

# THE LODGE "N" CIRCUIT: SPECIAL STATEMENT.

# Popular Wireless

Every Thursday  
PRICE  
3d.

No. 202. Vol. IX.

and *Wireless Review*  
*Scientific Adviser* SIR OLIVER LODGE, F.R.S., D.Sc.

April 10th, 1926.



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**COILS THAT DO NOT INTERACT.**  
**A DUO-COUPLED DX RECEIVER.**  
**USING A FRAME AERIAL.**

**THE**  
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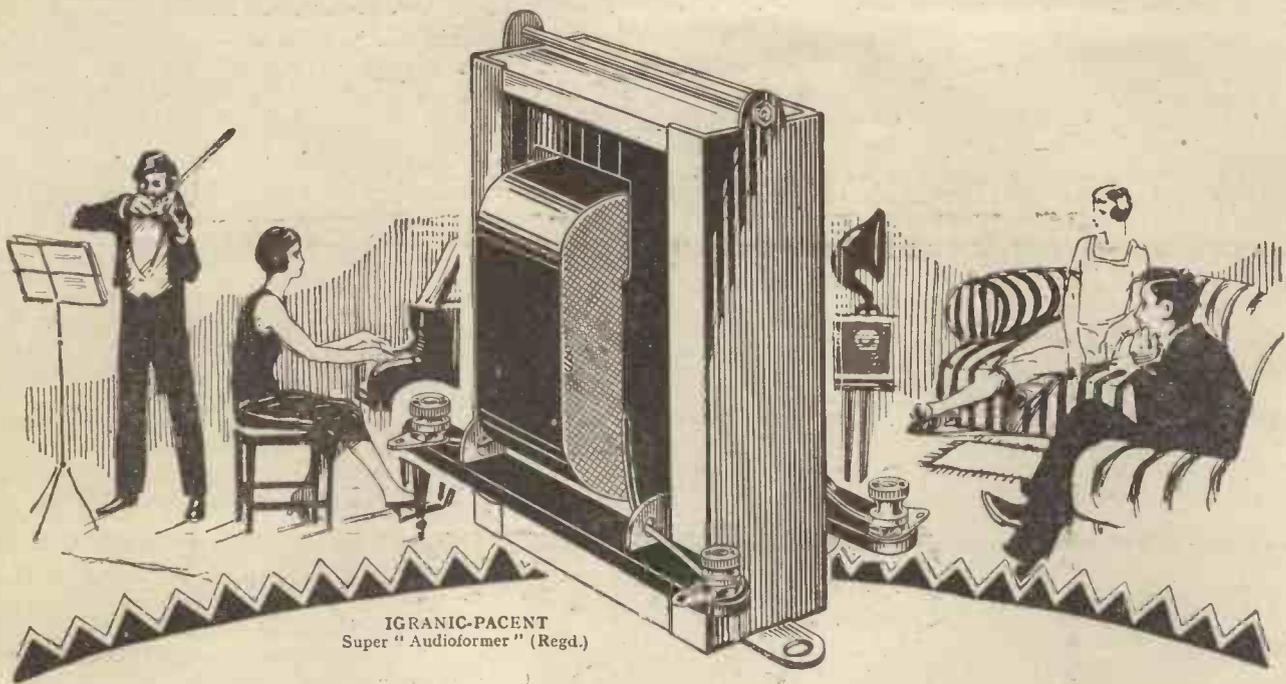
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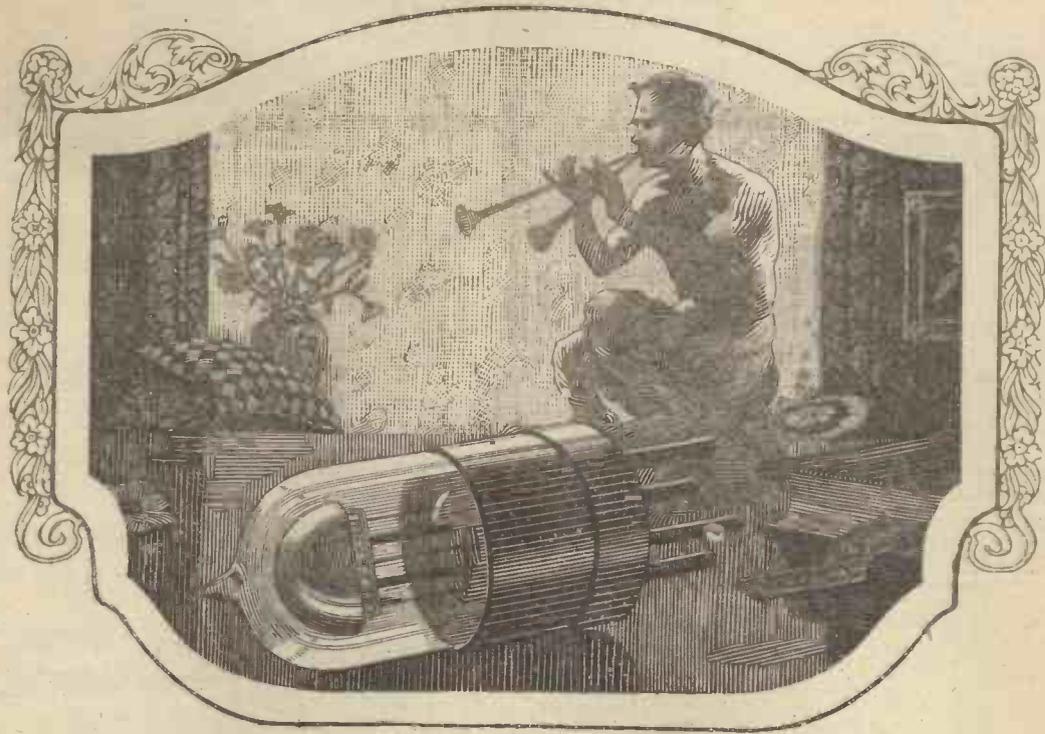
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Above: Type HQ  
 Below: Type H3

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## The Dull Emitter which defies old age

LISZT'S beautiful Rhapsody Hongroise—full of dramatic fire and brilliantly contrasted passages—was being broadcast. Away in the Studio, the artiste's fingers tripped lightly over the ivory keys. At home, the family sat enthralled—captivated by the richness and emotion of the masterpiece which won for its composer a niche in the Hall of Fame.

And then suddenly . . . dead silence. A valve in the Receiving Set had burnt out.

What causes a valve to burn out prematurely? Excessive heat—nothing else—is the devastating influence. All metals when heated expand—when cool, they contract. A valve filament constantly expands or contracts as the current is turned on or off. The higher the temperature, in fact, the greater the expansion. Such treatment, in course of time, produces brittleness and inevitably renders the filament very susceptible to fracture.

This was the problem Cossor set

out to solve—and so successfully unriddled—by the invention of the triple-coated filament used only in the Wuncell Dull Emitter Valve.

Whereas in most dull emitters, low current consumption has been obtained by the use of extremely fine filaments operating at temperatures as high as 2000°, the Wuncell ensures economy by entirely different methods. Its special filament is *triple-coated* to ensure a prolific electron stream at only 800°—practically the temperature of the embers of a dying match.

Further, its filament is practically as stout as that used in any bright emitter. Because of this, and the fact that its working temperature is so much lower than hitherto thought possible, heat has little or no effect upon it.

As a result the Wuncell has already won a great reputation throughout this country and abroad among broadcast listeners as the one dull emitter "which really defies old age."

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- W. 3. The Loud Speaker Valve - 18/6  
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\*Also in special base with resistance to suit 2, 4 or 6-volt Accumulator 16/-

# Cossor Valves

# Popular Wireless

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## RADIO NOTES AND NEWS.

**Ships that Jam in the Night—Summer Programmes—Rome Calling—European Interchange of Programmes—All Wireless Exhibition for Birmingham—The Lodge "N" Circuit.**

### Rome Calling.

THE new broadcasting station at Rome seems to be coming over extremely well lately. A great many readers have reported clear reception upon two valves, and the fact that announcements are made in English all helps to make Rome a popular catch. The wave-length is 424 metres.

### Resistance v. Transformer Coupling.

A WEEK or two ago I referred in these notes to an interesting test at Manchester between resistance-capacity

and transformer-coupling for amplifiers. The idea was that a hidden set incorporating each system should work a loud speaker, and the votes of the meeting would decide which gave the better results.

I hear from the Manchester Radio Scientific Society that the tests were duly carried out—and transformer-coupling won, as regards the all-round reproduction of music. But, on the whole, rather more votes were cast for the resistance-capacity method, though this needed three valves against the transformer-coupled two.

### Ships that Jam in the Night.

ACCORDING to an official report, the number of ships registered in the United Kingdom which were at the beginning of last February required to carry wireless apparatus (under the Merchant Shipping Wireless Telegraphy Act, 1919) was 3,156.

A Plymouth reader estimates that he has heard at least three thousand of these sending Morse all at the same time, and all on full power!

### A NEW "P.W." CONSULTANT.

Appointment of Mr. E. J. SIMMONDS. We are pleased to announce that Mr. E. J. Simmonds, the famous British experimenter and owner of station 2 O D, has joined the consulting staff of "P.W." Mr. Simmonds' expert knowledge of short wave and general amateur transmitting work will prove of great value to this journal, and we welcome his association with our consulting staff.

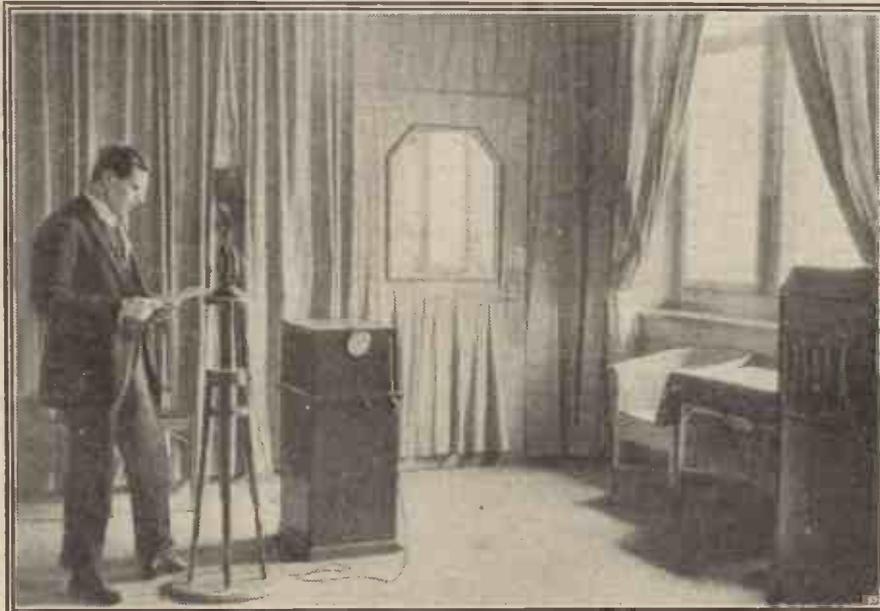
Articles will appear exclusively in "P.W." from Mr. Simmonds' pen from time to time.

### Across the World on Low Power.

THE short-wave wonder-workers have been at it again. Our old friend Mr. J. A. Partridge, of Wimbledon (now chief of the B.B.C.'s receiving station at Keston), has been co-operating with 2 O D, Mr. E. J. Simmonds, of Gerrards Cross. And their fellow-conspirator was that famous Australian experimenter, Mr. Maclurean, of Sydney, New South Wales. Between them they have been doing some big business in the Antipodean ether, which makes one wonder whether long-distance telephony will not come sooner than is now admitted to be likely.

### Short-Wave Phenomena.

THE tests started with 2 O D trying telephony to Australia, and Mr. Maclurean astonished the Sydney-side natives by reproducing this upon the loud speaker! Unfortunately, the Australian used A.C. for his own transmitter, and his carrier wave was wobbly, so that his conversation was unheard in England, though his Morse came through well. Then Mr. Partridge "had a go," and again the Australian loud speaker rattled away. The amazing thing about it is that,



A view of the studio at Radio Zurich, showing the small microphones in use at that station.

### Summer Programmes.

SUMMER broadcasting hours come into force this year upon April 25th. After that date the B.B.C. proposes to broadcast the two main portions of the evening programme from 8-9.30 and from 10-11 p.m. The General News Bulletin (copyright-by-you-know-and-all-the-rest-of-it) will therefore be given at the witching hour of 9.30 p.m.

Dance bands will play as usual from 10.30 p.m. to midnight, three nights a week.

although 2 O D was getting through so well across the world, his signals were quite faint in London, where his fellow-conspirator listened to him whilst waiting his turn to talk to Australia.

### "My Mistake."

THIS is the title of a programme that is being worked out by the B.B.C.'s Dramatic Department for production next week. The idea is that, owing to a

(Continued on next page.)

## NOTES AND NEWS.

(Continued from previous page.)

last-moment mishap, a deaf man has to be brought in to do the announcing, and naturally he rather "misses the boat" here and there.

The date arranged is April 13th. It sounds an unlucky day, too.

### Swedish Radio Stations.

A STIRLINGSHIRE reader who has picked up several Swedish stations asks me if it is true that there are twenty broadcasting stations in that country?

I believe this figure is exactly correct, for, besides Stockholm, Gothenburg, Malmö, Sundsväl and Boden—the main stations—there are just over a dozen relays working upon low power.

### Announcing to Music.

THAT little stunt of making studio announcements upon a background of organ music or church bells is now defunct. A good many protests reached the B.B.C., and, like good fellows, they weighed the pros and cons and did what listeners asked them—cut it out!

### Radio Burns.

THE aerial current employed by 2 D A—POPULAR WIRELESS' experimental transmitting station at Dulwich—seldom exceeds 15 amp., but nasty H.F. burns can be got from parts of the transmitter if it is touched lightly. At first smoke arises from the part of the hand making contact, but after a time the skin is burnt off!

Only a light touch will produce these effects, as if the transmitter is held firmly the valve stops oscillating, and consequently no effect is noticeable.

### Reports from 2 D A.

BY the way, to be of any use at all, reports of 2 D A's signals must contain some information besides "73's O.M." and compliments of that kind.

Every report should include (1) Time and date of reception, (2) wave-length (approx.), (3) signal-strength (fading, steadiness of wave, etc), (4) type of receiver used, and finally, any unusual or noteworthy variations from the normal.

All the good wishes and "F. B. O. M." (fine business, ole man) are appreciated, but, after all, it's radio facts that 2 D A is after.

### Long-Wave Interference.

ISN'T it a pity that Daventry's wave-length is steadily being encroached upon by interference? Every time that I have tuned in on 1,600 metres lately some interloper has been morsing or howling there, and oscillation from listeners, which at one time was rarely heard upon the high waves, now seems to be on the increase. It is about time that the new Post Office anti-oscillation motor-van got busy patrolling the streets on the track of the offenders.

### European Interchange of Programmes.

THE B.B.C.'s scheme for the development of international broadcasting, which is now being worked out, will include some interesting anniversary items. It is proposed to celebrate the various great personages by suitable broadcasts from their mother country. Hilversum, Paris,

or one of the other powerful Continental stations will co-operate with 5 X X in this connection.

### The Voice from the Void.

A PROPOS of the Post Office telephony tests with America, here's rather an amusing story told me by a Hanwell reader.

One listener was telling another of the conversations which he had overheard between Rugby and New York.

"I heard Mr. . . . speaking quite clearly from New York."

"But I thought Mr. . . . was dead."

"Well, I don't know. He said it was New York he was speaking from!"

### One-Valve Results.

ONE of the most formidable-looking lists of stations heard upon one valve that I have received this season, has been sent to me from a fourteen-year-old Hull reader.

Besides all the main and most B.B.C. relays, he has tuned in nearly forty foreigners, all upon a one-valve Chitos!

Breslau, Hamburg, Dortmund, and Brussels are nearly as loud as the local station! How do other Hull readers get on with these stations?

## SHORT WAVES.

"The awfully beastly jolly prattle of Uncle Whatsisname may sometimes become slightly fatiguing, and in a multitude of 'birthday greetings' boredom may reside; but a broadcast Budget speech would make these offerings appear positively scintillating."—Daily Sketch.

"I use bottom bend or anode rectification always."—Capt. P. P. Eckersley, writing in "Lloyds Sunday News."

"Is there any mention of radio in the Bible?"

"Yes. A spare part of man was taken, and out of it was made a loud speaker."—News of the World.

### The Set You Will Want.

HAVE you noticed how much better are the sets of to-day than the sets of yesterday? Neater, cleaner, more effective in every way, the up-to-date receiver makes a last-year's set look a bit of a Tut-Ank-Amen.

Take the "P.W." "Simplicimus," which is described in this issue. Even if you're not building a set for a time, it will pay you to notice the article outlining this receiver, for it is a good example of the kind of set you will have to get some day.

### Everything on Two Dials.

THE "Simplicimus" covers all the broadcasting wave-lengths. You can get Daventry or the local station, by merely turning the two dials. The left-hand one tunes, the right-hand one strengthens, and if you can't work the "Simplicimus," you'll have to give up wireless and take to a barrel-organ!

All broadcasting wave-lengths, no switch, all on two dials, no trouble—what more could heart desire?

### All-Wireless Exhibition for Birmingham.

BIRMINGHAM is to have an All-Wireless Exhibition this year. It's a long way ahead, but the dates have been fixed and already preparations are being made.

Lending its support to the exhibition is the Birmingham "Weekly Post," and its associated journals, the "Daily Post" and "Daily Mail."

The organisers are the Provincial Exhibitions, Ltd., 39, Carrs Lane, Birmingham, and the Exhibition will be open from Tuesday, October 5th, to Saturday, October 16th.

### 700 Stations on 2 Valves.

IN about three months I have bagged over 700 different stations, from all parts of the world," writes a Stratham Common reader, who can read Morse, and uses the Simmonds' Short-wave Set described in P.W. 182.

Within the three days previous to writing he had "toured" Australia, New Zealand, Phillipine Islands, U.S.A., Brazil, and various European countries.

### Children's Corner Experiment at 5 N G.

AN interesting innovation is to be tried at Nottingham to-morrow (April 9th), when an outside broadcast of the Children's Corner is to be given. A fancy dress dance has been arranged at the Palais de Danse, Nottingham, to which members of the Radio Circle will be admitted for 1s. 6d., non-members 2s. Tea will be provided, and ticket-holders will be able to witness the broadcasting of a 5 N G programme.

### Hilversum Improvements.

NOW that the power of the Hilversum station is to be greatly increased, and some of the programmes are to be relayed via Daventry, the Dutch officials have announced a gingering-up of the programmes. The best artistes procurable will be engaged for these broadcasts, of which operas and musical comedies will form part. A regular fortnightly exchange of items is hoped for.

### The "N" Circuit.

THE premature announcements regarding Sir Oliver Lodge's "N" circuit are dealt with by the editor on another page, but I feel sure readers will be interested to hear that when Sir Oliver is ready he will write about the "N" circuit only in "P.W." Exclusive information and reports on the working of an N circuit set, specially made for Sir Oliver by Mr. Melensky, and by "P.W." will appear exclusively in "P.W." very shortly.

### Sir Oliver's Statement.

THE following was issued to the Press by Sir Oliver Lodge:

"Reports about an 'N' circuit, which have appeared in the Press, are premature and unauthorised.

"As a matter of fact, several sets have been on practical trial for some time, and the method is now being submitted to independent test. Until the experts have reported, I do not wish to enter into details, except to admit that one object of the system is the elimination of re-radiation from a valve receiver without loss of efficiency.

"In all probability the plant could be adopted by existing sets. In due course I shall explain the system in POPULAR WIRELESS.

"(Signed) OLIVER LODGE."

ARIEL.

# USING A FRAME AERIAL



MANY people still imagine that a frame aerial can only be successfully used with a super-heterodyne or Neutrodyne receiver. This is far from being the case. For flat dwellers within six or seven miles range of 2 L O, excellent loud-speaker reception can easily be obtained on a two-

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**Some Useful Hints for the Beginner.**

By J. C. JEVONS.

\*-----\*

convenient to construct, the "pick up" is less efficient owing to the mutual screening action of the different windings.

We will assume that the frame has been made, and that it is intended for use with a standard three-valve set, comprising one H.F. stage, a detector, and one L.F. amplifier.

The first step is to connect the two leads from the frame to the aerial and earth terminals on the set. The next is to see that the aerial tuning condenser is in parallel with the frame windings. If the set has a series-parallel switch, this should be turned to the parallel position, and the plug-in aerial inductance coil removed from its holder.

reception up to thirty miles has been obtained on a single detector valve, whilst the addition of an L.F. amplifier will very considerably extend this distance.

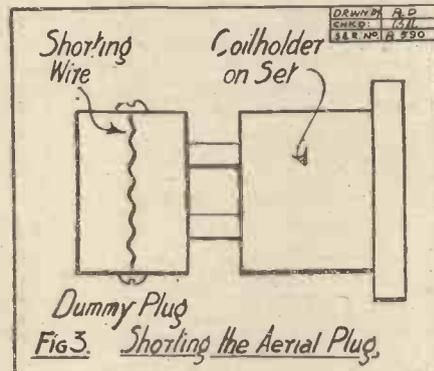
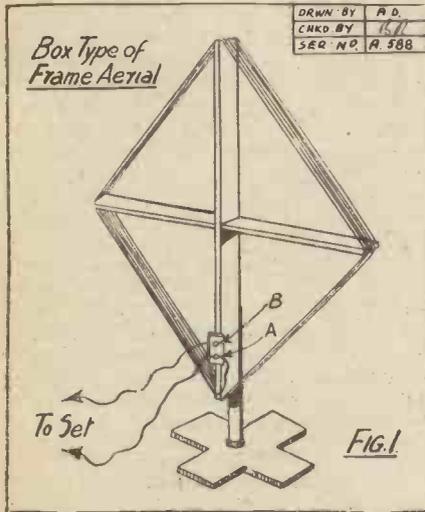
Of course, the size of the frame determines to a large extent the particular valve combination that will give best results. Where,

### Reaction Essential.

If the aerial circuit is such that the plug-in coil and condenser are permanently wired up in series, the aerial coil should be removed and the two terminals on the coil holder shorted in any suitable way, preferably by inserting a "dummy" holder with a piece of shorting wire connected across the two side terminals, as shown in Fig. 3.

The frame is now properly connected to the input circuit. Good results will not, however, be secured unless some form of reaction is employed. Most standard sets are provided with a two-coil holder, allowing for reaction on the "tuned anode" winding of the high-frequency stage. This is accordingly brought into action. With a No. 75 coil normally in the tuned-anode plug, a 50, 75, or 100 coil should be tried out in the anode reaction plug until the best signal strength is obtained.

The circuit arrangement is then as shown in Fig. 4, L being the anode coil and R the reaction coil.

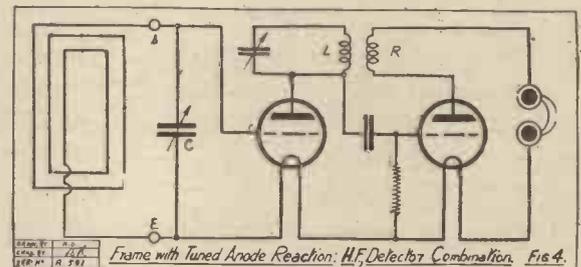
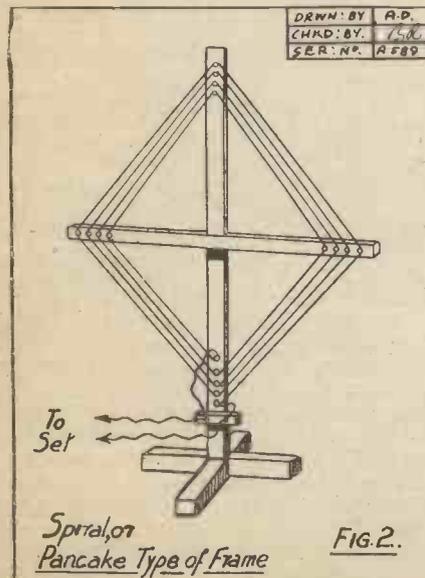


for instance, it is desired to work a loud speaker within six miles of 2 L O on the size of frame previously mentioned, a high-frequency valve followed by a detector is an arrangement that has given satisfactory results.

In the first place, it may be useful to give one or two examples of the number of turns of wire necessary for broadcast reception, using different sizes of box-frame and a .0005 tuning condenser. On a two-foot side frame, nine turns of 18 S.W.G. wire, spaced  $\frac{3}{8}$  in. apart, will tune up to 500 metres. With a frame of three-foot side the number of turns can be reduced to six, using the same gauge wire, the winding being spaced  $\frac{1}{2}$  in. apart. If a smaller frame, say, of fifteen-inch side is preferred, twenty-two turns spaced  $\frac{1}{8}$  in. apart will be necessary.

### "Box" Type Most Efficient.

In each case the windings should preferably be wound in box formation, as shown in Fig. 1, rather than spirally, as in Fig. 2. Although the latter form is somewhat more



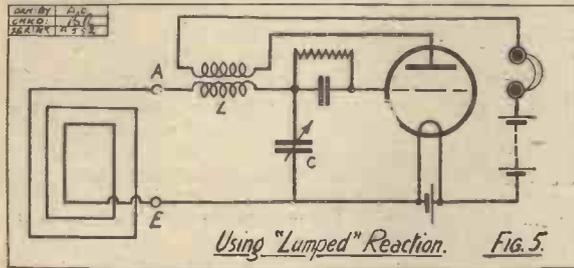
If the set is provided with means for cutting out the low-frequency amplifier at will, it will be found that quite excellent loud-speaker strength can be obtained in this way, using the first two valves alone, at distances up to six or seven miles from 2 L O on a two-foot frame.

(Continued on next page.)

## USING A FRAME AERIAL.

(Continued from previous page.)

Tuning-in is naturally somewhat more difficult than with an outside aerial, particularly as the H.F. stage is in circuit and there are two condensers to control. However, by connecting an ordinary earth lead to the earth terminal of the set—in addition to the frame lead—it will be found easier to pick up the station in the first place. Once reception has been secured in this

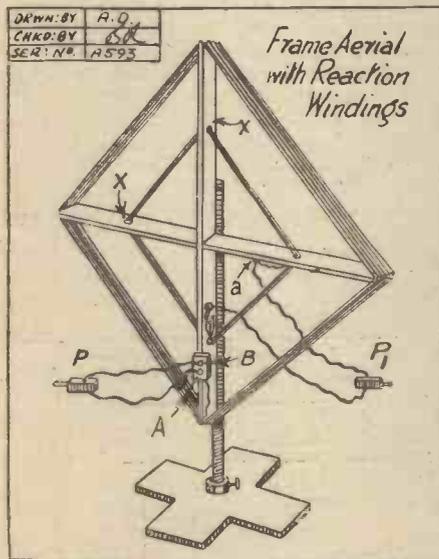


way, the earth lead can be disconnected, and the set will be found to require very little retuning to pick up on the frame alone.

If there is no high-frequency stage, the best method is to apply reaction directly to the frame windings in the manner about to be described.

### Using "Lumped" Reaction.

It is, of course, possible to utilise the ordinary plug-in aerial and reaction coils as a means of providing a "lumped" reaction effect, as shown in Fig. 5. In this case the plug-in aerial coil must be used in series with the aerial tuning condenser C,



so that the parallel-series switch on the set should accordingly be moved over to the "series" position. If the coils L and R are higher than No. 25 or 30, the number of frame windings originally specified should preferably be reduced, owing to the additional loading introduced into the aerial circuit by the coil L. Actually this method of reaction does not give results equal to those to be obtained as follows.

Four holes are bored through the sides of the aerial frame, as shown at X in Fig. 6, and six turns of wire threaded through—in the case of a two-foot frame—the last three turns being brought out to separate tappings co-acting with a moving-arm contact, as shown at S. It will be found convenient to connect the main frame windings from the terminals A, B to the two terminals of a dummy plug-in holder P, the leads from the reaction terminals a, b being similarly connected to a dummy plug P<sub>1</sub>.

With this arrangement the frame is connected to the set simply by plugging P into the two-coil holder in place of the usual aerial inductance coil, and inserting P<sub>1</sub> into the socket intended for the ordinary reaction coil. The aerial and earth terminals of the set are not used, the main frame windings being automatically connected across the grid and filament of the detector valve, and the reaction windings automatically inserted in the plate circuit merely by plugging-in as described.

It may be found necessary to reverse the leads from the reaction windings on to the plug P<sub>1</sub> so as to ensure positive reaction instead of reverse, and this adjustment should always be tried if there is any difficulty in receiving signals. As before, it is useful to leave an outside or ordinary earth lead attached to the earth terminal of the set as a preliminary help in tuning-in. Reaction is controlled by moving the switch-arm S, Fig. 3, over the tappings, thus varying the number of reaction turns in circuit.

## VARIABLE CONDENSERS.

From a CORRESPONDENT.

THE variable condenser has long been in use in electrical science, especially in radio work, and the recent boom in wireless has only brought it right to the front, from a laboratory instrument into a household tool, so much so, that young children talk of it with the freedom of savants of the past, but not with the same precision. The first type of condenser to be sold in the great boom was made with semi-circular plates, but this suffered with end effects, which means that at both end positions 0° and 180° the capacity was not proportional to the twist. This was easily corrected, but the other and more serious trouble was that the twist was not proportional to the wave-length.

### The Square Law Effect.

The wave-length of an electric wave is, if other things remain constant (such as the inductance) proportional to the square root of the capacity, and therefore if the twist is to be proportional to wave-length it must be proportional to the square root of the capacity or reversed.

$$\text{Capacity} \propto (\text{twist})^2$$

When the manufacturer had time to think, the shape was modified to give the "square law" effect, that is, to make the capacity

proportional to the square of the deflection, as before stated. It is difficult to do anything but blame the manufacturers for not putting this form on the market in the first instance, as the shape of the vanes had been calculated many years ago, and it was a known laboratory instrument. This type of condenser leaves little to be desired, if of sound construction, for it must be remembered that even if the plates are correctly stamped, bad assembly will entirely upset the "square law." The plates must be all exactly parallel and move parallel to maintain the square law, a condition that is only obtained in cheap condensers by accident.

### "Straight Line Frequency" Condensers.

The next and very necessary addition to the condenser was the vernier, but this has the effect of complicating the readings as so far the vernier part is never provided with a scale, and hence the square-law effect is blurred. These remarks do not apply, of course, to geared devices acting on the dial, or to the more recent geared heads, but one has to be very careful of backlash before selecting a geared condenser, and although backlash may be absent when new, it might develop with age.

The most recent addition to variable condenser is the "Inverse Square Law" condenser, in which the capacity is proportional to the inverse of the square of the twist.

$$\text{Capacity} \propto \frac{1}{(\text{twist})^2}$$

This comes about in this way since the velocity of an electric wave U is given by

$$U = n\lambda$$

Where n = frequency, λ = wave-length,

$$n = \frac{U}{\lambda} \quad (\text{I})$$

and further  $n = \frac{1}{2\pi\sqrt{LC}} \quad (\text{II})$

Where L is the inductance and C the capacity.

From I and II we find

$$\lambda = 2\pi U \sqrt{LC} \text{ or } \lambda \propto \sqrt{C}$$

and from II  $n \propto \frac{1}{\sqrt{C}}$

These last two equations show the "square law" and "inverse square law" condensers respectively.

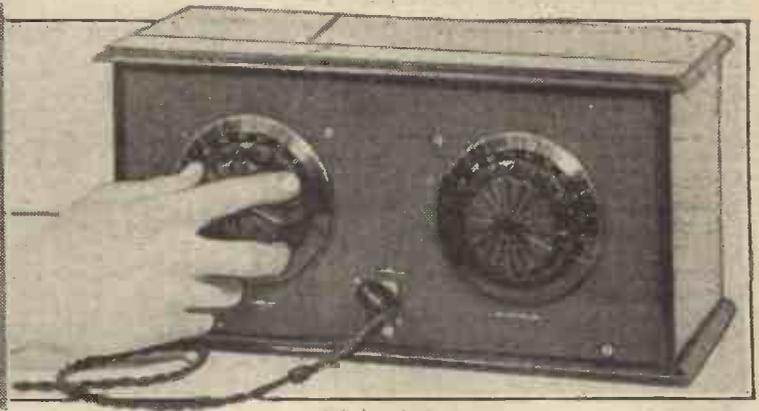
This last form has been introduced from America because the separation of station is not proportional to the length, but the frequency of the waves, a matter of great importance when we compare waves of 600 metres with those of 60 metres.

As the variable condenser is the fundamental part of the average set, it is advisable to get a really good one and build on a secure foundation.

### Moving Vane Connections.

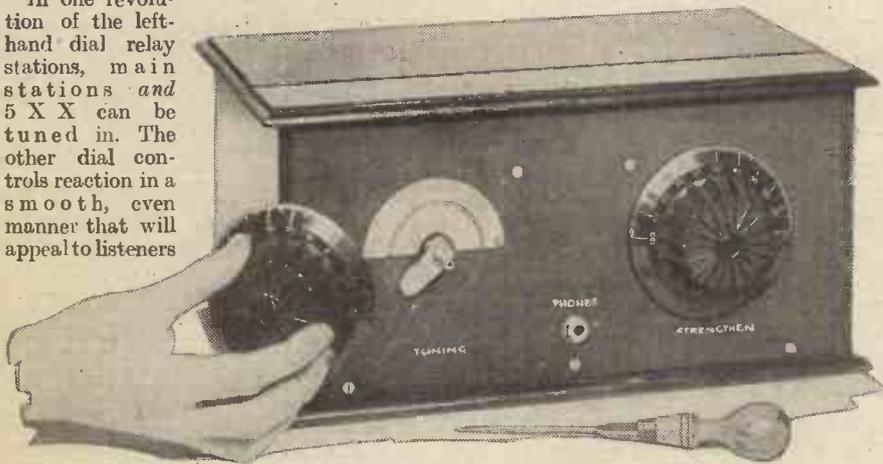
Finally, in choosing a condenser the disposition of the bearings should be carefully considered and any chance of end play occurring should be noted. Also it is of importance that due regard be taken of the method employed for making connection between the moving vanes and the terminal provided for external connections. This moving vane contact should preferably be of the "pigtail" type, and on no account should it be left to the bearings to provide electrical contact.

# The "P.W." "Simplicimus" Receiver



**A**FTER a considerable amount of experiment we have been able to apply the principles of The "P.W." Automatic Crystal Set to a valve circuit, and in this article we are going to describe the construction of a valve set that is unique in its simplicity and effectiveness. We consider it to be the "dernier cri" of broadcast receivers. A glance at the photograph of the complete set will convince readers that it is at least somewhat out-of-ordinary. There is nothing on the panel except two large condenser dials and one telephone or loud-speaker socket. The act of inserting the 'phone plug switches the set on, and it can be switched off again by pulling it out.

In one revolution of the left-hand dial relay stations, main stations and 5 X X can be tuned in. The other dial controls reaction in a smooth, even manner that will appeal to listeners



There are only three items on the panel: a 'phone plug and two dials. One of the latter is removed in the above photograph to show the wave-band change system.

and delight the experimenter. There is little or no wave-length alteration when the reaction is adjusted, so that there is none of the critical balancing which is necessary when a conventional circuit is employed. Therefore, in the case of the "P.W." "Simplicimus," the reaction control is entitled to be styled a "strength increaser," or "intensifier," for the tuning knob is rotated until the desired station is heard and then the reaction is brought in to build up signal strength. And this is, of course, as it should be, and is a system that makes for a quieter ether.

### Suitable for Loud-speaker Work.

There is nothing to go wrong in this receiver; it is stable and sensitive. It gives slightly louder signals than a straight Det.-L.F., while its controls make it more suitable for DX work. Tuning is very sharp, although the least technical listener will find no difficulty in handling it.

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

This extraordinarily simple set has been specially designed and constructed for "P.W." It marks a distinct advance in simply operated sets, and the novelty and ingenuity of the design will be apparent to every constructor.—  
The Editor.

Altogether, then, it is a receiver that should prove very popular indeed. It is eminently suitable for household loud-

this is how both the lower wave-length band and 5 X X is covered in one complete rotation.

### No Loss of Sensitivity.

A system of shunted H.T. is introduced which has the result of confining the steady anode current to the 'phones. An H.F. choke, on the other hand, blocks the H.F. impulses, and these are prevented from passing through the telephone circuit. This

### LIST OF COMPONENTS.

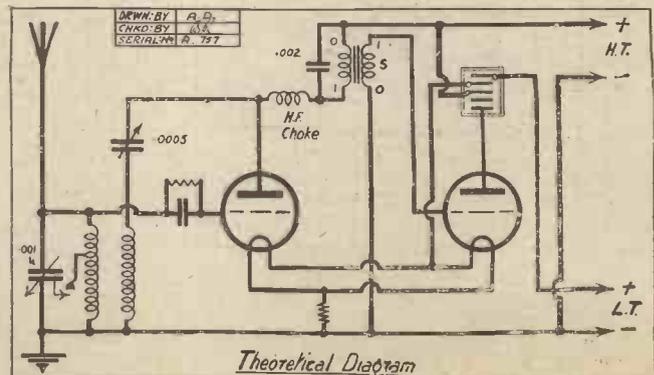
	£	s.	d.
1 ·001 variable condenser (Ormond)	8	0	
1 ·0005 variable condenser (Atlas)	11	6	
1 Peanut lamp-holder		9	
1 Fixed resistor (Burndept)	1	6	
2 Valve Holders (Lotus)	4	6	
1 ·0003 fixed condenser (T.C.C.)	2	4	
1 Lissen H.F. choke	10	0	
1 L.F. transformer (Eastern Wireless Co., Sutton, Surrey)	8	0	
1 ·002 fixed condenser (Lissen)	2	0	
1 5-point jack (Igranic)	4	0	
2 4-inch Radion dials (optional but tend to improve appearance of set)	5	6	
6 Terminals		9	
1 Igranic auto-plug	2	6	
1 Panel, 13 x 6½ x 1, with cabinet to fit (Peto-Scott)	1	6	0
½ lb. 28 S.W.G. D.C.C. wire	2	6	
2 4½ in. spider-web formers		8	
1 Ebonite strip, 1 x 7 x ¼ in.		6	

obviously tends to increase the instrument's stability. The reaction coil, which is separate from but in close proximity to the aerial coil, does not require changing, but remains, as does the aerial coil, permanently fixed in position. Probably by now "P.W." readers will understand why we  
(Continued on next page.)

speaker work on the local station, although either a fairly good indoor aerial or an outdoor aerial must be used.

There are no complications to be encountered in its construction, everything is very straightforward.

The circuit has its elements of novelty, as a glance at the diagram will show. The aerial tuning is accomplished by means of a ·001 mfd. variable condenser which, in a simple manner, shorts a part of the aerial coil through 180° of its movement. Thus a minimum to maximum capacity is available both for the whole of the coil and for a part of the coil, and



\*-----\*  
 "SIMPLICIMUS"  
 RECEIVER.  
 (Continued from previous page.)  
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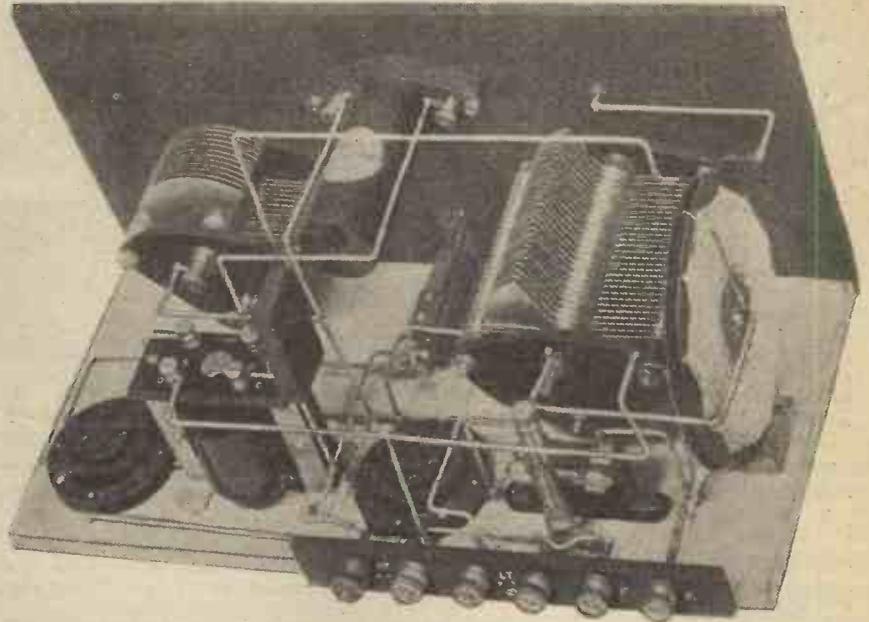
have styled this set the "Simplicimus," which is Latin for simplest, or extremely simple.

But we do wish to stress the fact that the receiver in no way loses sensitivity by the introduction of the above circuit developments or improvements. It is capable of receiving signals just as strongly, and over just as great distances, as an ordinary Det.-L.F. two-valve set. That is our definite claim, although actually it is even more suitable for DX work because of its very efficient reaction control.

**Range of Reception.**

The question of range is a very difficult one; in fact, it is impossible to make really definite statements, for there are so many variable factors to take into consideration. However, given average local conditions and a fairly good outdoor aerial and earth, comfortable loud-speaker reception up to 10 or 20 miles from an ordinary station and some 70 or so from 5 X X should be obtained. These are conservative estimates, and will, doubtlessly, be exceeded in many cases. Using telephone receivers the ranges will be considerably increased.

Now as to the construction of the set, it will be noticed that the list of components and materials include little else but standard apparatus. It must be pointed out, however, that it is essential that the .001 mfd. variable



Note the lead connected to one of the screws holding the contact plate and also how the coils are held in position by a small block of wood.

condenser should be provided with true semi-circular vanes and be able to rotate freely through 360°—a complete revolution of the spindle. A condenser fitted with end stops, or square law vanes, would not be able to do this. The Ormond type specified is quite suitable.

The other variable condenser need conform to no special design. The rest of the components also are quite standard and, if required, can be replaced by other makes

should such be on hand. Finally, the L.F. transformer must have a low self-capacity with no condenser across its primary. The M.U. answers the purpose admirably.

**The Contact Plate.**

The terminals are situated at the back on a strip of ebonite mounted on the base-board. Therefore, a cabinet with an aperture through which these can protrude, is necessary.

The panel drilling is quite straightforward, and full details of this are given in an accompanying diagram.

**POINT-TO-POINT CONNECTIONS.**

Aerial terminal to fixed plates of .001 variable condenser, beginning of 150 turn coil, and one side of grid leak and condenser, other side of which goes to grid socket of first valve holder. Tap (35th turn) to contact plate on panel. Earth terminal to moving plates of .001 variable condenser, end of 150-turn coil and to L.T. negative, which is also connected to H.T. negative and to one side of the fixed resistance holder, the other side going to one filament socket of each valve holder. The other two filament sockets are connected together and to contact 2 of the jack. Contact 1 of jack is taken to L.T. positive.

Plate socket of first valve holder to one side of H.F. choke and to moving plates of .0005 variable condenser, fixed plates of which go to one side of reaction coil, other side of reaction coil to earth.

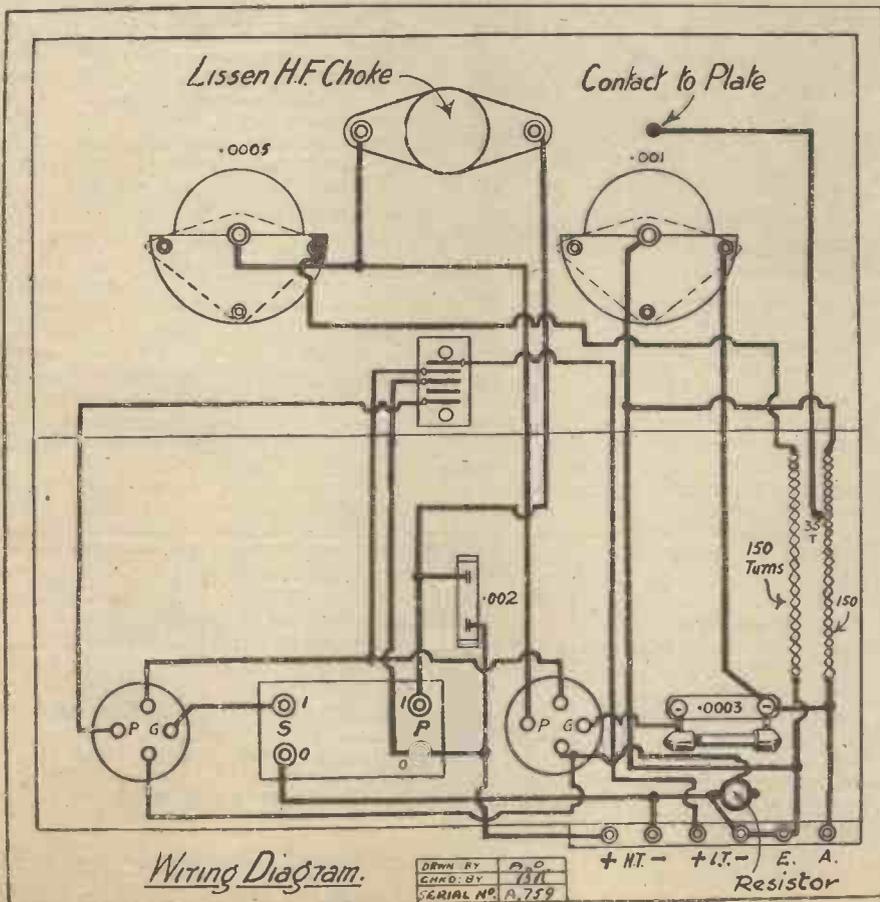
Other side of H.F. choke to I.P. of L.F. transformer, O.P. of same to H.F. positive and 3rd contact of jack. A .002 fixed condenser is connected between I.P. and O.P.

I.S. of transformer to grid socket of second valve holder, O.S. to L.T. negative.

Plate socket of second valve holder to contact 5 of jack. There is no connection to contact 4.

Here it will be as well for us to mention the contact plate which must be fitted under the dial of the .001 mfd. variable condenser. The instructions for fitting such were given in detail in the article describing

(Continued on next page.)



## "SIMPLICIMUS" RECEIVER.

(Continued from previous page.)

the Automatic Crystal Set, but are repeated here for the convenience of constructors. An ordinary aluminium condenser vane can be used or, of course, a piece of sheet brass or even "tin" cut to the correct shape. The contact will be quite a self-cleaning one, so it is unnecessary to use platinum! The condenser vane or brass sheet (whatever is used) should be fastened to the panel by means of three brass screws, one of which should be allowed to protrude underneath so that a connection can be taken to it. The other two should be cut off close to the panel.

### Winding the Coils.

Their heads must be countersunk and filed down fairly flush, although the contact strip should be so cut and bent that it rides over an arc that clears them.



This photograph clearly shows the simplicity and symmetry of the panel lay-out. We hope readers will agree that the set forms an ideal all-range broadcast receiver.

Having mounted the variable condenser the spring contact should be fashioned. This fits on the spindle as shown in the photograph, and is situated between the nut and dial. A spot of solder on the point of contact makes for easier adjustments, and with just a little care perfect contact will be

given and the presence of anything mechanical under the dial be absolutely unknown to any but the constructor.

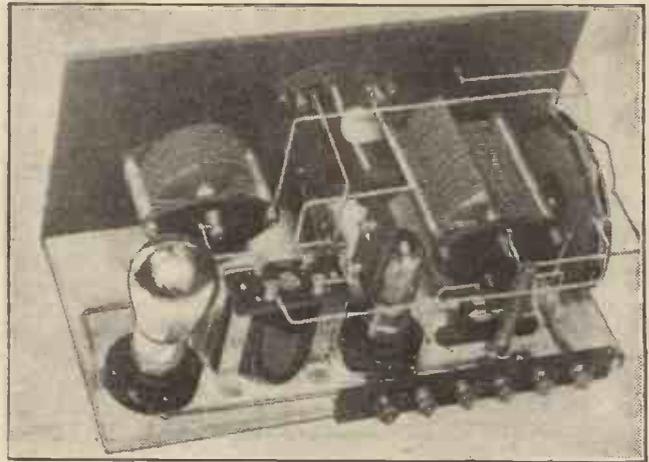
The exact position of the arm in respect of that of the dial zero reading is not of great importance as a little thought will show, for it will be impossible to miss obtaining the two ranges as long as a good, continuous contact is made with the plate.

If 2-volt valves such as the D.E.R. or Cleartron C.T.15, etc., are to be used, the Burndept resistor and pealamp holder will not be required, for owing to the loss in wiring full filament voltage will be needed all the time. Filament resistances are quite unnecessary in a set of this nature if care is taken in the choice of valves. But more of this when the question of accessories is dealt with. In case other types of valves are to be used it is as well to include the resistor—it will not be in the way and is quite a cheap component.

After the .001 mfd. variable condenser has been fitted on the panel the other components can be mounted, including those that are situated on the baseboard. The H.F. choke should be secured to the panel

by means of two countersinking screws and nuts.

The coils are ordinary spider-web coils wound on cardboard formers having 11 slots. Both coils should be wound with 150 turns of 28-gauge S.S.C. wire, the aerial coil being tapped at its 35th turn. In order



A back-of-panel view showing the valves in position.

to get the wire on they should be wound missing every other slot.

The two coils should be fixed together with their windings in the same direction. They can be held together by means of a brass screw, nut and washers. A little  $\frac{1}{4}$  in. long tube of rubber or ebonite inserted so as to hold the coils that distance apart should be used.

### Commencing the Wiring.

The two coils were secured to the panel in the original set by taking a small block of wood and cutting two slots in it. In these slots the edges of the formers were inserted, a little "Stickphast" being brought into service to make the job more secure. Screws were then driven through the block into the baseboard.

The terminal strip, measuring 7 by 1 in., should be cut from  $\frac{3}{8}$  in. ebonite and drilled for 6 terminals spaced 1 in. apart and  $\frac{3}{8}$  in. from the top of the strip. When the terminals have been fixed in position the whole can be screwed to the baseboard.

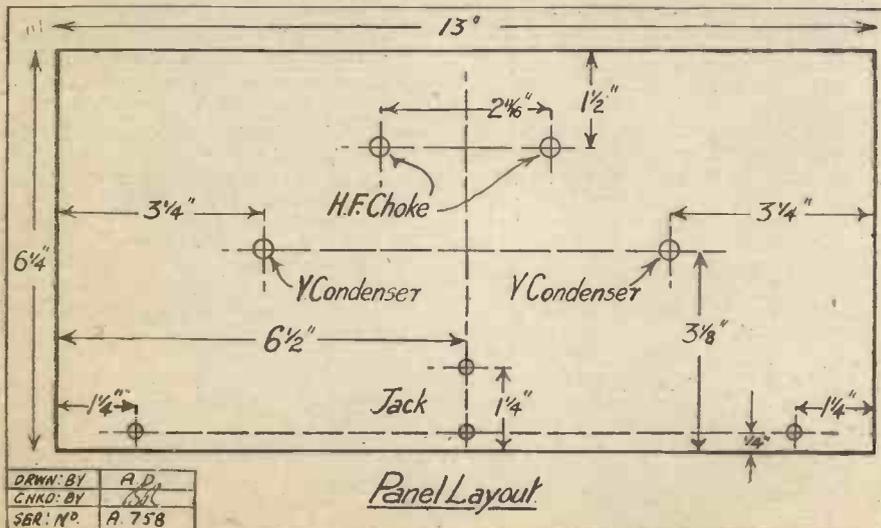
Then the wiring can be commenced, and here the constructor will have the assistance of both a wiring diagram and a list of point-to-point connections. The photographs, too, should be referred to, for these show clearly the actual routes taken by individual leads. Also it will be as well to draw the constructor's attention to the "For The Constructor" series which appears in our "Radiatorial" columns, for these contain all the essential information concerning soldering, etc., that a constructor needs in the assembly of a radio set.

### The Accessories to Use.

The .002 mfd. Lissen fixed condenser should be connected in circuit securely as no other method of holding it in place is employed. As will be seen from the back of panel photographs, it is suspended by its own leads. Care should be taken that ample clearance for the valves and the moving vanes of the variable condenser is allowed.

When the wiring is satisfactorily completed there remains but the final cleaning up and the set is completed. A high resistance loud speaker and phones will be required—the usual 2,000 to 4,000 ohms being the most suitable value. Using 2-volt valves no resistor is required and a Burndept Shorting Plug, which costs 1s. 6d., or a wad of tin foil jammed in the holder should be used instead. Two Ediswan P.V.6 D.E.'s operate very well in this set or a D.E.R.

(Continued on page 293.)





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

IT is interesting to see in "Radio" (S. Africa) some "Unidyne Don'ts" at the head of an article, showing that the Unidyne has secured enthusiastic users even in distant parts of the world. Here is a short summary of the items: "Don't forget the circuit requires even more careful hooking up than one using H.T. Don't use inferior components, especially the grid leak. Don't get the battery the wrong way round. Don't forget that the filament voltage of the valve is 4, and that great care should be taken with the rheostat if using a 6-volt battery. Don't forget, in the absence of signals, to try reversing leads to reaction coil, and, when once you have signals, see whether there is any improvement by changing bottom variable grid-leak connection to L.T. leads. Don't think the circuit is incapable of causing interference. Don't forget the silent background, which is disconcerting at first, is one of the Unidyne characteristics and advantages. Don't forget that a particularly fine reaction control is obtained by adjusting variable grid leak; this is one of the secrets of reaction control in Unidyne circuits."

#### A New Type of Valve.

A remarkable new development in connection with wireless valves and broadcasting is reported from the United States. It is understood that engineers of the Cleartron Co., of New York, are working on a special kind of valve, by means of which it will be possible to "split up" long-wave or broadcast length transmission, so that, although in some ways the long-wave characteristics are preserved, the transmission takes on the well-known advantages of short-wave transmission, the principal one of which is the ability to travel great distances on small power. It is claimed that if the new system comes out according to expectations it will greatly simplify and cheapen broadcasting, and may also have an immense application in connection with receiving sets. Furthermore, it should be possible, according to the inventor, to establish direct telephonic radio communication, on quite small power, and at all times, between places several thousand miles apart. Important tests of the new system are to be arranged in the course of the next few weeks between London and parts of the Continent, and several points in the United States. Full technical details of the system are not to hand, but these will be given in these Notes in due course.

#### Indoor Aerials.

Since the mention of indoor aerials in these Notes a short time ago I have received a number of letters from readers giving me the results of their experiments and observations upon indoor aerials. None of these letters describe any very original type of aerial, but nevertheless some of the observations on the more conventional types are quite useful. Of the type of aerial which consists of a wire or wires stretched across



The Oxford Crew examining the operation of the Marconi "Straight Eight" Receiver.

the room between opposite walls, it appears that the one starting at one corner of the room and going alternately to and fro is the best for all-round work. The indoor aerial which consists of a number of parallel wires all connected together at one end and all free at the other end is not so efficient, whilst an aerial consisting of a number of parallel wires all connected together at both ends, the down lead being taken from one end of the system, is still less efficient. Very good results appear to be obtained from a vertical loop which is made by running a wire along the wall just below the ceiling, down one side at the corner of the room, along the wall by the floor and up again at the opposite side of the wall. This loop, which will usually be fairly large, according

to the size of the room, may have perhaps two or three turns of wire. It has the disadvantage that it is fixed in direction, and if the bearing of the wall happens to be near the worst position for the desired station it cannot, of course, be adjusted. This may, however, to some extent be overcome by putting another loop on the adjacent wall, which will usually be at right-angles to the first one, and making switching arrangements so that either of these loops can be thrown into action at will.

#### Interfering Harmonics.

It will often be noticed that, with certain types of set, a station can be tuned in at two different points on the tuning condenser, and sometimes at more than two points. This fact is due to the reception of the station on its fundamental wave-length and on one or more of its harmonics. The reception on any of the harmonics will, of course (in general) be much weaker than that on the fundamental, and if the strength of the fundamental is reduced from any cause the strength of the harmonics may disappear, so far as any practical reception is concerned. If a station is operated on a wave-length of, say, 372 metres, the harmonics will be one-half of this, that is 186, one-third 124, one-fourth 94, and one-fifth 77, and so on. With a receiver designed to

tune at broadcast wave-lengths these harmonics in this case would not be received, but suppose a station were operating on a wave-length of 1,130 metres, its second harmonic, that is about 377 metres, would be likely, if of sufficient strength, to cause interference. This is the reason why a set designed for broadcast frequency will sometimes, to the mystification of its owner, receive a station whose wave-length is four or five times that to which the set is tuned.

#### Loud-speaker Polarity.

It is well known that in the usual type of loud speaker there is a definite polarity to the terminals, and that if the loud speaker

(Continued on page 294.)

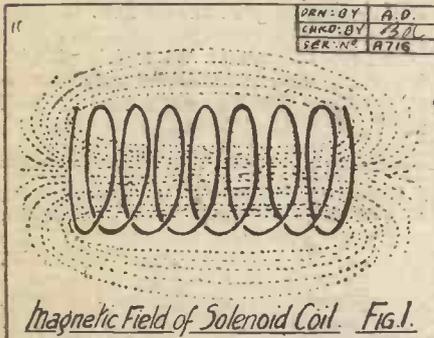


By R. H. WATSON.

## PART I. COIL FIELDS AND THEIR IMPORTANCE.

THE problem of the magnetic fields of inductances is one that has not so far received a great deal of attention; as we shall see, however, it is an exceedingly important one, and an understanding of it helps in no small degree towards the attainment of efficiency and stability in the design of wireless receiving sets.

For some time past a great deal of attention has been given to what are known as low-loss coils. The main object of the designers of these is to reduce self-capacity to a minimum and to keep down dielectric losses; this is accomplished in most cases by winding coils in solenoid form, with air spacing between turns, upon a former



Magnetic Field of Solenoid Coil. FIG. 1.

containing the smallest possible amount of solid dielectric material. Wireless is largely a matter of compromises. We can never hope to obtain complete perfection, for what we gain in one direction by improvements in design is nearly always offset by losses, greater or smaller, in another.

### The Field of a Solenoid.

The plain solenoid coil, for example, has the great advantage that it enables self-capacity to be kept low, since the difference in potential between adjacent turns is small. But unless you make the diameter of your coil large the length of the windings must be considerable, and this length is increased when you introduce spacing between the turns. There is a fairly definite optimum ratio between length and diameter for inductance coils.

Hence, if the air spacing is made wide there is a loss in efficiency owing to the increase in the length of the windings.

But there is another point with regard to the solenoid-wound low-loss coil which is not always fully realised. Such a coil has a very large magnetic field. Fig. 1 shows a typical solenoid field. In theory the lines of force extend for an infinite distance, but in actual practice their effects become negligible at a distance of some feet. The drawing shows the field set up in and around such a coil at a given instant when an oscillating current is passing through it. As current declines from its maximum the lines of force fall in and the field collapses.

### Miniature Aerials.

The reversal of the current causes the growth of a similar field, the poles of the coil being now reversed. The magnetic field is therefore continually expanding and contracting in "step with" the variations of the current. When the lines of a magnetic field cut a closed circuit during the process of expansion a spurt of current is induced in that circuit as they do so. During the contraction of the field a similar cutting takes place, and another spurt of current is induced in the opposite direction.

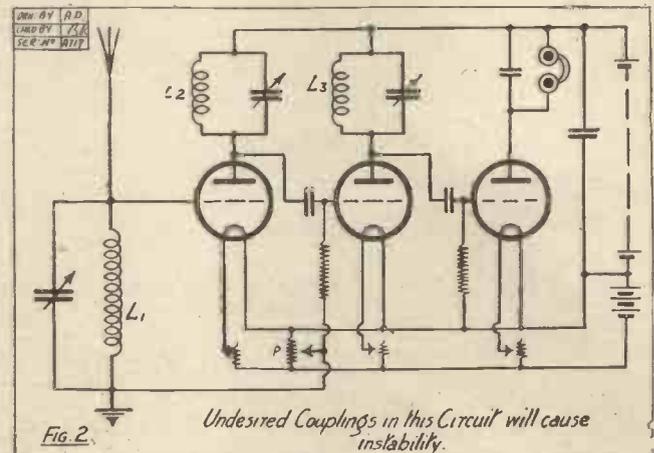
Further, when the field cuts a conductor impulses known as eddy currents are induced in it. Induction of any kind cannot take place without work being done; there is a transference of energy from the coil producing the field to the circuit or conductor in which impulses are induced. Unless we definitely desire such a transference, as we do, for example, when we couple the reaction coil to the aerial tuning inductance, its occurrence serves no useful purpose. It is, in fact, definitely a disadvantage, since, as the currents passing through the coil are made to do work, the H.F. resistance of the windings is increased and there is a direct loss in efficiency.

It appears, then, that if full advantage is to be taken of the air-spaced solenoid

coil, the greatest care must be exercised to select a position for it where its large field will not cause undue losses. And there is another consideration. A coil with a large magnetic field has usually well-marked "pick up" properties; that is to say, it acts as a miniature frame aerial, to the detriment of the selectivity of the receiving set. One sometimes hears enthusiasts boast that their sets will receive quite a weak signal without either aerial or earth; they do not always realise that such reception is due to the pick-up effects of the inductances and the wiring. With a receiving set of this kind it will generally be impossible to tune out a local station so that signals on wave-lengths fairly close on either side of it may be tuned in.

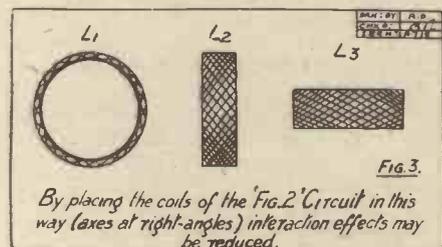
### Violent Reaction Effects.

The worst effects of inductances with large magnetic fields are found when the receiving set contains one or more stages of H.F. amplification. If, for example, magnetic coupling exists even to a small



extent between the inductances  $L_1$ ,  $L_2$ , and  $L_3$  in the circuit shown in Fig. 2, violent reaction effects will take place and the set will be so unstable that it can be "held down" only by introducing damping into the grid circuits of the first two valves by using the potentiometer P to apply a positive potential of several volts.

The use of the potentiometer in this way is most undesirable, since, though it may produce a kind of stability, it ruins the sensitiveness and the selectivity of the receiving set. By exercising care in the placing of inductances it is possible to reduce



to some extent the stray couplings which take place.

If, for example, plug-in coils are used, and their holders are placed so that the axes of the coils are at right angles to one another, as shown in Fig. 3, the set will become at once much more stable, and far less potentiometer damping will be needed, provided that the coils are mounted not

(Continued on next page.)

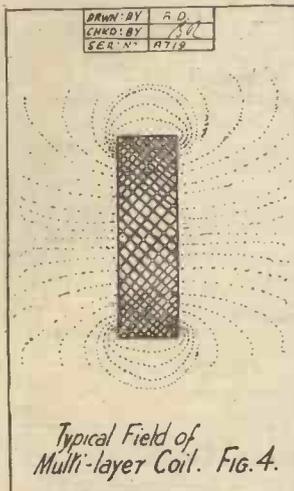
## COILS THAT DO NOT INTERACT.

(Continued from previous page.)

less than six inches from one another. Even the commercial plug-in coil, however, has a considerable magnetic field, and it is desirable that this should be the case, since these coils are frequently used in coupled circuits. Fig. 4 shows the field of a typical multi-layer plug-in coil.

And besides the magnetic field there is another cause of stray couplings whose importance is not always realised: this is capacity. How great the effects of capacity couplings are will be appreciated by those who have done any work upon neutrodyne circuits. The theory of the neutrodyne method is that we balance out the capacity feed-back between the grid and plate of the valve by introducing a neutralising condenser whose capacity is of the same order.

It is obvious that the capacity between the grid and the plate must be a very small one, even when we take into account the leads in the pinch and cap of the valve, the pins of the holder, and the legs of the holder. Yet when we come to apply the



neutrodyne principle we find that a comparatively large variable condenser is often necessary. This is so because we have to neutralise a much greater amount of capacity than is at first apparent, and also because when ordinary coils or transformers are used there are both magnetic and capacity couplings between them. If we could eliminate these entirely, the setting of the neutralising condenser would remain constant instead of having to be varied slightly to suit different wave-lengths.

### Limitations of Screening.

The most certain way of getting rid of the capacity coupling between coils is to screen them by placing them in closed metal boxes, shown diagrammatically in Fig. 5. The screens are connected to a point which is as nearly as possible at zero H.F. potential. In the case under discussion they are connected to the high tension positive lead, which may be regarded as practically at earth potential so far as H.F. currents are concerned, since a path to earth is provided for them in the large condenser placed across the H.T. battery. Now, consider the two coils A and B. The lower end of each is attached to the plate of one of the valves, and is therefore at a varying potential during reception.

At the upper ends the potential does not vary, and it is the same as that of the

screens. The capacity coupling of each coil is, therefore, to the screen, or in other words to the earth. The potential of the screen is unvarying, and there is thus no capacity coupling between the coils A and B. The screens will also intercept the magnetic fields of the coils, so that the magnetic couplings will be eliminated as well. But if we use metal screens with ordinary coils, the losses may be very great, owing to the setting up of eddy currents; tuning will be exceedingly flat, and the receiving set will become insensitive.

### "Small-field" Coils.

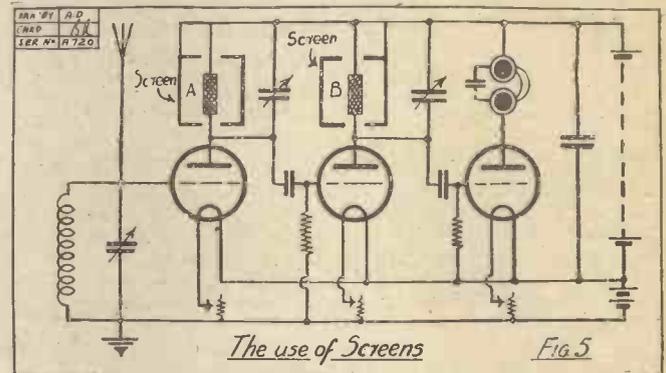
The solenoid coil with its large field can hardly be screened effectively; the multi-layer inductance may be dealt with in this way, but if heavy loss is not to be introduced, the screening box must be of very large size—for the average commercial coil it would have to be about as big as a 7 lb. biscuit tin!

It follows that if we wish to avoid interaction, due either to magnetic or to capacity coupling, we are most likely to be successful if for the H.F. couplings we use coils specially designed so as to have the smallest external field possible. When these are employed, we can make use of screens of reasonably small size, since there will be few or no losses due to eddy currents.

Up to the present three types of small-field coil have been evolved. These are the toroidal coil, the "binocular" coil, and the "D" coil. The toroidal coil, in its simplest form, is a solenoid bent round into a circle. The result of doing this is to confine the magnetic field almost en-

tirely to the interior of the coil. There must be a slight external field, but it is so small that it is undetectable by ordinary means.

The binocular coil consists of two solenoids standing side by side; the windings are in opposite directions, and are connected together at the mid-point of the coil. Here the field is very largely contained within the coil itself, but there is a detectable external field at the ends of the solenoids. Though the binocular coil has a smaller field than the plain solenoid or the multi-layer coil it has still an appreciable field, and it does not therefore eliminate magnetic couplings to the same extent as the toroidal inductance.



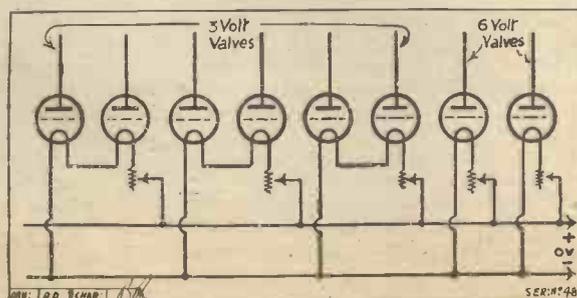
The D coil is wound on quite a different principle. Instead of being circular, each of its turns is shaped like a figure of eight. Though this coil is the most difficult of the three types to make satisfactorily, it has an exceedingly small and feeble field, and it is therefore a good one for H.F. coupling purposes.

The second part of this article will give full constructional details for making each of the three kinds of small-field coil in a novel and efficient form.

## MULTIVALVE SETS AND MONEY-SAVING.

From a Correspondent.

THE consumption of filament current by a four-valve set is by no means inappreciable, but the same factor in regard to an eight-valve set becomes a financial consideration—and a nuisance also, if the owner cannot charge his cells at home. A method of cutting down current consumption is to use for H.F. and detection "dull-emitter" valves of the type which take 0.06 ampere.



Consider the case of an eight-valve set (five H.F., one Det., two L.F.). For L.F. you will probably (and advisedly) use valves of the D.E.5 type, requiring 6 volts. In order to be able to use 0.06 type valves with a 6-volt accumulator without burning them out, they should be connected in series, as shown in the diagram.

A comparison will reveal the saving in current effected by this method.

Case 1.—Eight-valve set, using 6 R.5V. and 2 D.E.5 (6 × 0.7 amp.) + (2 × 0.25 amp.) = 4.7 amp.

Case 2.—Eight-valve set, using D.E.5 valves (8 × 0.25 amp.) = 2.0 amp.

Case 3.—Eight-valve set, using six of the 0.06 type and two D.E.5, connected as shown in diagram (3 × 0.06 amp.) + (2 × 0.25 amp.) = 0.68 amp.

Case 4.—Eight-valve set, using six of the 0.06 type and two D.E.8, connected as shown. (3 × 0.06 amp.) + (2 × 0.12 amp.) = 0.42 amp.

The difference in the current required for Cases 1 and 4 is no less than 4.28 amp. Case 4, compared with Case 2, shows a saving of 1.58 amp.



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Try the combination out for yourself. An illustrated catalogue giving full particulars will be sent for the asking if you write for Catalogue A. All valves are sent to you post free.



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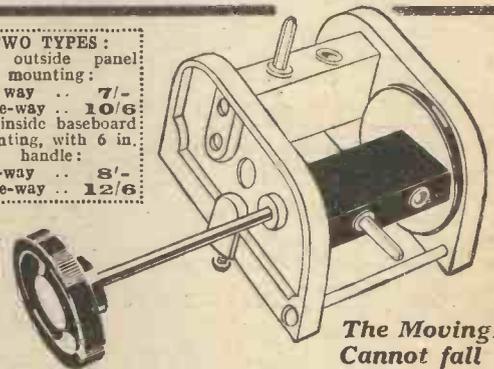
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 Makers of the New LOTUS BUOYANCY VALVE HOLDER

# BROADCASTING AND TRADE.

## Why Not Radio Advertising?

AN INTERVIEW WITH SIR WOODMAN BURBIDGE.

By "ARIEL."

IT was a few minutes before ten o'clock in the morning when I entered the stores to keep my appointment for fifteen with Sir Woodman Burbidge, chairman of Harrods. I made the mistake of entering by one of the main entrances, and was instantly swept off my feet by an avalanche of attractive femininity, and left stranded at a bargain counter, wedged between bales of "shadow cretonne" and a few thousand yards of what women rave over and let their husbands pay for.

However, slightly dishevelled, I arrived at the well-appointed but extremely business-like office of Sir Woodman Burbidge, situated on the second floor of the great building, just in time to keep the appointment.

"Wireless as a hobby is to me a great attraction," Sir Woodman Burbidge told me. "I think it is a very excellent entertainment. I used to have a set, but it has been dismantled. However, I shall shortly have another one."

### Unrealised Possibilities.

Sir Woodman finds the B.B.C. programmes quite entertaining, but he acknowledges that there is room for a great deal of improvement. He expressed the hope that next year it would not become an entirely government-run enterprise.

"This would spoil it entirely," he said. "I am not in favour of such an enterprise being run by the government; there would be too much red tape, and officialdom is so monotonous."

"Whenever I listen in, I find the programmes quite diverting. I think that speeches, for instance, are very interesting. It is pleasing to be able to listen to distinguished people talking without travelling many miles. I think also that the topical talks are well chosen, and they have always proved of interest to me."

Sir Woodman Burbidge who, not long ago, paid another visit to America, says that in England the broadcasting authorities have not realised the possibilities of wireless with regard to trade as has been the case across the Atlantic.

### A Housewives' Half-hour.

"Utilised in a certain way, broadcasting could be one of the most valuable mediums of advertising in existence. Such a thing as official wireless advertising exists in America. Why not here?"

Continuing, he said that in his opinion what would prove an interesting and valuable feature would be a special housewives' half hour from nine o'clock till half-past nine each morning.

"They would hear on the loud speaker that Scotch hares were being sold at one and tenpence per pound at So-and-So's, the various prices of meat at Black's, and new-laid eggs at White's, etc. But it would not be confined to these commodities.

Everything genuine in advertising could be treated. We should be one of the first to give a big contract for this kind of publicity. In America a fee of fifty dollars per minute is considered reasonable for radio publicity.

### A Huge Revenue.

"Housewives in this way would be able to save a lot of money shopping, and they would not waste any time making their purchases. They would welcome this idea, just as we would. Wireless publicity run by the B.B.C. would bring in a huge revenue, running into tens of thousands of pounds each year."

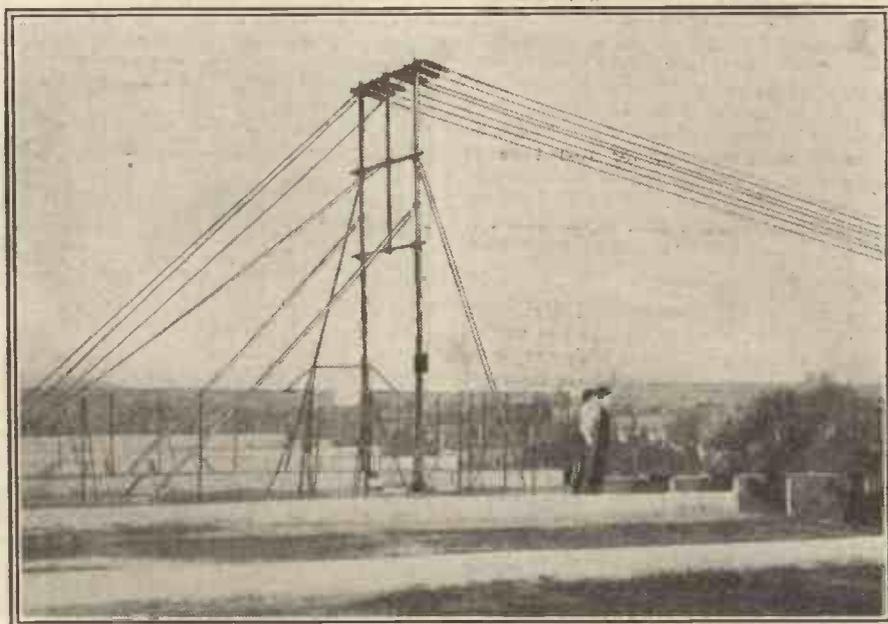
"There are, however, all kinds of restrictions in England which would not allow this kind of wireless publicity. While most big business men would wel-

come to go and see the whole play or musical show. Personally I prefer going to the theatre to listening to the words. I am a lover of good acting, and, of course, this is lost on the wireless. But I do think that if the broadcast excerpt is good, and is appreciated by the general public this will bring the crowd to the theatre.

"It is like reading a serial in a newspaper. Readers buy the paper day by day to see what's going to happen next. It is much the same with the wireless. The unseen audience wants to know what's going to happen next, or to be said next, and so they go to the theatre and pay to find out."

### No Restrictions in America.

On the whole Sir Woodman Burbidge



The aerials of the Ecole Supérieure broadcasting station, which are situated on the roof of the Paris Central Telegraph Office.

come the idea, a certain section of the British wireless public is right against it."

Sir Woodman Burbidge, despite the fact that his large business interests occupy most of his time, give him all work and allow him very little play, is an ardent theatregoer. Now and again he finds time to go to a "first night" and enjoy a good play.

### Value of Publicity.

"Whereas we in our business derive no publicity from broadcasting at the present moment, this does not seem to be the case with the theatre. Hardly a week passes that an excerpt from a play or musical comedy is not included in the B.B.C."

"I think this idea is of excellent advertising value. In my mind it is an induce-

ment that the wireless industry is all wrong.

"Wireless in America," he told me in conclusion, "is a revelation. There are no restrictions of any kind. That is why it is so successful. Here we have government restrictions. The less the government has to do with broadcasting the better. It is much safer in commercial hands. Run as it is now it should improve by leaps and bounds."

"One year of real hard work should make all the difference. We have everything that America has. Why should we be backward? As is the case with our films, nobody knows the reason. In 1927, however, I expect we will have a wireless organisation rivalling the radio perfection that exists in the United States to-day."



# CRYSTAL CHATS

By J. F. CORRIGAN, M.Sc., A.I.C.

(Staff Consultant).

## No. VII. SILICON.

**SILICON** is one of the very few rectifying materials which are elementary in nature; that is to say, which are not composed of two or more substances chemically combined together. Silicon is an element, and although it can exist in several different forms, the product which is used for wireless purposes invariably comes to the market in the shape of fused lumps of a steely-grey looking substance.

Silicon is a good rectifier, no matter whether it be used in conjunction with another crystal in a detector of the perikon type, or whether it is employed with a light wire or cat's-whisker contact.

The most sensitive grades of silicon have a light steel-grey colour. These will be found to be almost equally sensitive all over their surfaces. Lumps of fused silicon which exhibit a distinct blue appearance should be regarded with caution, for this type of material is very often poorly or unequally sensitive. Why this should be so is not by any means apparent, but, nevertheless, it is an empirical fact born out by experience.

### How it is Obtained.

In its free and uncombined state, the element silicon is not found in the earth's surface, although combined with oxygen in the form of silica, silicon is one of the most abundant elements which the earth possesses—it being, next to oxygen, the commonest element in Nature.

In order to obtain the pure element, purified sand (which is really silicon dioxide,  $\text{SiO}_2$ ) is mixed with magnesium powder, and the mixture is very strongly heated either by the thermite method or by means of a specially constructed electric furnace. Silicon is obtained in this way in the form of a light brown powder. This product is, however, of no use whatever for wireless or for other purposes, and, consequently, the silicon has to undergo at least one further process before it can be obtained in the lump form.

The brown silicon is packed into electric furnaces together with a certain proportion of some non-oxidising material, and it is there subjected to a prolonged period of heating. The brown silicon fuses, and in fusing it becomes changed into another form of the element—the familiar steel-grey modification with which every crystal experimenter is so conversant. After cooling, the lump silicon is chiselled out of the furnace.

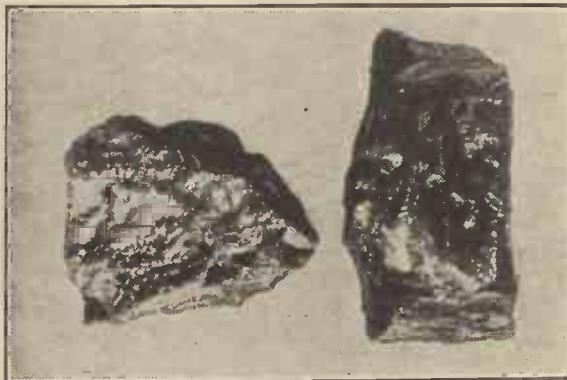
Not all of the material is radio-sensitive. In fact, only about 25 per cent of it possesses this desirable property. The sensitive lumps are therefore carefully selected by

the crystal dealer, and the rejected portions of the mass of silicon are reserved for those uses for which the silicon is primarily produced, i.e. for the manufacture of silicon steels and other alloys.

### Its Radio-Sensitive Properties.

Silicon crystals are very hard. They are non-brittle, and they will easily scratch glass. In fact, a silicon crystal suitably mounted is capable of making a very excellent cutter for thin sheets of glass such as electric light and valve bulbs.

Coming to the radio-sensitive properties of silicon, however, good lumps of this



Typical specimens of fused Silicon.

material make very reliable rectifiers. A silicon crystal can be used in contact with zincite, molybdenite, iron pyrites, copper pyrites, and galena. As a cat's-whisker crystal it also gives efficient results with any metallic point, particularly with brass or a similar alloy.

### Unaffected by Heat.

For perikon work, the best contacts to use with silicon are either zincite or iron pyrites. The contact-pressure is rather critical. Used as a cat's-whisker crystal, silicon does not necessitate a very critical contact-pressure, a short length of wire allowed to rest on the surface of the crystal under the pressure of its own weight affording about the right pressure required.

A crystal of silicon will stand any amount of heat without "going off" in sensitivity. Sometimes, in fact, such a crystal may be appreciably improved in sensitive properties by heating it to a white heat in a blowpipe and then allowing it to cool down slowly to normal temperatures.

Before the introduction of the ever-popular proprietary brands of galena

crystals, silicon was probably the crystal most generally employed in amateur receiving sets. First introduced into practical work in the year 1907, the element quickly found favour in the hands of the crystal enthusiasts of that period. It formed part of the crystal equipment of commercial receiving stations before the introduction of the valve, and therefore this fact alone should be sufficient to give the element a high place in the list of crystal and mineral rectifying materials which are available for the use of the present-day crystal-set owner.

### Experimental Contacts.

The popularity of silicon has waned, however. Probably this fact is due to the greater efficiency of carefully selected galena in the matter of distance-sensitivity. Silicon will only give reliable results over distances of about 10 miles or so from an ordinary broadcasting station, but some specimens of galena have been known on occasions to rectify signals coming from stations ten and twelve times this distance away.

Despite this fact, however, silicon has greater sensitivity-retaining powers than any galena crystal. It does not suddenly and mysteriously lose its rectifying powers like galena crystals very often do, and it is much more robust than the latter mineral in physical properties.

Like bornite, silicon contacts may be used effectively in double rectification crystal circuits. For the investigation of atmospheric disturbances affecting crystal reception, a crystal combination made up of silicon and metallic arsenic is especially sensitive, such a contact being employed in Austin's interference preventer.

Experimental contacts for silicon are antimony, cadmium, bismuth, tin, lead, aluminium, platinum, iridium, gold, thallium, cobalt, various steels, and various alloys of the above-named metals.

Certain jewels, such as diamonds, sapphires and rubies have, on occasion, given surprisingly good and effective results when used in conjunction with silicon, although in these instances the efficiency of the results depends upon the nature of the jewel employed, and therefore constantly effective rectification cannot always be expected when experimenting with these contacts.

Finally, a silicon-carborundum makes an efficient rectifier, but in this case a local E.M.F. is required. This E.M.F. is rather high, being about 2.7 volts, but, at the same time, an extraordinarily stable contact is afforded by the use of these two rectification elements.

### Useful Data.

COMPOSITION.—Element. Si.

APPEARANCE.—Most sensitive grades are light steel-grey in colour. Less satisfactory grades are bluish.

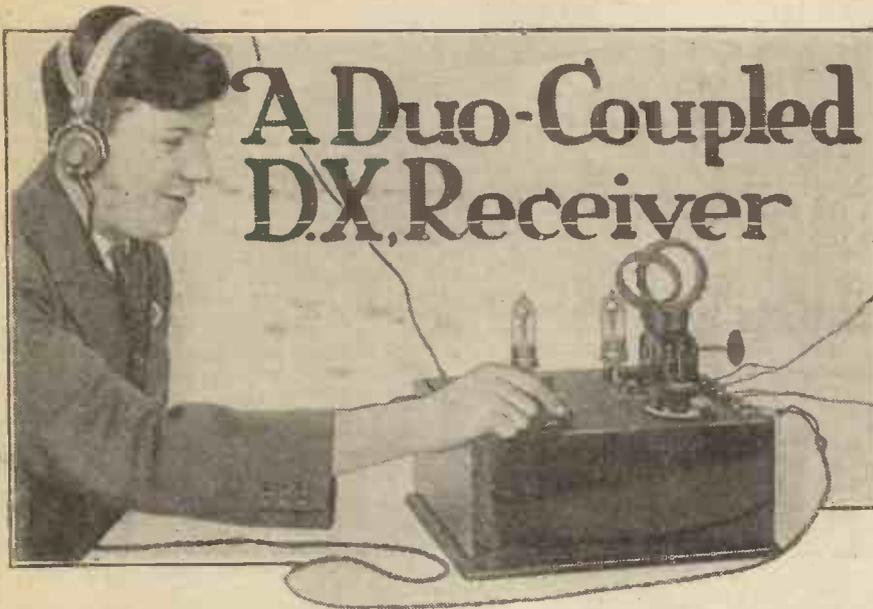
CHARACTERISTICS.—Extremely hard. Will scratch glass. Non-brittle. Makes a good rectifier with perikon or cat's-whisker contacts.

BEST CONTACTS FOR ORDINARY USE.—

Perikon : Zincite, Iron Pyrites.

Metallic : Brass or similar alloys.

CURRENT PRICE.—7d. per ounce.



The Set Designed and Described by  
**K. D. ROGERS**  
(Assist. Technical Editor),

Constructional Work by  
**G. V. COLLE and C. A. MEADOWS**  
(Technical Staff).

IN the issue of POPULAR WIRELESS dated February 27th, 1926 (No. 196), details were given of a crystal set employing a novel form of two-circuit tuning. This was known as the Duo-Coupled Crystal Set, and has proved so popular among readers that it was decided to apply the principle to a valve receiver.

**A Novel Circuit.**

For this purpose the well-known and popular H.F. and Det. tuned anode circuit was chosen, and this was adapted to take the new form of tuning, with the net result that the previous selectivity of the circuit was greatly increased, while signal strength upon the new set was noticeably improved above that normally expected from such a receiver.

As some readers may not be aware of the circuit arrangement, it will perhaps be

advisable to explain how the tuning is carried out on the duo-coupled principle, and more especially with regard to the circuit under consideration, as shown in Fig. 1.

It will be seen that two tuning coils are permanently embodied in the circuit, while provision is made for a loading coil placed in the aerial-earth lead. This is in addition to the tuned anode and reaction coils, which are of the plug-in variety. The two tuning coils referred to previously are fixed, and do not have to be changed for increase or decrease in wave-length range.

Considering first the reception of the local station (or other short-wave station operating between 300 and 450 metres), it must be remembered that the loading coil is removed, its sockets being automatically "shorted" by the action of pulling the coil out of its position. The action of the circuit is then as follows, the anode and reaction coils being plug-in coils of the size usually necessary for the covering of the wave-length band under consideration.

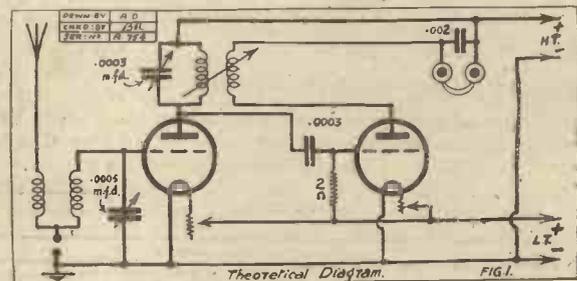
The impulses received by the aerial flow through the 30-turn coil to the loading plug (shorted) and thence to earth. Coupled tightly to this circuit is another circuit composed of the 65-turn coil placed, together with the tuning condenser, across the

grid and filament of the H.F. valve. The current flowing in the 30-turn coil will therefore induce similar currents in the second circuit, which therefore has the advantage of being free from the influence of the aerial and is capable of being very sharply tuned. Owing to the close coupling,

**LIST OF COMPONENTS.** s. d.

1 Panel, 10 x 12 x 1/4 (Peto-Scott) ..	7	6
1 Cabinet .. .. .	10	0
1 .0005 variable condenser (Lamplugh) .. .	17	6
1 .0003 variable condenser (Wates) .. .	7	9
2 Sets of valve holders (Security) .. .	2	0
2 Rheostats (Lamplugh) .. .	6	0
1 2-way coil holder (Lotus) .. .	7	0
1 Loading-coil plug (Redgate) .. .	1	0
1 .0003 fixed condenser and grid-leak clips (Lissen) .. .	2	0
1 2 megohm grid leak (Lissen) .. .	1	8
2 Basket-coil formers .. .	8	
1/4 lb. 26 D.C.C. wire .. .	1	3
1 Packet of Glazite .. .	1	0
1 .002 fixed condenser (Lissen) .. .	2	6
8 W.O. type terminals .. .	1	0

the aerial coil, which would otherwise be aperiodic, is only semi-aperiodic, so that a compromise between selectivity and sensitivity is made, resulting in a very satisfactory system which may be said to have most of the advantages of two-circuit tuning without the disadvantage of needing more than one control.



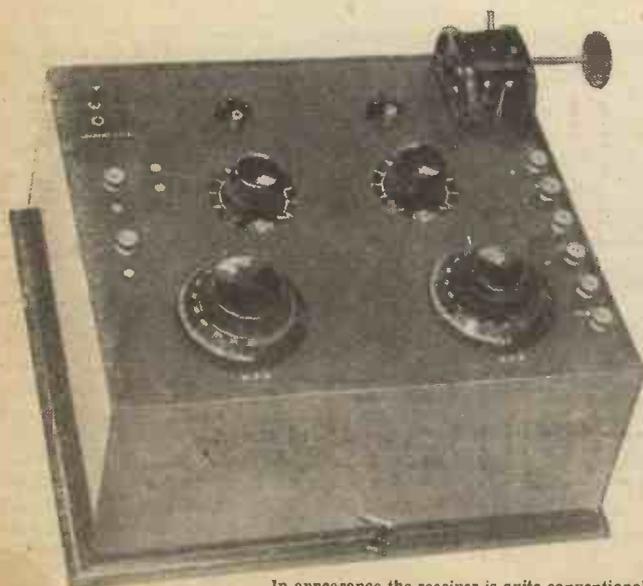
The rest of the circuit is quite normal, but it is worth pointing out that the fact of having the reaction coil coupled to the anode coil not only reduces the likelihood of radiation when the set is oscillating, but also still further increases the selectivity of the receiver, thus making it extremely selective and yet easy to operate.

**Action of the Duo-Coupling.**

Now let us suppose that Daventry or some high wave-length station is required, and let us see how the loading coil affects the tuning of the set. In the first place the anode and reaction coils will have to be changed—this is quite as usual—and then a loading coil inserted in the holder.

This coil has two functions—it loads both the aerial and the secondary circuit. In the usual two-circuit tuner two loading coils are required if full efficiency is to be obtained (that is, if the aerial circuit is not to remain aperiodic), but in this case only one coil is needed, because both circuits have a common connection. They are, in fact, auto-coupled, and as the loading coil is inserted in the small portion of the circuit that is common to both, it has the effect of loading both circuits.

(Continued on next page.)

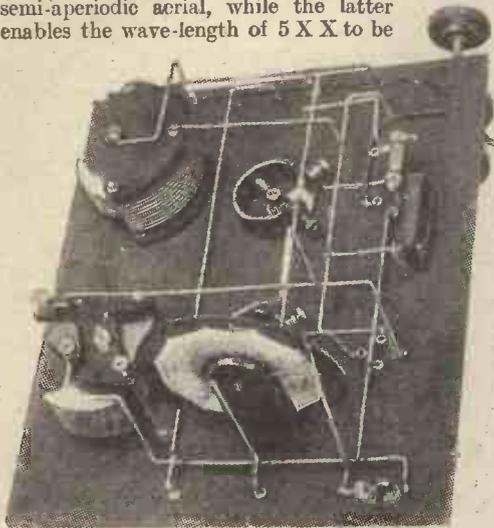


In appearance the receiver is quite conventional, with the controls laid out so that handling is extremely simple.

**A DUO-COUPLED DX RECEIVER.**

(Continued from previous page.)

Suppose a 150-turn coil is used for loading the set up to 5 X X, we then have an aerial circuit consisting of  $150 + 30 = 180$  turns, and a secondary of  $150 + 60 = 210$  turns. The former is an efficient size for a semi-aperiodic aerial, while the latter enables the wave-length of 5 X X to be



This illustration of the set should assist the constructor when the wiring up process is commenced.

covered by means of the variable condenser without the slightest trouble.

**Winding The Coils.**

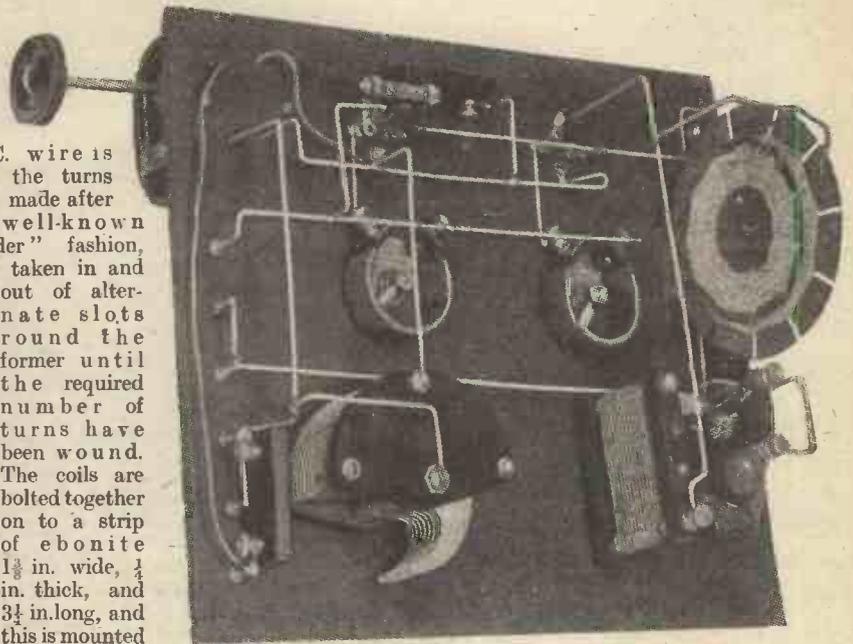
The two coils are wound on cardboard or fibre formers having 11 slots and overall diameters of 3 inches and  $4\frac{1}{2}$  inches respectively for the 30 and 60 turn coils. 26

D.C.C. wire is used, the turns being made after the well-known "spider" fashion, being taken in and out of alternate slots round the former until the required number of turns have been wound. The coils are bolted together on to a strip of ebonite  $1\frac{1}{8}$  in. wide,  $\frac{1}{4}$  in. thick, and  $3\frac{1}{2}$  in. long, and this is mounted vertically on the reverse side of the panel by means of two counter-sunk 2BA bolts.

**Insulated Wire.**

A panel 12 in. by 10 in. by  $\frac{1}{8}$  in. is required, with a cabinet to fit having a depth of about  $4-4\frac{1}{2}$  in. The full list of components is given on the previous page, and should be adhered to if the constructor wishes to make full use of the panel-drilling diagram given in Fig. 2. If different components are used the figure will have to be altered to suit the various items that are different from those given in the list.

Glazite connecting wire has been used in



A "close up" of the under panel wiring which clearly shows the simple nature of the receiver.

the set photographed, and constructors are recommended to use this, as it enables the wiring to be carried out neatly, efficiently, and with perfect safety, it being impossible for any accident to occur through wires touching each other at points where they run close to each other or have to cross over.

The mounting of the components is an easy matter, and the subsequent wiring should not prove difficult, providing careful soldering is done. There is one point in the former, however, that should be mentioned, and this concerns the Redhill self-shorting loading-coil holder.

This little instrument is sold already mounted on an ebonite base, but as this is to be discarded when the holder is to be mounted on a panel, it will be found a little tricky to get the spacing between the two sections of the holder accurate. The best way is to use the ebonite mount as a template, taking care that the points marked on the panel coincide exactly with the centres of the holes in the ebonite strip. If any error is allowed to creep in, a loose contact or none at all between the two sections may be the result, and the holder will not be shorted when the coil is removed.

**Range and Reception.**

In discussing sets of this description, it is always more satisfactory to state clearly what may be expected as regards range of reception, signal strength, etc., so that the constructor may know exactly where he is and what he may look for in the set he is building.

As regards range of reception, the duo-coupled H.F. and Det. may be said to be practically unlimited provided conditions are favourable. In other words, it should be capable of receiving all, or nearly all, the B.B.C. stations, many Continental, and on some occasions several American broadcasts. It will need careful handling, not because it is prone to oscillation or unstable, but because its selectivity necessitates accurate tuning before any distant transmission can be picked up. An outdoor

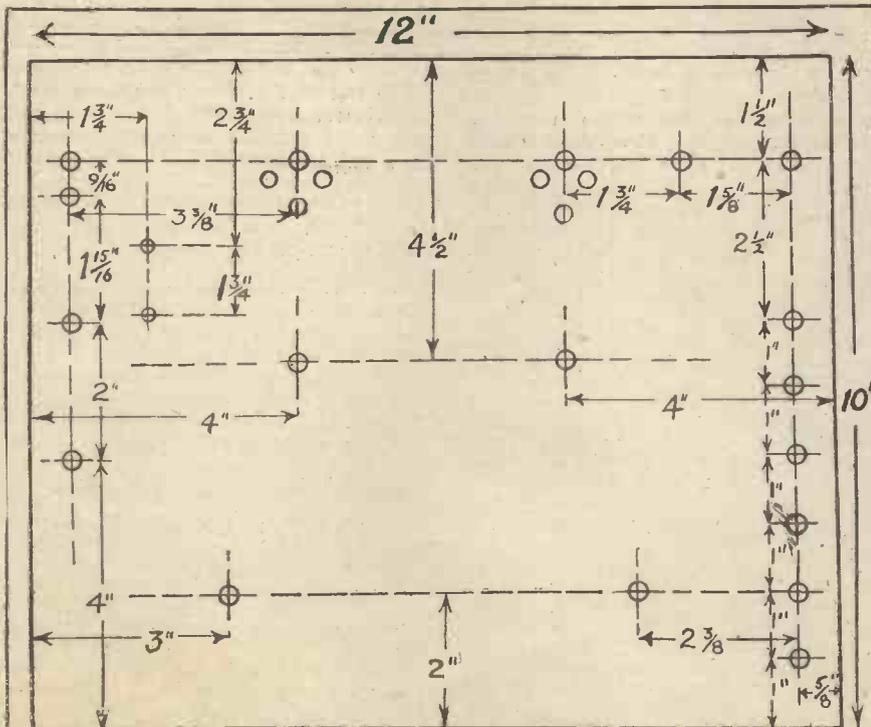


Fig. 2

Panel Layout

DRUN BY A.D.  
 CHED 13/21  
 SER. NO. A751

(Continued on next page.)

## A DUO-COUPLED DX RECEIVER.

(Continued from previous page.)

aerial should be used and valves suitable for the tasks they have to perform; i.e. an H.F. valve for the first stage and a detector for the second. Batteries to suit the valves will be required, the H.T. battery being capable of supplying 60-70 volts.

Signal strength will be of the order of "good 'phone strength," for no L.F. stage is employed, and so the set is not suitable (as it stands) for use with a loud speaker. An L.F. valve could be added afterwards, if desired, should the constructor wish the set to give loud-speaker results on some of the stations.

### Simple to Connect Up.

For the reception of broadcasting between 300 and 450 metres no loading coil need be inserted in the loading socket, but above that a coil of 25 turns should be used. For 5 X X 150 turns loading will be required. The anode and reaction coils will, of course, have to be changed at the same time, the former being 75 and 200 turns for the two wave-length ranges and the latter about 50 and 150 turns.

The wiring of the receiver is simple, and should be carried out according to Fig. 3, care being taken that all traces of flux and loose solder are removed before the set is tested.

When using the receiver it must not be forgotten that, although reaction is carried out on the anode coil and the set has an aperiodic-coupled aerial, the set is capable of causing interference to nearby listeners if it is carelessly handled. It will not be so violent in its interference

as a straight Det. receiver or an H.F. and Det. with reaction on the aerial; but, nevertheless, it is capable of upsetting neighbouring receivers, and so the listener should exercise the greatest care while he is testing it out, and until he is familiar with the handling of the set.

### POINT-TO-POINT CONNECTIONS

One side of 30-turn coil to aerial terminal, remaining side of this coil to end of 65-turn coil and one side of loading-coil plug.

Other side of loading-coil plug to earth, H.T.—, one filament pin of each valve holder, L.T.—, and one side of .0005 variable condenser.

Remaining side of .0005 to grid of 1st valve and other side of 65-turn coil. Plate of 1st valve to one side of anode coil and .0003 variable condenser and one side of grid condenser; other side of anode coil and condenser to H.T.+ . Remaining side of grid condenser to grid of 2nd valve and one side of grid leak, other side of grid leak to L.T.+ and one side of each rheostat, remaining filament pin of each valve holder to remaining side of its respective rheostat.

Plate of 2nd valve to one side of reaction coil, other side of reaction coil to one side of 'phones, remaining side of 'phones to H.T.+ .

Across the 'phone terminals is connected a .002 fixed condenser.

As a final check upon the wiring of the set, a point-to-point list of connections is included with this description, and this should be used in conjunction with Fig. 3. If the set does not oscillate, the connections to the reaction coil should be reversed; but it will be found that the connections given in the wiring diagram are correct for the majority of coils now on the market.

## THE "N" CIRCUIT.

### SIR OLIVER LODGE'S INVENTION.

By THE EDITOR.

DETAILS of a new invention by our Scientific Adviser, Sir Oliver Lodge, appeared recently in a London evening newspaper under the heading of "Great New Wireless Discovery."

The story published under this heading was not authorised by Sir Oliver, and at his request I circulated to the London Press a letter stating that I was authorised by Sir Oliver Lodge to say that the story above mentioned, regarding a great new wireless discovery by Sir Oliver Lodge, was premature.

### Special Test of the "N" Circuit.

The discovery referred to was the "N" circuit, about which Sir Oliver did not wish to authorise any technical details for publication at that time. Arrangements had been made between Sir Oliver Lodge, Mr. Melinsky (who is Sir Oliver's partner in the invention), and myself, for a special model of a set incorporating the "N" circuit to be built and thoroughly tested out. Not until this had been done did Sir Oliver wish to authorise any statement for publication regarding his invention.

A notice to this effect was sent to the newspaper referred to above, and resulted in the following statement being published the day following:

"Later an attempt was made to discount the value of the announcement on the part of the editor of a wireless journal who was at pains to issue a letter to the London Press to the effect that 'the statement regarding a great new wireless discovery is premature.'"

### An Authorised Statement.

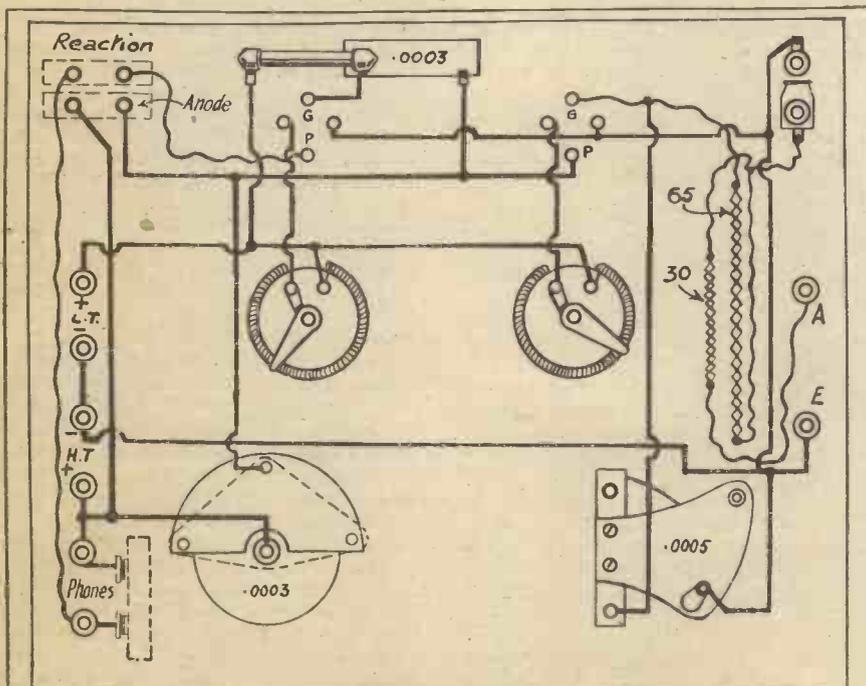
The above paragraph may possibly have given some of my readers the impression that I have attempted to discount Sir Oliver's invention on my own account, as it coincides with the fact that I did, at Sir Oliver's request, send out a notice to the Press, but the statement does not make it clear that this notice was sent to the Press at the request of Sir Oliver Lodge and Mr. Melinsky. Sir Oliver was in Salisbury at the time and could not send a statement.

But at his request I forwarded a statement to the Press.

Sir Oliver later followed this up with another statement from his own pen which is quoted on page 2 of this issue.

The "N" circuit, about which so much has appeared in the Press of late—much to the annoyance of Sir Oliver and Mr. Melinsky—was, my readers will remember, hinted at by Sir Oliver at our last "P.W." wireless meeting at the Central Hall, Westminster, some months ago.

(Continued on page 285.)



DRWN BY	A.D.
CHKD BY	J.S.O.L.
SER. NO.	A. 756

Wiring Diagram

FIG 3

**N**OWADAYS, one certain term is constantly recurring in wireless literature and on the lips of wireless amateurs. It glorifies nearly every radio advertisement; enters into nearly every radio conversation; provides the last irrefutable argument in favour of a thousand different "gadgets"; and—in the hands of the unscrupulous manufacturer—sells more enormous quantities of pitiable junk than any other slogan yet devised.

"Low loss!" It is now almost a household word. Nobody thinks of buying a condenser or a tuning coil or a valve socket without mentioning it. And yet there are hosts of amateurs who could not differentiate between a low-loss component and any other unless it were labelled as such. For this reason, a "low-loss" label has been sufficient justification for the sale of thousands of shoddy parts which had no other possible claim to the definition whatever.

#### Variable Condenser Faults.

These deceptive components are largely of Continental origin, but it behoves every amateur to investigate and decide on the merits or demerits of an article for himself—irrespective of its label. He must therefore know how to recognise the indications of low loss properties in the various parts in which this quality most essentially should belong.

First on the list comes the variable condenser—probably the most exploited article in the amateur's kit. A primary consideration here is the zero position. When the moving vanes are right out there should be absolutely no interleaving—in fact, the rotor section should be well clear of the fixed vanes, and the "minimum" capacity a real minimum.

The end plates should contain as little material as possible consistent with strength, whether they be of ebonite or metal. Especially in the latter case they should be a reasonable distance from the elements of the condenser and in all cases there should be electrical connection between the frame and the moving vanes in order to keep the former at earth potential and minimise to some extent the effects of body capacity.

The insulating portions should be of the best materials (Pyrex glass is becoming popular for this work in America) and the leakage paths should be long. Make a point of ascertaining how near are the nearest points of opposite potential on the instrument before you buy.

#### Importance of Good Bearings.

Bearings should be constructed of hard metal offering least facility to oxidation and all possible wear should be taken up by spring washers, collets or ball-races. The vanes should preferably be soldered or slotted into their supports, and provision should be made by means of a "pigtail" or spiral spring or phosphor-bronze, for sound electrical and mechanical connection. Friction contacts should be sedulously avoided.

Contrary to general opinion, the ideal low

## CUT OUT YOUR LOSSES!

### The "Low-Loss" Label.

By A. J. BOYINGTON.

loss valve-holder is not necessarily one of the antiphonic type. Though these are excellent adjuncts to the well-constructed receiver not all of them possess low-loss characteristics.

As with the variable condenser, the body should contain as little bulk of material as possible, and what there is should be of the best. An essential point is direct contact with the valve sockets. Many antiphonic designs do not provide for this, the problem of adequate suspension generally necessitating a system of springs or other devices which add to the internal resistance or self-capacity.

The valve sockets and soldering lugs should be of one piece. If terminal arrangements are provided the terminal should also be brazed to, or in one piece with the socket—chancey screw connections cannot be considered "low loss" here or elsewhere.



Four of America's leading radio engineers. Left to right: J. L. Hogan, A. H. Grebe, Dr. Goldsmith, Dr. Alexanderson.

The lugs should be so arranged that leads taken from them are well separated and there should be a minimum of material interposed between the valve pins.

#### "Low-Loss" Coils.

Regarding tuning coils some very queer notions are rife. Most amateurs seem to imagine that any coil wound on a skeleton former comes under the category of "low loss"—a pardonable error, since skeleton formers have been so widely and wisely adopted in the effort to keep down losses in the receiver.

But what does low loss in an inductance mean? Simply the reduction of the inherent self-capacity and internal resistance of the coil to the lowest possible limits while maintaining its self-inductance at the highest possible limits. This is the interpretation to be kept in mind when choosing your coils.

The ordinary plug-in type of coil does not pretend to have low-loss characteristics, but, in the duolateral form, it certainly represents the highest efficiency compatible with the compression of a large inductance value into a small space.

The plain single-layer solenoid is the most efficient coil possible to wind. It has

the highest self-inductance—but this is most frequently coupled with a correspondingly high self-capacity. If it were possible to wind this coil on air while spacing each turn of the bare wire two diameters apart something approaching perfection would be obtained.

It is not, however, possible to follow this ingenious plan, so that a compromise must be effected. We must cut out all the superfluous mass of material in the former, take pains to keep all metal objects, such as fixing screws and lugs, as far away as possible from the coil proper, and—a most important point if our coil is to be truly "low loss"—endeavour to approximate to a complete circle in the shape of the separate turns.

#### Need for Reliable Components.

It is frequently better to wind with a heavy gauge wire as this entails less resistance within the coil, but unless it is intended that the latter shall be partially self-supporting, very thick wire is not essential.

I have now outlined the three principal points where losses are apt to occur. But however excellent these components may be in themselves their efficiency is nullified if they have to work alongside others which are shoddy or faulty. An unbranded part may prove quite satisfactory—more often than not, however, the reverse is the case.

The radio-frequency portion of the receiver should have especial care and attention. Switches should be cut out; they are not necessary since such operations as were performed by series-parallel and tune-stand-by switches may be obtained by terminal arrangements.

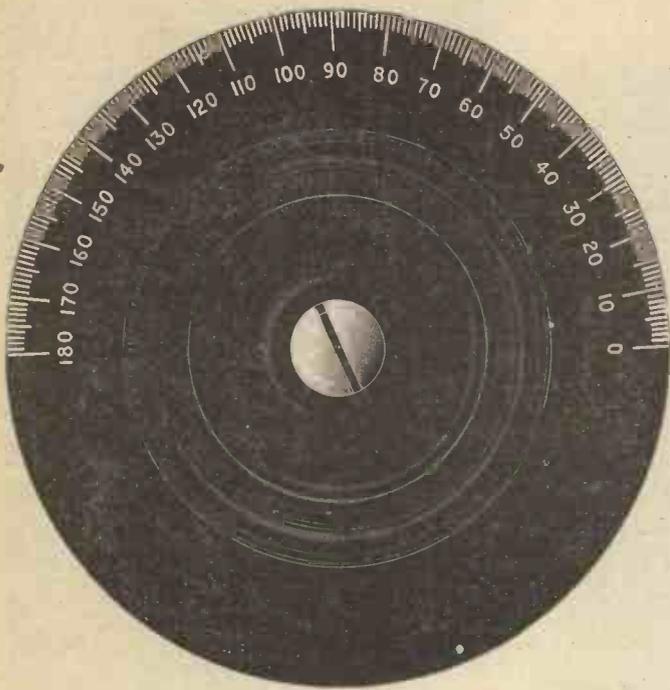
Such items, too, as variable grid leaks and variable anode resistances are quite unnecessary except in the case of special circuits of the "super" type. They may not, perhaps, cause specific losses but they do occasionally cause specific trouble, and fixed elements of reputable make will be found superior.

Regarding the filament rheostat. This must of necessity be a variable resistance. See to it, then, that the resistance is constantly variable. Carbon-compression types have many good points, but a well-made wire-wound rheostat provided with good contacts is often preferable.

#### Design of H.F. Circuits.

Use good fixed condensers with mica dielectrics, do not hesitate to pay the little extra for a sound piece of high-grade ebonite when buying your panel.

Finally, give attention to the lay-out of your receiver. Symmetry should be aimed at, but not at the expense of jumbling together components which disagree with each other. The shortest path is the easiest—don't allow the precious currents to loiter around corners and meander halfway round the set before they get to where their work awaits them. They are not unlike some schoolboys; if too many outside diversions and attractions are placed in their path, they are very apt to play truant!



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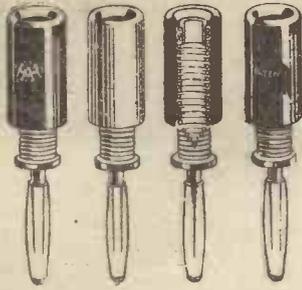


Fig. 975  
Code Word  
"WOBBLERS"  
Per 1/6 Set of Four  
(3 black, 1 red).

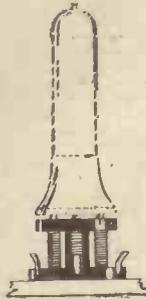
# THE ANTI-VIBRATION SPRING IS HERE

"YOU'LL CONVERT YOUR  
RIGID HOLDERS NOW IT'S  
SO EASY."

FROM ALL DEALERS,  
OR DIRECT.



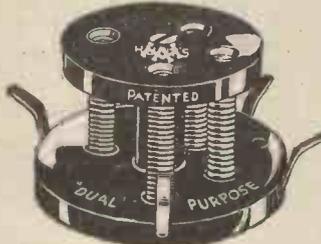
NO TROUBLE.  
JUST PLUG  
THEM IN.  
No Soldering.  
No Wiring.  
No alteration at all.



## AND HERE

FOR BASE OR PANEL  
FITTING OR IN ANY OTHER  
POSITION.

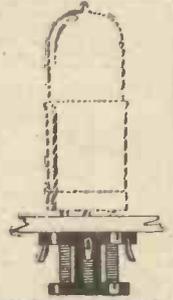
The smallest and neatest com-  
bined holder on the market.  
No joints because the solder-  
ing tag is the same piece of wire  
as the spring.  
Show cards and display cards  
free.



THE THREE LARGE ILLUSTRATIONS  
ARE FULL SIZE.

Fig. 976.  
Code "DUAL" Word  
PURPOSE.  
DOUBLE-ENDED.  
PRICE - 1/9 each.

THE FOOL-PROOF HOLDER



## AND HERE

For the genuine experimenter who must have  
a holder without capacity, and perfectly sprung,  
Hunt's "WOBBLY" is ideal. It is impossible  
to have fewer parts, or to better insulate, separate  
or spring them. Separately sprung legs are far  
more effective than a closed-in solid spring top.

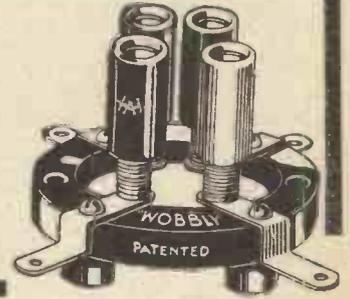
Made under Patent 242057/24, Prov. Pats. 30670/25 and 40/26 by:—

A. H. HUNT, Ltd. (Dept. 12), Croydon, Surrey.

Fig. 974.  
Code "WOBBLY" Word  
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EXPERIMENTER'S HOLDER

TOO SIMPLE TO IMPROVE.



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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.

### NEW YORK ON A CRYSTAL.

The Editor, POPULAR WIRELESS.

Dear Sir,—Re Mr. C. Dornier's letter in a recent issue of POPULAR WIRELESS, the following results may be of interest.

Using a crystal receiver, Rugby was picked up on the 7th ult. at moderate phone strength (rather disappointing, considering the high power). The replies from New York were also audible. A 500 turn duolateral coil was used with a '0005 mfd. variable condenser in parallel. An L.F. one-valve amplifier brought signals up to good strength, and the conversations were clearly followed. Of course, the American signals were induced on Rugby's transmission, and not received direct.

On Sunday, March 14th, the tests were received at full L.S. strength on a two-valve crystal reflex receiver, both sides of the conversations again being heard. The coils used were, primary 500, secondary 550 and anode 600 turns. The set is a modified "P.W." reflex, loose coupling being used to eliminate the local station.

Yours sincerely,  
G. E. COCKER.

234, Firth Park Road,  
Sheffield.

### "THE ORIGIN OF THE CRYSTAL TELEPHONE."

The Editor, POPULAR WIRELESS.

Sir,—I have read the letter from Mr. H. Gernsbach, Editor of "Radio News," in your current issue. All I knew at that time, of the history of the invention was stated in my lecture on "Loose-contact, Thermal Telephone Receivers," to The Wireless Society of London, on 23rd Nov., 1921: and there seems no need to add to it. In any case, America was years behind other nations in beginning to experiment, so far as is known. Everyone in early days missed one essential feature. This is the use of extra direct sensitising current of the right strength, through the contact that reproduces the sound.

Yours faithfully,  
LESLIE MILLER, A.M.I.E.E.

23, Rural Way, Streatham,  
London, S.W.16.

### "LET IT BE MUSIC."

The Editor, POPULAR WIRELESS.

Dear Sir,—In reference to the articles by Mr. E. J. Simmonds and Mr. B. Honri, I have read these with interest, and frankly admit that I have admired the work of these two gentlemen in many fields. I have myself been an experimenter for fourteen years, many of which have been entirely occupied in research upon resistance coupling, and it is upon this which I wish to criticise the portions of their articles. Like almost every writer upon this subject, these gentlemen are very much out of date indeed, and Mr. Simmonds' arrangement was one I used three years ago, whilst Mr. Honri's was one (improved) which I used later.

May I point out several mistaken ideas which have been made generally in resistance coupling.

Increased H.T. is not necessary, R.C. amplifying is voltage amplification, as everyone knows, therefore the elimination of current has been my object; 100,000 and 150,000 anode resistances are wrong; '01 condensers are just twenty times too large; '25 leaks are absolutely wrong, and valves of the D.E. '06 type are quite unsuited. These are the statements, and now to justify them.

Both gentlemen state the H.T. must be increased, as did Mr. J. F. Stanley, of the Radio Society, in his broadcast last Saturday. I do not agree. Ninety volts is ample, since the amplifier is a voltage operated device. I use two and three megohm anode resistances, and by decreasing the filament emission—by reducing filament the anode current is diminished by 100 times, so that this resistance is virtually reduced so as not to necessitate any increase of H.T. There is no detectable difference between 90 and 230 volts H.T. I have used R.5v. values on 3 volts L.T.; A.R. '06 valves @ 1.5 volts, and now using a valve of my own design which takes 7 volts @ '08 amps. The result is appreciably louder than any transformer coupled instrument, and by this method there is surprising rectilinearity of the working characteristic of the valve. Moreover, if the filament voltage is increased the valve ceases to function.

In working by this method the working characteristic of the valve is rather displaced to the zero grid bias potential point, and this must be counteracted by correct grid bias. Now, re grid leak, since space charge is diminished the grid accumulation is greatly reduced, so that the leak should be increased to 10 megohms.

In regard to the coupling condenser, it has been a mistaken idea for many years, which will be smilled

at as people become more enlightened, that this is controlled by the frequencies to be passed. Quite wrong. All that is required is that this should be large compared with the grid filament capacity of the valve—hence '0005 is quite sufficient and '0001 will work. To determine the amplification of the

valve the formula  $A = \frac{I \cdot Ra}{D \cdot Ra + R2}$  may be used where  $R1$  is the internal resistance of the valve and  $D$  is a constant equal to the quantity  $\frac{I}{\text{voltage amp. factor}}$

and  $Ra$  is the anode resistance. By using specially constructed valves an amplification of 50 per stage may be obtained.

I trust you will publish this, since there appears to be a lamentable lack of knowledge upon resistance coupling. It should be remembered that by reducing the length of the filaments (eventually I hope to use my short pin-point filaments) the voltage drop across the filament (and using a special "pinch" in manufacture) is much reduced, which is conducive to a greater "working steepness."

Yours faithfully,  
B. G. TURNER.

Chairman Northampton and District Radio Society.

4, Derby Road, Northampton.

P.S.—In constructing an amplifier upon this method, the ordinary mounting method is useless. I point this out so that amateurs will not endeavour to construct the amplifier, and due to good ebomite leaking at H.F., face complete failure. Perhaps at some future date I may give my experiments and the pitfalls which are met.

### MR. HONRI REPLIES.

(Mr. Honri was given the opportunity of replying to the above letter before it was published, and we append his reply.—ED.)

Dear Sir,—I quite agree with Mr. Turner, that the values given in my article are not always necessary. The capacity of the coupling condenser is determined by its impedance at the lowest audible frequency compared with the impedance of the anode and grid resistances. If we increase these resistances we can increase the impedance of the coupling condenser, so decreasing its capacity. The valves I gave enable any ordinary man in the street with little or no radio experience to use easily obtainable components and at the same time to be sure of straight-line amplification.

A German patent of some years ago specified the values given by Mr. Turner, but among other complications it was necessary to use valves having a magnification factor of 80-100! And then the amplifier was only suitable for use on extremely weak signals. Mr. Turner's amplifier, as operated by Mr. Everyman, reminds one of the single valve set with a reaction handle six feet long, which will cut out the local station and receive Timbuctoo—sometimes! Surely such a receiver does not make the neutrodyne and super-het., which do the job easily, out of date?

Yours truly,  
BAYSHAM HONRI.

### THE INTERNATIONAL TESTS.

The Editor, POPULAR WIRELESS.

Dear Sir,—The résumé of the 1926 International Tests, by Laurence W. Corbett, which appeared in POPULAR WIRELESS for March 13th, 1926, supplies a point of exceptional interest.

Quoting from the article mentioned, "It was almost impossible, during this period (that of the test week) to receive stations from an east or west direction.

The surprising thing about the whole matter is that reception from stations in a north or south direction, with respect to the receiver, was usually good. Many experts were of opinion that the Aurora Borealis was to blame for the poor radio conditions.

"McMillan discredits this, however. On his return from one of his Arctic trips he made the statement that the Aurora Borealis, which is common in Arctic regions, did not affect either wireless reception or transmission in the slightest degree."

The Aurora Borealis is suspected of being in some way connected with poor reception in an easterly and westerly direction, and it is hardly feasible to discredit that suspicion on the strength of observations made in a locality where east and west reception is hardly possible.

At the North Pole there is only one "earthly" direction, viz., south, and within a circle of 100 miles radius from the Pole all the W.T. stations in the world may be considered almost due south.

At a given spot on the circumference of such a circle the farthest distance one could place a station in a direction due east or west is nearly 160 miles, a distance which experience has shown useless for observations of general conditions of wireless reception.

Any place on the 0 or the 180th meridian can be reached from Great Britain by moving either north or south, so that good reception in New Zealand simultaneously with bad reception in the States would prove a matter of interest and speculation if coupled with Aurora displays of increased intensity, though "night effect" would prove a stumbling block.

Yours faithfully,  
GEO. ED. SHUFFLEBOTHAM.

S.S. "Benvannoch,"  
c/o Messrs. Aug. Bulcke & Co.,  
Shipping Agents,  
Antwerp.

### WIRELESS CONDITIONS IN NEW ZEALAND.

The Editor, POPULAR WIRELESS.

Dear Sir,—After careful consideration POPULAR WIRELESS has found a permanent subscriber in the writer, the work being the most practical and useful one which is published. To an experimenter it is most interesting and to a broadcast listener none the less so. Although you in England have congestion to overcome, we in New Zealand have a painfully reverse problem. We can turn our dials over 180 degrees and be thankful if there's one station worth tuning in. The broadcasting in this far-off land has been badly bungled by the Government, and the latest we have to take without salt is a time-extension of four months given to the Broadcasting Company of N.Z., in which to erect four 500-watt stations. In the meantime we pay 30/- per annum for the privilege of tearing our hair trying to tune decent music out of the stations at Auckland and Dunedin.

I live 1200 miles from Sydney (Australia) and using my home-built four-valve regenerative set, can nightly bring in station 2 B L Sydney at gramophone strength. Also 3 L O Melbourne (5 kw.) comes in loud enough to fill a good big room. The modulation from these two stations is of a high order, and not a word is missed. In the noon sun at 12.30 p.m. I have regularly received station 2 F C Sydney (1200 miles away), which operates with 5 kw. on 1,100 metres. Can you do this in England? The longer wave Morse stations have all been logged and G B R (Rugby) was received at R 7 on his first tests. He is badly jammed out here by K I B (Hawaii), H Z A (Saigon), P K X (Java), and L Y (Bordeaux), but is quite readable if one is a good operator. I have received 2 N M on telephony and Morse in daylight (4 p.m.) here, and here may state that my set is built so that I can operate it on wave-lengths from 35 metres to 23,000 metres without any bother. And apart from changing coils only one connection is made to change from low wave to high wave. This is a great country for DX work and any time of the day or night we can bring in amateurs from somewhere on the globe, or music from half-way round.

Wishing your paper continued popularity.

Yours truly,  
LLOYD A. ROBINSON.  
(Telegraphist R.N.R.)

Patea, New Zealand.

## THE "N" CIRCUIT.

Sir Oliver Lodge's Invention.

(Continued from page 281.)

Experiments have been going on ever since, and Sir Oliver has patented an arrangement which will cut out reaction and howling from a valve set.

The set now being built in the "P.W." laboratories will be carefully tested and compared with an ordinary two-valve with reaction set on the aerial to see if there is any difference in quality, volume, selectivity, etc.

Not until this has been done, and until Sir Oliver's permission has been expressly obtained, will further details be published.

My readers will naturally understand that a great scientist like Sir Oliver Lodge is adverse to premature reports of any of his discoveries and inventions. He, like all great scientists, wishes to exercise the most meticulous care and to be quite sure as to the capabilities, etc., of his invention before any claims are made for it, either by himself or by others.

And for that reason we very much regret that premature reports on the "N" circuit should have appeared in the Lay Press before Sir Oliver Lodge had authorised them, and before the Technical Press associated with Sir Oliver Lodge, and in particular with the building of the test model of the "N" circuit set, should have completed its labours and carried out Sir Oliver's instructions.

It can be stated that authorised facts and reports of the tests will be published very shortly in this journal, together with a special article on the "N" circuit by Sir Oliver Lodge himself.



# Apparatus Tested

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.

SOME time ago, Messrs. A. W. Griffin & Co., of Redditch, sent us a "Gripco" permanent crystal detector for test. It is very much of a permanent detector, for there are no adjustments whatever. The device consists of a cylinder of coloured eronoid material with screw terminals at each end. A nut is supplied so that the component can be mounted on a panel. It can be connected across existing detector terminals if desired. It has been tried out in various crystal and crystal valve circuits, and has given good results.

Especially in reflex circuits did it appear to be very efficient indeed, proving both sensitive and stable. A special feature of the "Gripco" is that it is guaranteed for twelve months. The makers undertake to put the detector in order should its sensitivity become reduced even through accident or short circuits whilst it is being installed in a receiver. It is a well-made

little component, and with its 12 months guarantee is, in our opinion, quite reasonably priced at 2s. 6d.

Messrs. C. A. C. Radio, Ltd., recently sent us one of their new C.A.C. L.F. transformers for test. It has a ratio of 5 to 1, and retails at 12s. It is a neat little article, and is very nicely made and finished. We tested it in a det.-L.F. circuit and it functioned with the efficiency of a much larger, and more expensive component. Transference of energy was carried out with inappreciable frequency distortion and resultant amplification was full and mellow.

Messrs. Goswell Engineering Co., Ltd., have placed on the market a new "anti-pong" valve holder under the name of the Quality Spring Valve Holder. In appearance it resembles their ordinary legless type of holder, and at first it would be hard

to believe that it included anything to make it anti-microphonic. But when a part of the insulation material is chipped away it can be seen that each socket is mounted on a spiral spring and is surrounded with soft rubber. Although it looks like an ordinary holder and is very small it answers the required purpose very efficiently.

We hooked it up in a detecting circuit and brought a valve known to be highly microphonic into service. This was a severe test, but the Goswell component came up to scratch and even although the bench and panel were struck violently no noises were produced. The valve holder sells for 2s., and should prove popular at this price.

Mr. S. Lyons, of 119, Clerkenwell Road London, E.C.1, has sent us one of his "Lion Micro" detectors for examination and test. Similar elements to those used in the "Lion King" are employed, but the design is very different. A glass tube enables the crystal to be seen, and the detector can be mounted on a panel either by two screws on its base or, if the popular single-hole mounting is preferred, by one at its side. A close adjustment can be made of the setting of either of the crystals.

The "Lion Micro" proves to be just as sensitive and stable as the "Lion King," which was favourably reported upon by us some time ago; but the visibility of the crystal elements is, in our opinion, a noteworthy improvement. It is reassuring to be able to check the adjustments visually.

The detector is well made and is reasonably priced at 3s. 6d.

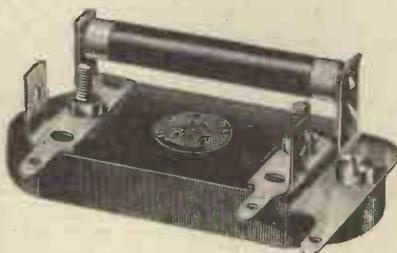
(Continued on page 288.)

# EDISON BELL RADIO

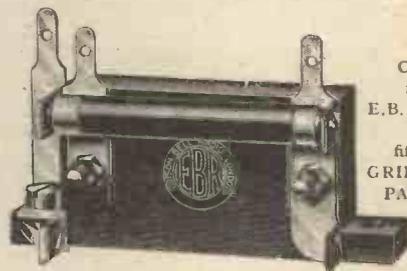
THE FINEST FIXED CONDENSERS MONEY CAN BUY OR SCIENCE PRODUCE.

FIT THEM TO YOUR SET AND BE SATISFIED.

CAT. No. 139/327.  
E.B. FLAT TYPE  
fitted with GRID LEAK IN SERIES.



Ask your Dealer for Catalogues and list R.E. 144. If unable to obtain write direct to Manufacturers:—  
J. E. HOUGH Ltd.,  
Edison Bell Works,  
LONDON, S.E.15,  
and at Huntingdon.



CAT. No. 139/328.  
E.B. UPRIGHT TYPE  
fitted with GRID LEAK IN PARALLEL.

In these condensers the two clips used when the grid leak is in parallel are fitted under the terminals. The third clip is supplied loose and should be held in position by the screw which holds the condenser to the panel. The exact position of the third clip is clearly indicated in the above illustration, and full directions are supplied with each condenser.

TESTED 500 VOLTS  
FLAT TYPE



The parallel connection is usual in valve detectors, and the series arrangement is used in tuned anode and resistance couplings, etc

The above can be supplied with or without grid leaks fitted.

TESTED 500 VOLTS  
UPRIGHT TYPE



## INSIST ON EDISON BELL CONDENSERS

THEY ARE BRITISH MADE AND GUARANTEED BY A NAME WITH 30 YEARS REPUTATION BEHIND IT

# Osram Valves

for Broadcasting

Osram  
D.E.2  
H.F. & L.F.

Only 12 Amp. filament Current Consumption at 1.8 Volts

Wireless users all over the country are welcoming the new D.E.2 OSRAM VALVES. Their introduction spells *cheaper wireless without loss of efficiency*. Accumulator charges are halved or reduced by a third on account of the markedly low current consumption of the D.E.2. Expressions of opinion continue to pour in:

Better in clarity and strength of signal.

*Frank B. Sawyer.*

I could not wish for better results.

*Fred. Gomershall,  
Hon. Sec. Dewsbury and District Wireless Society.*

Delighted with performance. It is my intention to replace my present valves with OSRAMS.

*N. J. Hignett.*

Delighted with the excellent results... I can safely say that 25 users have now in use the OSRAM D.E.2 through my recommendation.

*H. Burnley.*

Performance beyond reproach. For general all-round listening, we thoroughly recommend these two new OSRAM VALVES.

*"Electrical Industries."*

2-VOLT VALVES  
with a 6-Volt Result

PRICE 15/6 EACH

*The G.E.C. - your guarantee*

## APPARATUS TESTED.

(Continued from page 286.)

We recently received a number of T.C.C. Series-Parallel Mica Condensers of values from .0002 mfd. to .0009 mfd., complete with grid leak clips. These condensers are supplied with three terminals instead of the conventional two. They are so arranged that the grid leak can be used either in the shunt or series position, merely by altering one connection, thus obviating the necessity of changing the wiring of a circuit. Supplied with neat green cases similar to normal T.C.C. practice, except that insulation material is used instead of metal, these condensers should prove a very popular addition to a famous "line."

For the mellow reproduction of speech and music a wooden loud-speaker horn is much to be preferred to one of metal conventionally designed. Realising this, Messrs. Walker Brothers, of St. Joseph's Works, Bramley, Guildford, well known wood specialists, have produced a range of wooden loud-speaker horns, constructed by a patent process. We believe a number of different types and sizes are available. Recently they sent us one of the straight type (D2/DO). It is of medium size and is very artistically produced, with a nice wide neatly modelled flare. It is supplied with a rubber connection so that it can be adapted to most of the loud-speaker units available.

We tested the article with a "Lissenola" (Messrs. Lissen's Unit), and very faithful projection resulted. The combination was undoubtedly very effective, for reproduction was both full and mellow. After this we removed the metal horn from a cheap loud speaker and fitted the Walker production to it. The difference in results was most marked and reflected credit on the wooden type. Constructors desirous of obtaining "expensive" loud-speaker effect, at low cost, should consult Messrs. Walker. For 12/6 they supply the model mentioned above.

We are asked to point out that a mistake occurred in the Louden Valve advertisements in the issues of March 27th and April 3rd. The purpose for which the different types are designed was incorrectly given. "H.F. Amplification" should have read "Detection and L.F. Amplification" and vice versa in each case.

In our issue of March 27th the construction of an H.F. unit for the Trinadyne was described. It will have been noticed that a Burndept Dual Rheostat was used and was priced at 7s. 6d. in the list of components given. Messrs. Burndept have written us pointing out that their new type of dual rheostat costs only 6s. and that the Burndept Super Dual Rheostat (10-60 ohms) is now available at 7s. 6d. It will come as a pleasant surprise to constructors, no doubt, to learn that they will be able to obtain even better value for money than ever from the famous house of Burndept.

Messrs. Tunometer Works, of Gosford Road, Beccles, Suffolk, from whom we recently received some "Nick-o-Time" Tunometers for test, have written to us concerning a report we published in our March 27th issue dealing with those components. It may be remembered that we stated in our report that the adjustment of the reaction Tunometer was attended by noises.

The makers state that such could be caused only by dust accumulation on the contact wheel or wire, or by the wheel having been damaged.

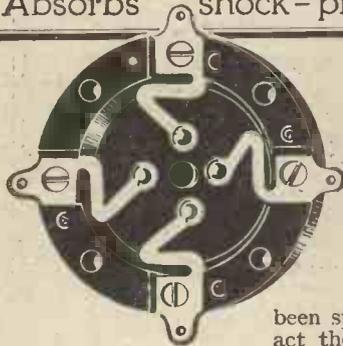
Obviously the noises were due to a faulty contact, for the moving arm and the winding of the Tunometer are placed directly in series in the anode circuit, and the interruptions were coincident with the adjustment of the device.

Messrs. Tunometer Works, however, say that they have paid particular attention to the above points. Now the Tunometer in our possession does not appear to be either dusty or damaged, but faults in contacts can be microscopic and still give trouble in anode circuits.

We would advise the manufacturers of the above undoubtedly efficient and interesting component to advocate a system of shunt H.T. The addition of a fixed condenser and choke used in some Hartley-cum-Reinartz form would tend to eliminate possibilities of noises, and would enable the Tunometer to be used in a uniquely efficient manner.

The aerial tuning Tunometer called for no criticism; to this the above remarks do not apply.

Absorbs shock - protects the valves



You know it's good because of the name 'LOTUS'

Don't have your valves spoiled by shock. The Lotus Valve Holder has been specially designed to counteract the microphonic elements that are so injurious to the delicate valve filaments.

The unique and original springs of the Lotus Valve Holder absorb any shock and eliminate all microphonic noises.

Protect YOUR valves by fitting the Lotus Holder.

# LOTUS

## VALVE HOLDER

From all Reliable Radio Dealers.  
GARNETT, WHITELEY & Co. Ltd.,  
Broadgreen Road, Liverpool.  
Makers of the famous LOTUS Coil Holder.

Valve sockets and springs are locked together by a mechanical process, making a definite and permanent connection. Bakelite mouldings, nickel silver springs and phosphor bronze valve sockets. Nickel plated.

2/3

With Terminals 2/6

## THE TRUTH ABOUT L.F. TRANSFORMER IMPEDANCE

(a) Since amplification depends greatly on high transformer impedance, the greatest possible impedance should be used at every stage.

Hence it is undesirable for the impedance of the transformer to match that of the valve.

(b) Impedance depends on frequency, and to state transformer impedance without stating the frequency at which it is measured, conveys nothing.

A good transformer has a high impedance at a frequency as low as 100 to reproduce low notes satisfactorily.

### FERRANTI

INTERVALVE  
TRANSFORMERS  
TYPE A.F.3

have the following impedances:

At 100 periods 50,000 ohms

At 500 periods 410,000 ohms

NO BETTER TRANSFORMER IS AVAILABLE AT ANY PRICE

Ask your dealer for Leaflet W.A. 401.

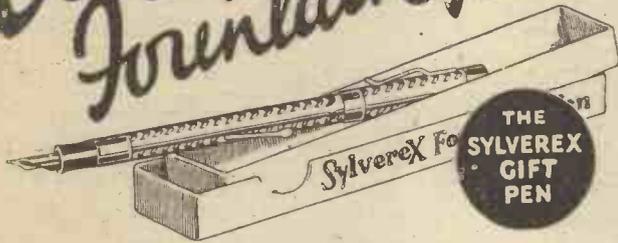


25/-

Ratio 3.5 to 1.

FERRANTI LTD., HOLLINWOOD, LANCASHIRE.

# A "Sylverex" Fountain Pen



Free to every purchaser of a

## Sylverex

RADIO CRYSTAL

Buy your Sylverex now and we will present you with a Free Gift of a Sylverex Fountain Pen. Your Dealer will give you the Pen when you buy a 2/- size Crystal, or two 1/- Test Size Boxes.

The Sylverex Fountain Pen is a well-made British production, self-filling, guaranteed, and fitted with a 14-carat gold-plated nib good for long wear—a gift well worth having!

**Get your Free Gift to-day—and be delighted with Sylverex Crystal to-night**

Note the vast improvement in reception when you change over to Sylverex Crystal. More volume and increased purity are immediate results.

One user writes: "I tried out Sylverex on my set last night and the results were astonishing—I could hardly believe that I could get such clarity and volume of sound from a crystal set. My set has always taken two pairs of phones more or less satisfactorily, but last night I fitted three pairs and, as I mentioned before, the results were astonishing. I believe I have tried practically all English Crystals and some German as well, and I think I am correct in saying that yours is 50% better than the rest; it's wonderful! I shall recommend it to a wide circle of my friends, or anyone else for that matter."

In container with special Cat's whisker & directions	2/-	Test size, exactly the same quality, but smaller in size	1/-
Full size. Sylverex Pen with every box.		Sylverex Pen with every two boxes.	

If unobtainable locally, send P.O. for 2- direct, with dealer's name and address, and the Crystal and Sylverex Pen will be sent Post Free by return

**SYLVEREX LTD.,**  
41, High Holborn,  
London, W.C.1.

Ask your dealer for **SYLVEREX H.T.** Batteries in 60 volt, 100 volt, and 9 volt tapped grid bias.

## COSMOS PERMACONS

### FIXED CONDENSERS GIVING FIXED RESULTS

The "Cosmos" Permacon is an ideal fixed condenser, being light in weight, of guaranteed accurate capacity, and having the lowest possible losses. The dielectric is mica and each condenser is tested at 500 Volts during inspection. Nickel plated cases give them a particularly neat appearance.

.0001 mfd. . . . .	1/6
.0002 " " " " "	1/6
.0005 " " " " "	1/6
.0003 " " " " "	1/8
.001 " " " " "	1/8
.002 " " " " "	1/10
.005 " " " " "	2/8
.01 " " " " "	3/9

**"COSMOS" GRID LEAKS** are uniform and permanent. 1, 2 and 3 megohms, each 1/6

Ask for copy of the Cosmos Components Brochure.

**METRO-VICK SUPPLIES LTD.**  
(Proprietors—Metropolitan-Vickers Etc. Co. Ltd.)

4, Central Buildings, Westminster,  
**LONDON, S.W.1**

# RADIO TUTORIAL

All Editorial Communications to be addressed to 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 inquiries concerning advertising rates, etc., to be addressed to the Sole Agents, Messrs. John H. Lile, Ltd., 4, Ludgate Circus, London, E.C.4.

As much of the information given in the columns of this paper concerns the most recent developments in the Radio world, some of the arrangements and specialties described may be the subject of Letters Patent, and the amateur and the trader would be well advised to obtain permission of the patentees to use the patents before doing so.

Readers' 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. The envelope should be clearly marked "Patent Advice."

**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.)

**BLUE PRINTS.** A series of 20 Blue Prints can be obtained from the Query Dept., price 6d. per Blue Print.

Only a limited number of circuits are covered by this series, and full details of the circuit arrangements available in Blue-Print form are published fortnightly in the advertisement columns of this journal.

All other back-of-panel wiring diagrams are specially drawn up to suit the requirements of individual readers, at the following rates: Crystal Sets, 6d. One-Valve Sets, 6d. One-Valve and Crystal (Reflex), 1s. Two-Valve and Crystal (Reflex), 1s. Two-Valve Sets, 1s. Three-Valve Sets, 1s. Three-Valve and Crystal Reflex, 1s. 6d. Four-Valve Sets, 1s. 6d. Multi-Valve Sets (straight circuits), 1s. 6d. Except SUPER-HETERODYNE DIAGRAMS, all of which, irrespective of number of Valves used, are 2s. 6d.

If a panel lay-out or list of point-to-point connections is required, an additional fee of 1s. 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

**LOADING WITH A CONDENSER.**

T. D. Y. (Brighton).—If I place a large fixed condenser across the aerial coil of my set, will this enable me to tune up to Daventry? I have been told that the bigger the coil or the bigger the condenser the higher the wavelength, so surely it would be just as good to increase the condenser as to use a loading coil.

(Continued on page 292.)



**JUST THINK  
WHAT IT  
MEANS!**

**NO CONDENSER  
NO VARIOMETER  
NO VERNIERS**

The Radio Enthusiast's dreams of an infinitely variable all wire inductance and reactance tuner

need worry him no more. To tune a station on the 200-600 metre waveband in bare wire without the aid of reactive capacity—imagine the accuracy, the high figure of inductance, and the powerful coupling which this method will allow.

**NICK-O-TIME INDUCTANCE - 25/-  
NICK-O-TIME REACTION - 25/-**

Patentees and Manufacturers:—

**TUNOMETER WORKS**  
GOSFORD RD.,  
BECCLES, SUFFOLK, ENGLAND  
Telegrams: TUNOMETERS, BECCLES.

## D.X. WORK ON TWO VALVES!



**66/3** buys all the parts for the famous "P.W." CONTINENTAL.

THOUSANDS of "P.W." readers have built this set under our Pilot scheme—which definitely guarantees you successfully good results.

The "P.W." Continental is particularly suited for long-distance reception—its range includes every B.B.C. main station, and the chief Continental ones. Its cost is surprisingly low and its upkeep expenses are practically negligible.

### Have you tried the 1926 Unidynes?

ONE of the most remarkable circuits of the last twelve months has been the Unidyne.

The elimination of the high tension battery lessens running costs, and the possibility of burning out valves

through wrong connections is removed. Unidyne users comment upon the entire absence of crackling noises inevitable with a weak high tension battery.

Here are the prices:—

	1-Valve Set.	2-Valve Set.
"Pilot" Kit of Components	40/-	84/8
Panel, drilled and engraved	6/6	8/6
Polished Mahogany Cabinet	8/6	21/-

### Another Splendid "BESTWAY" Set.

**GET THE "PILOT" MANUAL.**

It is not merely a catalogue. It tells you, step by step, how to build a fine 4-Valve Set. It contains 3 pages of circuit diagrams, and detailed descriptions of over twenty sets of proved efficiency, each one illustrated. Above all, it tells you all about the wonderful PILOT service for home constructors, which guarantees you good results. **6d.**

We are daily receiving enthusiastic letters from customers who have built the 4-VALVE LOUD SPEAKER RECEIVER (Bestway Series No. 192) under the PILOT scheme. This fine set is ideal for loud speaker use on all B.B.C. main stations and the nearer Continental ones. Full particulars appear in the Pilot Manual.

When complete Sets of parts and panel are purchased together a Marconi Royalty of 12/6 per valve must be remitted.

**PETO-SCOTT Co., Ltd.**  
77, CITY ROAD, E.C.1.

Also 62, High Holborn, London, W.C.1.  
Walthamstow: 230, Wood Street.  
Plymouth: 4, Bank of England Place.  
Liverpool: 4, Manchester Street

**PILOT SERVICE ENSURES SATISFACTION!**

Figures to Remember



The Crossing Sweeper

A FIGURE that never failed to attract the attention of the passers-by. Every day the figures 660 are attracting more and more attention because wireless enthusiasts are realising that the new Six Sixty range includes valves specially designed to suit their individual requirements.

The S.S.7—a wonderful Dull Emitter Power Amplifier—has evoked widespread enthusiasm. This Valve is entirely non-microphonic, and is capable of handling output sufficient to work the largest Loud Speaker with entire absence of distortion. It works at such a low temperature that even in the dark there is absolutely no glow from the filament when operating at the correct voltage. And this is not all—despite the remarkably low temperature attained, the unique design of the S.S.7 ensures that there is no decrease whatever in electron emission, in short, the S.S.7 combines unequalled volume with a wonderful purity of tone.

There is no valve that can boast of a longer life than the Six Sixty S.S.7, because there is no valve that operates at a lower temperature. Test it for yourself or get your Dealer to demonstrate it for you.

The S.S.7 is a 3.7 Volt Valve and its current consumption is so low—only .1 amps.—that it can be satisfactorily operated from dry cells or a 4 Volt accumulator.

For long life, real economy and perfect tone insist on

Six Sixty Valves.

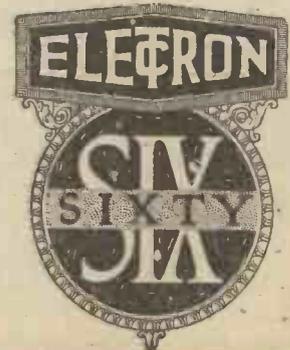


S.S.7

Voltage - 3.7 volts.  
Consumption .1 amps.

PRICE 22/6

Ask your Dealer for Leaflet S.S.1.7 for full particulars of complete range

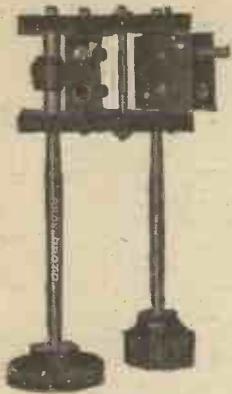


BETTER BY SIX TIMES SIXTY

The Electron Co., Ltd., Triumph House, 189, Regent Street, London, W.1. 7

Quality RADIO

VERNIER COIL HOLDER Cam Operated



THIS COIL HOLDER is designed on the sound engineering theory that a cam action gives the smoothest possible action. Both coil sockets are movable. The right hand one gives coarse tuning in the usual way and the left hand one, the usual fixed socket, is controlled by a cam operated by a separate knob. The latter gives a smooth and micrometric movement through 10 degrees in both directions.

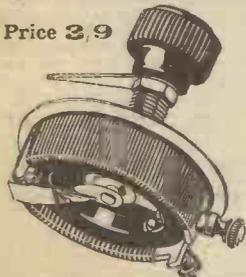
Write for one of these holders and hear the difference.

Postage 4d. PRICE 5/6  
British—from start to finish

GOSWELL ENGINEERING CO., LTD.  
98, WHITE LION STREET, LONDON, N.1

Telephone: North 3051.

Price 2/9



THE NEW DUAL RHEOSTAT

The great popularity of Dull Emitter valves has given rise to an increasing demand for Dual Rheostats, and by employing them it is possible to use bright or dull emitter valves at will.

The introduction of the C.E. PRECISION RHEOSTAT met with the approval of the wireless public, as was evidenced by their large sales, and we feel confident that C.E. PRECISION DUAL RHEOSTATS will enjoy an equal measure of popularity.

These Dual Rheostats have two distinct windings, one high and the other low resistance. A definite stop is fitted between them, thus eliminating the possibility of the arm traveling too far and causing a burn out. One-hole fixing is provided for, and the silvered dial is calibrated for both dull and bright emitters.

Like all C.E. PRECISION Components, these Rheostats are GUARANTEED and thoroughly TESTED before dispatch. They are obtainable through all reliable dealers.

C. EDE & CO.,  
High Road, Byfleet, Surrey.  
ALL Enquiries to London Electric Stores, Ltd.,  
9, St. Martin's St., Leicester Sq., W.O.2

C.E. PRECISION RHEOSTAT: 7 and 15 ohms 2/9, 30 ohms 3/-  
C.E. PRECISION POTENTIOMETERS, essential for efficient H.F. control, 3/9.

Used in such Famous Circuits as: The 1925 Unidyna 2-Valver; The Marconi Short Wave Receiver; The Household 5-Valver; The Trinadyna 1-Valver, &c.

"POPULAR WIRELESS" Advertisement Rates

WHOLE PAGE £40 QUARTER PAGE £10  
HALF PAGE .. £20 EIGHTH PAGE £5

Narrow Column Advts. (3 cols. to page) per inch 30/-  
Minimum Space accepted - - - - half inch 15/-

NO SERIES DISCOUNTS. ALL ADVERTISEMENT COPY SUBJECT TO EDITORIAL APPROVAL COPY AND BLOCKS MUST BE IN HAND 11 DAYS BEFORE DATE OF ISSUE TO ENSURE PROOFS.

ALL Communications respecting advertising must be made to

JOHN H. LILE, LTD., 4, Ludgate Circus, London, E.C.4.

Phone: City 7281

## RADIOTORIAL QUESTIONS & ANSWERS.

(Continued from page 290)

It should be cheaper, for I suppose a large fixed condenser could be used in conjunction with my present variable.

It is true that a large capacity and a small inductance can provide the same frequency and wavelength tuning as a small capacity and large inductance, but it should be remembered that capacity is a dampening factor. It will probably shine in this "capacity" so well, that your projected arrangement will damp Daventry right out. The use of a loading coil is almost essential.

### FIRST STAGE TRANSFORMERS.

A. J. S. (Southend).—I have a Marconi Ideal transformer (2.7-1 ratio) which I have been using in the second stage of a two-valve L.F. amplifier. I have since been told that it should be used in the first position. Is this correct?

Yes, the transformer was designed for use in the first L.F. position of a set to be followed by a power valve, and if necessary another transformer of 4 or 5-1 ratio. It will act quite well in the second position, but to get best results we should advise you to place it in the first, preceded by a suitable detector valve (fairly high impedance) and followed by a power valve.

### THE CHITOS ONE-VALVER.

P. B. (Ilford).—Having constructed the one valve Chitos, I find that I cannot get it to oscillate properly. What is likely to be the trouble?

The Chitos—in spite of its unorthodox appearance—is such a simple circuit that nothing much can go

wrong, and in all probability the trouble is due to the use of a faulty grid leak or unsuitable coils. If the former is faulty, it would be quite enough to cause the set to refuse to oscillate, while the latter are of unsuitable values the same fault would be experienced. The aerial coil should be of good make and consist of 100 turns, while the reaction should have about 45 turns. Basket coils or any of the well-known plug-in coils are suitable. We, of course, assume that the valve you are using is above reproach. If this happens to be too soft it is conceivable that the set would not oscillate, but it should show signs of being "alive," and, judging from your letter, we take it that your receiver is completely "dead." Make sure all connections are quite in order, and that no dry joints have been made, and see that the H.T. and L.T. batteries are in good condition.

### CHOKE-COUPLED H.F.

G. N. H. (Radlett).—What are the advantages—if any—of having a choke coupled-tuned grid H.F. and Det. receiver above the more usual tuned anode coupling?

There is usually a gain in selectivity, and as there is very little loss, very often none at all—in amplification, this is an important advantage. Another advantage is that as the H.F. valve has an untuned plate the self-capacity of the valve does not tend to make the set unstable, so that reaction from the detector on to the H.F. grid can be efficiently carried out, and the set will give full results without the need of delicate reaction adjustments due to a tendency for the set to burst into oscillation every time a station is tuned in.

### NEUTRODYNE TOO SELECTIVE.

B. E. M. (Gower Street).—Although I live so close to 2 L O, I find that my neutrodyne is too selective, and I have difficulty in finding any other station without a wave-meter. Even with this, the task is a tedious one. Can I reduce the selectivity slightly without impairing the efficiency of the set?

advantage from the point of view of broadcasting. This service should set a new standard which I hope will be maintained.

The danger from "high browism" is again in evidence. Its latest manifestation is perhaps a natural outcome of the Report of the Broadcasting Committee. That much discussed document was careful to deal in generalities except in regard to the educational side of broadcasting. In this connection it came down definitely on the side of a larger proportion of educational and "uplift" broadcasts than is the case at present.

This has given great encouragement to those influences which are constantly endeavouring to put entertainment and amusement in the background. The "uplift" pundits feel that at long last they are to come into their own. I confess to some anxiety at the prospect. Whatever may be said to the contrary, the Commission which replaces the B.B.C. Board will have to swing a new broom to justify its existence. The Commissioners are expected to function as a sort of "shadow cabinet" as early as June. They will certainly try to have some say in the distribution of programme time for the whole of the new broadcasting season starting in September.

### More Talks?

In the absence of a marked expression of public opinion against such a move, there is a strong probability that they will try to secure a much bigger proportion of educational broadcasts than is the case at present. My own view is that we have already reached the saturation point in the proportion of educational broadcasts.

Any increase would be a grave mistake and would be a singularly inauspicious beginning for the new regime. The B.B.C. has been on sure ground in regarding its service as essentially and primarily one of general entertainment and wholesome amusement. Education and uplift have their rightful and useful places at present. If the new broom mist function in this direction let it add greater variety and vigour to the material used in the educational periods. Most of this material is already good, but there are places which would be the better for strengthening. But, on the main issue of a fair sense of proportion, listeners would be well advised to keep a close eye on developments.

Microphone advertising is a subject which, curiously enough, is barely touched upon in the Report which is to be the basis of the future constitution of our broadcasting. One infers, therefore, that the Committee were satisfied with the way in which the B.B.C. has been handling this thorny problem. Contrary to the general belief, the B.B.C. has wide latitude under its licence in this matter of microphone advertising. It has, in fact, prescribed its own limitations in practice. There is, of course, no payment to the B.B.C. for broadcast advertisements. These now take the standardised form of courtesy acknowledgements incidental to programme values

Yes, this can be done by increasing the number of turns on the primary windings of the neutro-formers. Increase the primaries to about 30 turns, and see what effect this has. If the turns are too much increased it will be difficult to neutralise the set. After increasing the primary turns it will be necessary to re-neutralise the set. If the primaries are tapped (centre H.T. feed) this tapping must be moved so that it is still in the centre of the winding. In the case above, it will be at the 18th turn.

### For the Constructor

No. 5.—Cutting Out an H.F. Valve.

How to insert a single-pole double-throw switch for cutting out an H.F. valve (tuned anode) is shown above.

The existing lead from plate to grid condenser is broken, and the grid end is joined to the centre of the switch. Two new leads are then necessary, as shown by the heavy black lines.

One connects the lower switch contact to the grid of the preceding valve, and the other joins the top contact to the plate of that valve.

## BROADCAST NOTES.

By O. H. M.

Empire Day—Better Sermons—More  
"High Browism"—Microphone Ad-  
vertising—Commissioners Salaries.

ON Empire Day last year, the Prime Minister broadcast from London a special message to the Empire. By pre-arrangement, this message was received direct by a number of amateurs in the various Dominions and India. It was, of course, put out by all the B.B.C. stations simultaneously. I remember in connection with the announcement of this message that the B.B.C. said something about the regular relaying and re-broadcasting of similar messages in the future.

I gather now that this promise has not been forgotten and that a strenuous attempt will be made to mark Empire Day this year with a really notable broadcast gesture. There are rumours of Royal intervention, but nothing definite has so far emerged. Were there any prospect of the King or the Prince of Wales greeting the Empire by radio on this occasion, the relaying and re-broadcasting would follow, almost automatically. I would like to see something of the kind arranged as a regular annual event. That it would add to the prestige of broadcasting would be an incidental effect.

### Better Broadcast Sermons.

Its real value would be in giving the whole Empire not only a real thrill, but also a new and intimate token of the solidarity of the British Commonwealth of Nations, not in any Chauvinistic spirit but in the true spirit of dedication to the cause of the progress of civilisation. I am sure the B.B.C. will not lose an opportunity such as this. We may look forward to May 24th, 1926, in justifiable expectancy.

I have had occasion recently to criticise the average standard of the broadcast sermons and religious services generally. In looking through prospective arrangements I am glad to recognise signs of improvement. I am sure, for instance, that the typical Brotherhood service planned for Sunday, May 2nd, at London, will be widely appreciated by those who have complained with reason at the lack of vitality in the average broadcast religious service of recent months. The Brotherhood movement is full of power. Its emotional bias is an added

received. Thus, the Savoy Bands are acknowledged; so too are the providers of acceptable programme material. But there are some people who have been anxious to apply still further restrictions. They would disallow the acceptance of even the highest grade programme material if any advertisement, however incidental, were a consideration.

For the sake of the programmes which, after all, are the only things that really matter, I sincerely trust that these particular "purists" are foiled. There can be no valid objection to the advertisement contained in a courtesy acknowledgement of programme material which brings delight to millions of listeners and which releases a little licence money for badly needed extensions and development. On this matter of microphone advertising the B.B.C. has been eminently sane and sound. Their successors can do no better than adopt the same practice and principle.

There is undoubtedly growing alarm and despondency among listeners at the Press reports of extravagant salaries for the Broadcasting Commissioners. I am glad to be able to say with authority that these reports are based merely on lobby gossip and have no foundation in fact. The chairman will no doubt get a reasonable salary, perhaps something of the order of £3,500. The commissioners will be lucky to receive as much as £750 each.

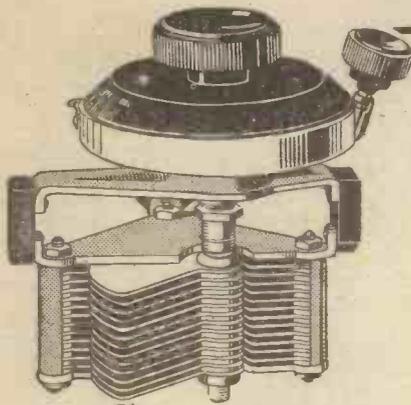
The biggest salary will go to the Executive Commissioner who will do most of the responsible work. I have heard no figure mentioned for this post, but I know it is worth not a penny less than £7,000 a year, rising to £10,000. Unless the Commission handle this in a generous way they will not retain the quality of talent for the pivotal post without which the whole service will suffer seriously. The executive head of British Broadcasting should rank with the biggest business executives of the Empire.

I was surprised to hear the other day that the British seaside resorts are not showing much alacrity in responding to the offer of the B.B.C. to help to put them more prominently "on the map." With the exception of Brighton, Bournemouth, Eastbourne and one of two others there is so far little or no response.

### The Sea-side Broadcasts.

This is a great pity and for the sake of the populations concerned, I hope the civic authorities will soon take action. The idea is quite simple and feasible. The B.B.C. is willing to take appropriate and characteristic programme material from any British holiday resort. This will be worked up into programmes and broadcast throughout the country together with brief talks on the particular merits of the place of origin of the programme.

Most resorts have suitable programme material to hand and need not go to more than nominal expense in the matter. There is, of course, no payment to the B.B.C. Here is an excellent example of the right use of the microphone in advertising.



## The "Utility" Low Loss Condenser is backed by our Guarantee

Loss has been practically eliminated in this "Utility" Condenser by token of its construction.

One end plate only is used, and all sources of loss have been reduced to a minimum. Like every "Utility" component, this Condenser is unconditionally guaranteed.

If for any reason a "Utility" Component fails to give complete satisfaction, we will correct or replace it free of charge. You are therefore safe in buying Guaranteed "Utility" Components.

All up-to-date dealers stock "Utility" components.

**WILKINS & WRIGHT LTD**  
KENYON ST. *Utility* BIRMINGHAM

**Utility**  
GUARANTEED  
COMPONENTS

## SCRAP H.T. BATTERIES!



**THE EKCO H.T. UNIT**  
(PATENTS APPLIED FOR)

Derives H.T. from the mains (D.C.) by just attaching adaptor to electric light lamp-holder 1

**NO NOISE — NO "HUM."**  
RUNNING COSTS NEGLIGIBLE.  
ENSURES PERFECT RECEPTION.  
VARIABLE AND FIXED VOLTAGES.

SIZE 6" X 6" X 3"  
Model 2 A.

### A RECENT REPORT.

16/3/1926.

Edinburgh.

"I am perfectly satisfied with the 'EKCO' H.T. Unit supplied me. It supplies ample current for my 4-valve A.J.S. receiver, and for the first time I have 'heard' a silent background. Its chief charm lies in the constant voltage—with an H.T. battery, when 'hanging' on a distant station, as the voltage dropped slightly (which it did every 10 minutes or so) retuning was necessary. This is now unnecessary, as I can keep a foreign station on the L.S. as long as I like. Finally, when cost is considered, H.T. batteries cost me £2 15s. 0d. every 4-6 months. The H.T. unit with one payment of £2 9s. 0d.—itself less than the cost of one set of batteries—is an immense saving."

(Signed) W. J. S. M.

ILLUSTRATED CATALOGUE

(Giving full particulars of the "EKCO" H.T. Unit Models)

**FREE!**

SATISFACTION OR CASH RETURNED.

**PRICES from 35/-**

TRADE ENQUIRIES INVITED.

**E. K. COLE** (Dept. A.) 505, London Road, WESTCLIFF-ON-SEA

FIT

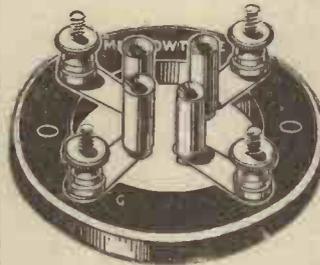
THE

## MELLOWTONE

### LOW LOSS VALVE HOLDER

—and ensure BETTER RESULTS

THIS is a scientifically designed component that meets a real need and is far superior to any other. The base is made from turned pure grade "A" Post Office quality ebonite—TERMINALS are fixed as standard—its self capacity is negligible—the dielectric losses are virtually zero—ensures perfect contact without any necessity for soldering—and is absolutely vibrationless.



Fit this Holder—it is guaranteed to give entire satisfaction. Obtainable from all reputable dealers.

PRICE

**3/3**

SATISFACTION. Obtainable from all reputable dealers.

Write for illustrated list of this and other "Mellowtone" specialities.

**MELLOWTONE**

MIDLAND RADIOTELEPHONE MFRS LTD.

BRETTELL LANE WORKS

STOURBRIDGE

London Depot:

"TRIUMPH HOUSE,"

Radio Ads.

189, REGENT ST., W.1.

## TECHNICAL NOTES.

(Continued from page 272.)



When  
every aid  
tells

When you have tuned in the carrier wave of a distant station then it is that a turn of your "Lissenstat" will put that final edge on your tuning which nothing else will. With "Lissenstat" control your valve is made sensitive to a touch. Signals from farther away are brought in stronger, sharper than ever before—through a background of dead silence. In your search for distant stations you can have no better ally.



Sold in three  
models:

Lissenstat  
Major 7/6

Lissenstat  
Minor 3/6

Lissenstat  
Universal  
10/6

# LISSEN

LISSEN LIMITED,  
8-16, Friars Lane,  
Richmond, Surrey

be connected to the receiver the wrong way round the steady current (if there is any steady current) will have the effect of diminishing the sensitivity of the loud speaker. It is sometimes a little troublesome to discover the polarity of the output terminals of the receiver, and most people do not take this trouble. A new and very simple device, however, by which the desired result may be obtained consists of a plug and socket attached to the loud speaker, so that the connections to it can be instantly reversed by pulling out the two-point plug and reversing it. This operation takes only a second, and by repeating the operation two or three times it is very easy to tell in which position the best result is obtained from a loud speaker, this being, of course, the correct position. The combination of this easily reversible two-point plug and socket with the loud speaker is the subject of an application for patent by the reader who submits the suggestion to me, but there would appear to be no reason why a similar result should not be obtained by connecting a two-point plug and socket to the loud speaker terminals by means of an inch or two of twin flex and achieving practically the same result.

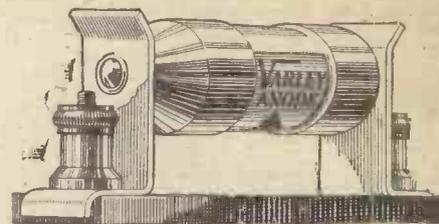
### Leclanché Batteries Popular.

There is a considerable tendency recently to revert to the Leclanché type of battery, not only for high-tension but also for low-tension filament lighting work, and by this I mean, of course, the liquid type, not the dry cell type, although the latter is also a Leclanché type battery. The dry battery has much to recommend it from the point of view of convenience, but on the other hand it has many serious drawbacks from the point of view of efficiency and life, and in this connection I have myself frequently urged during the past two years that a return to the wet type of Leclanché battery would be a very desirable step, particularly since the almost universal adoption of the dull-emitter type of valve. Judging from letters which I receive there must be a large number of wireless users who are in districts where electric supply is not available and who find the recharging of accumulators a very awkward matter. The use of ordinary primary batteries should be a great convenience to people so situated, as when the batteries are exhausted it is only necessary to recharge them chemically, which is a comparatively simple matter. I have had a number of special types of primary battery, including batteries of the Leclanché type, and certain other special ones, both for high-tension and low-tension work, under test for nearly two years, with some remarkable and promising results. Fuller particulars of these, however, will be forthcoming shortly.

### Accumulator Acid Fumes.

A reader points out a curious experience he had with the oak of his cabinet, due, presumably, to the gases from his accumulators, which were entirely housed within the cabinet, without any ventilation. The terminals and many of the metal parts within the cabinet became corroded, but that would not be a matter for surprise,

(Continued on page 296.)



### The Varley Constant Wire-Wound Anode Resistance

ensures absolutely perfect tone and constancy under all atmospheric conditions, because it is non-inductively wire wound on the famous Varley Bi-Duplex principle with the turns silk-separated. This resistance is a sound product of 27 years' experience in intricate and accurate wire winding. For inter-valve coupling where freedom from distortion is required, resistance capacity is unequalled. To obtain the height of perfection the resistance unit should be a Varley.

### Wire Wound and Weatherproof.

Complete with  
Clips and Base **7/6**

Without Clips and Base 6/-

60,000 ohms, 80,000 ohms, 100,000 ohms.

Write for Leaflet



Constant always

THE VARLEY MAGNET Co., WOOLWICH,  
(Proprietors: Oliver Pell Control, Ltd.) S.E.18.  
Telephones: Woolwich 588, 889.

### THE 'PHONE REPAIR SERVICE

Phones Rewound and Remagnetized ... 4/6  
Phones Remagnetized and Readjusted ... 2/-  
Loud Speakers and Transformers Rewound  
Earcaps, Leads, Diaphragms. Postage extra.  
The H.R.P. Co., 48, St. Mary's Road, Leyton, E.10

### RADIAX DX COILS

Increase Selectivity 100%.

Give an auto-coupled tuning circuit without altering your set. You will cut out the local, or separate two difficult stations to an extent undreamed of. 5 terminals make it a Universal coil. To introduce, a free chart will be given with each purchase, showing the many circuits in which this coil can be used—Auto-Coupled, Neutrodyne, etc.

No. 35, 4/6. No. 50, 5/-. No. 75, 5/6. No. 150, 7/6. Set of 4, 21/- Postage extra.

RADIAX LTD. 10, Accessory House,  
Palmer Place, Holloway, N.7



### HEADPHONES 3/9 Only.

We have 700 pairs of Headphones. ALL-BRITISH manufacture, light aluminium headbands, 4,000 ohms resistance, 7 feet cords. Every pair is brand new, and tested before despatch. These are to be cleared at the exceptional price of 3/9 per pair, post paid. This is an offer which can never be repeated after present stock is cleared, so write NOW and make sure of getting your pair.

C. WILDE, Wireless Dealer,  
WILLESBOROUGH, ASHFORD, KENT

### H.T. Accumulators

60 Volts

3 Actual Amp-hour **37/6**



MONEY RETURNED IF NOT SATISFIED

Obtainable only from:  
ACCUMULATORS ELITE,  
31, Waterhouse Street, HALIFAX.  
Trade Supplied. Telephone 1304.

# THE MARC CHARGER

For alternating currents, all voltages.



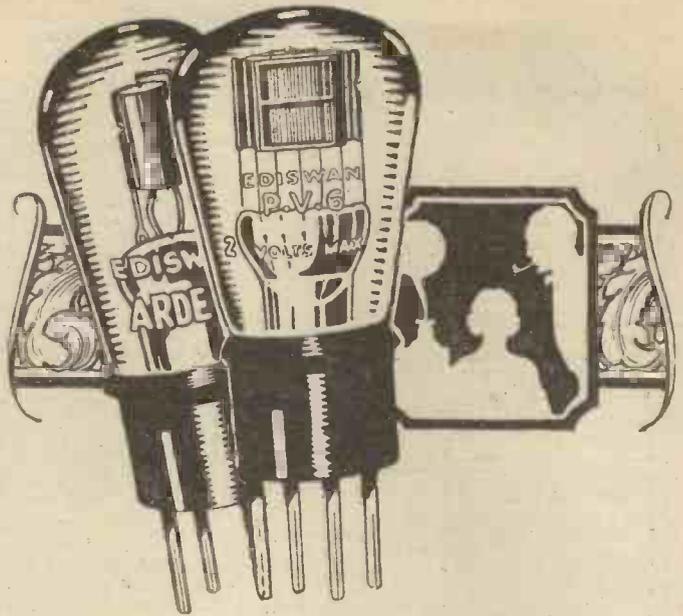
RECHARGE YOUR ACCUMULATORS AT HOME for LESS THAN ONE FARTHING PER DAY

2-4-6 Volts, and 40-80 Volts. Charges up to 6 Amps. 20,000 in use in France.

SILENT, SAFE, PRACTICAL, ABSOLUTELY RELIABLE, GUARANTEED.

Describeive Brochure for 6d. P.O. Listen-in while you re-charge. Postage to France, 2½d. POST FREE **15/-** POSTAL ORDERS ONLY

S. S. GARRIGAN (Ex-Service Men), 83, Rue Lamarck, PARIS, FRANCE



Once, the *first* Valve ever made: now, the *best* Valves ever made

## EDISWAN VALVES

WILL IMPROVE ANY SET.



A SCIENTIFIC COMBINATION

achieving results unrivalled in clarity, purity and economy, is obtainable by the use of the Edison

### P.V.6. (The Loud Speaker Valve) & A.R.D.E VALVES

For 2 Volt Battery

Tests in thousands of experiments have endowed this combination with a wonderful record.

Made in Britain's Most Efficient Valve Works by THE EDISON SWAN ELECTRIC CO., LTD., 123/125, Queen Victoria Street, London, E.C.4

## BECOL — the dependable EBONITE

REGISTERED TRADE MARK

"BECOL" is more than a trade mark—it is your protection. It stands for all that is best in ebonite manufacture—it is a positive guarantee of panels free from surface leakage. That's why the expert, wherever he may be, says "BECOL." He knows from experience there is no better ebonite in the world.

RODS, TUBES, SHEETS, MOULDINGS.

Always ask for "BECOL."

THE BRITISH EBONITE Co. Ltd., Hanwell, LONDON, W.7.



### Two in One!

The new Dual Rheostat is a "Peerless" product in every way. Specially designed to meet the demand for a resistance equally applicable to bright or dull emitters. It has two windings—one offering a resistance of 6

ohms, whilst a continuation of this is of 30 ohms resistance. The resistance element is wound on a hard fibre strip under great tension. One hole fixing is provided and the terminals are placed in convenient positions. The contact arm has a smooth silky action, and all metal parts are nickel-plated.

### 3/9 PEERLESS 3/9 DUAL RHEOSTAT

Ask your Dealer or send direct.

THE BEDFORD ELECTRICAL & RADIO CO., LTD. 22 Campbell Road, Bedford.





**WIRELESS - BUREAU**  
 For your Wireless Set. Compact as a Gramophone, free from dust or interference, delightfully finished—  
**High Grade Solid Oak, from £3.3.0 to £6.6.0**  
 Sent on APPROVAL. Satisfaction or Money returned. Unrivalled selection of Cabinets. Send for Lists to—  
**PICKETT'S CABINET WORKS (P.W.)**  
 (Members B.B.C.) BEKLEY HEATH, Kent.

**PATENTS, TRADE MARKS,**  
 Inventions, Advice, Handbook & Consultations  
**FREBE - B. T. KING, C.I.M.E., Regd.**  
 Patent Agents (G.B., U.S. & Canada), 146A, Queen Victoria Street, London, E.C.4.  
 40 years' references. Phone: Cent. 682.

**EBONITE BUSHES**  
 FOR MOUNTING ON WOOD. PERFECT INSULATION.  
 Orders under 1/- send 1/6 postage. Two required for each hole.  

NUMBER	0	1	2	3	4	5	6
Hole in Bush	6BA, 4BA, 2BA, 1/4"	5/16"	3/8"	7/16"			
Price each	1d.	1d.	1d.	1d.	2d.	2d.	2d.

**DAREX RADIO CO., Standard Works, Forest Hill, S.E.2.**

**REPAIRS** SETS PHONES TRANSFORMERS  
 Officially Approved by Radio Association.  
**ALL WORK GUARANTEED LOWEST PRICES 24 HOUR SERVICE**  
 Cash on Delivery if Desired.  
**JOHN W. MILLER, 68, Farringdon St., E.C.4.**  
 Phone: Central 1950.

**EASY PAYMENTS**  
 Send a list of the parts you want and we will forward you a quotation on the hire purchase system! Example of terms—£2.10s. parts; 25/- deposit and 6 monthly payments of 6/6.  
**LOUD SPEAKERS.** Any make to your selection. Examples: Brander T.T., 4 monthly payments of 8/-; Brown's H.I., deposit 25/6, 6 monthly payments of 10/9.  
**H. W. HOLMES, 29, Foley Street, Great Portland Street, W.1.** Phone: Museum 1414.



**RADIAX H.T. ACCUMULATORS**  
 Give a perfect H.T. Supply for many months with one charge. Improve reception wonderfully.  
 10 Volt Unit..... 6/9  
 60 Volt Battery..... 50/-  
**RADIAX LTD.,**  
 10, Accessory House, Palmer Place, Holloway, N.7.

**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/-; new 66-Volt H.T. Battery, guaranteed, 7/-; 2-Valve All Station Set, £4. Approval willingly.  
**P. TAYLOR, 57, Studley Road, Stockwell, LONDON.**

**VALVES Repaired Quick**  
 Let our valve making plant repair your broken or burnt out valves efficiently & promptly (most makes). Guaranteed—equal to new. Bright emitters 5/-; "DE" 12 and 3v. types, 7/6. Power valves slightly more, see list. Not repairable: S.P.'s WECCO v.24.  
**RADION** Reliable Repairs  
**RADIONS Ltd., Bellingdon, Nr. MACLESFIELD, Ches.**  
 Largest valve-repairing firm in the world. List Free.

**—ware damp!**  
**DUOPRENE SOLUTION**—Prevents damp attacking brown paper, parchment, textiles, etc., used in the manufacture of Loudspeaker Horns, Diaphragms, etc.  
**DUOPRENE SOLUTION**—Is easily applied. Does not disfigure the surface, and renders the material impervious to damp, thus assuring clarity of sound.  
 Packed in cartons containing solution, brush and instructions for use. 1/6 each.  
**A. H. DAVIS, LTD.,**  
**Paint and Varnish Manufacturers,**  
 MAGUIRE ST., LIVERPOOL, & 23 BILLITER ST., LONDON, E.C.3. (Established 1887)  
**STOCKISTS WANTED.**

**TECHNICAL NOTES** (Continued from page 204.)

What, however, was more strange was that the wood itself was evidently affected in a way that seemed to show that chemical action had taken place between the fumes from the battery and some chemical used in the preparation of the wood.

As a general principle, if the batteries are to be housed within the cabinet, they should be in a compartment which is divided off from the main cabinet, and proper ventilation should be provided. The terminals of the battery itself should also be well varnished. As for the wood, this may be painted inside the battery compartment with anti-acid paint, or even with paraffin wax.

**THE "P.W." "SIMPLICIMUS" RECEIVER.**  
 (Continued from page 271.)

in the detector position and an Ediswan P.V.6 D.E. in the L.F., or again a Six-Sixty S.S.2 and a Cleartron C.T.15, etc., etc. Between 60 and 72 volts H.T. are required.

Using two valves of the 3-volt '06 type with dry cells, no resistor will be needed, and the same applies to a 6-volt accumulator and two B.T.H. B.4's. These last, the B.4's, are the valves to deliver "punch," they are almost unequalled for this by the lower voltage types. When a shilling here and there is of no vital consequence the constructor should certainly go for B.4's.

**Easy to Handle.**

There are many values of resistors available ranging from .3 ohms to 55 ohms, so that any suitable type of valve can be used with any suitably sized battery. If the constructor desires to employ valves he has on hand he should ask Messrs. Burndey to supply a suitable resistor—they will be only too pleased to do this. Perhaps, better still, he could write to Messrs. Burndey and ask them to send him their leaflet W.P.42, which gives full information concerning the component. It must be remembered, however, that both valves must be of the same voltage type.

Tuning the "P.W." "Simplicimus" is so simple that it hardly requires to be detailed in this article. All that it is necessary to do is to adjust the left-hand dial until the desired station is heard and then to bring up its strength by adjusting the other dial. If there is any knack in getting real DX results with the set it will very quickly be acquired. If the set will not oscillate it will probably be found that the reaction coil has been connected the wrong way round. This can easily be put right.

Finally, we trust every reader who builds the "P.W." "Simplicimus" will agree that the mysterious manner with which it is possible to slip from the local station to 5 X X, the general excellence of reproduction and ease of operation, justifies our claim that it is the broadcast receiver of the year.

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**FOREIGN RADIO NEWS.**  
 FROM OUR OWN CORRESPONDENTS.

**Broadcasting in Venezuela.**

A RADIO broadcasting company has been established in Venezuela which will enable the transmission of programmes from the central station in Caracas to be broadcast throughout the most distant portions of the Republic. The programmes will include musical numbers, daily press news and talks on science, agriculture, commerce and subjects of general interest. For every receiving set installed in the Republic the company holding the contract will be entitled to collect a small fee.

**More Stations for Bolivia.**

The Bolivian Government has entered into a contract for the erection of an additional radio station at Roboré, in addition to that now undergoing construction at Santa Cruz. When completed these will give Bolivia II radiotelegraphic and radiotelephonic stations, the greater part of which have been equipped by the Marconi Company and others by the Telefunken Company.

**Radio in Costa Rica.**

A wireless station is in course of erection at San José, the capital of Costa Rica. The enterprise, which is the work of Mexican engineers and the gift of the Mexican Government, calls for the erection of two towers respectively of 146 metres and 95 metres in height. The transmission power of 10 kw. will enable the station to be heard in all parts of the Americas. The station will be modelled upon that of Buenos Aires.

**Belgians Plan Congo Radio.**

In the course of an interview with the *Nation Belge*, the Belgian Minister for the Colonies stated that the Government were firm believers in the usefulness of radio in linking up the colonies with the mother-country and were planning a big extension of radio in the Congo.

"At present," he stated, "we have twenty wireless stations in our African colonies. The station of Ilebo, which was finished in 1924 and uses 15 kilowatts, acts centrally and can communicate with every other colonial station. Elizabethville station, using 75 kilowatts, serves as liaison with Brussels.

"We are building at Stanleyville another station of equal power to that of Elizabethville, and this should be in working order in six months' time. It will then be possible to communicate from Brussels with any of our colonial posts with a single relay, at Ilebo, Stanleyville or Elizabethville.

"So important do we feel wireless communication to be that we are not resting content with this, but are studying plans for another three stations in various parts of our African possessions, which should be available before another year has passed. We are paying special attention to the question of short wave-lengths, and my personal belief is that this is at present the most promising field for radio progress."

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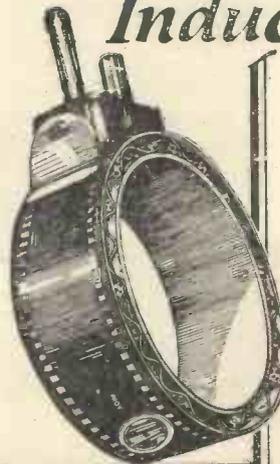
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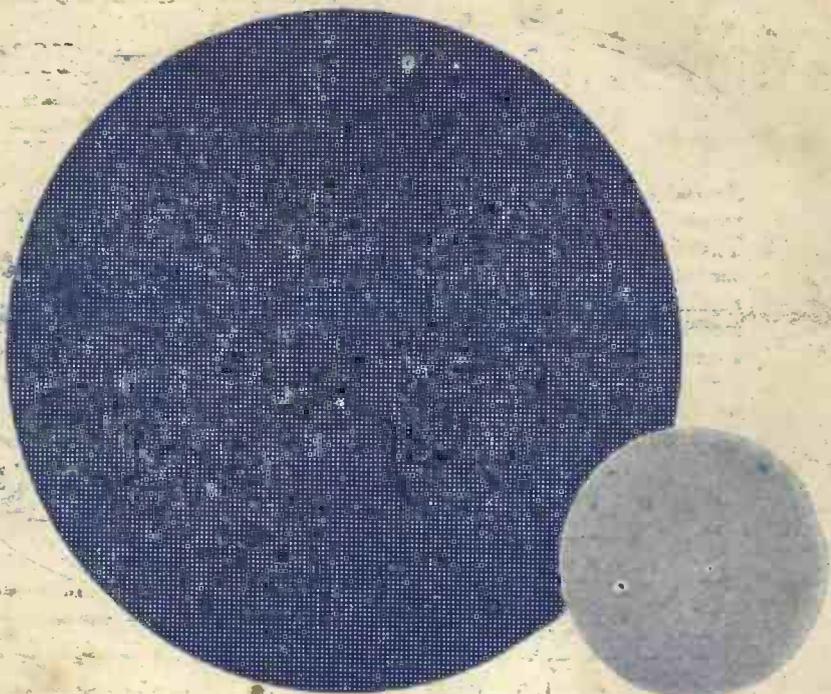
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