40,000,000 amp., 365/6; 6 v. 50,000,000 amp., 371/6; 6 v. 60,000,000 amp., 377/6; 6 v. 80,000,000 amp., 383/6; 6 v. 100,000,000 amp., 389/6; 6 v. 120,000,000 amp., 395/6; 6 v. 150,000,000 amp., 401/6; 6 v. 200,000,000 amp., 407/6; 6 v. 250,000,000 amp., 413/6; 6 v. 300,000,000 amp., 419/6; 6 v. 400,000,000 amp., 425/6; 6 v. 500,000,000 amp., 431/6; 6 v. 600,000,000 amp., 437/6; 6 v. 800,000,000 amp., 443/6; 6 v. 1,000,000,000 amp., 449/6; 6 v. 1,200,000,000 amp., 455/6; 6 v. 1,500,000,000 amp., 461/6; 6 v. 2,000,000,000 amp., 467/6; 6 v. 2,500,000,000 amp., 473/6; 6 v. 3,000,000,000 amp., 479/6; 6 v. 4,000,000,000 amp., 485/6; 6 v. 5,000,000,000 amp., 491/6; 6 v. 6,000,000,000 amp., 497/6; 6 v. 8,000,000,000 amp., 503/6; 6 v. 10,000,000,000 amp., 509/6; 6 v. 12,000,000,000 amp., 515/6; 6 v. 15,000,000,000 amp., 521/6; 6 v. 20,000,000,000 amp., 527/6; 6 v. 25,000,000,000 amp., 533/6; 6 v. 30,000,000,000 amp., 539/6; 6 v. 40,000,000,000 amp., 545/6; 6 v. 50,000,000,000 amp., 551/6; 6 v. 60,000,000,000 amp., 557/6; 6 v. 80,000,000,000 amp., 563/6; 6 v. 100,000,000,000 amp., 569/6; 6 v. 120,000,000,000 amp., 575/6; 6 v. 150,000,000,000 amp., 581/6; 6 v. 200,000,000,000 amp., 587/6; 6 v. 250,000,000,000 amp., 593/6; 6 v. 300,000,000,000 amp., 599/6; 6 v. 400,000,000,000 amp., 605/6; 6 v. 500,000,000,000 amp., 611/6; 6 v. 600,000,000,000 amp., 617/6; 6 v. 800,000,000,000 amp., 623/6; 6 v. 1,000,000,000,000 amp., 629/6; 6 v. 1,200,000,000,000 amp., 635/6; 6 v. 1,500,000,000,000 amp., 641/6; 6 v. 2,000,000,000,000 amp., 647/6; 6 v. 2,500,000,000,000 amp., 653/6; 6 v. 3,000,000,000,000 amp., 659/6; 6 v. 4,000,000,000,000 amp., 665/6; 6 v. 5,000,000,000,000 amp., 671/6; 6 v. 6,000,000,000,000 amp., 677/6; 6 v. 8,000,000,000,000 amp., 683/6; 6 v. 10,000,000,000,000 amp., 689/6; 6 v. 12,000,000,000,000 amp., 695/6; 6 v. 15,000,000,000,000 amp., 701/6; 6 v. 20,000,000,000,000 amp., 707/6; 6 v. 25,000,000,000,000 amp., 713/6; 6 v. 30,000,000,000,000 amp., 719/6; 6 v. 40,000,000,000,000 amp., 725/6; 6 v. 50,000,000,000,000 amp., 731/6; 6 v. 60,000,000,000,000 amp., 737/6; 6 v. 80,000,000,000,000 amp., 743/6; 6 v. 100,000,000,000,000 amp., 749/6; 6 v. 120,000,000,000,000 amp., 755/6; 6 v. 150,000,000,000,000 amp., 761/6; 6 v. 200,000,000,000,000 amp., 767/6; 6 v. 250,000,000,000,000 amp., 773/6; 6 v. 300,000,000,000,000 amp., 779/6; 6 v. 400,000,000,000,000 amp., 785/6; 6 v. 500,000,000,000,000 amp., 791/6; 6 v. 600,000,000,000,000 amp., 797/6; 6 v. 800,000,000,000,000 amp., 803/6; 6 v. 1,000,000,000,000,000 amp., 809/6; 6 v. 1,200,000,000,000,000 amp., 815/6; 6 v. 1,500,000,000,000,000 amp., 821/6; 6 v. 2,000,000,000,000,000 amp., 827/6; 6 v. 2,500,000,000,000,000 amp., 833/6; 6 v. 3,000,000,000,000,000 amp., 839/6; 6 v. 4,000,000,000,000,000 amp., 845/6; 6 v. 5,000,000,000,000,000 amp., 851/6; 6 v. 6,000,000,000,000,000 amp., 857/6; 6 v. 8,000,000,000,000,000 amp., 863/6; 6 v. 10,000,000,000,000,000 amp., 869/6; 6 v. 12,000,000,000,000,000 amp., 875/6; 6 v. 15,000,000,000,000,000 amp., 881/6; 6 v. 20,000,000,000,000,000 amp., 887/6; 6 v. 25,000,000,000,000,000 amp., 893/6; 6 v. 30,000,000,000,000,000 amp., 899/6; 6 v. 40,000,000,000,000,000 amp., 905/6; 6 v. 50,000,000,000,000,000 amp., 911/6; 6 v. 60,000,000,000,000,000 amp., 917/6; 6 v. 80,000,000,000,000,000 amp., 923/6; 6 v. 100,000,000,000,000,000 amp., 929/6; 6 v. 120,000,000,000,000,000 amp., 935/6; 6 v. 150,000,000,000,000,000 amp., 941/6; 6 v. 200,000,000,000,000,000 amp., 947/6; 6 v. 250,000,000,000,000,000 amp., 953/6; 6 v. 300,000,000,000,000,000 amp., 959/6; 6 v. 400,000,000,000,000,000 amp., 965/6; 6 v. 500,000,000,000,000,000 amp., 971/6; 6 v. 600,000,000,000,000,000 amp., 977/6; 6 v. 800,000,000,000,000,000 amp., 983/6; 6 v. 1,000,000,000,000,000,000 amp., 989/6; 6 v. 1,200,000,000,000,000,000 amp., 995/6; 6 v. 1,500,000,000,000,000,000 amp., 1001/6; 6 v. 2,000,000,000,000,000,000 amp., 1007/6; 6 v. 2,500,000,000,000,000,000 amp., 1013/6; 6 v. 3,000,000,000,000,000,000 amp., 1019/6; 6 v. 4,000,000,000,000,000,000 amp., 1025/6; 6 v. 5,000,000,000,000,000,000 amp., 1031/6; 6 v. 6,000,000,000,000,000,000 amp., 1037/6; 6 v. 8,000,000,000,000,000,000 amp., 1043/6; 6 v. 10,000,000,000,000,000,000 amp., 1049/6; 6 v. 12,000,000,000,000,000,000 amp., 1055/6; 6 v. 15,000,000,000,000,000,000 amp., 1061/6; 6 v. 20,000,000,000,000,000,000 amp., 1067/6; 6 v. 25,000,000,000,000,000,000 amp., 1073/6; 6 v. 30,000,000,000,000**

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TECHNICAL NOTES.

(Continued from page 555.)

placed in very close proximity, with their cores parallel, without interaction, whereas this is rarely the case with unshrouded transformers; but in any case, it is never wise to crowd the transformers so close together.

A question with which the beginner often finds himself confronted is this. If the size of the aerial or secondary tuning coil is altered, is it necessary to make a corresponding adjustment in the reaction coil? The answer is that, generally speaking, there is no exact relation between the two, and a good deal of margin is allowable.

For broadcast wave-lengths the number of turns on the reaction coil will generally exceed the number on the tuning coil. Thus, if any great change is made in the turns on the tuning coil (which is unlikely), a corresponding change may be made in the reaction, but for small changes there need be no adjustment of the reaction turns.

Dead End Losses.

Sometimes, when experimenting, you require a coil with a larger number of turns than the largest single coil in your collection. The equivalent of a larger coil may be obtained, however, by the simple process of connecting two or more coils together in series, when the turns are added together. You can easily make for yourself a special holder in which two or more coils can be inserted.

In this connection it may be noted that if you are using a coil for tuning comparatively short waves, the coil having many more turns than are actually needed for the purpose in question, the extra turns, if connected to those in use, cause losses of energy, known generally as "dead end" losses. The state of affairs is as though you had extra coils connected in series with the one you were using. The dead end losses may be overcome, however, by disconnecting entirely the part of the coil which is not in use from the part that is in use.

Or you may make up a coil of a number of small sections, entirely unconnected with one another, and you may connect together a sufficient number of the sections or units until you have approximately the value you require. In this way the unused or "dead end" portion is comparatively small, and all the remaining sections or units are entirely out of circuit and unconnected, and so do not have any effect (or any appreciable effect) upon the signal strength.

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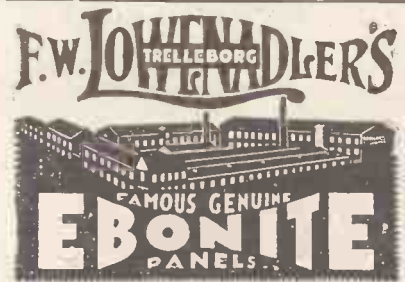
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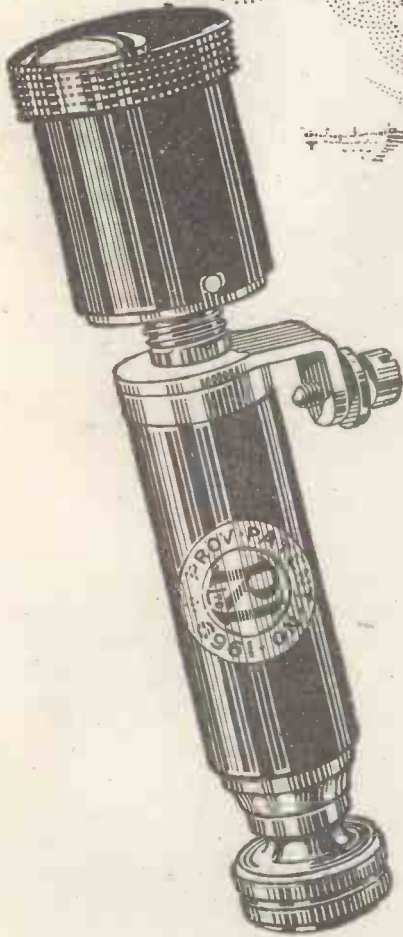
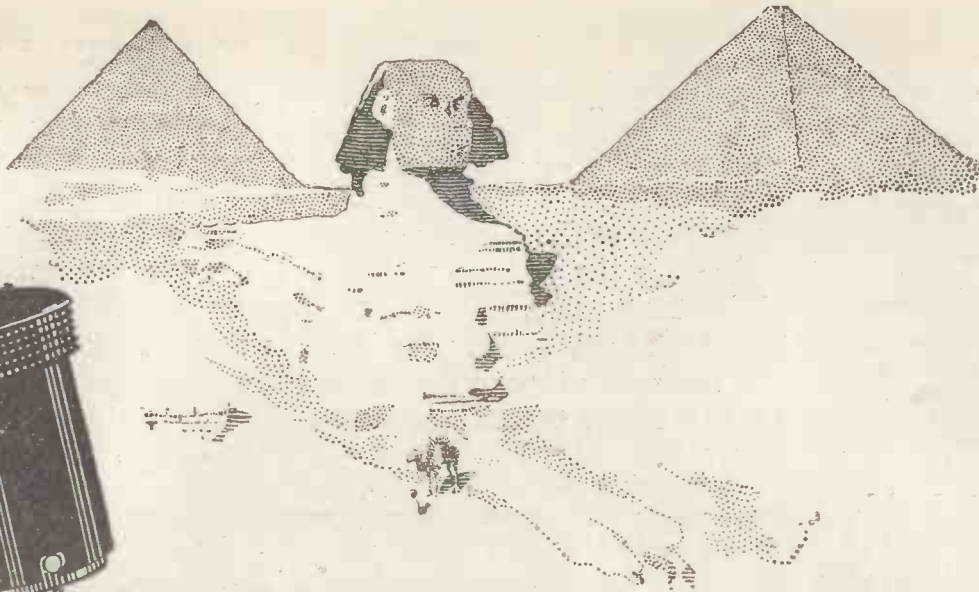


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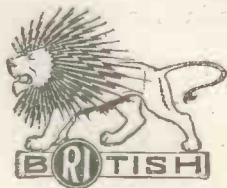
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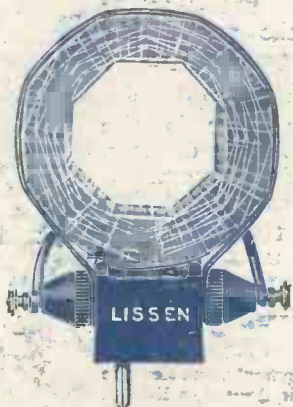
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LISSENIAGON COILS tune so sharply and strongly because there is no energy loss. The farther coils can be kept apart, the sharper and more selective tuning becomes. **LISSENIAGON** coils will transfer energy even though the coils are comparatively a great distance apart. This is partly due to the strong magnetic field existing between the coils themselves due to the design and making, and partly due to the negligible losses in the coils themselves. Due to this also **LISSENIAGON** coils will oscillate easily even though widely separated. There are practically no damping losses to be overcome in **LISSENIAGON** coils, even on the extreme low wave-lengths.

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